C831

Mrs. Peterson/JC/AV 793-5482

DEPARTMENT OF THE ARMY

HEADQUARTERS, US ARMY ARMAMENT MATERIEL READINESS COMMAND

ROCK ISLAND, ILLINOIS 61299

REPLY TO ATTENTION OF

DRSAR-SF

08 JUN 1983

SUBJECT: Nuclear Regulatory Commission (NRC) Request for Additional Information in Support of Renewal Application for By-Product Material License 12-00722-06

Commander
US Army Materiel Development and Readiness Command
ATTN: DRCDE-I

1. Reference letter, DRCSF-P, HQ, DARCOM, 6 April 1983, SAB.

2. The following replies are provided to the request from NRC, 31 March 1983, with Control Number 12383.

a. Request 1: Clarify the type of periodic radiation surveys that will be conducted in the maintenance and bulk storage facilities. Please confirm that these surveys will consist of instrument and smear testing surveys. Please specify the contamination limits that are acceptable under the smear survey program. Please refer to Regulatory Guide 8.21 (copy enclosed). You may state the criteria given in Tables 1 and 2 of this guide will be followed. Please confirm your safety instructions will be modified to include this criteria.

Response: Army Regulation (AR 700-64) requires monitoring at bulk storage locations by conduct of quarterly surveys using appropriate instruments to detect the taking of removable smears and evaluating them. Under the present 12-00722-06 license smears are taken in bulk storage locations monthly and evaluated by liquid scintillation counting for tritium. Action level is 400 dpm/100cm^2.

b. Request 2: Provide a copy of the instructions to personnel picking up, receiving, and opening packages of radioactive materials and confirm that you will follow the procedures given in 20.205 of 10 CFR Part 20.

Response: Army Regulation 700-64, para 5-6, Radioactive Commodities in the DOD Supply Systems (Encl 1), and AR 385-11, para 1-22, Ionizing Radiations Protection (Encl 2), define responsibilities for pickup, receipt, and opening of packages containing radioactive materials. This information

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is usually further supplemented by a local standard operating procedure at the particular Army installation. ARRCOM health physicists annually inspect bulk storage locations which store tritium devices under the 12-0072-04, 06, and 09 license. During these inspections the adequacy of fulfilling the above regulations is determined and corrective measures instituted as required. The Army regulations follow the procedures given in 20.205, 10 CFR Part 20.

c. Request 3. Under your proposed bioassay program, please clarify the conditions under which the Army will conduct tritium bioassays.

Response: The Army conducts tritium bioassays at those depots and Rock Island Arsenal which are designated locations for rework of equipment which contain the vials. Personnel who work with tritium have a baseline urinalysis taken at start of work and monthly thereafter. If an incident with tritium occurs, urinalysis for tritium is done at that time.

d. Request 4: With respect to the quality assurance program for contamination testing of the radioactive sources and related subassemblies, please clarify the wipe test contamination limit acceptable to the Army in terms of dis./min./cm2 of area tested (please specify).

Response:

(a) The present limit stated on drawings of sources submitted for the license is "removable radiological contamination by wiping shall be less than 1,000 dpms." This limit of removable contamination has been applied as 1,000 dpms per source regardless of the exact size of the source. The surface area of some sources is under 100 cm^2.

(b) The limit of 1,000 dpms removable contamination per source, where the source has a smaller surface area than 100 cm^2 is still far below the allowable contamination level. The total body burden for tritium is 2mCi (IRCP handbook). $2mCi = 4.44 \times 10^9$ dpm. If a worker were to ingest the maximum allowable contamination of 1,000 dpm per source per minute, it would take 1,850 40-hour work weeks or 9,250 8-hour work days to reach the tritium body burden. This assumes maximum allowable contamination and a constant ingestion rate of 1,000 dpm per minute. This does not take into account the biological half-life of tritium, i.e., 16-18 days. It is apparant that the 1,000 dpm limit per source will not present a hazard to the user in excess of allowable limits.

(c) Additionally, we requested in a letter dated 14 May 1982 and hand carried to the NRC, that the removable contamination level be set at 2,000 dpm/100 cm^2 for surfaces of equipment in which sources are installed. Using the same justification as above, if 2,000 dpm were ingested per minute constantly, it would take 925 40-hour work weeks to reach the maximum tritium

body burden. This is not taking into account the biological half-life of tritium, i.e., 16-18 days. We request that the contamination level be raised to a maximum 2,000 dpm/100 cm^2 for surfaces in which sources are installed. This limit is required to prevent losses of expensive equipment which cannot be reasonably decontaminated below the prestated limit.

(d) Use of equipment decontaminated to the 2,000/100 cm^2 level will be controlled to field use within the DOD. Equipment planned for release outside the DOD will be decontaminated to 100 dpm/100 cm^2 as stated in the license application.

3. Anniston Army Depot had been listed on the 12-00722-06 license as a bulk storage and depot level maintenance facility. However, the renewal request for the 12-00722-06 license listed Anniston only as a bulk storage facility. Request Anniston be listed as BOTH a bulk storage area and depot level maintenance facility. Attached are the Depot SOP for Handling Tritium, Resume for the RPO, and Repair Room Layout (Encl 3, 4, and 5).

4. Point of contact at this office are Mrs. Betty Peterson and Mrs. Kathy LaFrenz, AUTOVON 793-3482/FTS 367-3482.

FOR THE COMMANDER:

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LAWRENCE E. SMITH
Chief, Safety Office

5-4. PACKAGING

a. When it is necessary to repackage radioactive commodities because of loose issue or damage to the original container, the commodity shall be repackaged in accordance with instructions in the directives or regulations cited in paragraph 5-2 or to conform with the original package. The original container shall be opened and repacked carefully, and shall be monitored. Packaging and repacking operations, including monitoring, shall be carried out in a controlled area in the presence of qualified radiation protection personnel.

b. Containers shall be marked and labelled in accordance with MIL-STD-1458 and DSAM 4145.3/AFM 71-4/TM 38-250/NAVSUP PUB 505/MCO P4030.19.

