

INCH-POUND

MIL-PRF-62541A

28 April 1997

SUPERSEDING

MIL-E-62541(AT)

24 February 1988

PERFORMANCE SPECIFICATION

ENGINE, DIESEL, 6-CYLINDER, V-TYPE, 275 H.P., TURBOCHARGED

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

1. SCOPE

1.1 Scope. This specification covers a commercial, 6-cylinder, V-type, liquid-cooled, 2-stroke-cycle, crosshead-piston, turbocharged, by-pass blower, internal-combustion, compression-ignition (diesel) engine for use in military vehicles M730A2 and M113A3.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirement documents cited in sections 3 and 4 of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BLUE, Warren, MI 48397-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A

FSC 2815

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-PRF-62541A

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

A-A-52557 - Fuel Oil, Diesel: For Posts, Camps and Stations.

DEPARTMENT OF DEFENSE

MIL-PRF-2104 - Lubricating Oil, Internal Combustion Engine, Combat/Tactical Service.

MIL-F-46162 - Fuel, Diesel, Referee Grade.

MIL-T-83133 - Turbine Fuel, Aviation, Kerosene Types, NATO F-34 (JP-8) and NATO F-35

(Unless otherwise indicated, copies of above specifications, standards, handbooks are available from Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

ARMY

11650200 - Engine, Diesel, for the M730A2 Carrier (Interface).

11650249 - Engine, Diesel, for the M113A3 Carrier (Interface).

(Copies of these drawings are available from the U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BLUE, Warren, MI 48397-5000.)

MIL-PRF-62541A

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI/ASQC Z1.4 - Sampling Procedures and Tables for Inspection by Attributes (DoD Adopted).

(Application for the copies should be addressed to the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a first article sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Materials. Materials shall be in accordance with the manufacturer's materials specifications for diesel engines. The materials shall be capable of meeting all the operational and environmental requirements specified herein (see 4.5.1).

3.3 Design and construction.

3.3.1 Construction. All interface and envelope dimensions shall conform to drawings 11650200 and 11650249 (see 4.5.2).

3.3.2 Interchangeability. Component assemblies and parts shall be so constructed that any part, except those furnished in matched sets or for which a selective fit is specified, may be installed, replaced, and adjusted with no modification required (see 4.5.2).

3.3.3 Accessories and equipment. Unless otherwise specified herein, all accessories and equipment shall be installed on the engine and properly adjusted (see 4.5.2).

3.3.4 Speed range. The engine shall be designed to operate satisfactorily under all loads and conditions as specified herein throughout the specified speeds (see 4.5.2).

MIL-PRF-62541A

3.3.5 Fuel. Fuel shall be No. 2D of A-A-52557 or JP-8 of MIL-T-83133.

3.3.6 Coolant. Engine coolant shall be protected against freezing down to -25 degrees Fahrenheit (°F). Operation at full load throughout the speed range in ambient temperatures of +125°F shall not cause overheating or boiling of the coolant (see 3.4.10 and 4.5.3.8).

3.3.7 Oil. Lubricating oil shall conform to MIL-PRF-2104.

3.4 Performance. Except as otherwise specified herein, the engine shall meet all performance requirements as specified in 3.4.1 through 3.4.14.

3.4.1 Limiting operating temperatures. Oil sump and engine coolant temperatures when operating at full load throughout the speed range under any of the conditions specified herein shall not exceed 235°F and 190°F respectively (see 4.5.3).

3.4.2 Exhaust. The engine shall operate at all conditions with an exhaust back pressure less than 3.0 inches of mercury (in. Hg) (see 4.5.3).

3.4.3 Idle speed. The engine shall maintain an idle speed of 650 to 700 revolutions per minute (rpm) (see 4.5.3.1).

3.4.4 Governor. The governor shall limit maximum engine speed at full load and no load operation to 2775 to 2825 rpm, and 2940 to 2990 rpm respectively (see 4.5.3.2).

3.4.5 Dynamometer performance. The engine at the full rack setting shall meet the performance specified in 3.4.5.1 through 3.4.5.3 when corrected to standard conditions (see 4.5.3.3 and 6.3).

3.4.5.1 Torque. Torque at the flywheel shall be not less than 595 pound-feet (lb-ft) at an engine speed of 1600 rpm (see 4.5.3.3).

