

MIL-C-62310A(AT)  
21 SEPTEMBER 1982  
 SUPERSEDING  
 MIL-C-62310(AT)  
 24 April 1981

## MILITARY SPECIFICATION

CARRIERS, ARMORED, FULL-TRACKED:  
 M113A2, M106A2, M125A2, AND M577A2, AND  
 CHASSIS, WEAPON, FULL-TRACKED: M741A1, AND M901

### 1. SCOPE

1.1 Scope. This specification covers six types of armored, full-tracked, diesel powered vehicles designed for cross country and amphibious operations.

#### 1.2 Classification (see 6.2).

<u>Model</u>	<u>Army drawing</u>	<u>Vehicle type</u>
M106A2	8750026	Carrier, 107MM Mortar
M113A2	8750024	Carrier, Personnel
M125A2	8750027	Carrier, 81MM Mortar
M577A2	8750025	Carrier, Command Post
M741A1	8750030	Chassis, Weapon, Full-tracked
M901	12253500	Chassis, Weapon, Full-tracked

### 2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### FEDERAL

VV-F-800 - Fuel Oil, Diesel.

##### MILITARY

DAPD-285 - Generator Set, Gasoline Engine Driven, 4.2 Kilowatt, 28 Volt, Direct Current.

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Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Tank-Automotive Command, ATTN: DRSTA-GSS, Warren, MI 48090, 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-P-514   | - Plates, Identification, Instruction and Marking, Blank.   |
| MIL-C-45360 | - Carrier, Personnel, Full Tracked, Armored M113 and M113A1, and Mortars, Self Propelled, 107MM, M106 and M106A1, and 81MM, M125A1, Processing for Storage and Shipment of. |
| MIL-C-46746 | - Carrier, Command Post, Light Tracked, M577 and M577A1, Processing for Storage and Shipment of.  |
| MIL-C-62074 | - Chassis, weapon, Full-tracked M741, Processing for Storage and Shipment of.   |
| MIL-T-62099 | - Transmission, Hydraulic, Modified Automatic TX-100-1.   |
| MIL-E-62140 | - Engine Diesel: 6 Cylinder, V-type, 210 HP.  |
| MIL-C-62291 | - Chassis, Weapon, Full-tracked, F12253500, Processing for Storage and Shipment of.   |
| MIL-H-62315 | - Heater Assembly, Combustion, Vehicular Compartment, 60,000 BTU/hr.  |

## STANDARDS

### MILITARY

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|--------------|---|
| MIL-STD-105  | - Sampling Procedures and Tables for Inspection by Attributes.  |
| MIL-STD-130  | - Identification Marking of US Military Property.   |
| MIL-STD-461  | - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference. |
| MIL-STD-462  | - Electromagnetic Interference Characteristics, Measurement of.   |
| MIL-STD-642  | - Identification Marking of Combat and Tactical Transport Vehicles.   |
| MIL-STD-1275 | - Electrical Circuit, 28 Volt DC Transient Characteristics Military Vehicles.                               |
| MIL-STD-1474 | - Noise Limits for Army Material.   |

## DRAWINGS

### ARMY

- |         |  |
|---------|--|
| 8750026 | - Carrier, 107 Millimeter Mortar, M106A2.            |
| 8750024 | - Carrier, Personnel, Full Tracked, Armored, M113A2. |
| 8750025 | - Carrier, Command Post, Full Tracked, M577A2.       |
| 8750027 | - Carrier 81 Millimeter Mortar, M125A2.              |
| 8750030 | - Chassis, Weapon, Full-tracked, M741A1.             |

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10942803

- Lubrication Chart, Production, Fuel and Coolant.

12253500

- Chassis, Weapon, Full-tracked (M901)

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

### 3. REQUIREMENTS

3.1 First article (preproduction). When specified (see 6.2), the contractor shall furnish sample units for first article inspection and approval (see 4.3 and 6.3).

3.2 Initial production vehicles. Vehicles manufactured on initiation of quantity production shall be inspected, and shall pass, initial production inspection (see 4.4). Initial production vehicles shall be representative of vehicles to be furnished under this specification, and shall include all current modifications. No modification shall be applied to subsequent vehicles without approval of the Government.

3.2.1 Reliability. Reliability shall be not less than 750 Mean Miles Between Failure (MMBF) during the first 5,000 miles, when operated in accordance with the operational profile (see 3.2.4). For calculating MMBF, the definition in the M113A2 family 50 mile mission failure scoring criteria shall be used (see 6.11).

3.2.2 Durability. The vehicle with rated payload shall have a 50 percent probability of completing the first 5,000 test miles without replacement, rebuild, or major overhaul of the engine, transmission, transfer gear unit, differential steer unit, or final drives, and without repair or rebuild of the hull, when operated in accordance with the operational profile (see 3.2.4).

3.2.3 Maintainability. Total maintenance, excluding driver/crew checks and services, shall not exceed 175 manhours during 5,000 miles of operation in accordance with the operational profile (see 3.2.4). This equates to a Maintenance Ratio (MR) of 0.35 at 10 operational miles, equivalent to one operational hour. The scheduled maintenance interval shall be three months or 750 miles, whichever comes first.

3.2.4 Operational profile. Test mileage shall be apportioned as follows:

- a. 20 percent hard-surfaced roads
- b. 40 percent secondary roads
- c. 40 percent cross country

NOTE: During operation on hard-surfaced roads and cross country, the vehicle shall be capable of towing a vehicle of equal weight for 20 miles in each mode.

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3.3 Materials. Materials shall be as specified herein and in referenced drawings, specifications, and standards. Materials shall be free of defects and imperfections that might affect the serviceability and function of the finished product (see 6.10).

3.3.1 Ozone resistance. When rubber components are required to be ozone resistant, the degree of resistance shall be as specified in applicable specifications or drawings.

3.3.2 Qualified products. The contractor shall be responsible for using parts and assemblies from Qualified Products Lists (QPL's) whenever available. Contractor's inspection records shall specifically list all QPL items by number and date of the QPL, name of contractor and part or drawing number(s). When parts and assemblies are approved as qualified products, but not yet listed on the QPL, the contractor shall list the products by number and date of the approved document and name of contractor.

3.4 Construction. The vehicle shall be constructed in accordance with the following drawings, as applicable, and applicable specifications and standards (see 2.1). If more than one unit of a particular component is used, the components used shall be identical in make, material and quality. Riveting, welding practices and quality shall be the same on each vehicle. Completed vehicles shall meet all requirements specified herein, and be of a quality that assures a vehicle free of defects that would compromise, limit, or reduce its performance.

<u>Model</u>	<u>Drawing Number</u>
M106A2	8750026
M113A2	8750024
M125A2	8750027
M577A2	8750025
M741A1	8750030
M901	12253500

3.4.1 Bearing seals. When fording, operating amphibiously, or in mud, sand or snow, seals shall prevent the entrance of foreign matter into the bearings, which are exposed to contamination during these operations. Bearing seals shall restrict the leaking of lubricants from bearings.

3.4.2 Special equipment.

3.4.2.1 Winterization equipment. Provisions shall be made for installation of winterization equipment, including personnel heaters. When installed (see 6.2), winterization equipment shall assure operation under arctic conditions in ambient temperatures of minus 25°F to minus 60°F.

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3.4.3 Doors and covers. All doors and covers furnished shall conform to applicable drawings. When doors and covers are installed in accordance with the drawings, they shall fit and be water, dust and snow resistant and function without interference or misalignment.

3.4.3.1 Hatches and vision devices. All hatches and vision devices furnished shall conform to applicable drawings. Hatches shall have positive locks for open position. Vision device receptacles incorporated in the vehicle shall accept Government supplied vision devices without binding or interference, and provide adequate support during all vehicle operating conditions. All closed hatches and installed vision devices shall restrict entrance of water to a maximum of 10 drops per minute, collectively, into the vehicle.

3.4.3.2 Doors (M106A2 and M125A2). The roof access door center section on M106A2 and M125A2 vehicles shall open back on right door section, and lock securely and open in combination with the right door section on top deck and lock securely. The left door section shall open back on top deck, and lock securely. When open during vehicle operation, access doors shall remain securely locked in open position.

3.4.3.3 Covered extension lightproofness (M577A2). When installed and attached to the M577A2 vehicle in accordance with applicable drawings, the lighted interior of the covered extension shall be invisible at a distance of 125 yards under natural pitch darkness conditions. All junctions shall be lightproof when operating under field conditions.

3.4.3.3.1 Covered extension wind resistance. The covered extension, when assembled over the frame assembly and attached to vehicle, shall withstand a steady wind pressure of 40 miles per hour.

3.4.3.3.2 Covered extension stowed. All covered extension items stowed (combat loaded) on the vehicle in the spaces provided shall fit properly and not interfere with the operation of vehicle or components.