5-5. OTHER SHIPMENTS. References cited in paragraph 5-2 above, regulates shipment of radioactive commodities by the U.S. Postal Service, and Commercial Carrier originating in the United States. The International Atomic Energy Agency and International Air Transport Association regulations are used often by foreign governments and for overseas air transport.

5-6. RECEIVING ACTIVITY RESPONSIBILITIES

a. Receiving activities shall establish procedures for the pickup, receipt, monitoring, opening, recording, and reporting radioactive commodity shipments in accordance with Title 10, CFR, sections 20.205 and 20.401.

b. As soon as a radioactive commodity is located in an incoming shipment, it shall be monitored with appropriate instruments to determine existence and magnitude of radiation hazards. When the exterior container of radioactive material shows signs of damage or leakage upon removal from the transport vehicle, the vehicle shall be monitored for contamination. A contaminated vehicle should be decontaminated below applicable levels in Table 4-1 and shall be decontaminated below levels in Title 49 CFR, section 173.397. Where contamination is noted, and when more than one carrier is involved in a particular shipment, the receiving activity shall initiate action to have radiation surveys made on the other carriers' equipment used to transport the material.

c. Should a container be leaking, it shall be resealed in the presence of qualified radiation protection personnel (chapter IV, paragraph 4-6d(4)) to prevent spread of contamination. When the cause of leakage has been determined, e.g., packaging deficiency or damage in transit, one of the following forms shall be prepared:

(1) DD Form 6, Packaging Improvement Report (AR 700-58/NAVSUP PUB 378/AFM 71-4/MCO P4030.29/DSAR 4145.8).

(2) SF 361, Discrepancy in Shipment Report (AR 55-38/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A/DSAR 4500.15). Radiological safety assistance may be required in preparing the aforementioned forms in order to prevent needless exposure of personnel who investigate the deficiency.

5-7. STORAGE AREAS

a. Open storage should only be employed when:

(1) The radioactive commodity is a component of an item that is authorized such type storage under Service or Agency directives or as required by the license or authorization.

(2) The radioactive commodity is a component part of an end item that is designed for use under conditions that involve exposure to elements. Example of such items are

Encl 1

(2) Proper equipment, facilities, and procedures to handle emergencies.

e. Obtain required licenses, authorizations, or permits before purchase, receipt, use, transfer, or disposal of radioactive materials.

d. Designate in writing an RPO, an alternate RPO and, when required, an ionizing radiation control committee (IRCC). A part-time duty assignment as an RPO has priority over normal duty assignments.

e. Provide a technical and administrative review and sign each application for an NRC license, DA authorization or permit, and every plan to use radioactive material and ionizing radiation sources. This ensures the adequacy and completion of each application and plan.

f. Enforce steps prescribed by the NRC and DA for the safe use, control, and disposal of radioactive materials, and report and correct safety defects and noncompliances (10 CFR 19, 20, and 21). If the provisions of each license, permit, or authorization are not followed, violations could—

(1) Cause grave risk to the health and safety of the public and personnel of the installation or activity.

(2) Lead to loss of license or to other restraints (including fines).

g. Advise all non-Army agencies wanting to use radioactive materials on Army property of the requirements of this regulation. This includes the need to acquire an Army permit. All Army contracts and leases will contain the requirement to restore Army property to NRC unrestricted use criteria. This regulation will be referenced as the authority.

h. Maintain an inventory of radioactive materials and of ionizing radiation producing devices under their command.

i. Continue to fulfill obligations of NRC licenses until relief is given through an amendment to the license. Licensed applicants will coordinate applications with involved major Army commands or specific field activities to inform them of the responsibilities the amended license will impose.

1-21. Point of origin commander. The commander at the point of origin for a radioactive shipment will—

a. Ensure the consignee is authorized by a proper NRC or Agreement State license (if required) to receive the shipment.

b. Arrange the movement of radioactive material (see AR 55-16, AR 55-162, and AR 55-355).

c. Coordinate with civil law enforcement agencies when help is needed to move and route radioactive shipments.

d. Comply with host nation transportation requirements or transportation SOFAs, whichever is more stringent.

e. Arrange for technical escorts, when required.

f. Inspect and survey vehicles and cargo.

g. Package, label, mark, block, and brace radioactive material for shipment and prepare the shipping documents.

1-22. Receiving activity commander. The commander of the receiving activity will—

a. Accept, off-load, survey, inspect, and acknowledge receipt of shipment.

b. Arrange for receipt or quick pickup of packages containing amounts of radioactive materials in excess of Type A quantities (see 49 CFR 173.389-173.390).

c. Pick up incoming packages of radioactive material within 3 hours of notification by the carrier, when practicable.

d. Monitor each package of radioactive material within 3 hours after receipt (except packages exempt by 10 CFR 20.205) during normal working hours or within 18 hours if received after normal working hours and document the results. Even though 10 CFR 20.205 exempts certain packages from immediate monitoring, all packages of radioactive materials should be monitored before they are opened.

e. Notify at once the carrier delivering the materials if external radiation or radioactive contamination in excess of that specified in 10 CFR 20.205 or in 49 CFR 173.397 is detected.

f. Inform the NRC regional office (see table 4-2) by telephone or telegraph when the external radiation or radioactive contamination exceeds that listed in 10 CFR 20.205.

g. Notify the appropriate Army command (see table 4-1) when—

(1) A radiological accident happens in transit, which is reportable under AR 385-40.

(2) A host nation, Federal or State agency, or delivering carrier must be notified of radioactive contamination caused in shipment or by an incident involving the transport of radioactive materials. (See 10 CFR 20.205, 20.403, 20.405, 73.30, 73.36, 46 CFR 171.15 and 171.16; and 29 CFR 1910.9861); and appropriate host nation or agreement state requirements.)

h. Notify the NRC licensee of radiation incidents occurring in transit if the licensee must report them to the NRC. (See 10 CFR 20.205, 20.403, 20.405, 71.61, 73.31, and 73.36.)

1-23. Commanders responsible for radioactive material logistics. Commanders or managers logistically responsible for radioactive items will—

a. Ensure the technical literature on the item includes—

(1) Amount and type of radioactive material contained.

