MIL-T-62531(AT)
18 September 1986

MILITARY SPECIFICATION

TRUCKS, MILITARY, UP TO 5 METRIC TON PAYLOAD, GENERAL SPECIFICATION FOR

This specification is approved for use by US Army Tank-Automotive Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers general and special purpose diesel powered truck chassis, trucks, and truck tractors of all sizes up to and including 5 metric ton payload. Trucks may have single front and single rear axles, or single front and dual rear axles.

1.2 Applicability. The requirements and verification contained in this specification applies to military design and non-development item (NDI) trucks. The vehicles shall be capable of performing ground transport tasks in selected combat support and service missions.

1.3 Use. This specification cannot be used without supplemental information. The need for this information is identified by blanks within this specification. Blanks not applicable should be marked "N/A". The rational for the requirements in section 3 and the inspections in section 4 are provided in the appendix. The appendix of this specification parallels sections 3 and 4 of the general specification including corresponding numbers and titles. Each requirement and inspection verification is supported by a rationale, guidance, and lessons learned statement.

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: AMSTA-GDS, Warren, MI 48397-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A FSC 2320

This document provides basic and fundamental information characteristics and requirements. It will provide valuable information and guidance to personnel concerned with the preparation of specifications.

The overall concept of this document is not necessarily to restrict or limit requirements, but rather to summarize what the Government expects in a military truck with respect to the function, material, manufacturing quality and workmanship and the special characteristics of that vehicle.

The requirements cited in this document, although not all inclusive, represents those which are selectively provided on existing military vehicles and most likely will be required on vehicle configurations for future procurements.

This document is not intended to be referenced in purchase specification requirements.

1.4 Deviation. Any projected design for a given application which will result in improvement of system performance, reduced life cycle cost or reduced development cost through deviation from this specification or where the requirements of this specification result in compromise in operational capability, shall be brought to the attention of the acquisitioning activity for consideration of change.

1.5 Supplemental information required. Appendix D will provide a quick reference to the paragraphs that require supplementary engineering data to complete this specification for the specific vehicle, model, and type required.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS
FEDERAL

O-1-00490	- Inhibitor, Corrosion, Liquid Cooling System.
P-C-437	- Cleaning Compound, High Pressure (steam) Cleaner.
PPP-C-96	- Cans, Metal, 28 Gauge and Lighter.
PPP-P-704	- Pails, Metal: (Shipping, Steel, 1 through 12 Gallons).
VV-F-800	- Fuel Oil, Diesel.

MILITARY

MIL-P-514	- Plates Identification, Instruction and Marking, Blank.
MIL-L-2104	- Lubricating Oil, Internal Combustion Engine, Tactical Service.
MIL-A-8421	- Air Transportability Requirements, General Specifications of.
MIL-A-11755	- Antifreeze, Arctic Type.
MIL-R-46164	- Rustproofing for Military Vehicles and Trailers.
MIL-L-46167	- Lubricating Oil, Internal Combustion Engine, Arctic.
MIL-C-46168	- Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
MIL-E-52798	- Enamel, Alkyd, Camouflage
MIL-E-52835	- Enamel, Modified, Alkyd, Camouflage, Lusterless.
MIL-T-62314	- Test Equipment (Simplified) for Interior Combustion Engines (STE/ICE).

STANDARDS

MILITARY

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-193	- Painting Procedures and Marking for Vehicles Construction Equipment and Material Handling Equipment.
MIL-STD-209	- Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment.
MIL-STD-210	- Climatic Extremes for Military Equipment.
MIL-STD-461	- Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference.
MIL-STD-462	- Identification Marking of Combat and Tactical Transport Vehicles.
MIL-STD-810	- Environmental Test Methods and Engineering Guidelines.
MIL-STD-1179	- Lamps, Reflectors and Associated Signaling Equipment for Military Vehicles.
MIL-STD-1180	- Safety Standards for Military Ground Vehicles.
MIL-STD-1472	- Human Engineering Design Criteria for Military Systems, Equipment and Facilities.
MIL-STD-1474	- Noise Limits for Army Materials.
MIL-STD-45662	- Calibration System Requirements.

HANDBOOKS

MIL-HDBK-759	- Human Factors Engineering Design for Army Materiel.

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

DEPARTMENT OF TRANSPORTATION (DOT)

Federal Motor Carrier Safety Regulations.
Federal Motor Vehicle Safety Standards.

(Application for copies should be addressed to the Department of Transportation, Federal Highway Administration, Washington, D.C. 20591.)

(Copies of specifications, standards, handbooks, drawings, publications, and other Government documents required by the contractors in connection with specific acquisition functions should be obtained from the contracting activity or as described by the contracting activity.)

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J198	- Windshield Wiper System - Trucks, Buses, and Multi-Purpose Vehicles.
SAE J816	- Engine Test Code - Spark Ignition and Diesel.
SAE J903	- Passenger Car Windshield Wiper Systems.

(Information as to the availability of the above standards may be obtained from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.)

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGENISTS (ACGIH)

ACGIH ISBN: 093712-54-6	- TLVs Threshold Limit Values for Chemical Substance in the Work Environment Adapted by ACGIH.

(Information as to the availability of the above document may be obtained from ACGIH, 6500 Glenway Avenue, Building D-7, Cincinnati, Ohio 45211.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

2.3.1 Safety precedence. Nothing in this specification shall supercede the requirements of MIL-STD-1180 unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. Unless otherwise specified (see 6.2), the contractor shall furnish _____ which shall be subjected to first article inspection (see 4.1.7). First article inspection vehicle, properly marked with identifying information shall be representative of the unit to be furnished to the Government. All subsequent vehicle(s) delivered to the Government shall conform to these samples in all of their pertinent physical and performance attributes.

3.2 Materials. Materials shall be as specified herein and in referenced specifications, standards and drawings. Material shall be free of defects which affect performance or serviceability of the finished product (see 4.3).

3.3 Qualified products. The contractor shall be responsible for using parts and assemblies from Qualified Products List (QPLs) whenever applicable. Contractor's inspection records shall specifically list all QPL items by number and date of the QPL, name of supplier 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 supplier(s) (see 4.3).

3.4 Kits.

3.4.1 Special kits. Provisions shall be made for installation of special kits including winterization equipment. When specified (see 6.2), special kits shall be furnished as equipment. Special kits, when installed, shall fit properly without interference or misalignment and meet applicable environmental and performance requirements specified herein.

3.4.1.1 Arctic kit. Arctic kits 3.4.1.1.1 through 3.4.1.1.7 shall assure engine starting, operational performance, and provide protection for personnel in ambient temperatures from a minus 32°C measured 1.2 to 1.8 meters above ground, to a minus 54°C, measured at ground level.

3.4.1.1.1 Engine coolant heater kit. The engine coolant heater kit furnished shall be in accordance with drawing _____. When installed, the engine coolant heater kit shall assure engine starting and operation in ambient temperatures from minus 32°C to minus 54°C.

3.4.1.1.2 Radiator and hood cover kit. The radiator and hood cover kit furnished shall be in accordance with drawing _____. This kit shall be used in conjunction with the engine coolant heater kit.

3.4.1.1.3 Personnel heater kit. The personnel heater kit furnished shall be in accordance with drawing _____. When installed, the personnel heater kit shall supplement the cab personnel heater and windshield defrosting during ambient temperatures from minus 32°C to minus 54°C. The heater shall provide a comfortable temperature for personnel dressed in arctic clothing.

3.4.1.1.4 Soft top kit. The insulated soft top kit furnished shall be in accordance with drawing _____. When installed in accordance with applicable drawings, the insulated top shall provide maximum protection for personnel when the vehicle is operating in adverse climatic conditions.

3.4.1.1.5 Insulated cargo area cover kit. The cargo body kit furnished shall be in accordance with drawing _____. When installed, the cargo area cover kit shall completely enclose the cargo area to provide maximum protection for personnel and cargo when operating in adverse conditions.

3.4.1.1.6 Cargo area personnel heater kit. The cargo area personnel heater kit shall be in accordance with drawing _____. When installed, the cargo area personnel heater kit shall provide sufficient heat for personnel comfort (when dressed in arctic clothing) and materiel protection (i.e. perishable food) when operating in ambient temperatures to minus 54°C.

3.4.1.1.7 Hard top kit. The hard top kit furnished shall be in accordance with drawing _____. The hard top insulation shall afford protection from ambient air temperatures to minus 54°C for personnel dressed in arctic clothing.

3.4.1.2 Deep water fording kit. The deep water fording kit furnished shall be in accordance with drawing _____. When installed, the kit shall permit the vehicles to be operated in water (salt or fresh) to the depth specified in 3.7.3.1 without damage to the vehicle.

3.4.1.3 A-frame kit. The A-frame kit furnished shall be in accordance with drawing _____. The kit includes an A-frame or derrick mounted at the front of the vehicle for use as a general utility lifting device, and as a derrick in conjunction with the vehicle winch.

3.4.1.4 Vehicle rear lifting kit. The vehicle rear lifting kit furnished shall be in accordance with drawing _____. When installed, the rear lifting kit shall be capable of loading material weighing up to _____ kg into the cargo area.

3.4.1.5 Vehicle front lifting kit. The vehicle front lifting kit furnished shall be in accordance with drawing _____. When installed, the front lifting kit shall be capable of lifting material weighing up to _____ kilogram (kg).

3.4.1.6 Bow and tarp kit (long cargo body). The bow and tarp kit (long cargo body) furnished shall be in accordance with drawing _____.

3.4.1.7 Bow and tarp kit (drop side cargo body). The bow and tarp kit (drop side cargo body) furnished shall be in accordance with drawing _____.

3.4.1.8 Bow and tarp kit (short cargo body). The bow and tarp kit (short cargo body) furnished shall be in accordance with drawing _____.

3.4.1.9 Tarpaulin extension kit. The tarpaulin extension kit furnished shall be in accordance with drawing _____.

3.4.1.10 Gun-ring mounting kit. The gun-ring mounting kit conforming to drawing _____, when installed, shall permit a _____ degree rotation of the machine gun without interference or binding.

3.4.1.11 Automotive alarm kit. The automotive alarm kit furnished shall be in accordance with drawing _____.

3.4.1.12 Electric brake kit. The electric brake kit furnished for vehicles used with trailers having electric brakes, shall supply power to the brakes for stopping and holding the combination. The unit shall be in accordance with drawing _____.

3.4.1.13 Hand air brake kit. The hand air brake kit furnished shall be in accordance with drawing _____. When installed, the hand air brake kit shall activate and apply braking action to towed vehicles when the hand brake lever is applied by the driver, without applying pressure through the foot brake pedal (for air braked trucks only).

3.4.1.14 Tie down kits. The rear cargo tie down kits drawing number _____ shall be installed in the cargo body in accordance with drawing _____.

3.4.2 Soft top (cab). The cab soft top furnished and installed in accordance with applicable drawings shall provide adequate protection for personnel when vehicle is operating in adverse climatic conditions (see 4.3.1).

3.4.3 Stowed material. All Basic Issue Items shall be stowed on the vehicle in spaces provided. The stowed items shall not interfere with other components and operation of the vehicle (see 4.3.1).

3.4.4 Front winch. When specified (see 6.2), a front mounted winch shall be provided, including rigging block and utility chains, winch, controls, and equipment installed in accordance with applicable drawings on vehicles requiring winches and shall be capable of retrieving disabled equipment under all climatic conditions. The single line capacity of the winch shall be not less than _____ Newtons (N) on the bare drum. The wire rope for the winch shall be not less than _____ meters (m) in continuous length, without splice or joint, and shall be provided with a chain and hook. Rigging block shall be in accordance with drawing _____ and utility chain in accordance with drawing _____. The winch system, consisting of the winch and the winch cable assembly, shall have a maximum load rating based on a safety factor

of no less than 3.5. The rigging block (snatch-block) will have at least a 2.0 safety factor based on the maximum anticipated force applied to it (see 4.4.4).

3.4.5 Engine diesel. The diesel engine furnished shall be the latest series or standard model, tailored to meet the minimum performance and RAM-D requirements of this specification for the _____ metric ton vehicle (series and model). The vehicle shall be equipped with a liquid cooled compression ignition two-stroke or four-stroke cycle diesel engine, with not less than _____ cylinders, with a minimum gross horsepower rating of _____, and a no-load governed speed not to exceed _____ RPM. The engine assembly shall include the following accessory equipment. The vehicle throttle and engine accelerator shall comply with MIL-STD-1180, Requirement No. 24 (see 4.4.5).

a. Alternator and belts.
b. Air compressor.
c. Power steering pump and belts.
d. Cooling fan and belts.
e. Starter.
f. Injection pump and nozzles.
g. Lube filter.
h. Water pump and belt.
i. Tachometer drive adapter
j. Temperature and pressure sending units.
k. Primary positive fuel shut-off.
1. Emergency, immediate positive fuel shut-off.
m. Flywheel housing.
n. Flexplate and starter ring gear assembly.
o. Cold weather starting aid for minus 4° Celsius (C) (complete with piping and electrical harness(s))
p. Fuel filter system.

3.4.5.1 Production engine settings and requirements. The engine assembly with alternator, air compressor, and power steering pump operating unloaded and corrected to standard conditions as established in SAE J816 shall meet the following requirements (see 4.4.5.1):

a. Net horsepower, _____-_____ observed horsepower with engine operating at _____ ± _____ percent rpm.
b. Peak torque, _____ Newton-meters (N m) observed.
c. Fuel consumption shall not exceed _____ ± _____ percent kilograms per observed brake horsepower per hour (BHP) with the engine operating at full load and speed, without fan.
d. Oil consumption, _____ kilograms per observed BHP hours maximum at full load throughout the speed range of the engine.

3.4.5.2 Engine governor. The engine governor provided shall be set to limit engine speed to not more than _____ rpm, no load. The governor shall be sealed, or constructed so that any tampering with the setting shall be readily apparent (see 4.4.5.2).

3.4.5.3 Fuel. The engine shall be capable of full performance consuming fuel in accordance with DF-2 of VV-F-800 (see 4.4.5.3).

3.4.5.3.1 Fuel tanks. The vehicle fuel tank(s) will be designed and constructed in accordance with FMCSR 393.67. The fuel tank(s) will be certified in accordance with FMCSR 393.67(f). The fuel tank/lines venting system shall not be combined or inter-connected with other vent systems (see 4.4.5.3.1).