3.4.5.2 Brake horsepower. The engine shall develop at least 264 gross brake horsepower (bhp) at a speed of 2800 rpm (see 4.5.3.3).

3.4.5.3 Fuel consumption. Fuel consumption shall not exceed 0.365 and 0.381 pounds per brake horsepower-hour at 2200 and 2800 rpm respectively (see 4.5.3.3).

3.4.6 Exhaust smoke density. Exhaust smoke density at full rack position, through the speed range of 2000 to 2800 rpm when measured within 3 feet (ft) of the turbocharger outlet, shall not exceed a number 3 (light gray) smoke condition as defined in 4.5.3.4.

MIL-PRF-62541A

3.4.7 Oil consumption. After 25 hours (hr) of operation, the engine shall have consumed not more than 0.0035 lb of lubricating oil per brake horsepower-hour, when operating at full rack throughout the power check phase with an oil sump temperature of 200 to 230°F measured at the oil cooler outlet of the main gallery (see 4.5.3.5).

3.4.8 Oil pressure. Under all performance conditions specified herein (including a 1 quart low sump condition), with an oil sump temperature range from 200 to 230°F, gallery oil pressure shall not be more than 80 pounds per square inch (psi) and not less than 40 psi, when the engine is operating at 2800 rpm. Gallery oil pressure shall not be less than 5 psi when the engine is idling as specified in 3.4.3, with the oil sump temperature range from 180 to 230°F (see 4.5.3.6).

3.4.9 Endurance (400 hr test). The engine shall operate as specified in 4.5.3.7 for a period of 400 hr. During the test, the engine shall require only minor repairs, such as replacement of belts and filters. At the conclusion of this test, the engine shall conform to the performance requirements specified in 3.4.3 to 3.4.7, with the exception that the engine shall not develop less than 90% of its initial power output with a maximum exhaust smoke density as specified in 3.4.6 without adjustments to the engine and shall develop 95% of full rated power after an authorized tune-up procedure. There shall be no evidence of abnormal wear such as scuffing or galling of cylinder bores, pistons, piston rings, piston pins, bearings, bearing journals, gear teeth, cam surfaces, valves, tappets, or other parts; burning of valves or pistons; sticking of valves or piston rings; leakage of gaskets or seals; imminent failure of components; or other malfunction.

3.4.10 Extreme temperature starting conditions. The engine shall start within 2 minutes under any of the following conditions or possible combination of conditions:

- a. With integral cold starting aid, without external aids after being cold-soaked for a 24 hr period, without benefit of solar radiation, in an ambient temperature of -25°F, and with the engine cranking speed not less than 120 rpm and the voltage to the air pump at 16 volts (V) (see 4.5.3.8).
- b. Without external aids, and when operated at the following temperature with exposure to maximum solar radiation (see 4.5.3.8):

Ambient air temperature	125°F
Intake air temperature (at air cleaner inlet)	125°F
Coolant outlet temperature	230°F
Outlet sump temperature attainable	Maximum temperature up to 275°F

3.4.11 Low-pressure conditions. At an atmosphere pressure equivalent to 8000 ft, the observed power output of the engine shall be not less than 90% of rated power (see 4.5.3.9).

MIL-PRF-62541A

3.4.12 Humidity conditions. The engine shall perform as specified herein under relative humidity conditions as low as 5% at a temperature of 125°F and as high as 100% at all temperatures from -25 to +85°F (see 4.5.3.10).

3.4.13 Steam and water jet cleaning. Engine and components shall withstand cleaning specified in 4.5.3.11 without deterioration of seals or hose, leakage past seals or gaskets, or other defects. Paint removal shall not be considered a deficiency (see 4.5.3.11).

3.4.14 Engine interchangeability. Engine shall install with no modifications to the engine, vehicle or vehicle components (see 4.5.3.12).

3.5 Exterior surface treatment. All exposed exterior surfaces of the engine and its components shall be cleaned, and painted or treated for corrosion resistance as specified on the applicable drawings or equivalent, or if not so specified, in accordance with the manufacturer's standard practice (see 4.5.2).

3.6 Identification marking. Engine shall be marked with permanent, legible characters and shall be suitable to withstand the environmental requirements specified herein. The engine shall be marked with the National Stock Number (NSN), the manufacturer's name and part number (see 4.5.2).