(2) Safe handling, storing, and disposal procedures.

(3) Ways of preventing enemy use.

b. Prepare a security plan for disposing of classified radioactive material. The plan will—

(1) Be a part of the technical literature for the item.

(2) Provide security protection equal to the level of security classification involved.

(3) Furnish procedures for declassification.

1-24. Commanders having unwanted radioactive material. Commanders of organizations, units, and activities having unwanted radioactive material will—

a. Ensure, when property is contaminated by radiation, all practical efforts are made to decontaminate the items before disposal (see TM 3-220 and AR 700-64). If it is not economically sound to decontaminate the property or if the contamination cannot be reduced to a safe level, then the property will be treated as radioactive waste.

b. Report through command channels all surplus radioactive material to be screened for further use or disposal.

c. Declassify radioactive waste, if possible. If declassification is impossible, the classified waste must be processed, stored, packaged, and reported separately from all unclassified radioactive waste.

d. Obtain disposal instructions for radioactive waste to be buried at sites in the United States from Cdr, ARRCOM, (ATTN: DRSAR-MAD-GC), Rock Island, IL 61299. Oversea activities will route their requests for disposal instructions as directed by the major Army commander in that area.

e. Provide for local storage and shipment of unwanted radioactive material.

1-25. Ionizing Radiation Control Committee (IRCC). *a.* The IRCC is an advisory body to the commander in fulfilling his or her responsibilities. The committee should consist of the—

(1) Commander

(2) Radiation protection officer

(3) Medical officer (if one is assigned)

(4) Safety officer, or

(5) Representatives of the officers in (1) through (4) above

(6) Representatives of an employee organization

(7) Other personnel knowledgeable in radiation safety

b. The committee should establish the local rules and procedures for procurement, storage, and safe use of radiation sources. Additional responsibilities of the committee are to—

(1) Review proposals to use or procure radioactive items, such as SOPs and applications for licenses and authorizations.

(2) Study reports of incidents and adverse findings.

ANNISTON ARMY DEPOT

SAFETY SOP

HANDLING DEVICES CONTAINING TRITIUM GAS

1. PURPOSE: To provide policies and guidance, establish responsibilities, and describe procedures for the safe handling of self-luminous devices and components which contain tritium gas as authorized by Nuclear Regulatory Commission (NRC) licenses.

2. SCOPE: This SOP is applicable to all depot organizations and personnel who are working with devices or components that contain tritium gas.

3. POLICY:

a. Military and civilian depot employees and all installation visitors will be afforded radiation safety at least equal to that required by 10CFR19 and 20.

b. Proposals to obtain, use, store, transport, maintain, or dispose of items which contain tritium gas will be carefully evaluated to assure that all resulting exposures to radiation will be kept to a minimum.

c. Adequate procedures, facilities, equipment, and trained personnel will be provided to assure the safe use and handling of devices and components that contain tritium gas. Failure to meet this requirement will result in cessation of operations or delay in start-up.

4. DEFINITIONS:

a. Activity (Radioactivity) The number of nuclear transformations occurring in a given quantity of material per unit time. The unit of measure is the curie (Ci).

b. Contamination (Radioactive) Deposition of radioactive material in any place where it is not desired, and particularly in any place where it's presence can be harmful.

c. Curie (Ci) A measurement unit of radioactivity. One Ci equals 3.7×10^{10} nuclear transformations per second. One millicurie (mCi) is one-thousandth of a curie. One microcurie (uCi) is one-millionth of a curie.

d. Decontamination The process of removing radioactive contamination from facilities and personnel.

e. Exposure, Occupational Exposure to ionizing radiation that is incurred as a result of an individual's employment or duties which are in support of facilities which use materials or machinery capable of producing ionizing radiation.

f. Ionizing Radiation Electromagnetic or special radiation capable of producing ions, directly or indirectly, in it's passage through matter. Alpha and beta particles, gamma rays, X-rays, and neutrons are examples of ionizing radiation.

g. Ionizing Radiation Control Committee A group of qualified personnel officially appointed by the Commander to set local policy and to guide the radiation protection program.

h. Leak Test Test of how well an encapsulated source is containing it's radioactive content.

i. License (specific) A document issued by the NRC under 10CFR that gives the right to the bearer to procure, receive, store, transfer, and use specified radioactive items under specific terms.

j. Radiation Area Any area, accessible to personnel, in which there exists radiation, originating in whole or in part within licensed material, at such levels that a major portion of the body could receive in any one hour a dose in excess of 2 millirem, or in any five consecutive days, a dose in excess of 100 millirems.

k. Radiation Controlled Area Any area where access or occupancy is controlled for the purpose of protection of individuals from exposure to ionizing radiation and radioactive materials.

SUBJECT: Handling Devices Containing Tritium Gas

l. Radiation Hazard A condition under which persons might receive radiation in excess of the applicable maximum permissible dose, or where radiation damage might be caused to materials or personnel.

m. Radiation Protection Officer A person appointed by the Commander to give advice on the hazards of ionizing radiation and to supply effective ways to control these hazards.

n. Radiation Sources Materials or devices that produce or are capable of producing ionizing radiation.

o. Radiation Worker Any person occupationally exposed to ionizing radiation and/or radioactive materials.

p. Radioactive Waste Includes the following:

(1) Property contaminated to the extent that decontamination is economically unsound.

(2) Surplus radioactive material whose sale, transfer, or donation is prohibited.

(3) Surplus radioactive material that is determined to be unwanted after being advertised as surplus.

(4) Waste that is radioactive due to production, possession, or use of radioactive material.

q. Radioactive Self-Luminous Source Consists of pyrex glass tube coated on the inside with phosphor material and filled with radioactive tritium gas. The interaction between the phosphor and tritium gas produces light.

r. Tritium Gas Radioactive hydrogen gas. It emits weak beta particles. Detection must be accomplished by air monitor or analysis of smear samples by a liquid scintillation detector.

