

MIL-H-8790D
30 DECEMBER 1981

SUPERSEDING
MIL-H-8790C
24 May 1966

MILITARY SPECIFICATION

HOSE ASSEMBLIES, RUBBER, HYDRAULIC HIGH PRESSURE (3000 PSI)

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

*1.1 Scope. This specification covers hose assemblies for use in hydraulic systems using MIL-H-83282 hydraulic fluid.

1.2 Classification. Hose assemblies shall be furnished in the sizes listed on MS28759, MS28762, MS28920, MS28921, MS28922, MS28923, and MS28924 as specified (see 6.2).

2. APPLICABLE DOCUMENTS

*2.1 Government Documents.

2.1.1 Specifications and Standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein:

SPECIFICATIONS

FEDERAL

MMM-A-1617

Adhesive, Rubber Base, General Purpose

MILITARY

MIL-P-775

Hose, Hose Assemblies, Rubber, plastic, Fabric, or Metal (Including Tubing), and Fittings, Nozzles and Strainers, Packing of

MIL-C-5501

Cap and Plug, Protective, Dust and Moisture Seal

MIL-H-5606

Hydraulic Fluid, Petroleum Base,

MIL-L-6082

Aircraft, Missile and Ordnance Lubricating Oil: Aircraft

MIL-H-8788

Reciprocating (piston) Engine Hose, Hydraulic, High Pressure

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: HQ AFLC CASO/LODS, Federal Center, Battle Creek MI 49016 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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| | |
|---------------|--|
| MIL-F-8789 | Fitting End, Attachable Hydraulic, Pressure Hose |
| MIL-S-45180 | Sealing Compound, Gasket, Hydrocarbon Fluid, Water Resistant |
| * MIL-H-83282 | Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, Aircraft |

STANDARDS

MILITARY

| | |
|--------------|--|
| MIL-STD-105 | Sampling Procedures and Tables for Inspection by Attributes |
| MIL-STD-129 | Marking for Shipment and Storage |
| MIL-STD-1523 | AGE Controls of Age-sensitive Elastic Material |
| MS28759 | Hose Assembly, Hydraulic and Pneumatic, (3000 psi), Flared Tube |
| MS28762 | Hose Assembly, Hydraulic and Pneumatic High Pressure (3000 psi) Flareless Tube |
| MS28920 | Hose Assembly, Rubber, Hydraulic (3000 psi), Fitting End To Elbow 45 , Flared Tube |
| MS28921 | Hose Assembly, Rubber, Hydraulic (3000 psi), Fitting End To Elbow 90 , Flared Tube |
| MS28922 | Hose Assembly, Rubber, Hydraulic (3000 psi), Elbow 45 to Elbow 45 , Flared Tube |
| MS28923 | Hose Assembly, Rubber, Hydraulic (3000 psi), Elbow 45 to Elbow 90 , Flared Tube |
| MS28924 | Hose Assembly, Rubber, Hydraulic (3000 psi), Elbow 90 to Elbow 90 , Flared Tube |

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

***2.2 Other Publications.** The following document forms a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

(Application for copies of the above publication should be addressed to the Consolidated Classification Committee, 202 Chicago Union Station, Chicago, Illinois 60606.)

***2.3 Order of Precedence.** In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 General. The hose assemblies furnished under this specifications shall consist of hose conforming to MIL-H-8788 and end fittings conforming to MIL-F-8789, which when assembled, meet the quality assurance provisions of section 4 herein. Prior to assembly, MMM-A-1617 or MIL-S-45180A type II sealant shall be applied to each end of the MIL-H-8788 hose. The sealant shall provide a moisture seal for the exposed wire braid and shall not be harmful to the hose or fitting material.

3.1.1 Loosening or changing end fitting position. After the end fittings have been installed on the hose, there shall be no loosening or changing of an end fitting position on the hose.

3.2 Data. Unless otherwise specified in the contract or order, no data are required by this specification or any of the documents referenced in section 2 herein (see 6.2).

3.3 Length. Hose assemblies shall be made only to the length increments specified on MS28759, MS28762, MS28920, MS28921, MS28922, MS28923, and MS28924.

3.4 Orientation angle of bent tube couplings. When hose assemblies in accordance with MS28922, MS28923, or MS28924 are required, the orientation angle shall be as specified (see 6.2).