3.4.4 Engine. The engine shall conform to MIL-E-62140 and shall operate throughout all speed ranges without evidence of cooling system, lubricant, or fuel leakage.

3.4.4.1 Engine air induction system. The air induction system, as installed, shall prevent entrance of foreign matter as specified on applicable drawings.

3.4.5 Exhaust systems. The engine exhaust system, as installed and the personnel heater exhaust system when installed, shall not permit concentration of toxic fumes in the driver and crew compartments to exceed 50 ppm for carbon monoxide (CO) or 5 ppm for oxides of nitrogen (NO<sub>x</sub>).

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3.4.6 Fuel system, grades and slopes. During vehicle operation, the fuel system shall maintain a continuous supply of fuel to the engine when ascending and descending 60 percent grades in forward and reverse gear, and when vehicle is being operated on 30 percent side slopes with either side of vehicle up slope.

3.4.6.1 Fuel cells. Provision shall be made to assure the internal cleanliness of the fuel cell(s) prior to initial fueling of vehicle. The fuel cell(s) shall be capable of receiving 50 gallons of fuel per minute.

3.4.6.2 Fuel and hydraulic lines. Fuel and hydraulic lines and connections shall be internally clean prior to initial fueling and servicing of vehicle. All fuel and hydraulic lines, connections, and cells shall be leak-free.

3.4.6.3 Rack linkage. With rack linkage installed in accordance with applicable drawings, and with the accelerator pushed against the stop, the rack shall be at full open position.

3.4.7 Transmission, transfer gear case and controlled differential. The transmission shall conform to MIL-T-62099. When installed in vehicle the transmission transfer gear case and controlled differential shall operate throughout all gear ranges without evidence of leakage.

3.4.8 Ammunition racks (M106A2 and M125A2). Ammunition racks, when installed, shall support and retain the ammunition, or simulated ammunition of the same size and weight, within the racks during all conditions of vehicle operation.

3.4.9 Electrical system.

3.4.9.1 Generating system voltage (alternator). After no less than 20 minutes of operation with headlights on, regulator control shall be observed. Alternator shall be operated at  $4000 \pm 100$  rpm with an output of  $50 \pm 5$  amperes, and the voltage regulator rheostat adjusted to provide  $27.3 \pm 0.3$  volts at the vehicle batteries. Voltage at the vehicle batteries shall be  $28.0 \pm 0.5$  volts when the load is removed.

3.4.9.1.1 Auxiliary generator (M577A2). The auxiliary generator shall conform to DAPD-285, and shall deliver 150 amperes continuously for operation of all command post equipment.

3.4.9.2 Lights Internal and external lights specified on applicable drawings shall operate, and all electrical contacts and connections shall maintain positive contact, under all vehicle operating conditions.

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3.4.9.3 Heater (M577A2 and M901). The heater shall conform to MIL-H-62315 and shall start and shall operate satisfactorily with vehicle electrical system, and diesel fuel conforming to VV-F-800.

3.4.9.4 Communication and electrical circuits. Communication and electrical circuits shall maintain continuity from end to end, without shorts from pin to pin, or from pin to connector shell.

3.4.9.5 System voltage characteristics. Electrical system voltage characteristics shall fall within the limits for transient and steady state voltage requirements specified in MIL-STD-1275.

3.4.9.6 Electromagnetic interference suppression. The vehicle, when operating, shall meet the requirements for EMI/EMC suppression in accordance with emission requirements REO5 and CEO7 of MIL-STD-461A, Notice 4.

3.4.10 Controls. All electrical, mechanical and hydraulic controls shall operate without malfunction throughout all ranges of operation under all vehicle operating conditions.

3.4.11 Adjustment mechanisms. All adjustment mechanisms shall function properly and maintain adjustment within required settings during all vehicle operating conditions.

3.4.12 Trim vane. The trim vane shall retain its extended position when vehicle is operated amphibiously.

3.4.13 Ramp system. The ramp hydraulic system shall be internally clean, and have all connections tight, prior to initial filling of the system. The system shall be free of leakage before and after operation. Ramp raising time, from the fully lowered position to closed position, shall be not more than 18 seconds with engine operating at a maximum of 1200 rpm.

3.4.14 Stowed material. All interior and exterior Basic Issue Item (BII) shall be stowed (combat loaded) on the vehicle, in spaces provided, to assure that items will not interfere with operation of vehicle and components.

3.4.15 Welding repairs. Welding repairs of any kind shall be made only when, and to the extent, specifically authorized by the procuring activity. (see 6.2).

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3.4.16 Suspension lockout system (M741A1). A suspension lockout system shall be provided on the M741A1 chassis to prevent suspension springing action relative to the chassis hull. The system shall incorporate an activation mechanism (on/off), and shall be provided with an interlock to prevent chassis from being driven with suspension locked.

3.5 Break-in run. Prior to tests, each vehicle shall be given a break-in run for the distance specified in table I on smooth, level, hard-surfaced roads or test track. After completion of the break-in run, there shall be no indication of damaged components, loss of original adjustment, or other defects that may cause faulty vehicle operation subsequent to Government acceptance.

TABLE I. Speeds and distances for break-in run.

Division of run	Speed – mph	Distance – miles
a	0 to 10	5
b	11 to 20	5
c	21 to 30	10
d	31 to maximum governed	10

3.5.1 Preparation. Prior to break-in run, except for equipment and component installation and servicing performed by the contractor as a final processing of vehicles for acceptance, the vehicle shall be completely assembled and all adjustments completed. Vehicle, including all components requiring lubrication, shall be lubricated as specified in drawing 10942803, and serviced with fuel conforming to VV-F-800. Specific applications by grades or types for various expected seasonal temperature ranges shall be as specified.

3.6 Performance. A complete vehicle, loaded with rated payload, serviced as specified in 3.5.1, and equipped for existing climatic conditions, shall operate as specified herein without special equipment. The engine disconnect clutch shall be considered special equipment. Performance shall be demonstrated on smooth, level, hard-surfaced roads free of loose material.

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3.6.1 Environmental conditions. The complete vehicle shall operate in ambient air temperature of plus 125°F to minus 25°F and, with special equipment installed, down to minus 60°F. The complete vehicle shall withstand storage at minus 80°F without deterioration that may cause failure of any component part of the vehicle.

3.6.2 Cooling systems.

3.6.2.1 Engine cooling. With the vehicle operating in an ambient temperature of 125°F, the engine cooling system shall maintain engine coolant at not more than 230°F, measured at a point in the engine outlet to radiator. Radiator pressure cap shall relieve between 13 and 18 psig.

3.6.2.1.1 Deaeration/clearing capacity. Cooling system shall perform as specified while ingesting air at rates up to 0.6 cubic feet per minute (cfm). With the system stabilized at an air injection rate of 0.6 cfm, for 12 minutes minimum, the system shall purge itself of air within 4 minutes after stopping air injection.

3.6.2.1.2 Drawdown capacity. Cooling system shall perform as specified while operating with a coolant volume loss of up to 11 quarts.

3.6.2.2 Transmission lubricant cooling. With the vehicle operating in an ambient temperature of 125°F, the transmission lubricant cooling system shall maintain lubricant temperature at not more than 325°F, measured out of transmission into cooler, except at torque converter speed ratios less than 4/10.

3.6.2.3 Differential oil cooler. With the vehicle operating in an ambient temperature of 125°F, the differential lubricant cooler shall maintain lubricant temperature below 300°F, measured out of differential into cooler.

3.6.3 Bilge pumps. The bilge pumps, installed in accordance with applicable drawings, shall remove water from the vehicle at a minimum rate of 44 gpm each with a discharge head of 4 1/2 feet, and with pump motor operating on 27.5 volts impressed at the motor.

3.6.4 Speeds and vehicle control. The vehicle shall sustain speeds up to 32 mph, and shall attain a speed of 40 mph after 400 miles of operation, without damage to power plant or suspension system. With vehicle traveling between 15 mph and maximum speed, drift shall not exceed 3 feet in 100 feet.

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3.6.5 Acceleration. With the vehicle at a standstill, transmission in 1-3 range, and engine at idle speed, the vehicle shall accelerate from 0 to 20 mph in not more than 11 seconds.

3.6.6 Engine starting on grades and slopes. After vehicle has been standing on a 60 percent grade for not less than 2 minutes with engine operating under no load between 750 and 1000 rpm, the engine shall be stopped for not less than one minute. The engine shall restart in not more than one minute when vehicle is headed up or down a 60 degree grade. Similar engine starting tests shall be conducted on 30 percent side slopes, with right and then left side of vehicle up-slope.

3.6.7 Braking.

3.6.7.1 Stopping and vehicle control. Vehicle shall stop within a distance of 40 feet from point of service brake application when traveling at a speed of 20 mph on smooth, level, hard-surfaced roads free of loose material. Drift shall not exceed 3 feet in stopping distance. During stopping, the vehicle being under driver's individual control, steering action is permitted.