3.7 Workmanship. The workmanship shall be such quality as to assure that engines procured under contract meet all requirements specified herein. The engines produced shall be free of any defects or safety hazards which affect its performance or serviceability (see 4.5.2).

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2).
- b. Conformance inspections (see 4.3).

4.2 First article inspection. When specified (see 6.2), first article inspections shall be performed on preproduction or initial production samples as specified when a first article sample is required (see 3.1). This inspection shall include the examinations of 4.4 (see table I) and the applicable tests of 4.5.3.1 through 4.5.3.12 (see table II).

4.2.1 Preproduction inspection. When specified (see 6.2), first article preproduction inspection shall be performed on 2 engines. This inspection shall include the examinations of 4.4 (see table I) and the applicable tests of 4.5.3.1 through 4.5.3.12 (see table II).

MIL-PRF-62541A

TABLE I. Classification of defects.

Category	Defect	Method of examination
<u>Major:</u>		
101	Construction - Not in accordance with drawings (see 3.3.1).	Visual & SIE <u>1/</u>
102	Interchangeability - Adjustment or modification required (see 3.3.2).	Visual
103	Accessories and equipment - Not as specified (see 3.3.3).	Visual
104	Speed range - Operation not satisfactory (see 3.3.4).	SIE
<u>Minor:</u>		
201	Painting improper (see 3.5).	Visual
202	Identification - Not in accordance with drawing (see 3.6).	Visual
203	Workmanship - Defects, safety hazards or insufficient quality (see 3.7).	Visual & SIE

SIE 1/ = Standard Inspection Equipment.

4.2.2 Initial production inspection. Unless otherwise specified (see 6.2), the Government shall select 2 from the first 10 engines produced under the production contract for initial production inspection. Initial production units shall be inspected as specified in table II.

TABLE II. Classification of inspections.

Title	Requirement	Inspection	First article	Conformance
Materials	3.2	4.5.1	X	
Defects (see table I)	3.3.1 thru 3.3.4 & 3.5 thru 3.7	4.5.2	X	X
Limiting operating temperatures	3.4.1	4.5.3	X	
Exhaust	3.4.2	4.5.3	X	
Idle speed	3.4.3	4.5.3.1	X	X
Governor	3.4.4	4.5.3.2	X	X
Dynamometer performance	3.4.5	4.5.3.3	X	
Torque	3.4.5.1	4.5.3.3	X	X
Brake horsepower	3.4.5.2	4.5.3.3	X	X
Fuel consumption	3.4.5.3	4.5.3.3	X	
Exhaust smoke density	3.4.6	4.5.3.4	X	X
Oil consumption	3.4.7	4.5.3.5	X	
Oil pressure	3.4.8	4.5.3.6	X	X
Endurance test	3.4.9	4.5.3.7	X	
Extreme temperature starting conditions	3.4.10	4.5.3.8	X	
Low pressure conditions	3.4.11	4.5.3.9	X	
Humidity conditions	3.4.12	4.5.3.10	X	
Steam and water jet cleaning	3.4.13	4.5.3.11	X	
Engine interchangeability	3.4.14	4.5.3.12	X	

MIL-PRF-62541A

4.3 Conformance inspection. Conformance inspection shall include the examinations of 4.4 (see table I) and the tests of 4.5.3.1 through 4.5.3.12 (see table II).

4.4 Examination.

4.4.1 Sampling. Samples from an inspection lot for examination shall be selected in accordance with ANSI/ASQC Z1.4. Any redesign or modification of the contractor's standard to comply with specified requirements shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations and dimensional measurements of requirements as listed in table I. Noncompliance with any specified requirement or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

4.5 Method of inspection.

4.5.1 Materials. Conformance to 3.2 shall be determined by inspection of contractor records providing proof or certification that materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

4.5.2 Defects. Conformance shall be determined by examination for the defects listed in table I. Examination shall be visual, functional, or measurement with gage.

4.5.3 Performance. Performance tests specified herein shall be performed on a dynamometer under the conditions listed in 3.3.5 through 3.3.7, 3.4.1 and 3.4.2.

4.5.3.1 Idle speed. To determine conformance to 3.4.3, the engine shall be observed for steady idling between 650 to 700 rpm.

4.5.3.2 Governor. To determine conformance to 3.4.4, the engine maximum speed shall be measured.

4.5.3.3 Dynamometer performance. Torque (see 3.4.5.1) and brake horsepower (see 3.4.5.2) shall be determined by dynamometer performance, and corrected to standard conditions. Fuel consumption (see 3.4.5.3) shall be determined from observed bhp and observed fuel rate.