5. GENERAL REQUIREMENTS:

a. Storage or use of eating, drinking, chewing, smoking, and cosmetic materials

DEPARTMENT OF THE ARMY
US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
DOVER, NEW JERSEY 07801

REPLY TO ATTENTION OF

APR 12 ..2

DRDAR-LCS-DI

SUBJECT: Renewal of Nuclear Regulatory Commission (NRC) License BML 12-00722-06

Commander
US Army Armament Materiel Readiness Command
ATTN: DRSAR-SF, Mr. Morris
Rock Island, IL 61299

1. Reference is made to your Le ter, DRSAR-SF, dated 25 Mar 82, to DRDAR-LCS-DI, same subject.

2. In reference to paragraph 3 of referenced letter, the following information is forwarded:

a. Twenty eight (28) M224, 60MM Mortars have been released to the field as of 12 Mar 82. These weapons were fired at Ft. Steward, GA and Ft. Lewis, WA. A total of 18,000 rounds have been fired in these weapons, of which 6,000 were M720 60MM Cartridges (new HE Round). To date, there have been a total of four Range Indicator Assemblies (RIA) failures of which two should be considered chargeable and two should be considered non-chargeable as reliability failures . The chargeable RIA failures include: (1) which failed during firing in Minnesota in December 1981, and (1) which failed during a jump in February 1982. The non-chargeable failures include: (1) which was accidentally stepped-on while removed from the handle in Jul 81, and (1) which broke when a weapon was accidentally dropped from a height of approximately (5) feet in Sept 81. These weapons were utilized by the U.S. Army Ranger Battalions.

b. During Feb 82 this command initiated a modified acceptance test to 100% proof test the M224 Mortars in lieu of the normal 20%, which contain four tritium sources of .8 curies each in the Range Indicator Assembly (RIA).

c. This proof testing involved firing mortar rounds at charges higher than is used in normal service, with the immeidate objective of accepting 698 mortars for delivery to the Marine Corps.

d. Utilization of this overtest procedure will screen marginal RIA's, resulting in a very minimal number which could eventually break during normal field use.

/

Mrs. LaFrenz/drn/AV 793-6982

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND
ROCK ISLAND, ILLINOIS 61299

REPLY TO ATTENTION OF
DRSMC-SF (R)/24-0095

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SUBJECT: Address Change

THRU: Commander
US Army Materiel Development
and Readiness Command
ATTN: DRCSF-P

'84 JAN -4 P3:27

TO: Director
Nuclear Material Safety and Safeguards
ATTN: Radiosotopes Licensing Branch
US Nuclear Regulatory Commission
Washington, DC 20555

1. Due to a recent reorganization, the new name and address of this headquarters is as follows:

Commander
US Army Armament, Munitions and Chemical Command
ATTN: DRSMC-SF (R)
Rock Island, IL 61299

2. Request the following Nuclear Regulatory Commission (NRC) licenses be amended to reflect the changes:

a. BML-12-00722-04

b. BML-12-00722-06

c. BML-12-00722-07

d. BML-12-00722-08

e. BML-12-00722-09

f. SMB-1314

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DRSMC-SF (R)
SUBJECT: Address Change

g. SUB-1340

h. SUC-1380

i. SNM-1745

FOR THE COMMANDER:

LAWRENCE E. SMITH
Chief, Safety Office

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DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND
ROCK ISLAND, ILLINOIS 61299

REPLY TO ATTENTION OF

DRSMC-SF (R)

11 APR 1984

SUBJECT: Request for Amendment to Nuclear Regulatory Commission (NRC) License BML12-00722-06

Commander
US Army Materiel Development and Readiness Command
ATTN: DRCSF-P

1. Reference:

a. Letter, DRDAR-LCS-DI, HQ, ARRADCOM, 18 Apr 82, subject: Renewal of NRC License BML12-00722-06 (encl 1).

b. 1st Ind, 28 Oct 83, to ltr, DRSMC-SF (R), HQ, AMCCOM, 12 Aug 83, SAB.

c. Letter, DRDAR-LCS-DI, HQ, ARRADCOM, 8 Apr 83, subject: QDR M12130-82-001, M224 Mortar, Range Indicator Assembly, USMC, Incident Report (encl 2).

2. Subject NRC license is held by this command. The license includes a requirement for 100 percent test firing of M224 Lightweight Company Mortar (LWCM) in lieu of the usual 20 percent testing, (reference 1a). This amendment request is asking for relief from this requirement.

3. The 100 percent test firing requirement was added to the license since breakages of tritium lamps occurred in the range indicator assembly (RIA) of the LWCM during preliminary testing. At that time, it was anticipated that the test firing would screen out marginal RIAs and preclude a high breakage rate in the field.

4. Since the initiation of the 100 percent test firing, data has been compiled (attached as encl 3) which shows that virtually all the breakages occur when the LWCM is fired at charge 5 and higher. Users in the field do not use a charge higher than charge 4. Each LWCM shell is provided with only four propellant increments that are located between the body and fin of the mortar. Unless additional charge increments are manually added to the mortar shell, personnel in the field cannot fire at a charge 5 or higher setting.

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DRSMC-SF (R) 11 APR 1984

SUBJECT: Request for Amendment to Nuclear Regulatory Commission (NRC) License BML12-00722-06

Additionally, range data in the firing table of the operator manuals for the LWCM include information for charges 0-4 only. The charges 5 and higher used during testing simulated "worst case" conditions. Therefore, this command feels the breakage rate in the field will be lower than that experienced during testing.

5. The original premise that the 100 percent test firing would screen out marginal RIAs is no longer valid, since the problem is in the design of the item and is not the quality of manufacture. A Product Improvement Program (PIP) to correct the design deficiency has been proposed and is scheduled for funding in the FY 85 budget. Therefore, to continue the 100 percent test firing serves no useful purpose whatsoever. The breakage rate in the field is expected to be far lower than what is experienced during testing due to the higher charges used in the testing.

6. Additionally, the cost to 100 percent test fire LWCMs for the Marine buy exceeded $900 per weapon. Breakdown of the costs from TECOM is attached as encl 4. Unless the 100 percent requirement is deleted from the NRC license, this command would have to spend over $900 per weapon to test an item when the failure rate and cause of failure are already known.