3.4.5.4 Engine lubrication system. The lubrication system shall operate satisfactorily under all intended service, operating, and performance requirements specified herein when serviced with seasonal grades of oils as specified in MIL-L-2104 from minus 23° Celsius (C) to 52°C and MIL-L-46167 from minus 54°C to 18°C. The oil pressure shall not fall below minimum recommended by the engine manufacturer even with the oil level at the lowest marked safe operation level on the oil gage. At initial truck assembly, contractor may utilize an engine oil of his own selection for ambients of minus 23°C to 49°C only, provided oil selected is compatible with oil as specified in MIL-L-2104. The vehicle throttle and engine accelerator shall comply with MIL-STD-1180, Requirement No. 124 (see 4.4.5.4).

3.4.5.5 Oil filler and gage. The crankcase oil filler location shall allow oil to be readily poured into the filler opening without requiring the use of a funnel, using a container conforming to type II, 5-quart size of PPP-C-96 and type II 5-gallon of PPP-P-704. The engine shall be provided with a properly accessible waterproofed bayonet gage (dipstick) that ensures ready and accurate reading of crankcase oil level (see 4.4.5.5).

3.4.5.6 Steam and water jet cleaning. The engine and all its components shall withstand cleaning with high pressure steam or water jet and cleaner, conforming to P-C-437 without deterioration of seals and hoses. Also there shall be no water leakage past seals and gaskets. Paint removal shall not be a basis for rejection under this requirement. Steam or water jet cleaning shall be conducted as follows (see 4.4.5.6):

> The jet is applied perpendicular to the surface being cleaned at a distance of not more than 0.3 meters (m) from the surface for steam cleaning, and not more than 1.5 m from the surface for water jet cleaning. The jet pressure shall not be less than 689 kilopascals (kPa) and not more than 758 kPa.

3.4.5.7 Cooling system. The cooling system shall maintain a coolant temperature from the engine no greater than 99°C, an engine oil sump temperature of no greater than 127°C, and a transmission oil temperature at converter outlet no greater than 163°C under all specified environmental performance and RAM-D requirements. The engine and cooling system as installed in vehicle shall perform as specified using water and anti-freeze solution conforming to MIL-A-11755 or water and corrosion inhibitor compound conforming to 0-1-00490 (see 4.4.5.7).

3.4.5.8 Diagnostic connector assembly (DCA). The vehicle will incorporate an accessible DCA for Simplified Test Equipment/Internal Combustion Engine (STE/ICE) per MIL-T-62314. The diagnostic connector, Drawing 12258941, on the vehicle will interface with the STE/ICE test equipment (see 4.4.5.8).

3.4.6 Exhaust system. The exhaust system shall be of leakproof construction, securely mounted and shall withstand vehicle racking, shock and vibration when subjected to RAM-D performance operation. Material for exhaust system, including those used for muffler and tailpipe, shall be made from corrosion resistant steel. Exhaust pipe shall be secured to the exhaust manifold with a quick disconnect design feature that can be quickly disconnected and reconnected. Design of pipe shall be such that it shall not interfere with power unit removal. The exhaust system should be so located and/or protected to prevent personnel from coming into contact with hot surfaces. The exhaust system shall comply with paragraph 393.83 of FMCSR, title 29, chapter III, subchapter B (see 4.4.6).

3.4.6.1 Toxic gas exposure.

3.4.6.1.1 Carbon monoxide. Operating and maintenance personnel shall not be exposed to concentrations of carbon monoxide (CO) in excess of values which will result in carboxyhemoglobin (COHb) levels in their blood greater than 10% in accordance with MIL-STD-1472C. The equation used to estimate the percent COHb blood levels will be in accordance with MIL-HDBK-759A using work stress level 4 for weapons firing and work stress level 3 for all other mission activities (see 4.4.6.1.1).

3.4.6.1.2 Other toxic gases. Nitrogen dioxide, ammonia, nitric oxide and sulfur dioxide will be limited to concentrations not to exceed those specified in the latest publication of the Threshold Limit Values by the American Conference of Governmental Industrial Hygenists (ACGIH) (see 4.4.6.1.2).

3.4.7 Gear train.

3.4.7.1 Transmission. The transmission shall have not less than _____ forward and one reverse gear ranges and must have a gear range capable of meeting the performance specification as stated herein. The transmission shall be provided with _____ power takeoff openings. Net torque capacity of the transmission shall be not less than _____ Newton-meters (N m) and net input power rating shall be not less than _____ horsepower (HP) (see 4.4.7.1).

3.4.7.2 Power takeoff. Power takeoff(s) shall be of HP rated capacity to operate powered equipment. Controls to operate the power takeoff(s) shall be located in the cab accessible to the seated driver. A caution plate reading, "DO NOT OPERATE VEHICLE AT HIGHWAY SPEEDS WITH POWER TAKEOFF ENGAGED", shall be provided and installed in a location readily visible to the seated driver (see 4.4.7.2).

3.4.8 Lighting. All vehicle lights, reflectors, and wiring shall be as specified herein and shall conform to MIL-STD-1179. Lights and reflectors shall not be mounted on vehicle bumpers. Rear lighting shall be mounted in a protective location to preclude damage when interfacing with other vehicles or ancillary equipment. Vehicles shall be equipped with a blackout and marker lighting system. Front and rear turn signal lamps shall be provided. Turn signal operating units shall have visible and audible flash indicators and shall be mounted on the steering column (see 4.4.8).

3.5 Reliability, availability, maintainability, durability (RAM-D). The RAM-D requirements shall be demonstrated by operating _____ vehicles, each for _____ kilometers for a total of _____ kilometers in accordance with the distance schedule specified in 3.6.1. For RAM-D calculations, _____ kilometers shall equal one operating hour (see 4.6).

3.5.1 Reliability (mission). The mission reliability of the vehicle system shall be not less than _____ percent at _____ percent confidence level and shall be demonstrated under the conditions stated herein. The mission duration shall be _____ kilometers for a total of missions. The number of mission failures shall not exceed _____ failures. A mission failure is a failure which precludes the completion of a mission, once started, and which cannot be corrected by the crew with material and equipment provided for crew level of maintenance (see 4.5.1).

3.5.2 Availability (inherent). The inherent availability of the vehicle system shall be not less than _____ percent and shall be determined based on the following relationship (see 4.5.2):

$$A = \frac{MTBF}{MTBF + MTTR} \times 100$$

where A = Inherent availability.
MTBF = Meantime (hours) between failures.
MTTR = Meantime (hours) to repair; the MTTR is the summation of all active repair times used to isolate a malfunction, effect repair and restore the vehicle system to operational status divided by the total number of mission failures. Active repair time does not include supply downtime, waiting administrative downtime and preventive maintenance.

3.5.3 Maintenance ratio. The maintenance ratio is an index which establishes a relationship between the total time required to perform maintenance and the total mission operating time in hours. The maintenance ratio shall not exceed _____ and shall be based on the following relationship (see 4.5.3):

$$MR = \frac{T}{M}$$

where MR = Maintenance ratio.
T = Total maintenance time (hours) expended to perform scheduled and unscheduled maintenance covering the total vehicle system operating time period.
M = Total mission time (hours).

3.5.4 Durability. The durability of the vehicle system shall be demonstrated when the number of component or structural failures that require direct support level of maintenance do not exceed _____ failures, and do not exceed _____ failures that require general support level of maintenance or higher (see 4.5.4).

3.6 Payload. Vehicle(s) shall be tested with rated payload and rated towed load. The towed system and its failures will not be charged (see 4.6).

3.6.1 Terrain mobility percentages. Vehicle(s) shall operate with rated payload and towed load on the highway and cross-country in accordance with the following mission cycles (see 4.6.1).

3.6.1.1 ___ kilometer percentages for all models except wreckers, expansible vans and tractors.

a. _____ percent on paved roads, either concrete or asphalt or any combination thereof.
b. _____ percent on secondary roads.
c. _____ percent on level and hilly cross country.
d. _____ percent on Belgian block.

3.6.1.2 ___ kilometer percentages for truck tractors.

a. _____ percent on paved roads, either concrete or asphalt or any combination of the two.
b. _____ percent on secondary roads.
c. _____ percent on level and limited hilly cross country.
d. _____ percent on Belgian block.

3.6.1.3 ___ kilometer percentages for wreckers and expansible vans.

a. _____ percent on paved roads, either concrete or asphalt or any combination thereof.
b. _____ percent on secondary roads.
c. _____ percent on level and hilly cross country.
d. _____ percent on Belgian block.

3.7 Performance. A complete vehicle, loaded with rated payload and towed load and serviced with standard products shall meet specified performance requirements. Vehicle, serviced and equipped with special kits for the appropriate climatic conditions, shall operate as specified. Unless otherwise specified, performance shall be demonstrated on relatively level, smooth, hard-surfaced roads free of loose material (see 4.7).

3.7.1 Vehicle loading. Vehicle performance requirements shall be demonstrated with the specific vehicle loaded to its gross vehicle weight (GVW) as specified (see table I) with full complement of fuel, lubricant, and coolant; with driver and assistant driver or equivalent mass of 91 kilograms each; with winch assembly of _____ kilograms equivalent weight; mounted at the front of the vehicle to simulate mounting of winch; with soft top cab and with full vehicular equipment (see 4.7.1).

3.7.2 Highway operation. The vehicle shall transport the rated payload and towed load over prepared roads. Performance shall be demonstrated on smooth, dry, relatively level, concrete roadway (see 4.7.2).

3.7.2.1 High speed. The vehicle transporting its rated payload and towed load, limited to a maximum gross combination weight of _____ newtons (N), shall operate at a sustained high speed of not less than _____ kilometers per hour (km/h) (see 4.7.2.1).

3.7.2.2 Low speed. With the engine operating in the speed range which delivers maximum torque, the vehicle with its rated payload and towed load shall operate at a sustained low speed of not more than _____ km/h without damage to the vehicle (see 4.7.2.2).

3.7.3 Fording operation. The vehicle shall transport the rated payload and towed load, when fording hard bottomed crossings of fresh or salt water not less than _____ millimeters (mm) in depth, for a 15 minute period without requiring addition of special equipment, or adjustments. For air brake systems, the brake actuation and release times required by FMVSS 121 will not be compromised (see 4.7.3).

3.7.3.1 Deep water fording. With the deep water fording kit installed, vehicles that require deep water fording capability shall ford hard-bottomed, fresh or salt water crossings, remaining immersed for a period of 30 minutes. While still submerged, the engine shall restart after being stopped for 3 minutes and then operated for an additional 15 minutes, without damage to the vehicle. Vehicles shall ford water up to a depth of _____ mm, including wave height. With the fording kit installed, the vehicle shall operate continuously on land, before and after fording operations, without damage to the vehicle. At the conclusion of such operation, a maximum of one percent water contamination by volume in the lubricating oil is permissible (see 4.1.3.1).

3.7.4 Gradeability. The vehicle shall demonstrate gradeability operations on prepared grades having the minimum percentage specified without stalling, slipping, overheating, or upsetting (see 4.7.4).

3.7.4.1 Longitudinal grades operation. The vehicle transporting its rated payload and towed load, limited to a maximum gross combination mass of _____ N shall ascend not less than a 2 percent grade at a speed of not less than _____ km/h. The vehicle transporting its rated payload, without towed load shall negotiate a 60 percent grade at a minimum speed of _____ km/h. Grade surface shall be smooth, dry concrete (see 4.7.4).

TABLE I. Load allowances (specify).

MODEL	MAXIMUM GROSS LOAD ALLOWANCE 1/	PAYLOAD 2/	TOWED LOAD 3/
_____	_____	_____	_____
_____	_____	_____	_____

1/ Gross load allowance, in newtons consists of body and payload without operating personnel, (1775 N) included for truck chassis only.
2/ Payload in newtons, maximum payload without operating personnel.
3/ Towed load in newtons, includes pintle towed trailers with pneumatic tires and semitrailer towed loads include truck-tractor fifth-wheel load allowances.

3.7.4.2 Side slope operations. The vehicle, loaded with its rated payload, shall operate on side slopes up to 20 percent with each side of vehicle upslope. As a result of the operation, no evidence of faulty lubrication, leakage or other malfunction shall be evident (see 4.7.4).

3.7.4.3 Engine operation on grades and slopes. The engine, as installed in the vehicle, shall demonstrate the performance characteristics specified herein for not less than 30 minutes in each direction, with dipstick oil level at full and at add level conditions in the sump, on longitudinal grades up to 60 percent and on lateral slopes up to 30 percent. As a result of this operation, no evidence of faulty lubrication, cooling, fuel supply, leakage, or other malfunction shall be evident (see 4.7.4).

3.7.5 Braking ability. The vehicle, fully equipped and with highway payload and towed load, shall be decelerated, held, and controlled by use of the brakes, under the conditions specified for each braking system. Road surface shall be smooth, dry, concrete. The vehicle braking system will be designed to meet all the performance and configuration requirements of FMVSS's 105 or 121, whichever is appropriate for the type of brake system installed in addition to the requirement stated herein. Vehicles equipped with full-air brakes shall include an alcohol aspirator with an unbreakable transparent container and an automatic moisture ejector (see 4.7.5).

3.7.5.1 Service brakes. Application of service brakes shall stop, hold, and control the vehicle when ascending and descending a 60 percent grade. On relatively level roadway, application of service brakes shall bring the vehicle to a complete stop, from a speed of _____ km/h within _____ meters, measured from point of brake application (see 4.7.5.1).

3.7.5.2 Parking brake. The parking brake shall be capable of holding the vehicle motionless with rated payload and towed load, at GVW on a 40 percent grade either headed up or downgrade, on dry, hard surface that is free from loose material, in accordance with MIL-STD-1180. An indicator light will be provided to alert the crew when the parking brake is engaged. This energy shall be isolated from any common source and used exclusively for the operation of the parking brake. The parking brake system shall be held in the applied position by energy other than fluid pressure, air pressure, or electric energy. The parking brake shall be such that it cannot be released unless adequate energy is available upon release of the parking brake to make immediate further application. “Park” position (transmission shift lever) is required. “Park” position mode must comply with the above parking brake requirements including release of “Park” mode on a 40 percent grade (see 4.7.5.2).