3.6.7.2 Holding. With brakes locked for parking and with transmission in neutral, the vehicle shall hold stationary when parked on a 60 percent longitudinal grade. For this operation vehicle shall be loaded with rated payload.

3.6.8 Turning. Vehicle, on smooth, level, hard-surfaced road or track, with differential steer, shall make continuous, full 360 degree turns to right and to left, with rear point of outer edge of vehicle at all times in contact with or within a 50 foot diameter circle. When in pivot steer, the vehicle shall pivot within a 28 foot diameter circle. The applied effort to the steering lever shall not exceed 100 pounds to pivot vehicle.

3.6.9 Water crossing.

3.6.9.1 Leakage. During shallow water crossings and amphibious operation, leakage of water into the hull shall be not more than one quart per minute.

3.6.9.2 Shallow water crossing. Vehicle shall ford shallow, hard-bottomed, salt or fresh water channels up to the depth required to float vehicle.

3.6.9.3 Amphibious operation. Vehicle, launched amphibiously, shall negotiate water of depth sufficient to float vehicle with height of waves not exceeding one foot. When afloat in calm water, vehicle shall attain a maximum speed of not less than 3 mph. The vehicle shall operate within a 30 foot corridor when crossing calm, open water.

3.6.10 Trench crossing. Vehicle shall cross trenches up to 36 inches in depth, and up to 66 inches in width, without damage to vehicle.

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3.6.11 Vertical obstacles. Vehicle, operating at low speeds in forward gear, shall cross vertical obstacles (wall) up to 24 inches in height and, in reverse gear, obstacles up to 14 inches in height without damage to vehicle.

3.6.12 Grade and slope operation. Vehicle shall ascend 60 percent grades in forward and reverse gear, from a standstill position in the grade, without stalling or damage to power plant or power train. Vehicle shall operate without malfunction or damage on 30 percent side slopes, with right and then left side of vehicle up-slope. Proper oil pressure and temperature shall be maintained in the engine, transmission, transfer gear unit, and controlled differential during all grade and slope operation. Oil pressure readings shall be made with engine operating at 600 to 800 rpm.

3.6.13 Suspension. The vehicle suspension shall operate over a minimum of three 6 x 6 inch obstacles, spaced 30 feet apart, at a speed of 18 to 22 mph, without bottoming out of the track drive sprockets, or idler wheels.

3.6.14 Cupola (M113A2, M125A2 and M106A2). The installed cupola without gun and ammunition shall rotate (after breakaway) without binding under an applied torque of 15 pound feet maximum with vehicle level and commanders hatch closed.

3.6.15 81mm mortar (M125A2). The installed 81mm mortar shall have an elevation range from 740 mils minimum to 1575 mils maximum, and a traverse range of 360 degrees. The travel lock provided shall hold mortar in locked position when vehicle is traveling over cross country terrain, main, and secondary roads.

3.6.16 107mm mortar (M106A2). The installed 107mm mortar shall have an elevation range from 740 mils minimum to 1125 mils maximum, and a traverse range of 775 mils to the right, and 825 mils to the left, of center of quadrant (1600 mils total traverse). The travel lock provided shall hold mortar in locked position when vehicle is traveling over cross-country terrain, main, and secondary roads.

3.6.17 Mortar mount (M106A2 and M125A2). The mortar mount, while supporting the weapon or a weight equivalent to the weapon, shall rotate without binding and have a maximum breakaway torque of 100 pound foot when vehicle is level.

### 3.7 Painting, marking and data plates.

3.7.1 Painting. Exterior and interior of vehicle and component assemblies and parts which require painting shall be prepared and painted in accordance with applicable Final Protective Finish Procedure Drawing (see 6.2).

3.7.2 Marking. Vehicle marking shall be in accordance with MIL-STD-642. Parts and components shall be marked in accordance with MIL-STD-130.

3.7.3 Name, shipping, and service data plates. The plates shall meet the requirements of MIL-P-514, or applicable drawings.

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3.8 Noise level. With a sound level meter (see 4.7.35) located 4 inches forward of the engine compartment rear bulkhead, 4 inches to the left of engine compartment left bulkhead, and 12 inches below the inside surface of the top armor plate, and the vehicle traveling at 30 mph in a 1-3 gear range on a hard-surfaced straight road with all doors and hatches closed, the sound level shall not exceed 119 db (A).

3.8.1 Noise hazard caution sign. The vehicle driver and passenger compartments shall be posted as noise hazardous areas as specified in MIL-STD-1474.

3.9 Fire extinguisher. The fixed fire extinguisher system, when installed in accordance with applicable drawings, shall be readily accessible for servicing and operation internally and externally.

3.10 Workmanship. Workmanship shall be of such quality as to assure that the vehicle and its components are free of defects that compromise, limit or reduce capability in the performance of its intended use. In addition to general appearance, the defects listed in table IV shall be considered to be cause for failure.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified in the contract, 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 inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Materials and qualified products. The contractor's records shall be reviewed to determine conformance to 3.3 and 3.3.2.

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4.1.2 Parts and components. Parts, components and assemblies shall be inspected for conformance to requirements of drawings subordinate to those specified in 3.4, and applicable specifications and standards. When applicable, inspection shall also be in accordance with Supplementary Quality Assurance Provisions (SQAP's) or Quality Assurance Requirements (QAR's) (see 6.2).

4.2 Classification of inspection. Classification of inspection shall be as follows:

- a. First article (preproduction) inspection (see 4.3)
- b. First production vehicle inspection (see 4.4).
- c. Quality conformance inspection (see 4.6).

4.3 First article (preproduction) inspection. First article inspection, shall be performed after award of contract and prior to production (see 3.1). Inspection shall be performed on a sample unit which has been produced with equipment and procedures normally used in production. One sample shall be subjected to the examination specified in table IV, all tests specified herein, and examined for conformance to applicable drawings. First article approval is valid only on the contract under which it is granted, unless extended by the Government to other contracts.

4.3.1 Failure. Failure to pass any examination or test, or defects in excess of the Acceptable Quality Level (AQL) specified, shall be cause for refusal to grant first article approval.

4.4 Initial production inspection. On beginning production, three vehicles shall undergo, and shall pass, initial production inspection (see 3.2). One vehicle shall undergo first production vehicle inspection, and the second and third vehicles will be subjected to the initial production test.

4.4 First production vehicle inspection.

4.4.1.1 In-process examination. During fabrication of the first production vehicle, an in-process examination will be conducted by representatives of TACOM Product Assurance Directorate to evaluate conformance of materials and workmanship to specified requirements. Examination will be made at the contractor's or subcontractor's facility prior to application of primer and paint. Processing and welding procedures, quality system, and inspection records will be evaluated during this examination.

4.4.1.2 Completed first production vehicle contractor inspection. The first completed production vehicle shall be road tested and inspected by the contractor, as specified in 4.6.5, to determine conformance to contract and specifications. After inspection, the contractor shall submit the acceptable vehicle (and all inspection records and certifications) to the responsible Government inspection element at contractor's plant for preliminary examination.

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4.4.1.3 Preliminary examination. The responsible Government inspection element will conduct a preliminary examination, as specified in 4.6.2, of the first completed production vehicle.

4.4.1.4 Provisional inspection. Provisional inspection of the first completed production vehicle will be conducted jointly by representatives of TACOM Product Assurance Directorate and the responsible Government inspection element. Contractor shall provide any required assistance. Testing will be as specified in 4.6.5. Contractor shall make available his inspection plan, records, and certifications pertinent to the vehicle and components.

4.4.1.5 Repair of defects. Defects found as a result of the foregoing inspections shall be corrected by the contractor at no cost to the Government. Failure of the contractor to correct defects promptly shall be cause for suspension of acceptance of vehicles until corrective action has been accomplished and approved by the Government.

4.4.1.6 Vehicle disposition. On completion of first production vehicle inspection, the vehicle shall remain at the manufacturing facility, as a production sample, and shall be the last vehicle shipped on contract. Vehicle may be released sooner at the discretion of the Government. The contractor shall service and maintain vehicle during this period.

4.4.1.7 Final approval and acceptance. Final approval and acceptance of the first production vehicle shall be withheld until second and third vehicles are accepted (see 4.4.2).

4.4.2 Second and third initial production vehicles inspection. Two additional vehicles (see 4.4) from the first month's production, or the first 20 produced, will be subjected to the initial production test.

4.4.2.1 Initial production test. To determine conformance to Section 3 (inclusive), vehicles will be examined as specified in 4.6.2, and tested as specified in table VI. Subsequently, both vehicles will be tested for 5000 miles, as specified in table II. Inspection will be performed by the Government, and will require no more than 90 days. The contractor shall expeditiously furnish repair parts, as required to support testing.