7. A previous submission of this amendment request was rejected by HQ, DARCOM (reference 1b). Additional requirements were imposed, many of which this command feels are not applicable to this amendment request. These are addressed in encl 5.

8. This amendment is simply asking for relief from the 100 percent test firing requirement. Request that serious consideration be given to allow the NRC to review this amendment request. Testing at the 100 percent level is no longer justified, is not cost effective, and provides no additional safety for the user.

FOR THE COMMANDER:

JON R. MORGAN
Colonel, GS
Chief of Staff

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as

DEPARTMENT OF THE ARMY
US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
DOVER, NEW JERSEY 07801

REPLY TO ATTENTION OF:

DRDAR-LCS-DI

SUBJECT: Renewal of Nuclear Regulatory Commission (NRC) License SML 12-00722-06

Commander
US Army Armament Materiel Readiness Command
ATTN: DRSAR-SF, Mr. Morris
Rock Island, IL 61299

1. Reference is made to your Letter, DRSAR-SF, dated 25 Mar 82, to DRDAR-LCS-DI, same subject.

2. In reference to paragraph 3 of referenced letter, the following information is forwarded:

a. Twenty eight (28) M224, 60MM Mortars have been released to the field as of 12 Mar 82. These weapons were fired at Ft. Steward, GA and Ft. Lewis, WA. A total of 18,000 rounds have been fired in these weapons, of which 6,000 were M720 60MM Cartridges (new HE Round). To date, there have been a total of four Range Indicator Assemblies (RIA) failures of which two should be considered chargeable and two should be considered non-chargeable as reliability failures. The chargeable RIA failures include: (1) which failed during firing in Minnesota in December 1981, and (1) which failed during a jump in February 1982. The non-chargeable failures include: (1) which was accidentally stepped-on while removed from the handle in Jul 81, and (1) which broke when a weapon was accidentally dropped from a height of approximately (5) feet in Sept 81. These weapons were utilized by the U.S. Army Ranger Battalions.

b. During Feb 82 this command initiated a modified acceptance test to 100% proof test the M224 Mortars in lieu of the normal 20%, which contain four tritium sources of .8 curies each in the Range Indicator Assembly (RIA).

c. This proof testing involved firing mortar rounds at charges higher than is used in normal service, with the immeidate objective of accepting 698 mortars for delivery to the Marine Corps.

d. Utilization of this overtest procedure will screen marginal RIA's, resulting in a very minimal number which could eventually break during normal field use.

Encl 1

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DRDAR-LCS-DI
SUBJECT: Renewal of Nuclear Regulatory Commission (NRC) License BML 12-00722-06

e. Concurrently, this Command is actively pursuing a Product Improvement Program (PIP) to upgrade the current design and eliminate future breakage of the RIA during intensive and normal handling, storage and firing of the LWCMS.

3. The information requested in paragraph 2. of the referenced letter is being forwarded under separate cover by our Safety Office (DRDAR-SF) and will include concurrence from this office.

HAROLD CHANIN
DPO - LWCMS

CF:
CDR, DARCOM
ATTN: DRCSP-P

DEPARTMENT OF THE ARMY Mr HGoldman/mlc/880-5983
US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
DOVER, NEW JERSEY 07801

REPLY TO ATTENTION OF

DRDAR-LCS-DI

SUBJECT: QDR M12130-82-001, M224 Mortar, Range Indicator Assembly, USMC, Incident Report

Commander
US Army Armament Materiel Readiness Command
ATTN: DRSAR-SF
Rock Island, IL 61299

1. Reference letter, DRSAR-SF, dtd 11 Mar 83, Subject: Quality Deficiency Report (QDR) M12130-82-001 on Range Scale of 60MM Mortar, M224.

2. Per request, subject QDR has been reviewed and the following comments are provided:

a. ARRADCOM technical representatives visited the USMC unit at Camp LeJeune in January 1983 and examined the damaged material. Meetings were also held with representatives of the USMC Logistics Base. The breakages are considered to be known reliability failures and not a safety issue.

b. A New Start, FY85 Product Improvement Program (PIP) has been approved in which the Range Indicator Assembly (RIA) will be redesigned to significantly improve its strength characteristics and thus increase field reliability. Forecasted availability of modified RIA's is in the 1987-1988 timeframe.

c. Until such time as the modified RIA's are available, it will be necessary to obtain spares via the normal supply system. An adequate quantity of spare RIA's has been procured in anticipation of the previously indicated marginal reliability condition.

3. For additional information, contact Harvey I. Goldman, AV 880-5983.

FOR THE COMMANDER:

HAROLD CHANIN
DPO - LWCMS

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nc

CF:
DRSAR-MAL-L

Encl 2

TEST FIRING SUMMARY

The test firing was performed at Aberdeen Proving Ground from February 1982 to May 1983. There were two types of test firing, proof and screen. Proof testing consisted of five rounds, round one at charge two; round two at charge four; round three and four at charge five; and round five at higher than charge five. There were three rounds fired in the screen test. Round one was at charge four; round two at charge five; and round three at higher than charge five. Eighty percent of the mortars were screen tested and 20 percent were proof tested.

Although the field does not use a charge higher than four, the mortars were fired at charge five and higher as a safety test to the mortar barrel to simulate "worst case" situations. Of the 750 weapons tested, there were 84 failures, or 11 percent failures. There were 82 failures at charge 5 and higher and only two failures at maximum field charge, charge four.

The data lists the failures that occurred during the test firing. Column one is the date of the test firing. Column two indicates the number of mortars fired. The "P" is the number proof tested and "S" is the number screen tested. Column three is the serial numbers of the mortars that experienced breakages of the RIA lamps. Column four is the number of broken lamps per assembly. There are four tritium lamps per RIA, each lamp containing 0.8 curies maximum for a total of 3.2 curies tritium per RIA. Column five is the round number when the breakage occurred. Column six is the charge when the breakage occurred. The "NA" indicates the pressure reading was not available. Column seven is the location of the broken lamps, T=Top, B=Bottom, L=Left and R=Right.