3.7.5.3 Emergency brakes. The emergency brake system, in the event of a single point failure in the service brake system, shall be able to stop the vehicle and be capable of being modulated by the service brake control. Emergency braking shall include a means of providing adequate stopping in the event of a trailer breakaway (see 4.7.5.3).

3.7.6 Cramping angle. Front wheel cramping angle shall be not less than degrees, measured at the wheel on the inside of the turning circle. Angle stops shall be provided, and adjusted (within a tolerance of plus _____ degree, minus _____ degree) to provide the maximum safe cramping angle. When adjusted, axle stops shall be so set that the angle adjustment cannot be readily altered and shall positively limit the cramping angle to the maximum angle of the stop adjustment (see 4.7.6).

3.7.7 Cruising range. Vehicle with rated payload and rated towed load shall operate for not less than _____ kilometers, at average road speed of _____ m/h on hard surface roads over an average rolling terrain, without refueling (see 4.7.7).

3.7.8 Ground clearance. The vehicle with rated payload shall have a ground clearance of not less than _____ centimeters (cm) (see 4.7.8).

3.7.9 Ramp angle. The vehicle with front mounted winch and with rated payload shall be capable of ascending, and advancing over the crest and descending a _____ degree ramp surface connecting two horizontal surfaces (upper and lower without any part of the vehicle, except the tires, touching the ground (see 4.7.9).

3.7.10 Approach and departure angles. The approach and departure angles, with and without kits, shall be a minimum of 45° (see 4.7.10).

3.7.11 Towing like vehicle. The vehicle at GVW shall be capable of flat towing a like vehicle also at GVW using a standard Army towbar (see 3.7.11).

3.8 Environmental operation. The vehicle shall operate in an ambient air temperature of 49°C to minus 32°C (1.2 to 1.8 meters above ground). With arctic kit installed, vehicle shall operate in an ambient air temperature of minus 32°C to minus 46°C (1.2 to 1.8 above ground) to minus 54°C (ground surface temperature). The complete vehicle when in storage shall withstand climatic extremes as specified for ground equipment in MIL-STD-210 (hot, basic, cold and severe cold), without deterioration that may cause failure of any component part of vehicle (see 4.8).

3.9 Electromagnetic interference. Each vehicle shall be radio interference suppressed in accordance with tactical vehicle requirements, class C1 of MIL-STD-461 (see 4.9).

3.10 Wood treatment. All wood parts for vehicles furnished in accordance with this purchase description shall be cleaned and treated in accordance with the requirements of MIL-STD-193 (see 4.10).

3.11 Painting. The vehicle, body(s) and components shall be cleaned, treated, and painted in accordance with MIL-STD-193, as specified for the appropriate service. When required, both camoufalge and noncamouflage topcoat paint shall be polyurethane type conforming to MIL-C-46168 (see 6.2). Painted surfaces shall be free of sags, runs, and thin areas (see 4.11).

3.11.1 Engine treatment and painting. The engine and its accessories shall be prepared and treated in accordance with good commercial practice, and painted any dark color that is lusterless. The engine spare parts and components shall be conditioned, primed and painted in accordance with MIL-STD-193 (see 4.11).

3.12 Marking. Vehicle marking shall be in accordance with MIL-STD-642. Letters and numbers shall be black lusterless paint and/or decals having equivalent infrared reflectance specified in MIL-E-52798 or MIL-E-52835 (see 4.12).

3.12.1 Data plates. Data plates conforming to Type III, Composition A, Class 2 of MIL-P-514 shall be used. Warning or precautionary data plates shall be provided, where necessary, to protect personnel or equipment (see 4.12.1).

3.12.2 Engine data plates. The engine data plates furnished shall be installed on engine block in location(s) readily visible to personnel performing maintenance on the engine (see 4.12.1).

3.13 Rustproofing. Vehicles shall be rustproofed in accordance with MIL-R-46164 (see 4.13).

3.14 Safety. Exposed components and systems, which are subject to high temperatures, high pressures, electrically actuated or inherently hazardous, shall be provided with correct safeguarding and insulating features. Suitable rollover protection and personnel restraint system for the crew shall be provided which shall be consistent with vehicle application, i.e., high speed off-road usage. Vehicle shall comply with all applicable requirements in MIL-STD-1180 (see 4.14).

3.14.1 Noise. The vehicle shall comply with both the exterior and interior noise limits specified herein. Exterior Noise - The vehicle shall comply with the exterior noise requirements as specified in MIL-STD-1474. Interior Noise - The steady state noise levels in personnel occupied areas shall be below 85 db(A) when measured for maximum noise as specified in MIL-STD-1474. The personnel occupied areas shall be each operator or crew position (see 4.14.1).

3.14.2 Windshield wiper system. The windshield wiper system shall meet the requirements specified in SAE J198 (see 4.14.2).

3.15 Servicing and adjustment. Unless otherwise specified (see 6.2), the contractor shall service the vehicles for operational use prior to delivery. Such servicing fit and adjustment shall include, as a minimum, the focusing of lights, the proper adjustment of the engine, electrical system, brake system, seats, doors, windows, windshield, and windshield wipers, horn, hood, tailgate, front wheel alignment and tire pressure. The chassis, engine and all running gear shall be serviced with lubricants of the proper grade for the climatic conditions at the destination point. Engine cooling system shall be serviced with a solution of ethylene glycol and water in equal parts by volume (see 4.15).

3.16 Transportability. Vehicle shall be equipped with towing device and lifting and tiedown provisions which shall be adequate for highway, rail, sea and air transport in accordance with MIL-STD-209 and MIL-A-8421 (see 4.16).

3.16.1 Lifting eyes. Two lifting eyes shall be installed on the front and two on the rear of the vehicle. Each lifting eye and its mounting shall withstand a load of at least _____ kg without failure or permanent deformation when the load is applied at an angle up to _____ degrees from the longitudinal axis (see 4.16.1).

3.16.2 Pintle. A towing pintle at the rear of the vehicle shall be provided. The pintle assembly shall be of the swivel type and conform to the size and strength described in Drawing _____. The assembly shall be furnished with mounting flanges and lubrication fitting. The pintle assembly mounting surface shall be not more than _____ mm forward of the rear most part of the vehicle. The mounting of the pintle assembly shall include reinforcements to transfer pintle loads directly to the web of the chassis frame. Provision for attachment of trailer safety chains shall be provided. Pintle height shall be _____ mm from the ground with vehicle loaded to its rated cargo capacity (see 4.16.2).

3.16.3 Tiedowns. Complete diagrams and instructions for lifting and tying down the vehicle for the various transport modes shall be provided. Instructions shall be included for component removal when required for transport. Stencil or decal markings shall be applied to the vehicle at each lifting and tiedown point conforming to MIL-STD-209. The tiedowns shall permit tiedown of the vehicle to the floor (or deck) of the transport medium in such a manner as to prevent shifting or movement in any direction (see 4.16.3).

3.16.4 Lift points. The vehicle shall have fixed lift points to permit slinging into/onto flat rail car or ocean carrier. Lift points shall have capacity for fully loaded vehicle (less trailer) (see 4.16.4).

3.17 Certification. The supplier and his component subsuppliers shall certify that the vehicle conforms to the requirements of MIL-STD-1180 (see 4.17).

3.18 Workmanship. The workmanship displayed in the fabrication and assembly of the vehicle(s) shall meet performance requirements under all applicable environmental conditions. The quality of workmanship shall assure delivery of vehicles which are free from defects, improper manufacturing or assembly practices, and meet or exceed the requirements specified herein, Defective components or parts and assemblies which have been repaired or modified to correct deficiencies shall not be furnished (see 4.18).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order (see 6.2), the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform or witness 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 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Inspection equipment. Unless otherwise specified in the contract (see 6.2), the contractor is responsible for the provision and maintenance of all inspection equipment necessary to assure that supplies and services conform to contract requirements. Inspection equipment must be capable of repetitive measurements to an accuracy of 10 percent of the measurement tolerance. Calibration of inspection equipment shall be in accordance with MIL-STD-45662.

4.1.3 Government verification. All quality assurance operations performed by the contractor shall be subject to Government verification at unscheduled intervals. Verification shall consist of (a) surveillance of the operation to determine that practices, methods, and procedures of the written quality assurance system plan are being properly applied, and (b) Government product inspection to measure the quality of the product offered for acceptance. Deviation from the prescribed or agreed upon procedure, or instances of poor practices which might have an adverse effect upon quality of the product, will immediately be called to the attention of the contractor. Failure of the contractor to promptly correct deficiencies shall be cause for suspension of acceptance until corrective action has been made, or until the conformance of the product to prescribed criteria has been demonstrated.

4.1.4 Qualified products. When a part or component is specified to conform to a specification having a Qualified Products List (QPL), the contractor shall make available to the Government documentation of item acquisition from such QPL. The documentation shall include the QPL date and identification of the supplier, purchase order, and quantity.

4.1.5 Quality assurance provisions. In the conduct of inspection, the contractor shall adhere to Quality Assurance Provisions (QAP) and General Quality Assurance Provision (STA Form 458) as applicable and as required by the documents forming part of this specification.

4.1.6 Certification. Where certification (see 4.3) is required, the contractor shall verify that material or components conform to a specification.

4.1.6.1 Classification of inspection:

a. First article inspection (see 4.1.7).
   1. First production vehicle inspection (FPVI) (see 4.1.8).
   2. Initial production test (IPT) (see 4.1.9).

b. Quality conformance inspections (QCI) (see 4.1.11).
c. Control tests (see 4.1.14).
d. Comparison tests (see 4.1.15).

4.1.7 First article inspection. First article inspection shall be performed on the first production vehicle and on additional vehicle(s), [randomly selected from _____,] which shall be designated as initial production vehicle(s). Approval of the first article vehicles shall not relieve the contractor of the obligation to supply vehicles that are fully representative of those inspected as a first article sample. Any change or deviation of production vehicles from the first article sample shall be subject to the approval of the contracting officer.

4.1.8 First production vehicle inspection (FPVI).

4.1.8.1 In-process inspection. During fabrication of the first production vehicle of each model, an in-process inspection will be conducted by the Government to evaluate conformance of materials and workmanship to requirements of specified documents. These inspections will be made at the contractor's or subcontractor's facility prior to the application of primer and paint. Processing and welding procedures, quality control system and inspection records will be reviewed and evaluated during this inspection.

4.1.8.2 Completed first production vehicle inspection. The first production vehicle of each model shall be road tested and completely inspected by the contractor for conformance to contract and purchase description requirements. Upon completion the contractor shall submit the vehicle (and make available all inspection records and certifications) to the responsible Government (DCAS) inspection element at the contractor's facility for preliminary inspection.

4.1.8.3 Preliminary inspection. The completed first production vehicle of each model will receive a preliminary inspection by the responsible Government (DCAS) inspection element. The preliminary inspection will be complete except for road test requirements which will be conducted jointly during a provisional inspection by representatives of the Government as specified in 4.1.8.4.

4.1.8.4 Provisional inspection and acceptance. The first completed production vehicle of each model will be subjected to provisional inspection at the contractor’s facilities by representative(s) of the Government. The inspection will be conducted to determine conformance to all contractual requirements. The contractor shall provide any inspection assistance as may be required. During this inspection, the contractor shall make available his inspection plan, inspection records and certifications pertinent to the vehicle and components. This inspection will include a road test of a minimum of _____ kilometers with payload.

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

4.1.8.6 Vehicle disposition. Upon completion of inspection and acceptance of the first production vehicle of each model, the vehicle(s) shall remain at the manufacturing facility as a production standard but is not to be considered as a basis for acceptance of future vehicles. At the discretion of the Government, the vehicle may be released for shipment as part of the contract quantity.

4.1.8.7 Final approval and acceptance. Final approval and acceptance by the Government of the first production vehicle of a specific model will be withheld until the initial production testing specified in 4.1.9 has been completed and a final determination has been made regarding conformity of the vehicle to contractual requirements, including, but not limited to, workmanship and materials.

4.1.9 Initial production test. To determine conformance to section 3 (inclusive), a quantity of vehicles specified in the contract will be selected by the Government for test. The selected vehicle(s) will be subjected to a test of _____ or _____ kilometers as specified in tables III, IV, or V and all tests specified in table II at the sites approved by the Government. These tests will be performed by the Government. The contractor shall preposition on test site(s) a maintenance test support package for each vehicle to be tested. This shall include all anticipated wear-out and service parts for the _____ or _____ kilometer test. The list shall be approved by the Government. The contractor shall also expeditiously furnish additional repair parts, as required to support the test. The contractor is liable for cost of parts that fail as a result of defects as to materials or workmanship nature. Delays caused by vehicle break-down due to poor quality of workmanship or material; failure of the contractor to adequately support the vehicle with spare parts during test; or failure of the contractor to comply with purchase description or drawing requirements; shall not be basis for adjustment of the contract delivery schedule or the contract price. Initial production testing will require approximately _____ days per vehicle to complete _____ kilometer test, and _____ days per vehicle for _____ kilometer test.

NOTE: _____ percent of the mileage specified for each course shall be performed with payload. The remaining _____ percent of the mileage shall be performed without payload. Trailed loads for vehicles shall be towed _____ percent of each course. Payloads for truck tractors (on semitrailer) may be utilized for the tests, with determination to be made by the Government as to proper weight distribution and type of payloads.

4.1.10 Deficiencies. Unresolved failures or deficiencies during, or as a result of, first article inspection shall be cause for rejection of the vehicles until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiency. Any deficiency found during or as a result of the IPT shall be evidence that all vehicles already accepted prior to completion of the IPT are similarly deficient unless contrary evidence, satisfactory to the contracting officer, is furnished by the contractor. Such deficiencies on all vehicles shall be corrected by the contractor.

TABLE II. Classification of inspections and tests.