*3.5 Performance. Hose assemblies shall satisfy the performance requirements specified in Table I and Section 4, when subjected to the following tests:

- a. Hydraulic proof pressure------(4.6.1)
- b. Coupling------(4.6.2)
- c. Leakage------(4.6.3)
- d. Burst pressure------(4.6.4)
- e. Hydraulic impulse test------(4.6.5)

TABLE I. PERFORMANCE CHARACTERISTICS

| Hose Size No. | Proof Pressure psi (min) | Burst Pressure psi (min) | Operating Pressure psi | Bend Radius Inside Inches (min) | Assembly Length in Accordance with MS28759, MS28762, and MS28920 through MS28924 |
|---------------|--------------------------|--------------------------|------------------------|---------------------------------|--|
| 4 | 8,000 | 16,000 | 3,000 | 3 | 16 |
| 5 | 7,000 | 14,000 | 3,000 | 3 3/8 | 18 |
| 6 | 7,000 | 14,000 | 3,000 | 5 | 21 |
| 8 | 7,000 | 14,000 | 3,000 | 5 3/4 | 24 |
| 10 | 6,000 | 12,000 | 3,000 | 6 1/2 | 30 |
| 12 | 6,000 | 12,000 | 3,000 | 7 3/4 | 33 |
| 16 | 5,000 | 10,000 | 3,000 | 9 5/8 | 24 |

*3.6 Identification of product. Each hose assembly shall be identified with a durable permanently attached tag. This tag shall show the MS number, date of assembly, and manufacturer's name or trademark.

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3.7 Age control. Hose assemblies shall meet the age limitation requirements specified in MIL-STD-1523.

3.8 End fitting nut thread class. After pressure testing Class 2B threads are acceptable on end fitting nuts.

*3.9 Workmanship. Workmanship shall be of the quality necessary to produce hose assemblies free from all defects that will affect proper functioning in service. Assemblies must be clean and dry in accordance with MIL-P-775.

4. QUALITY ASSURANCE PROVISIONS

*4.1 Responsibility for inspections. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspection set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

*4.2 Classifications of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.3)
- b. Quality conformance inspection (see 4.4)

*4.3 Qualification inspection. Sampling test shall be conducted in conformance with MIL-STD-105. Any hose assembly failing to meet the requirements of the routine test (4.3 and 4.3) shall be caused for rejecting the lot represented. Before a lot or part of a lot that has been previously rejected by the procuring agency. (Government or Commercial) can be submitted for test, full particulars concerning the cause of previous reject shall be submitted by the contractor.

*4.4 Quality conformance inspection. The quality conformance test shall consist of:

- a. Examinations----- (4.4.1)
- b. Individual Test----- (4.4.2)
- c. Sampling Test----- (4.4.3)
- d. Hydraulic Impulse Test----- (4.4.4)

4.4.1 Examinations

4.4.1.1 Examination of product. Each hose assembly shall be carefully examined visually to determine conformance to this specification with respect to materials, workmanship, and marking, and conformance to the applicable standards.

4.4.2 Individual tests. Each hose assembly submitted for acceptance under contract shall be subjected to the following tests, as specified under 4.6.

- a. Hydraulic proof pressure----- (4.6.1)
- b. Coupling----- (4.6.2)

4.4.3 Sampling tests. Eight hose assemblies individually selected at random from each 10,000 hose assemblies or less, of each size submitted under contract, shall be subjected, in order, to the following tests as specified under 4.5. These test assemblies shall not be delivered as part of the contract.

- a. Leakage------(4.6.3)
- b. Burst pressure------(4.6.4)

4.4.4 Hydraulic impulse test. Five hose assemblies shall be individually selected at random from each 10,000 hose assemblies (or fraction thereof), for each dash size. They shall be subjected to the hydraulic impulse test (4.6.5) and shall not be delivered as part of the contract.

4.4.5 Examination of preparation for delivery. An examination shall be made to determine that packaging, packing, and marking comply with the requirements of section 5 of this specification.

4.5 Test conditions.

*4.5.1 Test fluid. Unless otherwise specified, the test fluid shall be lubricating oil conforming to grade 1100 of MIL-L-6082 or hydraulic fluid conforming to MIL-H-5606 or MIL-H-83282 or water. Hoses must be cleaned and dried after test.