Column eight indicates the weapon pressure in pounds per square inch. Page three of this data indicates the expected pressures for the M720 and M49A4 ammunition. The M720 ammunition was used for the testing and it is the ammunition the Army proposes to use when the unit is fielded.

Column nine is the results of wipe tests of the RIA after a breakage occurred in counts per minute. This indicates the amount of removable contamination. The contamination has been limited to the handle of the RIA. The rest of the mortar has not been affected. When a failure occurs, the handle is simply removed, placed in a plastic bag, and sent to a licensed depot for repair. Contaminated items are not fielded.

Encl 3

HISTORY OF TRITIUM LAMP BREAKAGE DURING FIRING
VI SCREENING TESTS OF 60MM MORTAR ...24
TECOM PROJECT NO. 2-WE-500-224-003 (MARINE BUY)

DATE FIRED	NO. OF UNITS TESTED	SN OF CANNONS WITH BROKEN LAMPS	NO. OF BROKEN LAMPS	RD NO WHEN LAMP BROKE	CHRG WHEN LAMP BROKE	LOCATION OF BROKEN LAMPS	WEAPON PRESSURE (psi)	RESULTS OF SWIPE TEST (DPMs)
1 FEB 82	P 20	223	1	5	5.8	BR	8900	6,194,963
		420	2	5	5.8	T&BR	8800	1,309,440
		423	2	5	5.8	L&RT	8800	260,597
1 FEB 82	S 5	0	0	-	-	-	-	-
18 FEB 82	S 30	292	1	4	5.8	-	8600	171,870
		314	1	4	5.8	-	9600	12,098
21 APR 82	S 11	393	1	2	5.0	-	NA	2,000
22 APR 82	S 24	403	1	3	5.6	-	9700	21,022
10 APR 82	P 25	0	0	0	-	-	-	-
7 MAY 82	S 21	265	2	3	5.6	-	9600	30,275
		268	1	3	5.6	-	9200	364,387
14 MAY 82	P 10	560	1	2	5.6	-	9500	31,607
		757	1	5	5.6	-	9600	132,240
18 MAY 82	P 6	505	1	5	5.7	-	8800	66,717
		561	1	4	5.0	-	NA	83,481
26 MAY 82	P 12	0	0	-	-	-	-	-
1 JUN 82	P 12	835	3	4	5.0	T&BL,BR	NA	601,893
		838	1	3	5.0	-	NA	346,999
9 JUN 82	P 14	0	0	-	-	-	-	-
14 JUN 82	P 11	0	0	-	-	-	-	-
1 JUL 82	P 18	1061	1	2	4.0	TL	NA	37,437
		1065	1	5	5.8	TR	9600	8,103
		1068	3	5	5.8	R&LT,BL	10000	442,837
		1090	1	5	5.8	TR	9600	102,966
		1099	1	3	5.0	TR	NA	31,750
		1115	1	3	5,0	TL	NA	320,962
9 JUL 82	P 7	1060	3	5	5.7	R&LT,BL	10200	830,000
		1070	2	5	5.7	T&BL	8800	300,000
		1104	2	5	5.7	T&BL	9400	2,300,000
		1108	2	5	5.7	T&BL	9400	3,100,000
16 JUL 82	P 5	1062	1	5	5.8	TL	9600	205,000
		1067	1	5	5.7	TL	8400	1,050,000
	S 11	338	1	2	5.0	BR	NA	760,000
		343	1	3	5.7	TR	9200	820,000
		350	2	3	5.8	T&BL	9700	240,000
		354	2	3	5.7	T&BL	8900	1,500,000
		362	4	3	5.7	ALL	9900	1,600,000
20 JUL 82	S 14	353	1	3	5.6	BL	9000	180,000
		355	2	2	5.0	T&BL	NA	660,000

LEGEND: P=PROOF (5 RDS) 1 RD @ CHG 2 & 4; 2 RDS @ CHG 5; 1 @ CHG 5+ (.1%)
S=SCREEN (3 RDS) 1 RD @ CHG 4, CHG 5, & CHG 5+ (113%)

LOCATION OF LAMP FAILURES IN RANGE INDICATOR ASSEMBLY (RIA):
T=TOP L=LEFT
B=BOTTOM R=RIGHT

DATE FIRED	NO. OF UNITS TESTED	SN OF CANNONS WITH BROKEN LAMPS	NO. OF BROKEN LAMPS	RD NO WHEN LAMP BROKE	CHRG WHEN LAMP BROKE	LOCATION OF BROKEN LAMPS	WEAPON PRESSURE (psi)	RESULTS OF SWIPE TEST (DPMs)
4 AUG 82	S 30	436	1	3	5.65	TL	9600	67,645
		438	1	3	5.65	TR	9400	62 ?42
		453	1	3	5.65	TL	9500	,.48
		480	1	3	5.65	TL	9600	.99,652
		489	1	3	5.65	TL	8700	113,903
		530	1	3	5.65	TR	9000	71,212
12 AUG 82	S 29	332	1	3	5.7	BL	9400	20,078
		334	2	3	5.7	T&BL	9500	213,645
		355	2	2	5.0	T&BL	NA	660,000
		562	1	3	5.7	TR	P400	218,166
19 AUG 82	S 30	455	1	2	5.0	TL	NA	15,716
		464	1	3	5.6	TL	10300	100,297
		478	1	2	5.0	TL	NA	11,061
		485	1	2	5.0	TR	NA	51,648
27 AUG 82	S 30	494	1	3	5.8	TR	8900	126,083
		498	1	2	5.8	TL	9200	5,963
		548	1	2	5.0	TR	NA	52,723
2 SEP 82	S 30	566	1	3	5.7	TL	8800	1,060,106
		579	1	3	5.7	TL	8800	165,651
5 OCT 82	S 29	608	1	2	5.0	-	NA	10,321
		612	1	3	5.6	TR	9600	249,731
		644	2	3	5.6	R&LT	9200	96,076
19 OCT 82	S 30	591	1	1	4.0	TL	NA	1,168
		613	1	3	5.65	TR	9200	25,976
7 NOV 82	S 30	988	1	3	5.7	BR	9300	49,089
		2116	3	3	5.7	TL,R&LB	8400	100,469
		2145	4	3	5.7	ALL	9600	6,792
23 NOV 82	S 28	2118	1	3	5.7	TL	9200	109,463
		2122	1	2	5.0	TL	NA	55,416
		2125	1	3	5.7	TR	9100	136,149
		2126	1	3	5.7	TR	9800	52,516
		2129	1	3	5.7	-	9200	7,246
		2137	1	3	5.7	TR	10000	26,079
		2151	1	2	5.0	TR	NA	33,973
		2156	2	3	5.7	T&BR	9700	55,416
2 DEC 82	S 30	1993	1	3	5.68	BL	9200	1,672
10 DEC 82	S 24	650	1	3	5.8	TR	9800	218
		1938	1	2	5.0	TR	NA	26,883
		1965	1	2	5.0	TR	NA	3,572
		1966	1	3	5.7	TR	9200	33,866
		1997	2	3	5.8	T&BL	9400	1,323
		2010	1	3	5.8	TR	9500	1,323
		2011	1	2	5.0	TR	NA	437
		2015	1	3	5.8	TR	9200	2,974
		2029	1	3	5.75	TR	8700	1,007
		2037	1	3	5.75	TR	9200	3,339
		2041	1	3	5.75	TR	8600	296
27 JAN 83	S 30	0	0	-	-	-	-	-
4 FEB 83	S 28	0	0	-	-	-	-	-
10 FEB 83	S 30	0	0	-	-	-	-	-
24 FEB 83	S 30	1152	1	3	5.8	BL	9500	56,281
3 MAR 83	S 30	1327	1	3	5.8	BL	9600	16,967
11 MAR 83	S 30	0	0	-	-	-	-	-
[illegible]	S 30	1472	1	2	5.0	BL	NA	-