Characteristic	Requirements Para.	Inspection	First article		1/ QCI	1/ Control	1/ Comparison
			1/ FPVI	2/ IPT			
Materials	3.2	4.3	X		X		
Special kits	3.4	4.4.1	X	X	X		
Stowed material	3.4.3	4.3.1	X				
Front winch	3.4.4	4.4.4	X	X		X	X
Engine	3.4.5	4.4.5	X	X	X	X	X
Engine settings	3.4.5.1	4.4.5.1	X	X	X	X	X
Engine governor	3.4.5.2	4.4.5.23	X	X	X	X	X
Fuel	3.4.5.3	4.4.5.3	X	X		X	X
Engine lubrication system	3.4.5.4	4.4.5.4	X	X	X	X	X
Oil filler and gage	3.4.5.5	4.4.5.5	X		X		
Steam and water jet	3.4.5.6	4.4.5.6	X	X		X	X
Cooling system	3.4.5.7	4.4.5.7	X	X	X	X	X
Exhaust system	3.4.6	4.4.6	X	X	X		
Concentrations	3.4.6.1	4.4.6.1	X	X	X	X	X
RAM-D	3.5	4.5		X			
Reliability	3.5.1	4.5.1		X			
Availability	3.5.2	4.5.2		X			
Maintenance ratio	3.5.3	4.5.3		X			
Durability	3.5.4	4.5.4		X			
Payload	3.6	4.6	X	X		X	X
Terrain mobility percentages	3.6.1	4.6.1	X	X			X
Cargo models	3.6.1.1	4.6.1	X	X			X
Truck tractors	3.6.1.2	4.6.1	X	X			X
Wreckers and vans	3.6.1.3	4.6.1	X	X			X
Performance	3.7	4.7	X	X		X	X
Vehicle loading	3.7.1	4.7.1	X	X		X	X
Highway operation	3.7.2	4.7.1	X	X	X	X	X
High speed	3.7.2.1	4.7.2	X	X	X	X	X
Low speed	3.7.2.2	4.7.2.1	X	X	X	X	X
Fording operation	3.7.3	4.7.3	X	X			X
Deep water fording	3.7.3.1	4.7.3.1		X			X

TABLE II. Classification of inspections and tests - Continued.

Characteristic	Requirements Para.	Inspection	First article		1/ QCI	1/ Control	1/ Comparison
			1/ FPVI	2/ IPT			
Gradeability	3.7.4	4.7.4	X	X			X
Longitudinal grades	3.7.4.1	4.7.4	X	X			X
Side slopes	3.7.4.2	4.7.4	X	X			X
Engine operation	3.7.4.3	4.7.4	X	X			X
Braking ability	3.7.5	4.7.5	X	X	X	X	X
Service brakes	3.7.5.1	4.7.5.1	X	X	X	X	X
Hand brake	3.7.5.2	4.7.5.2	X	X	X	X	X
Cramping angle	3.7.6	4.7.6	X	X			X
Cruising range	3.7.7	4.7.7	X	X			X
Ground clearance	3.7.8	4.7.8	X				X
Ramp negotiation	3.7.9	4.7.9		X			X
Environmental	3.8	4.8		X			
Electromagnetic	3.9	4.9	X	X			
Wood treatment	3.10	4.10	X		X		
Painting	3.11, 3.11.1	4.11	X		X		
Marking	3.12	4.12	X		X		
Safety	3.14	4.14	X	X	X		
Servicing	3.15	4.15	X	X	X	X	X

1/ At place of manufacture
2/ At Government proving ground

TABLE III. ____ kilometer test for all models, except for truck tractor, wrecker and expansible van models.

Course	Distance and Speeds	Payload
Hard-surfaced roads	_____ kilometers at varying speeds up to maximum	_____ newtons
Secondary roads	_____ kilometers at speeds applicable to conditions of terrain	_____ newtons
Level and hilly cross country	_____ kilometers at speeds applicable to conditions of terrain	_____ newtons
Belgian block	_____ kilometers at speeds applicable to conditions of terrain	_____ newtons

TABLE IV. _____ kilometer test for truck tractors in combination.

Course	Distance and Speeds	Payload
Hard-surfaced roads	_____ kilometers at varying speeds up to maximum	_____ newtons
Secondary roads	_____ kilometers at speeds applicable to conditions of terrain	_____ newtons
Level and hilly	_____ kilometers at speeds applicable to conditions of terrain	_____ newtons
Belgian block	_____ kilometers at speeds applicable to conditions of terrain	_____ newtons

TABLE V. _____ kilometer test for wrecker and expansible van models.

Course	Distance and Speeds	Payload
Hard-surfaced roads	_____ kilometers at varying speeds up to maximum	_____ newtons
Secondary roads	_____ kilometers at speeds applicable to conditions of terrain	_____ newtons
Level and hilly	_____ kilometers at speeds applicable to conditions of terrain	_____ newtons
Belgian block	_____ kilometers at speeds applicable to conditions of terrain	_____ newtons

4.1.11 Quality conformance inspection (QCI). QCI shall consist of the examinations and tests specified herein and shall be performed in the following sequence and utilizing an approved Final Inspection Record (FIR).

a. Examination for the defects specified in table VI and classified in table II.
b. A _____ kilometer road test in accordance with 4.1.13.
c. QCI specified in table II.

4.1.11.1 One hundred percent. Each vehicle shall be subjected to the QCI specified in 4.1.11.

4.1.11.2 Acceptable quality level. When authorized by the Government acquisitioning authority, one hundred percent QCI (see 4.1.11.1) shall be waived. Thereafter, samples shall be selected in accordance with 4.1.12.2 and shall be inspected to determine conformance to the following acceptable quality levels (AQL).

Classification	AQL
Major	25/100 units
Minor	150/100 units

4.1.12 Sampling.

4.1.12.1 Lot formation. An inspection lot shall consist of each model type of vehicles produced in one month submitted at one time for acceptance,

4.1.12.2 Sampling for inspection. When sampling is authorized for QCI (see 4.1.11), samples shall be selected in accordance with general inspection level II of MIL-STD-105. Before sampling may be initiated, the contractor shall examine at least _____ consecutively produced vehicles. The examination shall establish that the process average percent defective, as defined in MIL-STD-105, is not greater than the specified AQL.

TABLE VI. Classification of defects.

Category	Characteristic	Defect	Method of inspection
Critical	None		
Major	AQL 25 Defects per 100 units		
101	Engine	Malfunction, leaks (see 6.4) unusual noise	Functional and visual
102	Cooling system and components	Malfunction, leaks, improper clearance	Functional and visual
103	Governor linkage	Malfunction, seals	Functional and visual
104	Electrical system	Malfunction, damaged, lighting connectors, bulbs	Functional and visual
105	Service and Hand brake and locks	Malfunction, leaks, adjustment	Functional and visual
106	Instrumentation switches, warning indicators	Malfunction	Functional and visual
107	Exhaust system	Damaged, leaks	Functional and visual
108	Tires	Damaged, wrong-size/type	Visual and gage
109	Winch and wire rope	Malfunction, improper size, length, damage,	Functional
110	Speeds - high, low	Nonconformance	Functional
111	Frame structure and welding defects		Visual
112	Tank structure and welding defects		Visual
113	Controls	Malfunction, improper clearance	Functional and visual
114	Rustproofing	Inadequate application, coverage.	Visual
115	Special purpose kits	Missing, improperly installed.	Visual
116	Transmission and power take off (PTO)	Inoperative, malfunction, leaks, improper installation of major components, damage, overheating, unusual noise	Functional and visual
Minor	AQL 150 Defects per 100 units		
201	Controls	Improper adjustment or assembly.	Functional and visual
202	Coolant	Low or improper mixture.	

TABLE VI. Classification of defects - Continued.

Category	Characteristic	Defect	Method of inspection
203	Lubricants	Improper levels and types (all units).	Visual
204	Wheels and tires	Tire pressure.	Gage
205	Pulleys and fan	Misalignment, improper mounting or clearance.	Visual
206	Belts	Tension improper, defective.	Visual
207	Wiring or tubing	Defective, improper assembly, installation or coding.	Visual
208	Brake system components	Improper assembly, installation, or protection.	Visual
209	Body, cab, doors, hood items, stowage brackets and boxes, Dump, van	Improper fits, assembly, or installation, defective weldments racks, bows, flooring, seals or hardware.	Visual
210	Sheet metal	Welding defects - cracks, splits.	Visual
211	Electrical system components	Improper installation or assembly.	Visual and functional
212	Paint	Improper application and color.	Visual
213	Exhaust system components	Improper assembly or installation.	Visual
214	Cooling system	Improper assembly or installation.	Visual
215	Fuel system components	Improper assembly or installation.	Visual
216	Canvas tops	Damage, improper fit and installation.	Visual
217	Decals, data and instruction plates	Missing, incomplete, painted over, improper location.	Visual
218	Vehicle registration and identification markings	Missing, improperly installed.	Visual
219	Workmanship	Loose nuts, screws, bolts, washers, cotter pins, safety wires, chain and lock pins, wiring clips, grommets stripped or damaged threads, binding and interference of components	Physical and visual
220	Stowed material	Missing, incomplete, improper location	Visual

4.1.12.3 Defects. The following rules shall be applied to the counting of defects.

4.1.12.4 Unclassified defects. All defects that have no effect on function, safety, interchangeability or life, but are considered departures from good workmanship will be noted in writing. Workmanship deficiencies falling within this category and recurring in five consecutive lots, or ten lots or more within a thirty-day period, will be added to the minor defects classification with no increase in AQLs.

4.1.12.5 Recurring major deficiencies. A major deficiency 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 deficiencies shall be cause for the entire lot or lots to be inspected for the recurring deficiencies. The deficiencies shall be corrected by the contractor when found.

4.1.12.6 Recurring minor deficiencies. A minor deficiency is recurring if it occurs more than twice in the same sample, or when the defect occurs in four successive samples. Recurring minor deficiencies shall be cause for the entire lot or lots to be inspected for the recurring deficiencies and correction shall be accomplished by the contractor prior to acceptance.

4.1.13 Road test. Each vehicle after final inspection shall be operated for a distance of not less than _____ kilometers (without payload) by the contractor and subject to all quality conformance tests specified in table II. Vehicles shall be completely assembled and serviced prior to road test. Performance of vehicles shall be demonstrated without payload at the place of manufacture on a smooth, relatively level, hard-surfaced road. Subsequently the vehicle shall be operated in reverse gear for a distance of not less than _____ kilometers.

4.1.14 Control test. The Government shall select at random _____ of the first _____ production vehicles of each model submitted and one per month threrafter but not less than one out of every _____ vehicles submitted to a _____ kilometer road test.

4.1.14.1 80.5 kilometer test. Vehicle shall be loaded with rated payload, operated for a distance of 80.5 kilometers, and subjected to all control tests specified in table II. These tests shall be performed at the place of manufacture by the contractor. The test course shall be a relatively smooth, level, hard-surfaced road.

4.1.14.2 Failure. If the vehicle selected fails to pass any of the control tests, the Government inspector shall stop acceptance examination and testing on subsequent vehicles until such time as conditions causing the failure have been corrected. Any defects found during or as a result of the test shall be prima-facie evidence that vehicles accepted subsequent to the previous acceptable control test vehicles are similarly defective unless evidence satisfactory to the contracting officer is furnished by the contractor that they do not have similar defects. Such defects on all vehicles

shall be corrected by the contractor at no cost to the Government. The contractor shall correct defects on all vehicles represented by the failed control test vehicles. Another vehicle with corrective actions implemented shall be subjected to the control test.

4.1.15 Comparison test. The Government may randomly select vehicles at anytime during the production contract period and subject these vehicles to the comparison tests specified in table VII, VIII or IX as applicable as well as a _____ kilometer test in accordance with 4.1.13. Tests shall be conducted at Government test sites. Vehicles selected for comparison tests shall not be previously tested vehicles according to 4.1.14, but shall have passed inspection according to 4.1.11.

4.1.16 Failure. Failure of any vehicle to pass any of the specified inspections or failure to meet inspection AQL levels, as applicable, shall be cause for the Government to refuse acceptance of the production quantity represented, until action taken by the contractor to correct defects and prevent recurrence has been approved by the Government.

4.2 Methods of inspection.

4.3 Materials and construction. Conformance to 3.2 and 3.3 shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to contract 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.

4.3.1 Defects. Conformance to 3.4.1 through 3.4.8 shall be determined by examination for the defects listed in table VI. Examination shall be visual, tactile, or by measurement with standard inspection equipment.

4.4.1 Special kits installation check. To determine conformance to 3.4.1 through 3.4.2, a specific kit when furnished shall be installed on vehicle(s), and checked for proper installation or interference with other components. When installation of kits require permanent change in vehicle configuration or adaption, such as weldments, drilled holes, metal cutouts, etc., prior approval must be obtained from the Acquisitioning Contracting Officer. Vehicles with arctic kits installed shall be tested in accordance with MIL-STD-810, Method 502.2, procedures I and II. Arctic kits (3.4.1.1.1 through 3.4.1.1.7).

TABLE VII. Comparison test of _____ kilometers for all models except truck tractor, wrecker and expansible van.

Course	Distance and Speeds	Payload (newtons)
Hard surface	_____ kilometers up to _____ km/h	_____ N
Secondary	_____ kilometers at speeds applicable to conditions of terrain	_____ N
Level and Hilly cross country	_____ kilometers at speeds applicable to conditions of terrain	_____ N
Belgian block	_____ kilometers at speeds applicable to conditions of terrain	_____ N

TABLE VIII. Comparison test of _____ kilometers for truck tractor combination.

Course	Distance and Speeds	Payload (newtons)
Hard surface	_____ kilometers up to _____ km/h	_____ N
Secondary	_____ kilometers at speeds applicable to conditions of terrain	_____ N
Level and Hilly cross country	_____ kilometers at speeds applicable to conditions of terrain	_____ N
Belgian block	_____ kilometers at speeds applicable to conditions of terrain	_____ N

TABLE IX. Comparison test of _____ kilometers for wrecker and expansible van models.

Course	Distance and Speeds	Payload (newtons)
Hard surface	_____ kilometers up to _____ km/h	_____ N
Secondary	_____ kilometers at speeds applicable to conditions of terrain	_____ N
Level and hilly cross country	_____ kilometers at speeds applicable to conditions of terrain	_____ N
Belgian block	_____ kilometers at speeds applicable to conditions of terrain	_____ N

4.4.4 Winch and wire rope test. To determine conformance to 3.4.4, winch and wire rope shall be tested with load and examined for proper assembly, installation and functional requirements. Rated load of the winch system shall be tested at Government Proving Ground (GPG). During control test at contractor's facility, winch and wire rope shall be tested and examined as above, except no load shall be used.

4.4.5 Engine examination. The engine with all accessories specified in 3.4.5, will be examined for completeness, proper installation in vehicle, electrical hookups, fuel line connections, air line connections, mechanical control hookups, oil level, and cooling fluid hookups.