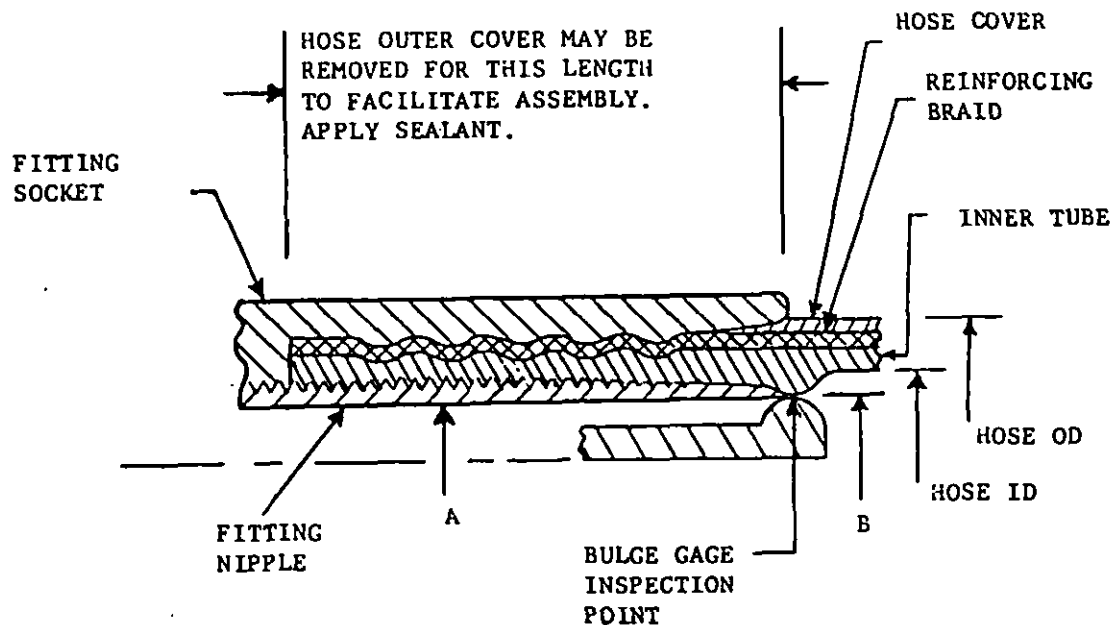
4.6 Test methods.

4.6.1 Hydraulic proof pressure. The test shall be made by applying the pressure not less than 30 seconds nor more than 5 minutes. Each assembly shall be subjected to the hydraulic proof pressure of Table I without indication of failure or leakage.

4.6.2 Coupling. The bulging of hose inner tubes caused by the attachment of the end fittings shall be measured by means of a ball-end type gage as specified in the coupling test of section 4 of MIL-H-8788. Bulg diameter of the inner tube smaller than the minimum allowed in Figure 1 shall be cause for rejection.

*4.6.3 Leakage. This test shall be made on two unaged samples. Hydraulic fluid conforming to MIL-H-5606 or MIL-H-83282 or water shall be used, and the pressure shall be accomplished on leakage specimens as follows. Seventy percent of the minimum burst value shown in Table I shall be obtained and held for 5 minutes, then reduced to zero, after which the pressure shall be raised to 70 percent of the minimum burst pressure for a final 5 minute check. The adjacent outer cover shall be carefully checked during this period for any wicking or leakage of the test fluid which might indicate leakage of the hose. There shall be no direct leakage from the end fitting, and no seepage back through the fabric which might produce separation or swelling of the hose. A written record shall be kept of leakage and of the additional tightening which might be necessary to stop all leakage at the end fitting if the threaded type of end fittings is used. After completion of the leakage test on these samples, they shall be subjected to the burst pressure test specified in 4.5.4. The assemblies shall be a minimum of 12 inches in length.

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| FITTING SIZE | A DIA, INCHES (MIN) | B (a) DIA, INCHES (MIN) |
|-----------------|---------------------------|-------------------------------|
| -4 | .146 | .146 |
| -5 | .177 | .177 |
| -6 | .271 | .271 |
| -8 | .365 | .365 |
| -10 | .455 | .455 |
| -12 | .568 | .568 |
| -16 | .778 | .778 |

(a) B DIA INDICATES BOTH THE MINIMUM PERMISSIBLE BULGE DIAMETER OF THE INNER TUBE, AND THE MINIMUM NIPPLE ID OF THE FITTING, WHEN THE FITTING IS ASSEMBLED WITH THE HOSE.

FIGURE 1. Minimum bulge diameter of hose inner tube.