DATE FIRED	NO. OF UNITS TESTED	SN OF CANNONS WITH BROKEN LAMPS	NO. OF BROKEN LAMPS	RD NO WHEN LAMP BROKE	CHRG WHEN LAMP BROKE	LOCATION OF BROKEN LAMPS	WEAPON PRESSURE (psi)	RESULTS OF SWIPE TEST (DPMe)
19 APR 83	S 15	0	0	-	-	-	-	-
2 MAY 83	S 16	0	0	-	-	-	-	-
27 MAY 83	S 20	0	0	-	-	-	-	-
TOTALS		83	110					

PROOF TEST SCHEDULE FOR 60MM MORTAR, M224
AMMUNITION: CARTRIDGE, M720

RD NO.	CHG	PRESSURE (psi)
1	2	3300 ± 300
2	4	6100 ± 300
3-4	5	8000 ± 300
5	5+	9100 ± 300

SCREENING SCHEDULE FOR 60MM MORTAR, M224
AMMUNITION: CARTRIDGE, M720

RD NO.	CHG	PRESSURE (psi)
1	4	6100 ± 300
2	5	8000 ± 300
3	5+	9100 ± 300

ROUND AND PRESSURE COMPARISON

M720 (3.75 lb)

CHG	PRESSURE (psi)
0	1500
1	2000
2	3300
3	4800
4	6100

M49A4 (3.10 lb)

CHG	PRESSURE (psi)
0	1300
1	2000
2	2200
3	2600
4	3800

COST BREAKDOWN
MORTAR, 60MM M224, Marine Buy, 698 Weapons

Proof Phase	Cost
140 weapons proofed at $746 per weapon (direct labor and overhead)	$104,511
Ammo required: 5 rounds per weapon at $75 per round	$ 52,500
Screen Phase	
558 weapons screened at $632 per weapon (direct labor and overhead)	$352,656
Ammo required: 3 rounds per weapon at $75 per round	$125,550
Total funds expended	$635,217
Average cost per weapon	$910

Cost breakdown was provided by Tom MacAnezie, TECOM project officer, 30 Jun 83

Encl 4

Additional Information Requested by HQ, DARCOM

1. A previous submission of this amendment request was rejected by HQ, DARCOM, 1st Ind, 28 Oct 83, to ltr, DRSMC-SF (R), HQ, AMCCOM, 12 Aug 83, SAB. DARCOM's additional requirements are addressed below.

2. In paragraph 1, the statement "Unfortunately, the range indicators were procured without having gone through the testing normally performed on other radioactive commodities (AR700-64)." is not true. The lamps on the range indicator assembly were tested to meet the drawing specifications as required in the current NRC license BML12-00722-06. The specification tests include a shock test where the lamps are exposed to an immediate -80°F and after returning to ambient, an immediate +160°F for a period of 8 hours at each temperature. Quality control sampling procedures, performed IAW title 10, part 32.110, resulted in zero failures. This further illustrates that the breakage problem is a result of design and not manufacturer's poor quality in production since the lamps meet drawing specifications.

3. In paragraph 1, the statement "the RIA tritium lamps can fail on even the first use" is not substantiated. The data used to support the amendment request shows that the RIA lamps are unlikely to break at field charges.

4. In paragraph 2, the statement "field use of zone 3 with the new rounds could exceed the impact of zone 5 during testing" is conjecture and unsubstantiated. First, the "new" round and test round are one and the same - the M720 round. Secondly, the data used to support the amendment request showed only 2 failures at charge 4 out of 750 weapons. Therefore, it is logical to assume that breakage at charge 3, at which test firing was not performed, is even more unlikely.

5. In paragraph 3a, HQ, DARCOM requests that the amendment proposal be signed by a member of the AMCCOM Command Group. This amendment proposal is signed by the Chief of Staff.

6. In paragraph 3(b), HQ, DARCOM requests that the supporting data be made more understandable. A cover sheet has been added to the attached data.

7. Paragraph 3(c), requests that if any testing will be conducted, the test procedures be stated along with what constitutes failure and actions to be taken in the event of failure. This amendment request is simply asking for relief from the 100-percent test firing requirement. This headquarters does not propose to eliminate all testing, nor to propose additional testing. The testing required to meet drawing specifications, which includes shock tests and leak tests, will continue.