4.4.5.1 Production engine settings and requirements test. The contractor shall perform a test analysis verifying that all requirements specified in 3.4.5.1 have been met as follows:

a. Net horsepower.
b. Peak torque.
c. Fuel consumption.
d. Oil consumption.

4.4.5.2 Engine governor test. To determine conformance to 3.4.5.2, the engine shall be started and operated without load, with foot accelerator depressed to the maximum permissible position, the engine speed shall not exceed _____ rpm. The governor shall be examined to assure that it is properly sealed.

4.4.5.3 Fuel test. To determine conformance to 3.4.5.3, all performance testing of vehicles with payloads shall be accomplished consuming fuel which conforms to DF-2 of VV-F-800.

4.4.5.3.1 Fuel tanks. To determine conformance to 3.4.5.3.1, vehicle fuel tanks will be designed and constructed in accordance with FMCSR 393.67 and certified to FMCSR 393.67(f). The fuel tank/lines venting system shall not be combined or inter-connected with other vent systems.

4.4.5.4 Engine lubrication system test. To determine conformance to 3.4.5.4 the contractor shall provide a laboratory analysis verifying that the oil provided in the engine meets the requirements of MIL-L-2104. The engine shall be operated at idling speed and the oil pressure shall not fall below the minimum safe operating pressure. The throttle and engine accelerator shall comply with MIL-STD-1180, Requirement No. 124.

4.4.5.5 Oil filler and gage examination. To determine conformance to 3.4.5.5, oil shall be poured into the crankcase filler opening from specified containers. Caution, do not overfill engine oil sump.

4.4.5.6 Steam and water jet cleaning test. To determine conformance to 3.4.5.6, the engine shall be steam and water jet cleaned during FPVI testing and subsequent to all other tests. The engine shall be equipped with all components listed in 3.4.5. The engine and components shall be disassembled to the extent necessary to determine probable entry of water or deterioration to seals, hose, gaskets, or driving belts. Any evidence of water entry or deterioration of seals, hose gaskets, or driving belts resulting from the above testing shall be cause for rejection.

4.4.5.7 Cooling system test. To determine conformance to 3.4.5.7, the cooling system shall be examined to assure that the system meets the specified cooling requirement. The maximum values of transmission oil temperature, engine coolant temperature and engine oil temperature and pressure shall be recorded during high ambient temperature and instrument tests conducted at GPG and shall not exceed the specified requirements.

4.4.5.8 DCA. To determine conformance to 3.4.5.8, the DCA shall be checked for installation and operation.

4.4.6 Exhaust system examination. To determine conformance to 3.4.6, the exhaust system shall be examined for proper installation, absence of leaks and verify that corrosion resistant steel was used to manufacture the entire system. The exhaust system shall comply with FMCSR 393.83.

4.4.6.1 Toxic gas exposure.

4.4.6.1.1 Carbon monoxide. To determine conformance to 3.4.6.1.1, requiring that operating and maintenance personnel shall not be exposed to concentrations of CO in excess of values which will result in COHb levels in their blood greater than 10%.

4.4.6.1.2 Other toxic gases. To determine conformance to 3.4.6.1.2, requiring nitrogen dioxide, ammonia, nitric oxide and sulfur dioxide be limited to concentrations not to exceed those specified by the ACGIH.

4.4.7 Gear train.

4.4.7.1 Transmission. To determine conformance to 3.4.7.1, the transmission shall have not less than _____ forward and one reverse gear ranges and must have a gear range capable of meeting the performance specification as stated herein. The transmission shall be provided with _____ power takeoff openings. Net torque capacity of the transmission shall be not less than _____ N m and net input power rating shall be not less than _____ HP.

4.4.7.2 Power takeoff. To determine conformance to 3.4.7.2, the power takeoff(s) shall be of _____ HP rated capacity to operate powered equipment. Controls to operate the power takeoff(s) shall be located in the cab accessible to the seated driver. A caution plate reading, "DO NOT OPERATE VEHICLE AT HIGHWAY SPEEDS WITH POWER TAKEOFF ENGAGED", shall be provided and installed in a location readily visible to the seated driver.

4.4.8 Lighting. To determine conformance to 4.4.8, all vehicle lights, reflectors, and wiring shall be as specified herein and shall conform to MIL-STD-1179. Lights and reflectors shall not be mounted on vehicle bumpers. Rear lighting shall be mounted in a protective location to preclude damage when interfacing with other vehicles or ancillary equipment. Vehicles shall be equipped with a blackout and marker lighting system. Front and rear turn signal lamps shall be provided. Turn signal operating units shall have visible and audible flash indicator and shall be mounted on the steering column.

4.5 RAM-D. To determine conformance to 3.5, the RAM-D requirements shall be verified by reviewing the test data developed during the testing of _____ vehicles at a Government Proving Ground. The vehicles shall be operated for a distance of _____ kilometers each, for a total of _____ kilometers. The data collected shall be reviewed, analyzed and computed as specified in 3.5.1, through 3.5.4 and appendix B, system failure definition/scoring criteria (FD/SC scoring criteria).

4.5.1 Reliability (mission). To determine conformance to 3.5.1, the vehicles shall demonstrate the ability to meet the reliability and confidence levels specified based on the duration of the mission, the number of missions, and the number of mission failures as scored by the FD/SC scoring criteria.

4.5.2 Availability (inherent). To determine conformance to 3.5.2, vehicle availability shall be calculated using the results of reliability testing and maintainability testing. The minimum availability acceptance shall be _____ percent.

4.5.3 Maintenance ratio. To determine conformance to 3.5.3, the vehicles shall not exceed the maintenance ratio specified.

4.5.4 Durability. To determine conformance to 3.5.4, the number of failures occuring during testing shall not exceed those specified.

4.6 Payload. To verify conformance to 3.6, vehicles shall be tested with their rated payloads as specified in table I, except that the truck tractor will include the towed payload with applicable semitrailer and all other trucks will tow their rated towed load whenever possible throughout the test.

4.6.1 Terrain mobility percentage. Vehicles shall be tested with rated payload and towed load as specified in 3.6.1, and shall be operated to the percentages specified.

4.7 Performance. The vehicle shall be verified as suitable for the intended use by satisfactorily completing the specified performance requirements. Vehicles submitted for acceptance shall pass the specified inspections and tests. The vehicles shall be completely assembled, including required kits, as applicable, and shall be properly adjusted and serviced for operation (see 3.7).

4.7.1 Vehicle loading. Vehicle performance shall be demonstrated with the vehicle loaded as specified in 3.7.1 and table I, over cross country operation (see 3.6.1.1,3.6.1.2 and 3.6.1.3).

4.7.2 Highway operation. To determine conformance to 3.7.2, the vehicle shall transport the rated payload and towed load over prepared roads. Performance shall be demonstrated on smooth, dry, relatively level, concrete roadway (see 3.7.2).

4.7.2.1 High speed verification. To determine conformance to 3.7.2.1, the vehicle shall transport the rated payload and/or towed load, limited to a maximum gross combination mass of _____ kg and at a sustained speed of not less than _____ km/h, on a smooth, dry, relatively level, concrete roadway (see 3.7.2.1).

4.7.2.2 Low speed verification. To determine conformance to 3.7.2.2, with the engine operating in the speed range which delivers the maximum torque, the vehicle shall be capable of operating at _____ km/h for sustained periods without damage to the vehicle. Payload and towed load shall be as specified in 3.7.2.2.

4.7.3 Fording test. To determine conformance to 3.7.3 the vehicle shall operate in a minimum of _____ mm of water for at least 15 minutes. Immediately following the fording test, the wheel hubs shall be removed and examined for water contamination. Oil samples shall be taken from the engine, transmission, transfer transmission and front, intermediate and rear differentials where applicable. Water contamination in excess of one percent by volume shall be cause for rejection. For air brake systems, the brake actuation and release times required by FMVSS 121 will not be compromised (see 3.7.3).

4.7.3.1 Deep water fording test. With deep water fording kit installed vehicle shall operate normally on land or in water to a depth of mm for a minimum of 30 minutes. Vehicle shall meet all performance requirements of 3.7.3.1. At the conclusion of test, examination for contamination shall be conducted as in 3.7.3.1.

4.7.4 Grade and slope operation. To determine conformance to grade and slope operation as specified in 3.7.4, 3.7.4.1, 3.7.4.2, and 3.7.4.3, vehicles shall be loaded and operated as specified. During operation on slopes and grades, any evidence of stalling, slipping, overheating or upsetting will be cause for rejection. During specified test, the engine shall be shut-off and restarted a minimum of two times in each direction, with a minimum of two minutes during shutdown, except that no shutdown will be performed on the two percent ascent grade. Oil pressure shall be carefully observed during test. If pressure falls below the minimum pressure indicated for safe operation, test shall be aborted. Any evidence of faulty lubrication, cooling, fuel supply, leakage, or other malfunction during or following tests, shall be cause for rejection.

4.7.5 Braking ability. To determine conformance to 3.7.5, the vehicle, fully equipped and with payload and towed load, and operated on smooth dry concrete shall stop and hold the vehicle under the conditions specified for each braking system. The vehicle braking system will be designed to meet all the performance and configuration requirements of FMVSS 105 or 121, whichever is appropriate for the type of brake system installed in addition to the requirements stated herein. Insure that vehicles equipped with full-air brakes include an alcohol aspirator with an unbreakable transparent container and an automatic moisture ejector.

4.7.5.1 Service brakes. To determine conformance to 3.7.5.1, application of service brakes shall stop, hold, and control the vehicle when ascending and descending a 60 percent grade. On relatively level, dry concrete roadway, application of service brakes shall bring the vehicle to a complete stop, from a speed of _____ km/h, within _____ m, measured from point of brake application. When conducting the brake tests the vehicle shall be centered in a 3.7 meter wide roadway lane and no part of the vehicle shall deviate from the lane when conducting the braking tests. The brake test shall be repeated for 40 consecutive stops.

4.7.5.2 Parking brake. To determine conformance to 3.7.5.2, the parking brake shall be capable of holding the vehicle motion and, at GVW on a 40 percent grade either headed up or downgrade, on dry hard surface that is free from loose material, in accordance with MIL-STD-1180. An indicator light will be provided to alert the crew when the parking brake is engaged. This energy shall be isolated from any common source and used exclusively for the operation of the parking brake. The parking brake system shall be held in the applied position by energy other than fluid pressure, air pressure, or electric energy. The parking brake shall be such that it cannot be released unless adequate energy is available upon release of the parking brake to make immediate further application. "Park" position (transmission shift lever) is required. "Park" position mode must comply with the above parking brake requirements including release of "Park" mode on a 40 percent grade.

4.7.5.3 Emergency brakes. To determine conformance to 3.7.5.3, the emergency brake system, in the event of a single point failure in the service brake system, shall be able to stop the vehicle and be capable of being modulated by the service brake control. Emergency braking shall include a means of providing adequate stopping in the event of a trailer breakaway.

4.7.6 Cramping angle test. To determine conformance to 3.7.6, the front wheels shall be turned to maximum right and left positions and, to assure that the degree turning angle is met, there shall be no clearance between traces of the axle stops. Faces of stops must contact each other simultaneously. The inside face of the tire shall not contact any part of the chassis, frame or vehicle components.

4.7.7 Cruising range. To determine conformance to 3.7.7, the vehicle fully loaded shall be driven on hard surface roads, over average rolling terrain, at an average road speed of _____ km/h, for a distance of not less than _____ km, without refueling.

4.7.8 Ground clearance. To determine conformance to 3.7.8, position the rated payload properly and measure the distance from the lowest part of the vehicle to the ground excluding the wheels and tires. The clearance shall not be less than _____ cm.

4.7.9 Ramp angle. To determine conformance to 3.7.9 the vehicle shall ascend, advance over the crest and descend a _____ degree ramp surface without any part of the vehicle, except the tires, touching the ground.

4.7.10 Approach and departure angles. To determine conformance to 3.7.10, the approach and departure angles, with and without kits, shall be a minimum of 45°.

4.7.11 Towing like vehicle. To determine conformance to 3.7.11, the vehicle at GVW shall be capable of flat towing a like vehicle also at GVW using a standard Army towbar for a distance of 80 km, at a speed of 56 kph, on paved level road without preparation.

4.8 Environmental operation. To determine conformance to high and low temperature operation of 3.8, the vehicle fully loaded shall meet the performance requirements of 3.7 through 3.7.1.2 at ambient temperatures of 49°C to minus 32°C (1.2 to 1.8 meters above ground). With arctic equipment installed, the vehicles shall meet the performance requirements at an ambient temperature of minus 32°C to minus 46°C (1.2 to 1.8 meters above ground), to minus 54°C ground surface temperature. The vehicle shall be placed in storage and be subjected to the temperature extremes specified in MIL-STD-210, for ground equipment, without deterioration that may cause failure of any component part of the vehicle. Testing shall be conducted in accordance with MIL-STD-810, method 501.2 and 502.2, procedures I and II.

4.9 Electromagnetic interference. To determine conformance to 3.9, the vehicle and components shall be subjected to the tactical vehicles suppression test of MIL-STD-462 for class IIIA.

4.10 Wood treatment. To determine conformance to 3.10, a laboratory analysis shall be provided to the Government, upon request, to ascertain that all requirements of MIL-STD-193 have been met.

4.11 Painting. To determine conformance to 3.11 and 3.11.1, painted surfaces shall be inspected for sags, runs, and thin areas. Vehicle, body(s) and components shall be cleaned, treated and painted in accordance with MIL-STD-193.

4.12 Marking examination. To determine conformance to 3.12, vehicle markings shall be inspected for conformance to MIL-STD-642. Letters and numbers shall be black lusterless paint having equivalent infrared reflectance of MIL-E-52798 or MIL-E-52835.

4.12.1 Data plates. To determine conformance to 3.12.1 and 3.12.2, data plates shall be properly located and meet all requirements of applicable drawings. Provide warning or precautionary data plates, where required, to protect personnel and/or equipment.

4.13 Rustproofing examination. Vehicle(s) shall be examined for conformance to MIL-R-46164. Vehicles undergoing RAM-D-and performance tests shall be examined for effectiveness of rustproofing to prevent corrosion of protected parts/areas. Vehicles undergoing QCI shall be examined for adequacy of rustproofing application to specification requirements.