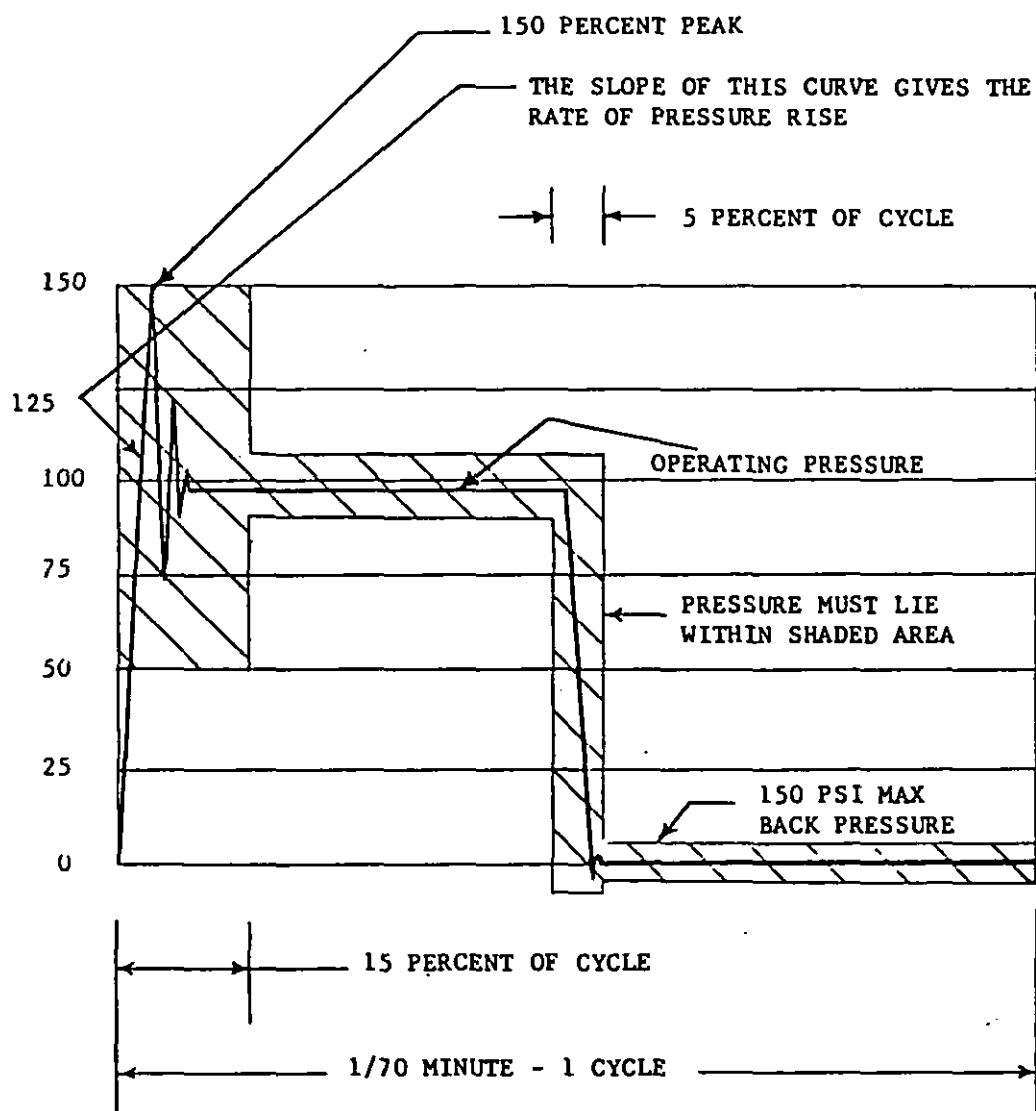


FIGURE 2. DYNAMIC PRESSURE IMPULSES

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***4.6.4 Burst pressure.** Two unaged assemblies shall be subjected to the hydraulic burst pressure specified in Table I within 24 hours after assembly of the end fittings to the hose. The tests shall be made with hydraulic fluid conforming to MIL-H-5606 or MIL-H-83282 or water. The rate of pressure rise shall be $25,000 \pm 0, -10,000$ psi per minute. Pressure shall be applied until failure occurs. Below the burst pressure, the end fittings shall not blow off or loosen, and there shall be no external leakage from the hose or end fittings. During this test, the hose assembly shall be fastened at one end to the source of pressure, the hose shall be extended straight, and the free end shall not be restrained or fastened in any way. The actual pressure at which the samples burst or otherwise fail shall be recorded. The assemblies shall be a minimum of 12 inches in length.