MIL-PRF-62541A

4.5.3.4 Exhaust smoke density. To determine conformance to 3.4.6, exhaust smoke density shall be measured by a standard smoke meter. Table III may be used to visually define the degree of exhaust smoke density in lieu of a smoke meter. Observation of exhaust smoke shall be made against a white background within 3 ft of the turbocharger outlet.

TABLE III Exhaust smoke density.

<u>Description of exhaust smoke</u>	<u>Classification</u>
Clear	1
Haze	2
Light Gray	3
Medium Gray	4
Dark Gray to Black	5

4.5.3.5 Oil consumption. To determine conformance to 3.4.7, the engine shall be operated on the dynamometer for 25 hr at full rack.

4.5.3.6 Oil pressure. To determine conformance to 3.4.8, the engine shall be operated at 2800 rpm, with oil sump temperature range from 230 to 250°F. The engine shall be idled as specified in 3.4.3, with an oil sump temperature range from 180 to 230°F.

4.5.3.7 Endurance. To determine conformance to 3.4.9, the following test shall be performed. The endurance test shall be 400 hr, consisting of four periods of 100 hr each. Each 100 hr period shall be made of ten 10 hr cycles, with each cycle in accordance with table IV. Running time less than 30 minutes shall not be counted toward fulfillment of the 400 endurance hr unless it is specified in table IV.

TABLE IV. 10 hr cycle.

Period	% Rated speed	% Load	Duration hours
1	Idle	0	1/2
2	100	100	2
3	Governed speed	0	1/2
4	75	100	1
5	Idle _____ 100	0 _____ 100 4 min. 6 min.	2
6	60	100	1/2
7	Idle	0	1/2
8	Governed speed	70	1/2
9	Max. torque speed	100	2
10	60	50	1/2
Total duration:			10

MIL-PRF-62541A

4.5.3.7.1 Temperature. Inlet air temperatures shall not be less than 70°F or more than 100°F unless otherwise specified (see 4.5.3.7.6). The lubricating oil temperature shall not exceed 230°F at the sump.

4.5.3.7.2 Fuel. During the 400 hr endurance test, diesel fuel conforming to MIL-F-46162 shall be used.

4.5.3.7.3 Power check. Full rack characteristics of the engine shall be measured according to the following schedule before the endurance test and after each 100 hr operating period:

<u>Period</u>	<u>Engine speed (rpm)</u>	<u>Rack position</u>
1	1800	Full rack
2	2000	Full rack
3	2400	Full rack
4	2600	Full rack
5	2800	Full rack

4.5.3.7.4 Acceptable 400 hr endurance performance. During the 400 hr test, the engine shall be observed for compliance with the following performance requirements during power check tests. The power checks shall be made at the beginning of the endurance run and at the end of each 100 hr period.

a. Idle speed	3.4.3
b. Governed speeds	3.4.4
c. Torque	3.4.5.1
d. Brake horsepower	3.4.5.2
e. Fuel consumption	3.4.5.3
f. Exhaust smoke density	3.4.6
g. Oil consumption	3.4.7
h. Oil pressure	3.4.8

4.5.3.7.5 Servicing. Prior to each power check test, the lubricating oil shall be changed, all filters serviced, and valve clearances and injector rack settings checked and adjusted to applicable requirements.

4.5.3.7.6 High temperature. The last 100 hr of the 400 hr endurance test shall be conducted with the air inlet temperature not greater than $125 \pm 5^\circ\text{F}$, in accordance with 3.4.10.b. The power check tests shall be made at room temperature (see 3.4.5).

MIL-PRF-62541A

4.5.3.8 Extreme temperature starting conditions:

- a. To determine conformance to 3.4.10.a, the engine, with integral winterization aids, shall be cold started at -25°F on fuel specified in 3.3.5. Prior to the cold start, the engine shall be cold soaked in an ambient temperature of -25°F for a period of 24 hr. After starting, the engine shall operate for sufficient time to stabilize engine operation.
- b. To determine conformance to 3.4.10.b, the engine shall be placed in a high-temperature chamber maintained at a temperature of 125°F and operated at full load until all temperatures are stabilized within the limits specified in 3.4.1. The engine shall then be shut down, hot soaked, and restarted when the fuel temperature at the inlet to the fuel transfer pump reaches a temperature of 170°F. Fuel shall be supplied to the engine mounted fuel transfer pump at a pressure of 5 psi. The fuel pressure shall be shut off during the hot-soak period. The starting time shall not exceed 2 minutes.