4.14 Safety examination. To determine conformance to 3.14, all exposed parts which are electrically energized shall be located, insulated, fully enclosed, or guarded to prevent hazards to operating personnel and function of equipment. All moving parts which are considered to be a hazard to operating or maintenance personnel, shall be enclosed or guarded. Protective devices shall not impair operating functions.

4.14.1 Noise. To determine conformance 3.14.1, the vehicle shall comply with both the exterior and interior noise limits specified herein. Exterior noise - The vehicle shall comply with the exterior noise requirements as specified in MIL-STD-1474. Interior noise - The steady state noise levels in personnel occupied areas shall be below 85 db(A) when measured for maximum noise as specified in MIL-STD-1474. The personnel occupied areas shall be each operator or crew position.

4.14.2 Windshield wiper system. To determine conformance to 3.14.2, the windshield wiper system shall meet the requirements specified in SAE J198.

4.15 Servicing and adjustment. To determine conformance to 3.15, vehicles shall be inspected and serviced for fit, adjustments, and functional adequacy. Records of inspection and adjustment shall be recorded on a final inspection record for each vehicle inspected. Subject records shall be maintained, at source, for a period of four years.

4.16 Transportability. To determine conformance to 3.16, the vehicle shall be equipped with towing device and lifting and tiedown provisions which shall be adequate for highway, rail, sea and air transport in accordance with MIL-STD-209 and MIL-A-8421.

4.16.1 Lifting eyes. To determine conformance to 3.16.1, two lifting eyes shall be installed on the front and two on the rear of the vehicle. Each lifting eye and its mounting shall withstand a load of at least _____ kg without failure or permanent deformation when the load is applied at an angle up to _____ degrees from the longitudinal axis.

4.16.2 Pintle. To determine conformance to 3.16.2, verify that a swivel type pintle assembly conforming to the size and strength described in Drawing _____, is provided. The assembly shall include mounting flanges and lubrication fitting. Ascertain that the mounting surface is not more than _____ mm forward of the rear most part of the vehicle. Pintle height shall be _____ mm from the ground with the vehicle loaded to its rated cargo be capacity.

4.16.3 Tiedowns. To determine conformance to 3.16.3, complete diagrams and instructions for lifting and tying down the vehicle for the various transport modes shall be provided. Instructions shall be included for component removal when required for transport. Stencil or decal markings shall be applied to the vehicle at each lifting and tiedown point conforming to MIL-STD-209. Verify that the tiedowns will permit tiedown of the vehicle to the floor (or deck) of the transport medium in such a manner as to prevent shifting or movement in any direction.

4.16.4 Lift points. To determine conformance to 3.16.4, verify that the vehicle has fixed lift points to permit slinging into/onto flat rail car or ocean carrier. Ascertain that the lift points have the capacity for fully loaded vehicle (less trailer).

4.17 Certification. To determine conformance to 3.17, the supplier and his component sub-suppliers shall certify that the vehicle conforms to the requirements of MIL-STD-1180.

4.18 Workmanship. To determine conformance to 3.18, the vehicle shall be visually examined to determine that paint coverage is thorough and does not sag or run, and completely covers the surfaces with uniform quality. Heads of bolts and nuts shall not be damaged or distorted. Electrical, fuel, and other external lines shall be located to preclude possible damage by rubbing of adjacent lines or appendages. All surfaces shall be free from burrs, sharp edges, gouges, or protrusions which might present a safety hazard or deter from the appearance of a quality product.

5. PACKAGING

5.1 Preservation, packaging, packing, and marking. Preservation, packaging, packing, and marking for the desired level of protection shall be in accordance with the applicable packaging standard or packaging data sheet specified by the contracting authority (see 6.2).

6. NOTES

6.1 Intended use. The vehicles covered by this purchase description are general and special purpose trucks intended for use by the United States Military Services in transporting personnel and/or cargo, towing trailers or semitrailers, and recovering disabled equipment during military operations. When fitted with special kits, the vehicles are intended for use under extreme or unusual conditions of climate, weather, terrain and military operations.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of purchase description.
b. Vehicle model(s) required.
c. First article inspection, if not required (see 3.1).
d. Identify special kits required for specific vehicles (see 3.4.1).
e. Front winch, when specified (see 3.4.4).
f. Special painting requirements (see 3.11).
g. Special servicing and adjustment (see 3.15).
h. Responsibility for inspection, if other than specified (see 4.1).
i. Responsibility for inspection equipment, if other than specified (see 4.1.2).
j. Selection of applicable levels of preservation, packaging, packing and marking (see 5.1).

6.3 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. Process average shall be computed as follows:

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

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.

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

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

6.5 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 a 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 tables VI) and definitions contained in MIL-STD-105. Corrective action shall be taken for recurring defects.

6.6 Subject term (key word) listing.

Military Trucks, Up to 5 Metric-Ton Payload
General Specification for.

APPENDIX A

Tailoring Criteria for Trucks

10. SCOPE

10.1 Scope. This appendix provides criteria (rationale, guidance, and lessons learned) necessary to tailor the basic specification, MIL-PRIME-T-XXXXX(AT) for a specific application.

10.2 Purpose. This appendix is intended to assist the Government engineer in the development of specifications for procurement of trucks for military use.

10.3 Format.

10.3.1 Requirement/quality assurance identity. Section 30 of this appendix parallels section 3 and section 4 of the basic specification; paragraph titles and numbering are in the same sequence. The requirement of section 3 and the associated verification inspection of section 4 have been arranged as a complete package to permit addition to, or deletion from, the criteria as a single requirement.

10.3.2 Criteria definitions. The criteria discussed herein are defined as follows:

a. Rationale: The reason for the requirement and associated verification inspection.
b. Guidance: The suggested wording or concepts to achieve the state requirement and associated verification.
c. Lessons learned: Background information and experience from previous programs.

20. APPLICABLE DOCUMENTS

20.1 Unless otherwise specified the following documents are referenced solely to provide supplemental technical data:

STANDARDS
MILITARY

MIL-STD-882 - System Safety Program Requirements.

30. REQUIREMENTS AND VERIFICATION

3.2 & 3.3 Materials. The materials used shall be as specified on drawings, specifications and standards. The contractor shall use parts and assemblies from Qualified Products Lists (QPL), whenever available.

APPENDIX A

Rationale

Review of materials selection and identification during design and drawing review will assure adequate identification of materials. The contractor must provide stringent quality control over materials received to verify that the parts and materials meet the drawing and specification requirements.

Guidance

Use only those parts and assemblies that comply with the specifications, drawings, and standards requirements.

Lessons Learned

Use of non-conforming parts and materials may result in premature failure of components which could result in mission failure of the vehicle.

4.3 Materials. Conformance to 3.2 and 3.3 shall be determined by examining the contractors records to ascertain proof or certification that design, construction, processing, and materials conform to requirements.

Verification Rationale

To assure that all materials used in the construction of the vehicles conform to drawings specifications and quality standards without duplicating costly and time consuming tests.

Verification Guidance

Perform an in depth review of the contractors receiving inspection records, processing and quality control reports, vendor certifications, laboratory analysis reports, and QPL parts and assemblies.

Verification Lessons Learned

3.4.1 Special kits. When specified in the contract or purchase order, various type kits may be furnished for specific vehicles.

Rationale

Special kits may be ordered to adapt specific vehicles for special performance requirements.

Guidance

The contract, purchase order and/or specification shall specify by part number and nomenclature the kit(s) required.

APPENDIX A

Lessons Learned

3.4.2 Soft top (cab). The cab soft top furnished and installed in accordance with applicable drawings shall provide adequate protection for personnel when vehicle is operating in adverse climatic conditions (see 4.4.2).

Rationale

To provide protection from the elements for the operator and crew while performing mission functions in all climatic conditions.

Guidance

See applicable drawings.

Lessons Learned

4.3.1 Defects. Conformance to 3.4.1 through 3.4.8 shall be determined by examination for the defects listed in table VI. Examination shall be visual, tactile, or by measurement with standard inspection equipment.

Verification Rationale

To assure conformance to part drawings and functional fit to the vehicle chassis.

Verification Guidance

See applicable part drawings and table VI.

Verification Lessons Learned

3.4.3 Stowed material. All Basic Issue Items shall be stowed on the vehicle in spaces provided. The stowed items shall not interfere with other components and operation of the vehicle (see 4.4.3).

APPENDIX A

Rationale

To assure that all required OVM is on the vehicle, and in its proper location.

Guidance

See applicable installation drawings.

Lessons Learned

4.4.3 Stowed material. See 4.3.1 for inspection requirements.

Verification Rationale

See 4.3.1.

Verification Guidance

See 4.3.1.

Verification Lessons Learned

4.4.1 Special kits installation check. To determine conformance to 3.4.1 through 3.4.2, a specific kit when furnished shall be installed on vehicle(s), and checked for proper installation or interference with other components. When installation of kits require permanent change in vehicle configuration or adaption, such as weldments, drilled holes, metal cutouts, etc., prior approval must be obtained from the Acquisitioning Contracting Officer. Vehicles with arctic kits (see 4.4.1.1.1 through 3.4.1.1.7) installed shall be tested in accordance with MIL-STD-810, method 502.2, procedures I and II.

Verification Rationale

To assure form, fit and function of the special purpose kits, a complete installation of each type of kit shall be made on the specific vehicle it is intended for.

Verification Guidance

No alteration of vehicles, components or kits shall be permitted during installation without prior submittal of the applicable engineering documentations and approval of the Contracting Officer.

APPENDIX A

Verification Lessons Learned

Alternations, changes or modifications that are not documented and or incorporated into the technical data package will cause problems and delays during field installation of the balance of the kits on order.

3.4.4 Front winch. Winch, controls, and equipment installed in accordance with applicable drawings on vehicles requiring winches, shall be capable of retrieving disabled equipment under all climatic conditions. The single line capacity of the winch shall be not less than _____ N on the bare drum. The wire rope for the winch shall be not less than _____ m in continuous length, without splice or joint, and shall be provided with a chain and hook. Rigging block shall be in accordance with Drawing _____ and utility chain in accordance with Drawing _____.

The winch system, consisting of the winch and the winch cable assembly, shall have a maximum load rating based on a safety factor of not less than 3.5. The rigging block (snatch-block) will have at least a 2.0 safety factor based on the maximum anticipated force applied to it.

Rationale

Vehicles designated for a winch will require the installation of a winch assembly with controls which will primarily be used to retrieve disabled vehicles or other mobile equipment. Vehicles with winches becoming mired in soft earth, mud and snow will be able to extract itself in many instances.

The ratings of some winch systems have previously been based on the bare winch only. With weaker components added to the winch, the system's load capacity becomes less than that of the winch. The safety factor of the winch system then is less than one.

Guidance

Insert the required kilogram load capacity in the first blank space and the required length of cable in meters in the second blank space. Proper installation of the winch assembly is a matter of prime concern to assure the proper functioning of the winch and for the safety of the operator. Great care must be given to the mounting of winch to the vehicle. Mounting bolts and nuts must be as specified on the drawings and torqued to the specified requirements.

Lessons Learned

A malfunctioning winch, inproper installation, lack of maintenance or improper use of the winch could result in injury or death to the operator, and/or damage to the vehicle(s) involved in a recovery operation.

4.4.4 Winch and wire rope test. To determine conformance to 3.4.4, winch and wire rope shall be tested with load and examined for proper assembly, installation and functional requirements. Rated load of the winch system shall be tested at GPG. During control test at contractor's facility, winch and wire rope shall be tested and examined as above, except no load shall be used.

Verification Rationale

Proper and thorough testing of the winch assembly is necessary to assure a safe, reliable and efficient vehicle retrieval system. Winch controls shall be exercised and observed for ease of operation and proper installation.

Verification Guidance

The winch must be mounted on the vehicle in such a way that it can maintain a full capacity pull without damage to the vehicle frame and/or components. Mounting hardware shall be examined for conformance to specified torque. The wire rope shall be one continuous length without a splice joint, and the ends of the cables shall have clevis ends and crescent thimbles.

Verification Lessons Learned

3.4.5 Engine. The engine furnished shall be a liquid cooled compression ignition, two stroke or four-stroke cycle diesel engine, with not less than _____ cylinders, with a governed speed not to exceed _____ RPM.

Rationale

The diesel engine defined above, and the engine and truck adaptation described herein shall be designed to provide the maximum practicable interchangeability with existing vehicular parts and components. The engine and adaptation designs shall utilize, when suitable for the purpose, components and manufacturing processes which shall not require special, new, or costly tooling, facilities, or procedures.

Guidance

Insert in the first blank space the number of cylinders required for the engine, and the RPM in the second space. Design shall include emphasis on reducing the need for maintenance, repair parts, supply and other logistic support for the vehicle. Durability and reliability shall be the maximum attainable to minimize requirements for unscheduled maintenance and shall not be compromised to achieve light weight. Scheduled and preventative maintenance shall be

minimized, wherever practicable, through utilization of designs reducing the number of parts requiring servicing and lubrication. Accessibility to, and ease of removal and replacement of all parts and components, and such other provisions as will further minimize maintenance time shall be incorporated to the maximum practicable degree.

Lessons Learned

4.4.5 Engine examination. The engine with all accessories specified in 3.4.5 will be examined for completeness, proper installation in vehicle, electrical hookups, fuel and air line connections, mechanical control hookups, oil level, and cooling fluid hookups.

Verification Rationale

Verification of the engine installation and proper attachment of all related components must be ascertained to assure the performance of the engine and to preclude engine failure because of fluid leaks or failure to perform due to disconnection of linkages and components.

Verification Guidance

Preparation and use of an inspection check sheet, such as a Final Inspection Record (FIR), citing all the accessories, components, adjustments, and connections will provide a documented record and assurance that proper installation has been accomplished.

Verification Lessons Learned

3.4.5.1 Production engine settings and requirements. The engine assembly defined herein with alternator, air compressor, and power steering pump operating unloaded and corrected to standard conditions as established in SAE J816 shall meet the following requirements:

a. Net horsepower - _____ observed horsepower with engine operating at _____ + _____ percent rpm.
b. Peak torque - _____N m, observed.

c. Fuel consumption shall not exceed _____ + _____ percent kilograms per observed brake horsepower (BHP) hour with engine operating at full load and speed, and without fan.
d. Oil consumption - _____kg per observed BHP hours maximum at full load throughout the speed range of the engine.