***4.6.5 Hydraulic impulse test.** The hydraulic impulse samples shall be of lengths specified in Table I. They shall be subject to the applicable proof pressure specified in Table I, prior to pulsing. The assemblies shall then be connected to manifolds installed in a testing machine which will produce dynamic pressure impulses in the inlet manifold of the magnitudes and frequency shown in Figure 2. Electronic measuring devices shall be used to measure and indicate the impulse pressures. The -16 size only shall be tested without surge peaks and in a straight position; one end may be free. The test fluid shall conform to MIL-H-5606 or MIL-H-83282, except that up to 25 percent of MIL-L-6082 oil may be added to the test fluid and shall be held at a temperature of $120 \pm 20^\circ\text{F}$ measured in the manifold. Leakage, burst or coupling blowoff shall be evidence of failure. The minimum impulse cycles shall be specified in Table II.

Table II. IMPULSE CYCLES

| Size | Minimum Impulse Cycles | Minimum Average Impulse Cycles (1) | Maximum Impulse Cycles that can be used to compute average (2) |
|------|------------------------|------------------------------------|--|
| 4 | 100,000 | | |
| 5 | 100,000 | | |
| 6 | 100,000 | | |
| 8 | 75,000 | 100,000 | 150,000 |
| 10 | 50,000 | 75,000 | 100,000 |
| 12 | 35,000 | 50,000 | 70,000 |
| 16 | 45,000 | 55,000 | 75,000 |

(1) Average of four test assemblies.

(2) When test assemblies impulse cycles are averaged, the maximum cycles that can be used to compute the average shall not exceed the figures given in this column.

*5. PACKAGING

***5.1 Preservation, packaging and packing.** Preservation, packaging and packing of the hose assemblies shall be in accordance with MIL-P-775. Both ends of each hose assembly shall be sealed with plugs conforming to MIL-C-5501.

5.2 Levels. The levels of preservation and packaging shall be level A or C and the levels of packing shall be A, B or C as specified.

5.3 Marking of shipments. Interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129. The identification shall include the hose cure date.

6. NOTES

6.1 Intended use. The hose assemblies are intended for use in hydraulic systems when used in accordance with the applicable assembly standard and at operating pressures not to exceed 3000 psi.

6.2 Ordering data. Procurement documents should specify:

(a) Title, number, and date of this specification.

(b) Size and length of hose assemblies to be furnished in accordance with the applicable hose assembly standard (see 1.2).

(c) Bent tube orientation angles.

(d) Data requirements (see 3.2).

(e) Applicable levels of preservation and packaging, and packing (see 5.2).

*6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is San Antonio ALC/MMIRCC, Kelly AFB, Texas 78241, and information pertaining to qualification of product may be obtained from that activity.

6.4 Superseding data. This specification superseded MIL-H-5512 for hose assemblies. Bulk hose formerly covered under MIL-H-5512 will be procured under MIL-H-8788. End fittings may be procured under MIL-F-8789.

6.5 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue are made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:

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Army - ME

Navy - AS

Preparing Activity:

Air Force - 99

Review Activities:

Army - MI, AV

DLA - CS

Project 4720-0398

| SPECIFICATION ANALYSIS SHEET | | Form Approved Budget Bureau No. 22-R255 |
|--|-----------------|--|
| <p>INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.</p> | | |
| SPECIFICATION | | |
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| CITY AND STATE | CONTRACT NUMBER | |
| <p>MATERIAL PROCURED UNDER A</p> <p><input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT</p> | | |
| <p>1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?</p> <p>A. GIVE PARAGRAPH NUMBER AND WORDING.</p> | | |
| <p>B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES</p> | | |
| <p>2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID</p> | | |
| <p>3. IS THE SPECIFICATION RESTRICTIVE?</p> <p><input type="checkbox"/> YES <input type="checkbox"/> NO (If "yes", in what way?)</p> | | |
| <p>4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)</p> | | |
| SUBMITTED BY (Printed or typed name and activity - Optional) | | DATE |

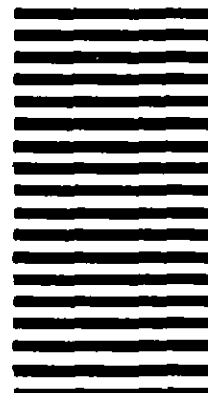
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