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Table II. 5,000 Mile initial production test combat loaded.

Course	Mileage and speeds
<u>1/</u> Hard-surfaced roads	1,000 miles at varying speeds up to maximum
Gravel and dirt roads	2,000 miles at varying speeds up to maximum
Level cross country	1,000 miles at varying speeds up to maximum
<u>1/</u> Hilly cross country	1,000 miles at varying speeds up to maximum
Amphibious operation	1 hour minimum at varying speeds up to maximum

1/ NOTE: Hard-surfaced road and hilly cross country mileage includes 20 miles each with towed load.

4.4.2.2 Reliability verification. To determine conformance to 3.2.1, a point estimate value equal to or greater than 750 miles shall be demonstrated during test. The point estimate will be computed by dividing the total cumulative test mileage of all the test vehicles by the total cumulative chargeable failures experienced on these vehicles.

4.4.2.3 Durability verification. Conformance to 3.2.2 shall be verified during test at or above a 50 percent confidence level. The durability requirement will be calculated using a binominal approach requiring a minimum test vehicle sample size of two vehicles.

4.4.2.4 Maintainability verification. To determine conformance to 3.2.3, a maintenance ratio (MR) equal to or less than that specified in 3.2.3 must be demonstrated during test. The MR will be based upon the total cumulative maintenance manhours with the exceptions of human induced errors and driver/crew checks and services.

4.4.2.5 Test failure. Failure of the vehicle as a result of any defects of a workmanship or materials nature during, or as a result of the 5,000 mile test, shall be cause for rejection of the vehicle. Further, the Government may refuse to continue acceptance of production vehicles until evidence has been provided by the contractor that corrective action has been taken to eliminate the defects. Any defects found during or as a result of the 5,000 mile test, shall be prima facie evidence that all vehicles already accepted prior to completion of the 5,000 mile test are similarly deficient, unless evidence satisfactory to the contracting officer is furnished by the contractor that they are not similarly deficient. Such defects on all vehicles shall be corrected by the contractor at no cost to the Government.

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4.5 Break-in run (track). To determine conformance to 3.5, each vehicle shall be operated on smooth, level, hard-surfaced roads as specified in table I. The undulating portion of the test shall be accomplished twice in each direction at speeds between 5 and 10 mph during division "a", and between 11 and 14.5 mph during division "b". Records shall be kept of vehicle instrument readings. The results of the break-in runs, on the first twenty vehicles that meet all requirements, will serve as a standard for the evaluation of the balance of production.

4.5.1 Reverse operation. After each division of the break-in run, vehicle shall be stopped, the engine allowed to idle for not less than one minute, and the vehicle driven in reverse for a distance of not less than 50 feet.

4.5.2 Oil pressure and temperature. Prior to the break-in run the engine shall be operated at 600 to 800 rpm until lubricating oil is at operating pressure and temperature. If at any time during the break-in run the engine has been stopped for at least 15 minutes the engine shall again be operated, as above, before continuing break-in run. Proper oil pressure and temperature shall be maintained in the engine, transmission, transfer unit, and controlled differential during operation on level ground, 60 percent grades, and 30 percent side slopes with either side of vehicle up-slope.

NOTE: The differential oil filter element shall be removed, cleaned and reinstalled following completion of the break-in run and prior to shipment.

4.5.3 Simulated break-in run. When specified (see 6.2), to determine conformance to 3.5, a simulated break-in run (see table III) may be accomplished on the Army Skid Type Dynamometer in lieu of the run specified in 4.5. The final ten miles of the total break-in run shall be on smooth, level, hard-surfaced roads. The undulating portion of the test shall be accomplished twice in each direction, at speeds between 5 and 10 mph during division "e" and between 11 and 14.5 mph during division "f". After completion of division "b" and "d", table III, the vehicle shall be operated in reverse as specified in 4.5.1.

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TABLE III. Simulated break-in run.

Division of run	Speed (mph)	Miles of test	Test conditions
a	0 to 10	5	Dynamometer
b	11 to 20	5	Dynamometer
c	21 to 30	5	Dynamometer
d	31 to Maximum governed	5	Dynamometer
e	21 to 30	5	Track (road)
f	31 to Maximum governed	5	Track (road)

4.6 Quality conformance inspection.4.6.1 Inspection provisions.

4.6.1.1 Lot size. An inspection lot shall consist of all vehicles of one model, produced during an identifiable production period, and submitted at one time for acceptance inspection. Production period shall not exceed one week.

4.6.1.2 Sampling for inspection. For the purpose of visual, dimensional, and primary functional inspection, a representative sample shall be selected from each inspection lot in accordance with inspection level II of MIL-STD-105. Before sampling, the contractor shall 100 percent inspect the first 20 vehicles to establish a process average (see 6.6), to allow normal sampling in accordance with MIL-STD-105.

4.6.2 Examinations. Visual, dimensional, and primary functional examination shall consist of examination of the vehicle for conformance to the applicable drawings and this specification. Examinations shall be performed against the classification of defects and with the acceptable quality levels specified in table IV. The following constitutes a part of the classification of defects (see 6.7)

- a. Any weep constitutes a minor defect.
- b. Any seep constitutes a minor defect.
- c. Any drip constitutes a major defect when the vehicle has been standing idle and the components are at ambient temperature.
- d. Any droplet that occurs at a static fit, metal to metal or gasket combination shall constitute a major defect.
- e. A malfunction that can be corrected by inherent adjustment features constitutes a minor defect.

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TABLE IV. Classification of defects.

Characteristic	Major - AQL 25 Defects/100 Units	Minor - AQL 150 Defects/100 Units	Method of Inspection
Engine	101. Malfunction, improper mounting, leaks <u>4</u> /	201. Improper Component Assembly (ICA)	Visual (V) and function (F)
Transmission	102. Malfunction, improper, mounting, leaks <u>4</u> /	202. ICA	V&F
Transfer gear case	103. Malfunction, leaks <u>4</u> /	203. ICA	V&F
Differential steer unit	104. Malfunction, leaks <u>4</u> /	204. ICA	V&F
Final drive units	105. Malfunction, leaks <u>4</u> /	205. ICA	V&F
Fuel system components	106. Malfunction, leaks <u>1</u> / <u>5</u> /	206. Improper Assembly or Installation (IAI)	V&F
Cooling system components	107. Malfunction, damage, coolant leaks, fan gearbox leaks <u>4</u> /	207. IAI <u>4</u> /	V&F
Instrumentation switches, warn- ing indicating any safety devices	108. Malfunction, damage	208. IAI	V&F

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TABLE IV. Classification of defects. (Cont'd)

Characteristic	Major – AQL 25 Defects/100 Units	Minor – AQL 150 Defects/100 Units	Method of Inspection
Electrical system, components and circuits, communication system <u>2/</u>	109. Malfunction, improper, lighting sequences	209. IAI	V&F
Suspension system components	110. Damage, leaks <u>4/</u>	210. IAI clearance or bolt and nut torque; misalignment	V&F and SIE <u>3/</u>
Tracks	111. Damage, pad separation	211. IAI, track tension or bolt and nut torque	V and SIE <u>3/</u>
Doors and hatches	112. Malfunction, damage	212. IAI	V&F
Ramp and hydraulic components	113. Malfunction, damage, leaks <u>4/</u>	213. IAI	V&F
Trim vane	114. Malfunction	214. IAI	V&F
Bilge pumps	115. Malfunction, damage	215. IAI	V&F
Covers, grilles, ducts vents, panels, stowage boxes, fenders, hardware locking devices	116. Malfunction, of torsion springs, hold-open and locking devices: damage	216. IAI or seals adhesion: defective welds sheet metal damage	V&F

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TABLE IV. Classification of defects. – (Cont'd)

Characteristic	Major – AQL 25 Defects/100 Units	Minor – AQL 150 Defects/100 Units	Method of Inspection
Controls	117. Malfunction	217. IAI	V&F
Track drive sprockets and drive shafts	118. Damage, clearance improper	218. IAI	V & SIE <u>3</u> /
Adjustment mechanisms	119. Malfunction	219. IAI	V&F
Vision Device and Receptacles	120. Damage, malfunction	220. IAI	V&F
Hull	121. Structural and welding defects	221. N/A	V&F
Towing pintle, lifting eyes, towing eyes and hooks	122. Malfunction, damage defects	222. IAI welding defects	V&F
Seats, crash pads and straps	123. Damage, seat control malfunctions	223. IAI	V&F
Fire extinguishers	124. Seals defective or missing, damage	224. IAI data card incomplete, safety wire broken	V
Electrical wiring, tubing and hoses	125. Damage, defective	225. Improper installation, coding or protection	V
Paint	N/A	226. Improper application or color	V

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TABLE IV. Classification of defects – (Cont'd)

Characteristic	Major - AQL 25 Defects/100 Unit	Minor – AQL 150 Defects/100 Unit	Method of Inspection
Decals, marking data and instructions plates	N/A	227. Missing, illegible; improper location, size or text	V
Lubrication and lubricants	N/A	228. Improper application, types or levels	V
Protective and anti-skid coatings	N/A	229. Improper application or materials; incomplete coverage	V
Records forms and publications	N/A	230. Missing, improperly processed or secured	V

1/ Fuel leaks constitute a special defect and will result in total inspection of the lot for this defect.