Rationale

Installing and operating the engine on an engine dynamometer in accordance with the conditions specified in SAE J816 will determine the performance data statistics for the engine being tested.

Guidance

Follow procedures of SAE J816. Insert the required engine data for a, b, c, and d above.

Lessons Learned

4.4.5.1 Production engine settings and requirements test. The contractor shall provide to the Government a test analysis verifying that all requirements specified in 3.4.5 have been met as follows:

a. Net horsepower.
b. Peak torque.
c. Fuel consumption.
d. Oil consumption.

Verification Rationale

Verification that the engine meets minimum performance requirements specified shall be ascertained prior to installation in a vehicle in order to avoid costly removal and installation charges should the engine fail to meet the requirements.

Verification Guidance

Each engine shall be installed on an engine dynamometer and operated using the specified fuel. The engine shall meet the minimum performance requirements specified in 3.4.5.1.

Verification Lessons Learned

3.4.5.2 Engine governor. Engine governor shall be provided and set to limit engine speed to not more than _____ rpm, no load. The governor shall be sealed to provide indication of tampering.

Rationale

With the engine operating in a no load status and the throttle in a wide open position, the tachometer shall not exceed the RPM specified. RPM in excess of that specified may cause serious damage to the engine.

Guidance

Insert the required RPM data. Engine governor speed shall be checked during the production performance run, and subsequent installation in a vehicle.

Lessons Learned

4.4.5.2 Engine governor test. To determine conformance to 3.4.5.2, the engine shall be started and operated without load, with foot accelerator depressed to the maximum permissible position and the engine speed not exceeding ____ rpm. The governor shall be examined to assure that it is properly sealed.

Verification Rationale

The engine governor must restrict the RPM as specified in case of an inadvertant wide open runway of the engine. Excessive RPM(s) will cause the engine to self destruct.

Verification Guidance

With the engine warmed up to its normal operating temperature and the transmission in neutral position, depress the foot accelerator to its maximum position and observe the tachometer RPM.

Verification Lessons Learned

3.4.5.3 Fuel. The engine shall be capable of full performance consuming fuel in accordance with DF-2 of VV-F-800.

APPENDIX A

Rationale

The engine shall demonstrate that it will perform to specified requirements consuming the same type and grade of fuel when it is placed in service.

Guidance

Fuel consumed for testing shall be certified that it conforms to DF-2 of VV-F-800.

Lessons Learned

4.4.5.3 Fuel test. To determine conformance to 3.4.5.3, all performance testing of vehicles with payloads shall be accomplished consuming fuel conforming to DF-2 of VV-F-800.

Verification Rationale

To obtain uniform test results, the fuel shall conform to DF-2 of VV-F-800.

Verification Guidance

Review testing facility records for proof or certification that the fuel consumed conforms to DF-2 of VV-F-800.

Verification Lessons Learned

3.4.5.1 Fuel tanks. The vehicle fuel tank(s) will be designed and constructed in accordance with FMCSR 393.67. The fuel tank(s) will be certified in accordance with FMCSR 393.67(f). The fuel tank/lines venting system shall not be combined or inter-connected with other vent systems.

Rationale

The fuel tank(s) design and construction shall conform to the rules and requirements of FMCSR 393.67 and the fuel tank(s) conform to the certification requirement of 393.67(f). The fuel tank/lines venting system shall not be combined with other vehicle vent systems.

3.4.5.4 Engine lubrication system. The lubrication system shall operate satisfactorily under all intended service, operating and performance requirements specified herein when serviced with seasonal grades of oils as specified in MIL-L-2104 from minus 23°C to plus 52°C and MIL-L-46167 from minus 54°C to 18°C. The oil pressure shall not fall below minimum recommended by the engine manufacturer even with the oil level at the lowest marked safe operation level on the oil gage. At initial truck assembly, contractor may utilize an engine oil of his own selection for ambients of minus 23°C to plus 49°C only, provided oil selected its compatible with oil as specified in MIL-L-2104.

Rationale

All engine parts that have working surfaces are subject to wear or deterioration and must be provided with adequate lubrication. The lubricant used shall be compatible with seals and other construction materials used, and shall deliver satisfactory performance over a wide range of climatic conditions. The lubricants specified will deliver the required performance for all conditions within the temperature extremes specified.

Guidance

Examine the contractors records for proof or certification that the lubricants meet the specification requirements.

Lessons Learned

4.4.5.4 Engine lubrication system test. To determine conformance to 3.4.5.4 the contractor shall provide a laboratory analysis or certification verifying that the oil provided in the engine meets the requirements of MIL-L-2104. The engine shall be operated at idling speed and the oil pressure must not fall below the minimum safe operating pressure.

Verification Rationale

To ensure the serviceability of the engine, the lubricating oils shall be as specified or proven to be comparable. Once the vehicle is fielded the lubricants provided in the engine shall be to specification, therefore conformance during testing shall be assured.

Verification Guidance

Verify that the contractors records contain laboratory analysis or certification that lubricants meet the specification requirements.

APPENDIX A

Verification Lessons Learned

3.4.5.5 Oil filler and gage. The crankcase oil filler location shall allow oil to be readily poured into the filler opening without requiring the use of a funnel and using a container conforming to type II 5-quart size of PPP-C-96 and type II 5-gallon of PPP-P-704. The engine shall be provided with a properly accessible waterproofed bayonet gage (dipstick) that ensures ready and accurate reading of crankcase oil level with engine stopped.

Rationale

Provide a readily accessible engine crankcase oil filler port that is compatible to current military oil containers. Use of a readily accessible oil filler will preclude oil spillage and insure ease of maintenance. An easily accessible and accurate bayonet type oil gage (dipstick) will ensure that the oil level is checked during prescribed maintenance. Adequate oil levels in the safe operating zones will enhance anticipated engine life. Overfilling or underfilling the oil level may cause damage to the engine.

Guidance

Locate the oil filler tube in the engine compartment in an easily accessible position where there are no components and or body braces which would impede the addition of oil from the prescribed oil containers. Locate the oil dipstick in an easily accessible and visible location which can be reached by hand with a minimum of stretching or climbing on the vehicle to check the oil level.

Lessons Learned

Oil level dipsticks and oil filler tubes that are difficult to reach may be bypassed by the maintenance personnel responsible for this requirement.

4.4.5.5 Oil filler and gage examination. To determine conformance to 3.4.5.5 oil shall be poured into the crankcase filler opening from specified containers. Caution, do not overfill engine sump. Check oil level by use of the dipstick on flat, level surface.

Verification Rationale

Demonstration of pouring oil into the crankcase filler port must be accomplished using the specified 5 quart and 5 gallon container to verify adequate clearance for pouring the oil into the filler tube without spillage. Withdraw the oil dipstick to check the oil level in the crankcase. The dipstick shall be in a position that is readily accessible to reach, withdraw, and replace without interference. The dipstick shall be marked with “full”, “safe”, and “add” operating levels.

APPENDIX A

Verification Guidance

If interference is encountered, relocation or rerouting of the item(s) is required.

Verification Lessons Learned

3.4.5.6 Steam and water jet cleaning. The engine and all its components shall withstand waterjet cleaning with cleaner and high pressure steam conforming to P-C-437 without deterioration of seals and hoses or water leakage past seals, gaskets, or other similar defects. Paint removal shall not be a basis for rejection. Steam and water jet cleaning are defined as follows:

> The jet is applied perpendicular to the surface being cleaned at a distance of not more than 0.3m from the surface for steam cleaning, and not more than 1.5m from the surface for water jet cleaning. The jet pressure shall not be less than 689 kPa and not more than 758 kPa.

Rationale

Vehicle engines are prone to becoming covered with road dust, oil, anti-freeze, water and brake fluid. High pressure steam and cleaning solution is the approved method of removing these contaminents.

Guidance

It is essential that the engine and components be designed and manufactured to withstand the effects of high pressure steam and waterjet cleaning and the cleaning solvents specified.

Lessons Learned

4.4.5.6 Steam and water jet cleaning test. To determine conformance to 3.4.5.6, the engine shall be steam and water jet cleaned during FPVI testing and subsequent to all other tests. The engine shall be equipped with all components listed in 3.4.5. The engine, and components shall be dissasembled to the extent necessary to determine probable entry of water or deterioration to seals, hose, gaskets, or driving belts. Any evidence of water entry or deterioration of seals, hose, gaskets, or driving belts resulting from the above testing shall be cause for rejection.

APPENDIX A

Verification Rationale

Any evidence of water entry past the seals or deterioration of seals, hoses, or drive belts will result in premature failure of the engine or its components. If such failure were to occur during an emergency condition, the vehicle, personnel and cargo could be in grave danger.

Verification Guidance

Disassembly of the engine and components shall be conducted to the extent necessary to assure that no water or cleaning solution has entered past any seals, and the seals shall be examined to determine if there is any evidence of deterioration or leakage. Close examination of hoses and driving belts shall be conducted.

Verification Lessons Learned

3.4.5.7 Cooling system. The cooling system shall maintain a coolant temperature from the engine no greater than 99°C, an engine oil sump temperature no greater than 127°C, and a transmission oil temperature at converter outlet no greater than 163°C under all specified environmental performance and RAM-D requirements. The engine and cooling system as installed in vehicle shall perform as specified using water and anti-freeze compound conforming to MIL-A-11755 or water and corrosion inhibitor compound conforming to O-I-00490.

Rationale

Adequate cooling must be provided for engines and transmissions to obtain satisfactory performance over a wide range of climatic conditions, and to preclude premature wear and subsequent premature failure of component parts.

Guidance

A heavy duty cooling system shall be furnished. The cooling system shall maintain the top tank coolant at a temperature recommended by the engine manufacturer but not more than 104°C when operated under the conditions outlined in all speed ranges. The radiator pressure cap shall be integrated with the engine manufacturer's coolant system recommendation for best commercial practice. The cooling system shall pass the engine manufacturer's cooling test in the installed configuration in an ambient air temperature of 49°C. If the radiator cooling system is used to cool transmission systems, the cooling system shall be capable of adequately cooling these components in addition to the engine. It shall have thermostatic controls for controlling the flow of engine coolant through the radiator. Cooling system shall be adequate to cool the torque

converter. The coolant system shall include a de-aeration system of sufficient capacity to handle the coolant drawn down as required by the engine manufacturer or a coolant recovery reservoir of not less than 5% of the total coolant system capacity. A high cooling system temperature warning light or buzzer shall be provided. The reservoir shall be located in a position readily accessible for inspection and service.

Lessons Learned

4.4.5.7 Cooling system test. To determine conformance to 3.4.5.7, the cooling system shall be examined to assure that the system meets the specified cooling requirement. The maximum values of transmission oil temperature, engine coolant temperature and engine oil temperature and pressure shall be recorded during high ambient temperature and instrument tests conducted at GPG.

Verification Rationale

The cooling system must be of adequate capacity to preclude the engine and transmission temperatures from exceeding the specified high temperature limits. Excessive high temperatures will result in inadequate performance and premature engine and transmission failures.

Verification Guidance

Record the temperatures of the engine coolant and the transmission oil during high ambient temperature operation at GPG. Temperatures in excess of the maximum temperatures specified should be considered as a potential problem. The cause should be identified and corrected.

Verification Lessons Learned

3.4.6 Exhaust system. The exhaust system shall be of leakproof construction, securely mounted and shall withstand vehicle racking. Material for exhaust system, including those used for muffler and tailpipe, shall be of corrosion resistant steel. Exhaust pipe shall be secured to the exhaust manifold with a quick disconnect design feature. Design of pipe shall be such that it shall not interfere with power unit removal.

APPENDIX A

Rationale

The exhaust system shall be located and/or protected so that personnel will not come into contact with hot surfaces. The design must prevent fumes from entering crew and other personnel compartments. Exhaust should be directed away from tires, roadways and ground to prevent damage to vehicle components, disturb roadway dust or cause brush/grass fires; in addition, the exhaust system should not be capable of being clogged or its function degraded when the vehicle is either operating on muddy surface or engaged in fording operations. The system should be mounted to the chassis securely, yet loose enough so that flexing between components will not cause damage. No part of the exhaust system should cause burning, charring or other damage to the vehicles electrical wiring, the fuel supply or any other components. The exhaust system should include mufflers (silencers) to limit the noise to which any occupant is exposed to the levels specified in the current issue of MIL-STD-1474.

Guidance

The exhaust system shall be designed to meet the requirements of MIL-HDBK-759, and for maximum ground clearance to lessen the chance for damage during off-road use. Corrosion resistant material shall be used due to various environmental conditions that the vehicles are exposed.

Lessons Learned

4.4.6 Exhaust system examination. To determine conformance to 3.4.6, the exhaust system shall be examined for proper installation, absence of leaks and conformance to MIL-HDBK-759. Verify that the exhaust system is securely fastened to the vehicle at the hanger straps. The pipe joints must be secure with exhaust clamps and there shall be no leakage at any joint. Pipes and mufflers shall be installed to prevent contact between the exhaust system and the chassis except at the hanger straps. If the vehicle has a vertical exhaust system, a securely mounted heat shield around the mufflers shall be provided to protect personnel from burns.

Verification Rationale

Exhaust system must be leakproof to preclude a potential health hazard to the operator and crew. Exhaust leaks also present a potential fire hazard when the vehicle is operated off road in a dry grass or brush area.

Verification Guidance

The complete exhaust system must be examined from the engine to the open end of the exhaust pipe or muffler. Since a majority of the exhaust is under the vehicle, the vehicle should be examined by being raised on a hoist, parked over a pit type opening, or by the inspector laying on a creeper and maneuvering under the chassis.

APPENDIX A

Verification Lessons Learned

3.4.6.1 Toxic gas exposure.

3.4.6.1.1 Carbon monoxide. Operating and maintenance personnel shall not be exposed to concentrations of CO in excess of values which will result in COHb levels in their blood greater than 10% in accordance with MIL-STD-1472C. The equation used to estimate the percent COHb blood levels will be in accordance with MIL-HDBK-759A using work stress level 4 for weapons firing and work stress level 3 for all other mission activities.

Rationale

The design and installation of the engine and heater exhaust systems must be leakproof to prevent the entry of noxious substances into an enclosed vehicle crew compartment. CO is particularly dangerous in that it is odorless, colorless and tasteless and is not ordinarily detectable by the human senses. In sufficient concentrations, the noxious substances may incapacitate personnel or reduce substantially their performance through eye irritation, nausea, reduced mental alertness, and even unconsciousness.