4.5.3.9 Low-pressure conditions. To determine conformance to 3.4.11, the engine shall be placed in a simulated environmental condition of 8000 ft elevation, 22.2 in Hg pressure and 90°F temperature, and its general performance characteristics observed. NOTE: Pressure is measured at turbocharger inlet and exhaust outlet.

4.5.3.10 Humidity conditions. To determine conformance to 3.4.12, the engine shall be verified to meet all performance requirements when subjected to relative humidity conditions as low as 5% at temperature of 115°F and as high as 100% at all temperatures from -25 to +85°F.

4.5.3.11 Steam and water jet cleaning. To determine conformance to 3.4.13, steam and water jet cleaning shall be performed as follows. The jet shall be applied perpendicular to the surface being cleaned at a distance of not more than 1 ft from the surface for steam cleaning and not more than 5 ft from the surface for water jet cleaning, and it shall be cleaned at a rate of 1 square foot per minute. The jet pressure shall not be less than 100 psi, and not more than 110 psi. Prior to cleaning, the air intake opening, flywheel, exhaust, and all other openings that might be affected shall be covered.

4.5.3.11.1 Post-cleaning test. The engine shall start and operate at idle speed without misfiring within 2 minutes immediately after the completion of both the steam and water jet cleaning operations.

4.5.3.12 Engine interchangeability. To determine conformance to 3.4.14, the M730A2 and M113A3 vehicles shall be operated satisfactory with the engine installed.

MIL-PRF-62541A

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. The engines covered by this specification are intended for production use, as spares, or as replacements for military tactical vehicles.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- c. When first article samples are required (see 3.1 and 4.2).
- d. When preproduction inspection is required (see 4.2.1).
- e. Initial production inspection, if other than specified (see 4.2.2)
- f. Packaging requirements, if other than specified (see 5.1).

6.3 Correction factors. Observed dynamometer performance may be corrected to standard conditions by application of correction factors as follows:

- a. Air inlet temperature: Add 2.1 bhp for each 10°F difference above 85°F. Subtract 2.1 bhp for each 10°F difference below 85°F.
- b. Fuel temperature: Add 0.90 bhp for each 4°F difference above 90°F. Subtract 2.1 bhp for each 10°F difference below 85°F.
- c. Fuel specific gravity: Add 0.600 bhp for each 0.001 difference less than 0.853 specific gravity measured at 60°F. Subtract 0.60 bhp for each 0.001 difference greater than 0.853 specific gravity measured at 60°F.

MIL-PRF-62541A

6.4 Subject term (key word) listing.

Compression-ignition
Internal-combustion
Liquid-cooled
M113
M730
2-stroke-cycle

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodian:
Army - AT

Preparing Activity:
Army - AT

Review Activity:
DLA-CS

(Project 2815-0175)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:
1. DOCUMENT NUMBER

MIL-PRF-62541A

2. DOCUMENT DATE (YYMMDD)

970428

3. DOCUMENT TITLE

Engine, Diesel, 6-Cylinder, V-Type, 275 H. P., Turbocharged

4. NATURE OF CHANGE (*Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.*)

5. REASON FOR RECOMMENDATION
6. SUBMITTER
a. NAME (*Last, First, Middle Initial*)

b. ORGANIZATION
c. ADDRESS (*Include Zip Code*)

d. TELEPHONE (*Include Area Code*)

 (1) Commercial
 (2) AUTOVON
 (*If applicable*)

7. DATE SUBMITTED
 (YYMMDD)

8. PREPARING ACTIVITY
a. NAME
b. TELEPHONE (*Include Area Code*)

 (1) Commercial (810) 574-8745
 (2) AUTOVON 786-8745

c. ADDRESS (*Include Zip Code*)

 Commander
 U.S. Army Tank-automotive and Armaments Command
 ATTN: AMSTA-TR-E/BLUE
 Warren, MI 48397-5000

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 Defense Quality and Standardization Office
 5203 Leesburg Pike, Suite 1403
 Falls Church, VA 22041-3466
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