2/ Filament failures are not to be classified as major or minor defects.

3/ SIE means standard inspection equipment.

4/ Oil weep or seep is permissible (See 6.7).

5/ Engine fuel pump (excluding all connections) with 1 drop per minute leakage is permissible.

4.6.2.1 Unclassified defects. Defects considered to be departures from good workmanship but having no bearing on function, safety, interchangeability, or life shall be noted in writing. Such defects recurring in five consecutive lots, or ten lots or more within a thirty-day period, will be added to the minor classification of defects with no increase in AQL.

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4.6.2.2 Examination failure. If a vehicle fails to pass any examination specified herein, the Government will stop acceptance until evidence has been provided by the contractor that corrective action has been taken.

4.6.3 Classification of tests. Classification of tests shall be as follows:

- a. Acceptance tests (see 4.6.4).
- b. Control tests (see 4.6.5).
- c. Comparison tests (see 4.6.6).

4.6.4 Acceptance tests. To determine conformance to Section 3 (inclusive), after the break-in run (see 4.5), each vehicle shall be examined as specified in 4.6.2, operated a distance of 8 miles or more by the contractor, and subjected to acceptance tests specified in table VI. Except for equipment and component installation, and servicing performed by the contractor as a final processing of vehicles for acceptance, vehicles shall be completely assembled and serviced with fuel, lubricants, and fluids as specified. Vehicles need not be loaded with rated payload, except for holding test and amphibious operation as specified in 4.7.24 and 4.7.27. After the tests, the vehicle shall be examined for evidence of fuel or lubricant leakage, or other defects. Such items as floor plates, personnel seat cushions, BII and decals may be omitted from the vehicle during testing.

4.6.4.1 Test failure. If a vehicle fails to pass any acceptance test specified herein, the Government will withhold acceptance of subsequent vehicle until evidence has been provided by the contractor that corrective action has been taken.

4.6.5 Control tests.

4.6.5.1 Frequency. One of the first 10 vehicles produced, and thereafter one per month, shall be selected for control testing after break-in run.

4.6.5.2 Fifty mile test. Vehicle shall be loaded to full combat weight and operated for a distance of 50 miles over relatively smooth, hard-surfaced roads. During and subsequent to the test, as appropriate, vehicle shall meet the requirements specified for control tests in Table VI.

4.6.5.3 Failure. If a vehicle fails to pass any control test specified herein, the Government will withhold acceptance examination and testing on subsequent vehicles until evidence has been provided by the contractor that corrective action has been taken.

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4.6.6 Comparison tests. The Government may select vehicles at any time during the contract production period and subject them to Government proving ground testing.

4.6.6.1 Sampling and lot size. Vehicles will be selected on a spot check basis, in a quantity and at a time specified by the Government.

4.6.6.2 Inspection routine. The sample vehicle will be subjected to the comparison tests specified in table VI, examined as specified in table IV and subjected to the 2,000 mile road test specified in table V. Samples will not include any vehicles previously tested.

4.6.6.3. Test Failure. Failure of any vehicle to comply with any of the requirements specified herein, or any major defect of a workmanship or materials nature occurring during, or as a result of, the tests may be cause for refusal to continue acceptance of vehicles by the Government until evidence has been provided by the manufacturer that corrective action has been taken to eliminate the condition which caused the rejection.

TABLE V. 2000 Mile comparison test, combat loaded.

Course	Mileage and speed
<u>1/</u> Hard-surfaced or gravel	200 miles at varying speeds up to maximum
Gravel and dirt road	500 miles at varying speeds up to maximum
Level cross country	650 miles at varying speeds up to maximum
<u>1/</u> Hilly cross country	650 miles at varying speeds up to maximum
Amphibious	One (1) hour minimum at varying speeds up to maximum

1/ Hard-surfaced road and hilly cross country mileage includes 20 miles each with towed load.

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TABLE VI. Classification and location of inspections and tests.

Title	Requirement	First article- initial vehicle production 1/	Acceptance 2/	Control 2/	Comparison 1/
Reliability	3.2.1	4.4.2.2			
Durability	3.2.2	4.4.2.3			
Maintainability	3.2.3	4.4.2.4			
Seals	3.4.1	4.7.1	4.7.1		4.7.2.1
Winterization equipment test	3.4.2.1	4.7.2.1			
Doors, and covers	3.4.3 and 3.4.3.2	4.7.3	4.7.3		
Hatches and vision devices	3.4.3.1	4.7.3.1		4.7.3.1	4.7.3.2
Covered extension lightproofness (M577A2)	3.4.3.3	4.7.3.2			4.7.3.3
Covered extension wind resistance	3.4.3.3.1	4.7.3.3			
Covered extension, stowed	3.4.3.3.2	4.7.3.4		4.7.3.4	
Engine	3.4.4	4.7.4	4.7.4		
Engine air induction system	3.4.4.1	4.7.4.1	4.7.4.1		
Exhaust system toxic-fumes	3.4.5	4.7.5		4.7.5	4.7.5
Fuel system, grades and slopes	3.4.6	4.7.6	4.7.6		4.7.6
Fuel cell(s)	3.4.6.1	4.7.6.1	4.7.6.1	4.7.6.1	
Fuel and hydraulic lines	3.4.6.2	4.7.6.2	4.7.6.2		
Rack linkage	3.4.6.3	4.7.6.3	4.7.6.3		
Transmission and controlled differential	3.4.7	4.7.7	4.7.7		
Ammunition racks	3.4.8	4.7.8		4.7.8	4.7.8
(M106A2 and M125A2)					
Generating system voltage	3.4.9.1	4.7.9.1	4.7.9.1		
Auxiliary generator (M577A2)	3.4.9.1.1	4.7.9.1.1		4.7.9.1.1	4.7.9.1.1
Lights	3.4.9.2	4.7.9.2	4.7.9.2		
Heater	3.4.9.3	4.7.9.3	4.7.9.3		4.7.9.3
Communication and electrical circuits	3.4.9.4	4.7.9.4	4.7.9.4		
System voltage characteristics	3.4.9.5	4.7.9.5			
Electromagnetic interference suppression	3.4.9.6	4.7.9.6			4.7.9.6
Controls	3.4.10	4.7.10	4.7.10		
Adjustment mechanisms	3.4.11	4.7.11	4.7.11		
Trim vane	3.4.12	4.7.12	4.7.12		
Ramp system	3.4.13	4.7.13	4.7.13		

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TABLE VI. Classification and location of inspections and tests. - Continued

Title	Requirement	First article- initial vehicle production 1/	Acceptance 2/	Control 2/	Comparison 1/
Stowed material	3.4.14	4.7.14		4.7.14	
Welding repairs	3.4.15	4.7.15	4.7.15		
Suspension lockout system (M741A1)	3.4.16	4.7.16			
Break-in run	3.5	4.5			4.7.17
Environmental conditions	3.6.1	4.7.17			
Engine cooling	3.6.2.1	4.7.18			
Deaeration/clearing capacity	3.6.2.1.1	4.7.18.1			
Drawdown capacity	3.6.2.1.2	4.7.18.2			
Transmission lubricant cooling	3.6.2.2	4.7.18			
Differential oil cooler	3.6.2.3	4.7.18			
Bilge pumps	3.6.3	4.7.19		4.7.19	4.7.19
Speeds and vehicle control	3.6.4	4.7.20	4.7.20		4.7.20
Acceleration	3.6.5	4.7.21	4.7.21		
Engine starting-grades and slopes	3.6.6	4.7.22	4.7.22		4.7.22
Stopping and vehicle control	3.6.7.1	4.7.23	4.7.23		4.7.23
Holding	3.6.7.2	4.7.24	4.7.24 3/	4.7.24	
Turning	3.6.8	4.7.25	4.7.25	4.7.25	
Leakage	3.6.9.1	4.7.26			
Shallow water crossing and leakage	3.6.9.2	4.7.26	4.7.26		
Amphibious operation	3.6.9.3	4.7.27	4.7.27	4.7.27	4.7.27
Trench crossing	3.6.10	4.7.28			4.7.28
Vertical obstacle	3.6.11	4.7.29			4.7.29
Grade and slope operation	3.6.12	4.7.30			4.7.30
Suspension	3.6.13	4.7.31			
Cupola (M13A2)	3.6.14	4.7.32	4.7.32		4.7.32
81mm mortar (M125A2)	3.6.15	4.7.33	4.7.33 4/		
107mm mortar (M106A2)	3.6.16	4.7.34	4.7.34 4/		
Mortar mount (M106A2 and M125A2)	3.6.17	4.7.33 and 4.7.34		4.7.33 and 4.7.34	
Noise level	3.8	4.7.35		4.7.35	
Fire extinguisher	3.9	4.7.36		4.7.36	
Workmanship	3.10	4.7.37	4.7.37		
Packaging	Section 5	4.7.38			

1/ Government proving ground.