8. In paragraph 3(d), HQ, DARCOM requests a mathematical study to predict the maximum breakage in the field and the predicted exposures. It is anticipated that until the modified RIAs are available, the field may experience occasional breakage of the tritium lamps due to firing. Calculations are attached (encl 1) which indicate that any tritium lamp breakage of the RIA due to firing will present no health risk to the user or to the environment. The field breakage rate is expected to be low and is

considered to be a known logistics and reliability problem and not a safety issue. To ease the logistics problem, 300 spare RIAs are available for use, until the redesigned RIA is available to the field.

9. In paragraph 3(e), HQ, DARCOM requests the action to change the design of the RIA. The start of the PIP is scheduled for Dec 84, with fielding by attrition scheduled for Dec 86.

10. In paragraph 3(f), HQ, DARCOM requests the instructions to be given to users if it is planned to limit the fielding of the LWCM to a smaller charge than zone 4. Again, this amendment request is only for relief from the 100-percent test firing requirement. Limiting the field charges is not only unnecessary but such action may impede the readiness capability of the LWCM and is not relevant to this amendment request.

11. In paragraph 3(g), HQ, DARCOM requires the amendment request be staffed through the chairman of the Tritium Committee, TECOM, TRADOC, FORSCOM, and other MACOMs. The concurrences of the commands are attached (encl 2).

2 Encl
as

HAZARD ASSESSMENT OF ACCIDENTAL
BREAKAGE OF ONE OR MORE TRITIUM SOURCES

1. Postulated accident: Accidental breakage of all four lamps in the Range Indicator Assemoly.

a. Four 0.8 curies sources for a total of 3.2 curies H-3.

b. Less than 1 percent of H-3 is tritiated water; therefore, .032 curies tritiated H_2O is released in 1 minute.

c. Standard man breathes 20 liters per minute.

d. Maximum permissable body burden = $2 \times 10^3 \mu Ci$.

e. Ten minute exposure time.

2. Assumption: The concentration of tritium gas following the breakage is of the form of a time dependent gradient with respect to distance from source. Assume the average concentration a user is exposed to is equivalent to having the activity uniformly dispersed in a spherical volume of radius 10 feet; i.e.:

$$\text{concentration} = \frac{3.2 \times 10^4 \mu Ci}{\frac{(4\pi)}{3}(10)^3(12)^3(2.54)^3(10^{-3})\ \text{liter}}$$

$$\text{concentration} = 2.7 \times 10^{-1} \mu Ci/\text{liter}$$

3. Exposure: Assuming even an unlikely 10 minute exposure, a man would inhale and retain the following amounts of trtiated water:

$$\text{intake} = 2.7 \times 10^{-1} \mu Ci/\text{liter} \times 20 \frac{\text{liters}}{\text{min}} \times 10 \text{ min}$$

intake = 53.8μCi tritiated water

intake = 1/37 maximum permissible body burden for continuous exposure.

17540

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND
ROCK ISLAND, ILLINOIS 61299

Balunis/sc/AUTOVON
793-4335

REPLY TO
ATTENTION OF:
DRSMC-ASI (R)

11 JUN 1984

SUBJECT: Request for Amendment to Nuclear Regulatory Commission (NRC) License BML 12-00722-06

Commander
US Army Materiel Development & Readiness Command
ATTN: DRCSF-P/Ms. P. Elker
Alexandria, VA 22333

1. Reference:

a. Letter, DRSMC-SF (R), HQ, AMCCOM, 11 Apr 84, SAB.

b. FONECON between Mr. J. Lamb, HQ, DARCOM, DRCDE-SG, and Mr. George Balunis, DRSMC-ASI (R), 25 May 84, SAB.

c. FONECON between Mr. George Balunis, DRSMC-ASI (R), and Mr. D. Taras, HQ, DARCOM, DRCSF-P, 25 May 84, SAB.

d. Letter, DRSTE-CM-F, HQ, TECOM, 28 Oct 83, subject: TECOM Statement on the Adequacy of Materiel Performance of the Lightweight Company Mortar System (LWCMS) (encl 1).

2. Reference 1a forwarded subject request for amendment signed by HQ, AMCCOM Chief of Staff. Enclosed to reference 1a was various back-up data and responses to an earlier inquiry from your office.

3. References 1b and 1c established the basis of concern that a response offered in enclosure 5 (paragraph 2) of reference 1a could be judged incomplete by the NRC. The response in question indicated that the system range indicator containing tritium lamps was subjected to shake, rattle, and roll testing under extreme temperatures. The potential issue with this response is that there is an absence of any reference to specific test data sources.

4. To avoid any restaffing action, this office offers the following information to supplement that already provided in reference 1a:

a. Extreme temperature shock testing of the range indicator assembly was successfully accomplished in TECOM design testing leading to type classification. This test data can be found in TECOM Test Report No. 8WE-500-LCM-004, titled Vol II DT II LWCMS, Aug 76, for RDTE Project No. 1T564602 D029.

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11 JUN 1984

DRSMC-ASI (R)
SUBJECT: Request for Amendment to Nuclear Regulatory Commission (NRC) License BML 12-00722-06

b. As part of First Article Initial Production Testing (FAIPT) philosophy, end items are subjected to test sequences performed in DT. The FAIPT conducted for the LWCMS including the range indicator assembly configuration incorporated extreme temperature shake, rattle, and roll testing. Reference 1d is enclosed and exhibits the types of testing performed while finding that the LWCMS exhibited no deficiencies. The actual test report has not been published at this time, and the test plan, referenced in reference 1d, is available at HQ, TECOM.

5. It is hoped that the above information is satisfactory. Efforts by your office to secure the subject license amendment are appreciated. POC at this office is Mr. George Balunis, DRSMC-ASI (R), AUTOVON 793-5147.

FOR THE COMMANDER:

C E Bradley
C. E. BRADLEY
Chief, Infantry/Air Munitions Division

1 Encl
as

CF:
Cdr, TECOM
ATTN: DRSTE-CM-F/Mr. T. MacAnespie
Cdr, DARCOM
ATTN: DRCDE-SG/Mr. J. Lamb
Cdr, ARDC
ATTN: DRSMC-LCS-DI (D)/Mr. M. Bornstein

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