2/ Manufacturer/contractor facility.

3/ To be performed with the vehicle unloaded

4/ To be performed without motor or weight simulation.

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4.7 Conformance verification.

4.7.1 Seals examination. To determine conformance to 3.4.1, prior to and after fording and amphibious operations, the vehicle shall be examined for lubricant leakage and water contamination.

4.7.2 Special equipment tests.

4.7.2.1 Winterization equipment test. To determine conformance to 3.4.2.1, provisions for installation of winterization equipment shall be examined for completeness. When specified, winterization equipment shall be installed, the vehicle operated at the specified temperatures, and equipment evaluated for functional requirements.

4.7.3 Doors, and covers examination. To determine conformance to 3.4.3, and 3.4.3.2, all doors and covers shall be operated, and examined for functional requirements.

4.7.3.1 Hatches and vision devices. To determine conformance to 3.4.3.1, all hatches shall be operated and examined for functional requirements. Vision devices shall be installed in their proper receptacles, examined for proper fit and observed during and after vehicle operation. With all hatches closed and vision devices properly installed, a spray of water shall be directed on the hatches and vision devices from an open hose with a line pressure of not less than 35 psi at a rate of 10 gallons per minute for a period of 3 minutes. Leakage shall not exceed an average of 10 drops per minute collectively.

4.7.3.2 Covered extension lightproofness test M577A2). To determine conformance to 3.4.3.3, the covered extension, assembled and attached to vehicle, shall be subjected to a lightproofness test. A lighted, white frosted 100 watt incandescent lamp shall be placed one foot away from inside wall of cover, and observed for light visibility at the specified distance and conditions of darkness.

4.7.3.3 Covered extension wind resistance test (M577A2). To determine conformance to 3.4.3.3.1, covered extension shall be subjected to a steady wind pressure of 40 mph for not less than 10 minutes.

4.7.3.4 Covered extension stowage test (M577A2). To determine conformance to 3.4.3.3.2, all covered extension items shall be stowed on the vehicle as specified on applicable drawings to verify proper fit and that they do not interfere with operation of the vehicle.

4.7.4 Engine test. To determine conformance to 3.4.4, the engine shall be operated throughout all speed ranges, and examined for proper installation and absence of leakage of lubricants, fuel and coolants. Prior to assembly and installation, all coolant, lubricant, and fuel lines shall be examined to insure internal cleanliness.

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4.7.4.1 Engine air induction systems examination. To determine conformance to 3.4.4.1, the engine air induction system shall be examined for proper installation and absence of leaks.

4.7.5 Exhaust systems toxic fumes test. To determine conformance to 3.4.5, the exhaust systems shall be examined for proper installation and absence of leaks. Toxic fume levels, measured in the driver and crew compartments, shall not exceed specified values. For the test, the vehicle shall be sealed, the engine operated at 900 to 1,000 rpm and the personnel heater, if installed, operated at high heat, for a period of not less than 30 minutes. However under ambient or test temperatures that exceed 55°F, the automatic shut-down of the heater before 30 minutes is acceptable.

4.7.6 Fuel system grades and slopes test. With the vehicle operating on specified grades and slopes, the vehicle engine and fuel system shall be observed to determine conformance to 3.4.6.

4.7.6.1 Fuel cell test. To determine conformance to 3.4.6.1, the fuel cell shall be examined for cleanliness. The fuel cell(s) filled to capacity, and all fuel lines and connections, shall be examined for leakage before and after the testing specified in 4.6.4.

4.7.6.2 Fuel and hydraulic systems leakage examination. To determine conformance to 3.4.6.2, the fuel and hydraulic systems shall be examined for leaks at all connections and sealed items before and after a road test on smooth, level, hard-surfaced road. Verify for internal cleanliness of the fuel cell and hydraulic lines prior to initial fueling and servicing of vehicle.

4.7.6.3 Rack linkage examination. To determine conformance to 3.4.6.3, the accelerator pedal shall be operated to full throttle, and the rack examined to assure that full open position has been reached when pedal is in contact with stop.

4.7.7 Transmission, transfer gear case and controlled differential test. To determine conformance to 3.4.7, transmission, transfer gear case and controlled differential shall be examined for proper assembly and operated throughout all gear ranges, and examined for proper installation and absence of leaks. Prior to assembly and installation, all lubricant and hydraulic lines shall be examined for internal cleanliness.

4.7.8 Ammunition racks test (M106A2 and M125A2). To determine conformance to 3.4.8, ammunition racks and fastening devices shall be examined for proper installation and positive fastening, and observed during vehicle operation for proper retention and support of ammunition.

4.7.9 Electrical systems test.

4.7.9.1 Generating system voltage (alternator) test. To determine conformance to 3.4.9.1, with the alternator operating as specified, a voltage measurement shall be made with a voltmeter after described load is removed, and immediately after the road test.

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4.7.9.1.1 Auxiliary generator test (M577A2). To determine conformance to 3.4.9.1.1, auxiliary generator shall be examined and command post equipment operated to determine continuous amperage output.

4.7.9.2 Lighting test. All lights shall be operated during and after break-in run throughout all stages of operation, and observed to determine conformance to 3.4.9.2.

4.7.9.3 Heater electrical test. To determine conformance to 3.4.9.3, the heater electrical control shall be turned on and the heater shall start and operate with the vehicle electrical system and diesel fuel.

4.7.9.4 Communication and electrical circuits test. To determine conformance to 3.4.9.4, electrical circuits supplying current to vehicle equipment shall be tested at all points to assure continuity throughout the circuits. Previously tested circuits shall be functionally tested after installation.

4.7.9.5 System voltage characteristics test. System voltage characteristics shall be evaluated as specified in MIL-STD-1275 to determine conformance to 3.4.9.5.

4.7.9.6 Electromagnetic interference suppression test. To determine conformance to 3.4.9.6, vehicle shall be tested as specified in MIL-STD-462.

4.7.10 Controls test. All controls shall be operated as specified and observed to determine conformance to 3.4.10.

4.7.11 Adjustment mechanisms test. To determine conformance to 3.4.11, all adjustment mechanisms shall be observed during operation, examined for proper adjustment, and adjusted if required.

4.7.12 Trim vane test. To determine conformance to 3.4.12, trim vane shall be examined for proper installation, and extended and retracted during amphibious operation to observe proper function.

4.7.13 Ramp system test. To determine conformance to 3.4.13, ramp hydraulic system shall be examined for internal cleanliness prior to filling, and for leaks before and after operation. Subsequently, the ramp shall be operated to fully opened and closed positions and the required time determined.

4.7.14 Stowed material test. To determine conformance to 3.4.14, all manufacturer and depot installed OVM shall be stowed (combat loaded) on the vehicle. All interior and exterior items shall fit in the spaces provided. The material shall be removed after the test. The OVM shall be of the latest configuration available to the contractor. The contractor shall be permitted to unpackage and repack equipment used for test (for domestic shipment only).

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4.7.15 Welding repairs and burning examination. To determine conformance to 3.4.15, all welding repairs and burning operations shall be examined to determine that slag has been removed and approved procedures have been followed.

4.7.16 Suspension lockout system test (M741A1). To determine conformance to 3.4.16, suspension lockout system shall be engaged and disengaged. Interlock mechanism shall be tested by trying to operate vehicle with interlock engaged. During engagement of the lockout system, turn engine off and verify that the system does not leak and to insure vehicle stability for a minimum of 20 minutes.

4.7.17 Environmental operation test. To determine conformance to 3.6.1, vehicle shall be stored and operated at the temperatures specified.

4.7.18 Cooling systems test. To determine conformance to 3.6.2.1, 3.6.2.2, and 3.6.2.3, the vehicle shall be operated at specified temperatures and cooling system temperatures measured during and after the test. Radiator pressure cap shall be pressure tested and shall relieve pressure within specified range.

4.7.18.1 Deaeration/clearing capacity test. To determine conformance to 3.6.2.1.1, the engine cooling system shall be subjected to the following test:

4.7.18.1.1 Initial test set-up. A set-up shall be accomplished within the vehicle (figure 2) and reflect the following:

- a. Sight glasses, pressure pick-ups, flow meter, and air injection provisions shall be installed in accordance with figure 2.
- b. Thermostat shall be installed and blocked open.
- c. Pressure cap shall be installed.
- d. Coolant - fresh water.

4.7.18.1.2 Initial test conditions. Initial test conditions shall be as follows:

- a. Engine speed - shall be maximum governed speed.
- b. Engine shall be operated at no load.
- c. Coolant flow shall be 70 gpm (min).
- d. Coolant temperature shall be  $180^{\circ} \pm 5^{\circ}\text{F}$ .
- e. Coolant level shall be at  $12 \pm .5$  gallons.

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4.7.18.1.3 Data requirements. Before test, determine pressure rise across the water pump as a function of coolant flow. The coolant temperature shall be  $180 \pm 5^{\circ}\text{F}$  with the pressure cap off. NOTE: Differential pressure across the pump shall be used to determine coolant flow (turbine-type meters are not accurate in aerated mediums). Excepting coolant loss, the following data shall be continuously recorded during test:

- a. Engine speed.
- b. Coolant flow.
- c. Coolant temperature (radiator inlet).
- d. Differential pressure across the water pump (water to pump - 0 to 30 psig)  
(water from pump - 0 to 60 psig).
- e. Surge tank pressure.
- f. Air injection rate.
- g. Elapsed time.
- h. Coolant loss shall be determined after test.
- i. Air entrained in coolant from radiator. 1/
- j. Air entrained in coolant makeup line. 1/

1/ Monitored visually using sight glass.

4.7.18.1.4 Test procedure. To insure that cooling system is full, fill with water and run engine until coolant temperature is  $190^{\circ}\text{F}$ . Stop engine and allow coolant temperature to fall below  $120^{\circ}\text{F}$ . Add water, as necessary, to the cold fill level (bottom of the fill neck extension). Start engine and establish initial operating conditions specified in 4.7.18. Visually insure that coolant is free of air. Begin injecting air into the cooling system at 0.15 cfm and 15 psig. Continue for 12 minutes, minimum, to insure stability. Increase air injection rate in 0.15 increments to 0.6 cfm. Inject air at each incremental change for 12 minutes minimum. After 12 minutes, minimum, at 0.6 air injection rate, shut off the air supply. Continue running the engine, until sight glass clears.

4.7.18.1.5 Test failure. The test is a failure, unless all the following criteria are satisfied:

- a. Coolant flow rate shall not fall below 50 percent of its initial value.
- b. Coolant loss shall not exceed 4 quarts.
- c. Cooling system clearing time (elapsed time required for coolant, as observed through a sight glass, to return to it's initial clarity after air injection stops) shall not exceed 4 minutes.

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4.7.18.2 Drawdown capacity test. To determine conformance to 3.6.2.1.2, the engine cooling system shall be subjected to the following test:

4.7.18.2.1 Initial test set-up and conditions. Set-up and initial test conditions shall be as specified in 4.7.18.1.1 and 4.7.18.1.2, except air injection fitting shall be replaced with a hose and valve suitable for draining coolant during test, and pressure cap shall be removed.

4.7.18.2.2 Data requirements. Before test, determine pressure rise across the water pump as a function of coolant flow. The coolant temperature shall be  $180 \pm 5^{\circ}\text{F}$  with the pressure cap off. NOTE: Differential pressure across the pump shall be used to determine coolant flow (turbine flowmeter may not be accurate when quantity of coolant is reduced). Excepting drained coolant volume, the following data shall be continuously recorded during test:

- a. Engine speed.
- b. Coolant flow.
- c. Coolant temperature (radiator inlet).
- d. Differential pressure across water pump.
- e. Coolant volume drained from system (see 4.7.18.2.3).
- f. Air entrained in coolant from radiator. 1/
- g. Air entrained in coolant makeup line. 1/

1/ Monitored visually, using sight glass.

4.7.18.2.3 Test procedure. Insure that cooling system is full as specified in 4.7.18.1.4. Start engine and establish initial operating conditions specified in 4.7.18.2.1. Insure visually that coolant is free of air. Drain 1 quart of coolant from system each minute (minimum) until 11 quarts have been drained.

4.7.18.2.4 Test failure. The test is a failure, unless the following criteria are satisfied:

- a. Coolant flow rate shall not fall below 98 percent of its initial value.
- b. There shall be no indication of entrained air in the coolant.

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4.7.19 Bilge pumps test. To determine conformance to 3.6.3, the vehicle shall have sufficient water in hull to measure bilge pumps operation. Rate of water removal, and discharge head shall be measured.

4.7.20 Speeds and vehicle control test. To determine conformance to 3.6.4, vehicle shall be driven at speeds from 2 to 3 mph for not less than 5 minutes and at specified speeds thereafter on smooth level hard surfaces, and performance observed.

4.7.21 Acceleration test. To determine conformance to 3.6.5, the vehicle shall be operated as specified on smooth level hard surfaces and acceleration measured.

4.7.22 Engine starting on grades and slopes test. To determine conformance to 3.6.6, the vehicle shall be driven up a 60 percent grade, engine stopped for not less than specified time and restarted. Vehicle shall then be operated on 30 percent side slopes and engine stopped for not less than specified time, then restarted.

4.7.23 Stopping and vehicle control test. To determine conformance to 3.6.7.1, the vehicle shall be driven at specified speed. Three stops shall be made and the results shall be averaged to determine acceptance.

4.7.24 Holding test. To determine conformance to 3.6.7.2, the vehicle shall be driven up the specified grade, brakes applied and vehicle observed for movement. Then, with brakes locked for parking, the vehicle shall again be observed for movement. During this test vehicle shall be combat loaded, or with a simulated load of equal weight placed in a position that will not restrict the flow of engine air (intake or exhaust).

4.7.25 Turning test. To determine conformance to 3.6.8, the vehicle shall be operated as specified, turned to the right and left in full 360 degree turns and performance observed.

4.7.26 Shallow water fording and floatation test. To determine conformance to 3.6.9.1 and 3.6.9.2, the vehicle shall be driven into water of specified depth without special equipment. Water accumulation shall not exceed specified amount after 15 minutes of test.

4.7.27 Amphibious operation test. To determine conformance to 3.4.1 and 3.6.9.3, the vehicle shall be loaded with rated payload, operated amphibiously and performance observed. The amount of water in the hull and leakage of lubricants from the bearings shall be measured.

4.7.28 Trench crossing test. To determine conformance to 3.6.10, the vehicle shall be operated over trenches of specified depth and width.

4.7.29 Vertical obstacle test. To determine conformance to 3.6.11, the vehicle shall be operated over vertical obstacles of specified height.

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4.7.30 Grade and slope operation. To determine conformance to 3.6.12, the vehicle shall be operated on specified grade and slope.

4.7.31 Suspension test. To determine conformance to 3.6.13, vehicle, operating at a speed of 18 to 22 mph, shall cross specified obstacles without bottoming out.

4.7.32 Cupola test (M113A2, M125A2 and M106A2). To determine conformance to 3.6.14, cupola shall be operated and observed to verify that it rotates without binding, and that applied torque does not exceed specified limit.

4.7.33 81mm mortar test (M125A2). To determine conformance to 3.4.3.2, 3.4.8, 3.6.15, and 3.6.17, the 81mm mortar shall be installed in vehicle and operated through all ranges of elevation and traverse. During weapon firing and vehicle operation over specified terrain, the ammunition rack and travel lock performance shall be evaluated. Operation of sight shall be confirmed at representative azimuths and elevations to insure that sight is not obscured by vehicle components.

4.7.34 107mm mortar test (M106A2). To determine conformance to 3.4.3.2, 3.4.8, 3.6.16 and 3.6.17, the 107mm mortar shall be installed in the vehicle and fired. During weapon firing and vehicle operation over specified terrain, the ammunition rack and travel lock performance shall be evaluated. Operation of sight shall be confirmed at represented azimuths and elevations to insure that sight is not obscured by vehicle components.

4.7.35 Noise level test. To determine conformance to 3.8, the vehicle noise level measured at the location indicated shall not be more than the specified db, when measured with a sound level meter which meets the requirements of MIL-STD-1474. Driver and passenger compartments shall be examined for signs indicating noise hazard, as specified in 3.8.1.

4.7.36 Fire extinguisher test. To determine conformance to 3.9, the fire extinguisher system shall be examined and functionally tested (see 6.4).

4.7.37 Workmanship. Vehicle shall be examined to determine conformance to 3.10.

4.7.38 Preservation, packaging, and vehicle processing inspection. Material and equipment shall be inspected, prior to shipment, to determine conformance to Section 5 of this specification. Sampling shall be as specified in applicable packaging specification referenced therein.

## 5. PACKAGING

5.1 Preparation for delivery. Preparation for delivery and storage shall be in accordance with MIL-C-45360 for models M113A2, M106A2, and M125A2, MIL-C-46746 for model M577A2, MIL-C-62074 for model M741A1, and MIL-C-62291 for model M901.

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## 6. NOTES

6.1 Intended use. Each model covered by this specification is capable of crossing inland waterways under its own power and is intended for use as specified below:

6.1.1 M106A2, 107mm carrier. The M106A2 carrier is used as a heavy mortar carrier by infantry and armored units.

6.1.2 M113A2 carrier. The M113A2 carrier is used as a personnel carrier.

6.1.3 M125A2 carrier. The M125A2 carrier is used as a medium mortar carrier by infantry and armored units.

6.1.4 M577A2 carrier. The M577A2 carrier is used as a command post.

6.1.5 M741A1 chassis. The M741A1 chassis is used as a self-propelled weapon carrier. The M741A1 chassis with the firing station is designated as the M163A1 Gun, Anti-aircraft, Artillery, Self-propelled.

6.1.6 M901 chassis. The M901 chassis is used as a self-propelled weapon carrier.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Model of carrier required (see 1.2).
- c. First article (preproduction model), if required (see 3.1).
- d. If winterization equipment is required (see 3.4.2.1).
- e. If welding repairs are authorized, and extent allowed (see 3.4.15).
- f. If simulated break-in run is authorized (see 3.5 and 4.5.3).
- g. Final protective Finish Procedure Drawing (see 3.7.1).
- h. If SQAP's or QAR's are required (see 4.1.2).

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6.3 First article. First article samples shall be tested and approved under the appropriate provisions of 7-104.55 of the Defense Acquisition Regulation. The contracting officer should include specific instructions in all procurement instruments regarding arrangements for examination, tests and approval of the first article (see 3.1).

6.4 Safety precautions. Caution should be used in handling carbon dioxide extinguisher cylinders. Extreme care should be exercised during reinstallation to avoid tripping fire-extinguisher control system since physical injury is highly probable.

6.5 Inspection equipment calibration and inspection. In inspecting the contractor's inspection equipment, the Government inspector will determine that the contractor has available, and utilizes correctly, gaging, measuring and test equipment of the required accuracy and precision. Except as otherwise specified, the contractor shall have available a set of master gages, standards and appropriate instruments for regularly scheduled calibration of his inspection equipment. Records of such regularly scheduled calibration shall be maintained by the contractor and made available for review by the Government. The calibration of gages, standards and instruments will be periodically checked by authorized Government personnel.

6.6 Process average. Sampling may be initiated if the process average value for the first twenty vehicles inspected is less than the AQL specified in the classification of defects for major and minor defects.

$$\text{Process average} = \frac{\text{Number of defects}}{\text{Number of vehicles inspected}} \times 100$$

If the computed process average exceeds the specified AQL, 100 percent inspection shall be performed and continued until such time that the process average for twenty consecutive vehicles is less than the specified AQL.

6.7 Definitions. The following definitions shall be used with the classification of defects for leaks:

- a. Weep: Any evidence of fluid beyond the seal.
- b. Seep: Any evidence of fluid beyond the seal that does not result in formation of a droplet.
- c. Droplet: Any evidence of fluid beyond the seal that results in the formation of a droplet.
- d. Drip: Any evidence of fluid beyond the seal where droplet forms and falls.

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6.8 Deficiency sheet. The Government inspector shall verify that a thorough inspection of each vehicle is performed by the contractor for the listed characteristics, and for any departures from good workmanship. The Government inspector shall assure that all defects encountered during inspection are enumerated on deficiency sheet for the vehicle. Defects noted on a deficiency sheet shall contain sufficient description to enable the Government inspector and the contractor's representative to classify the defects in accordance with the classification of defects (see table IV) and definitions contained in MIL-STD-105. Corrective action shall be taken for recurring defects.

6.8.1 Recurring major defects. A major defect is recurring when the same defect occurs more than once in the same sample, or when the defect occurs in two successive samples. A major defect may be considered recurring when the historical inspection records ("p" chart or approved equivalent) reflect such a condition. Recurring major defects shall be cause for the entire lot or lots to be inspected for the recurring defects.

6.8.2 Recurring minor defects. A minor defect is recurring if it occurs more than twice in the same sample or when the defect occurs in four successive samples. Recurring minor defects shall be cause for the entire lot or lots to be inspected for the recurring defects.

6.9 International standardization agreement. Certain provisions (3.6.9) of this specification are the subject of international standardization agreements NATO STANAG 2805-A (Edition 3), and ABCA-ARMY-STD-151. When amendment, revision or cancellation of this specification is proposed which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels, including departmental standardization offices, if required.

6.10 Recycled materials. The use of recycled materials, which meet the requirements of the applicable material specifications without jeopardizing the intended use of the item, shall be encouraged (see 3.3).

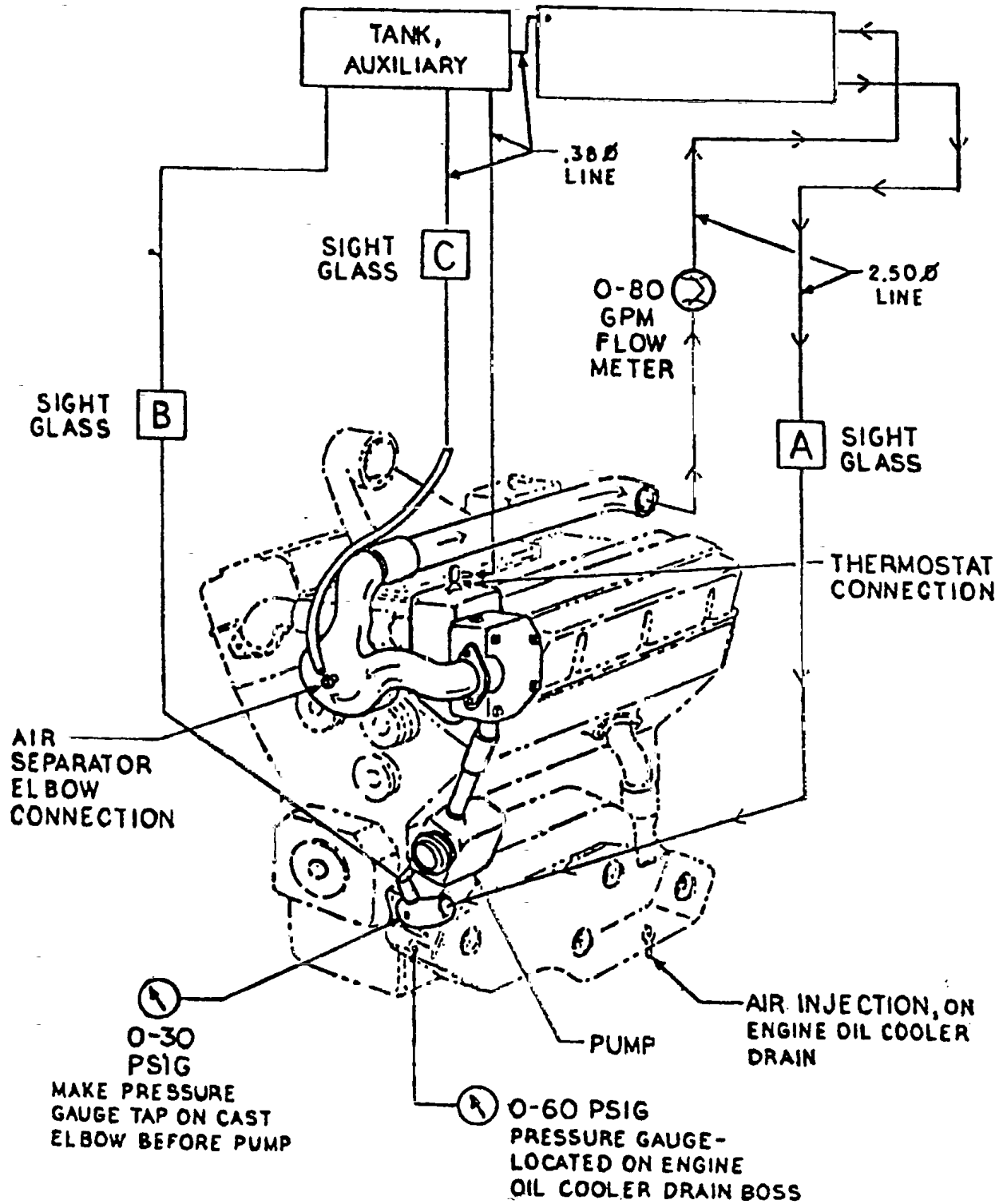
6.11 Mission failure scoring criteria. M113A2 Family Vehicles Failure Definition and Scoring Criteria may be obtained from US Army Tank-Automotive Command, Warren, MI 48090, ATTN: DRSTA-QRA.

Custodian:  
Army – AT

Preparing activity:  
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NOTE: Coolant lines need to be modified to accept gauges, flow meter, and sight glasses.

FIGURE 2. Coolant system test set up.