Guidance

All connections of the exhaust systems shall be symmetrical to assure a positive leakproof fit. Exhaust system clamps should be of the required size and shall be torqued to the specification requirements.

4.4.6.1.2 Other toxic gases. To determine conformance to 3.4.6.1.2, concentration of nitrogen oxides, ammonia, nitric oxide and sulfur dioxide shall be limited to those values specified by ACGIH.

Rationale

The presence of either carbon monoxide or ammonia in excessive concentration has been known to reduce the effectiveness of personnel. It is obvious that concentrations of such toxic agents should not be permitted to build up beyond their tolerable limits in personnel compartments.

Guidance

The vehicle shall be tested for concentration of CO not to exceed 50 parts per million (ppm); for ammonia (NH_3) 5.0 ppm; and for nitrogen dioxide (NO_2) 5.0 ppm. The NO_2 is a ceiling value which should not be exceeded at any time. Careful consideration should be given in designing vehicle compartments to provide sufficient ventilation to maintain the concentration of gases, vapors and fumes below an irritating and nauseating level.

3.4.7 Gear train.

3.4.7.1 Transmission. The transmission shall have not less than _____ forward and one reverse gear ranges and must have a gear range capable of meeting the performance specification. The transmission shall be provided with power takeoff openings. Net torque capacity of the transmission shall be not less than _____ N m and net input power rating shall be not less than _____ HP.

Rationale

Insert in the first blank space the number of forward gear ranges for the transmission, the net torque capacity to the second space, and the net input power rating for maintenance, repair parts, supply and other logistic support for the vehicle. Durability and reliability shall be the maximum attainable to minimize requirements for unscheduled maintenance. Scheduled and preventative maintenance shall be minimized, wherever practicable, through utilization of designs reducing the number of parts requiring servicing. The transmission and auxiliary components must be readily serviceable and have a high degree of reliability and must be able to withstand operate abuse. The transmission should have a relatively high mechanical efficiency and be as light in weight and as compact as is practicable.

Guidance

Insert the required transmission data in the blank spaces. Verification of the transmission installation and proper attachment of all related components must be ascertained to assure the performance of the transmission and to preclude transmission failure because of fluid leaks or failure to perform due to disconnection of linkages and components.

Verification Guidance

Preparation and use of an inspection check sheet, such as a FIR, citing all the accessories, components, adjustments and connections will provide a documented record and assurance that proper installation has been accomplished.

3.4.7.2 Power takeoff. The power takeoff(s) shall be of _____ HP rated capacity to operate powered equipment. Controls to the power takeoff(s) shall be located in the cab accessible to the seated driver. A caution plate reading, "DO NOT OPERATE VEHICLE AT HIGHWAY SPEEDS WITH POWER TAKEOFF ENGAGED", shall be provided and installed in a location readily visible to the seated driver.

Rationale

Insert in the blank space the horsepower rated capacity of the power takeoff. Design shall include emphasis on reducing the need for maintenance, repair parts, supply and other logistic support for the vehicle. Durability and reliability shall be the maximum attainable to minimize

requirements for unscheduled maintenance. Scheduled and preventative maintenance shall be minimized, wherever possible, through utilization of designs reducing the number of parts requiring servicing.

Guidance

Insert the required power takeoff data in the blank space.

Verification Rationale

Verification of the power takeoff installation and proper attachment of all related components must be ascertained to assure functional performance of the controls, gear, universal joints and shafts.

Verification Guidance

Preparation and use of an inspection check sheet, such as a FIR, citing all the accessories, components, adjustments and connections will provide a documented record and assurance that proper installation has been accomplished.

3.4.8 Lighting. All vehicle lights, reflectors and wiring shall be as specified herein and shall conform to MIL-STD-1179. Lights and reflectors shall not be mounted on vehicle bumpers. Rear lighting shall be mounted in a protective location to preclude damage when interfacing with other vehicles or ancillary equipment. Vehicles shall be equipped with a blackout and marker lighter system. Front and rear turn signal lamps shall be provided. Turn signal operating units shall have visible and audible flash indicators and shall be mounted on the steering column.

Rationale

Design shall include emphasis on providing sufficient lighting, reflectors and associated signaling equipment to enable safe operation of military vehicles in darkness and other conditions of reduced visibility, and during blackout conditions. Vehicles must be equipped, both fore and aft, with special low intensity blackout lights to prevent observation at night. A special switch is required in conjunction with the blackout lights to prevent accidental use of the regular service lights during blackout operations. All lights on the exterior of the vehicle must be totally waterproof. The voltage of the lamps must correspond to the design voltage of the electrical system.

Verification Rationale

Verification of the lighting system installation and proper attachment of all related components must be ascertained to assure functional performance of vehicle lights, reflectors and wiring.

APPENDIX A

Verification Guidance

Preparation and use of an inspection check sheet, such as a FIR, citing all the accessories, components, adjustments and connections will provide a documented record and assurance that proper installation has been accomplished.

3.5 Reliability, availability, maintainability, durability (RAM-D). The RAM-D requirements shall be demonstrated by operating _____ vehicles, each for _____ kilometers in accordance with the distance and percent of distance schedule specified in 3.6.1. For RAM-D calculations, _____kilometers shall equal one operating hour.

Rationale

To provide requirements, and specific tasks to ensure RAM-D requirements during the development, production and deployment of vehicles.

Guidance

Insert in the first blank space the quantity of vehicles to be tested. In the second blank space insert the number of kilometers that each vehicle shall be tested and the total amount of kilometers (accumulated test distance) in the third space.

Lessons Learned

4.5 RAM-D. To determine conformance to the RAM-D, the requirements shall be verified by reviewing the test data developed during the testing of _____ vehicles at a Government Proving Ground. The vehicles shall be operated for a distance of _____ kilometers each, for a total of _____ kilometers. The data collected shall be reviewed, analyzed and computed as specified in 3.5.1 through 3.5.4, and Appendix B, System Failure Definition/Scoring Criteria (FD/SC).

Verification Rationale

Reliability data collected during testing will be analyzed and failures scored utilizing the system FD/SC guidelines (Appendices B and C) and implemented during official scoring conferences. Scoring conferences will be held during and at the conclusion of initial production testing with a contractor representative in attendance. In addition aggregation committee meetings will be held with contractor representation when necessary to purge failures which have been corrected and verified through testing.

APPENDIX A

Verification Guidance

Insert the required data in the blank spaces i.e., number of vehicles tested, distance vehicle is to be operated in kilometers, and total distance for all the vehicles in kilometers. See appendices B and C for the FD/SC criteria for defining and scoring the failures.

Verification Lessons Learned

3.5.1 Reliability (mission). The mission reliability of the vehicle system shall be not less than _____ percent at _____ percent confidence level and shall be demonstrated under the conditions stated herein. The mission duration shall be _____ kilometers for a total of _____ missions. The number of mission failures shall not exceed _____ failures.

Rationale

Test data collected will determine the reliability requirements for the vehicles tested.

Guidance

Insert the reliability and confidence percentage numbers that the vehicles must attain, in the blank spaces, the distance to be operated in kilometers, the number of missions and the maximum number of mission failures that is acceptable.

Lessons Learned

4.5.1 Reliability (mission). To determine conformance to 3.5.1, the vehicles shall demonstrate the ability to meet the reliability and confidence levels specified based on the duration of the mission, the number of missions, and the number of mission failures as scored by the FD/SC scoring criteria.

Verification rationale

Test data collected will be used to assure the vehicle reliability for mission support capability.

APPENDIX A

Verification Guidance

Review the test data collected after scoring by the FD/SC scoring criteria to determine compliance with 3.5.1.

Verification Lessons Learned

3.5.2 Availability (inherent). The inherent availability of the vehicle system shall be not less than _____ percent and shall be determined based on the following relationship:

$$A = \frac{MTBF}{MTBF + MTTR} \times 100$$

Where:
A = Inherent availability.
MTBF = Mean time (hours) between failures.
MTTR = Mean time (hours) to repair, the MTTR is the summation of all active repair times used to isolate a malfunction, effect repairs and restore the vehicle system to operational status divided by the total number of mission failures. Active repair time does not include supply downtime, waiting administrative downtime and preventative maintenance.

Rationale

Test data collected will establish the vehicle availability.

Guidance

Insert the figure for the required minimal percentage of vehicle availability time.

Lessons Learned

4.5.2 Availability (inherent). To determine conformance to 3.5.2, vehicle availability shall be calculated using the results of reliability testing and maintainability testing. The minimum availability acceptance shall be _____ percent.

APPENDIX A

Verification Rationale

Availability of support equipment is required to minimize downtime and maximize time available for mission operational requirements.

Verification Guidance

Insert in the blank space the minimal available percent figure required.

Verification Lessons Learned

3.5.3 Maintenance ratio. The maintenance ratio is an index which establishes a relationship between the total time required to perform maintenance and the total mission operating time in hours. The maintenance ratio shall not exceed _____ and shall be based on the following relationship:

$$MR = \frac{T}{M}$$

Where:

MR = Maintenance Ratio
T = Total maintenance time (hours) expended to perform scheduled and unscheduled maintenance covering the total vehicle system operating time period.
M = Total mission time (hours).

Rationale

To provide assurance that the vehicles are cost effective from a maintenance standpoint and that the maintenance support meets specified requirements.

Guidance

Insert the maximum acceptable maintenance ratio figure in the blank space.

A system failure is defined as any actual or incipient malfunction of the vehicle that requires corrective action which could not be deferred:

a. Until the next scheduled maintenance (exclusive of lubrication services) if unit maintenance is prescribed for correction.
b. For the remainder of its specified life before overhaul, replacement, rebuild or salvage.

c. Inability to commence operation, cessation of operation, or reduction in performance capability to the extent that a prescribed system fails to perform its intended function.
d. Prescribed unit level corrective actions deferred, or deferable, to the scheduled maintenance, are to be accomplished without charging a system failure. Incipient malfunctions of the vehicle detected during prescribed inspections connected with a scheduled maintenance, will also be corrected without charging a system failure, unless higher level maintenance is prescribed for the corrective action. In this event a system failure will be charged if the corrective action was not deferable. A system failure will also be charged if a malfunction of a subsystem of the end item was detected during the scheduled maintenance, that would have been made to operate the affected subsystem prior to the scheduled maintenance (e.g. malfunction of a night vision device during daylight vehicle operation prior to scheduled maintenance). If an incipient malfunction of the vehicle was detected during the correction of another malfunction, two system failures will be charged provided that; the malfunctions were totally unrelated.

Lessons Learned

4.5.3 Maintenance ratio. To determine conformance to 3.5.3, the vehicles shall not exceed the maintenance ratio specified.

Verification Rationale

To assure that maintainability requirements specified in 3.5.3 are met.

Verification Guidance

Review test data in accordance with the FD/SC scoring data to determine the MR.

Verification Lessons Learned

3.5.4 Durability. The durability of the vehicle system shall be demonstrated when the number of component or structural failures that require direct support level of maintenance do not exceed _____ failures, and do not exceed _____ failures that require general support level of maintenance or higher.

APPENDIX A

Rationale

To assure that the vehicles do not exceed specified maintenance requirements.

Guidance

Insert the failure data in the blank spaces.

Lessons Learned

4.5.4 Durability. To determine conformance to 3.5.4, the number of failures occuring during testing shall not exceed those specified.

Verification Rationale

To determine if the vehicles are capable of performance and mission accomplishment within acceptable maintenance actions.

Verification Guidance

Review accumulated test data against the FD/SC scoring criteria and compare results to the data required in 3.5.4.

Verification Lessons Learned

3.6 Payload. Vehicle(s) shall be tested with rated payload and rated towed load. The towed system and its Basic Issue Items failures will not be charged.

Rationale

To simulate user conditions the vehicles shall be loaded as specified and tested at Government Proving Grounds over courses that reflect the terrain conditions specified.

Guidance

Ninety percent of the mileage specified for testing shall be performed with payload. Towed loads if applicable shall be for 25 percent of the course. The payload for truck tractors shall be on a semitrailer and shall be pulled for 90 percent of the course.

APPENDIX A

Lessons Learned

The vehicles shall be operated for ten percent of the mileage specified with no load aboard. Shocks and vibrations encountered in an unloaded condition are greatly magnified and it is during this period of operation that parts susceptable to these sudden shocks may fail or loosen their fastenings.

4.6 Payload. Vehicles shall be tested with their rated payloads as specified in table I, except for the truck tractor which will include the towed payload with applicable semitrailer.

Verification Rationale

The vehicle(s) will be subjected to tests as specified. The tests will be conducted by the Government at a Government test site. Payloads will be positioned on the vehicles according to weight distribution and type of payload for the specific vehicle type.

Verification Guidance

The vehicle loading shall be as specified, usually with a full complement of fuel, lubricant and coolant, driver, assistant driver or equivalent weight of 91 kg and, if applicable, with winch assembly mounted at front of vehicle or an equivalent weight to simulate mounting of the winch, and with full vehicular equipment.

Verification Lessons Learned

3.6.1 Terrain mobility percentages. Vehicle(s) shall operate with rated payload and towed load on the highway and crosscountry courses in accordance with the following mission cycles specified in 3.6.1.1, 3.6.1.2, and 3.6.1.3 as applicable.

Rationale

The vehicles shall be operated on the Government test courses corresponding to terrain and distances specified with the required payloads. Data collected during the test cycles will be utilized to determine RAM-D statistics.

Guidance

Insert in the blank spaces the required distance in kilometers that the vehicle will be tested to.

APPENDIX A

Lessons Learned

4.6.1 Terrain mobility percentages. To verify conformance to 3.6.1 the vehicle with payloads specified shall be subjected to the tests specified in table I for the speeds and course conditions listed. Ten percent of the mileages listed will be performed with the vehicle operating without payload.

Verification Rationale

The tests when conducted under the conditions specified will simulate actual operating conditions that the vehicle(s) will subsequently be subjected. Defects of design, materials and manufacturing should be exposed during the test, and remedial action can be taken prior to fielding the vehicle(s).

Verification Lessons Learned

Past experience in similar testing has been effective in disclosing potential problems and implementing corrective actions that reduce maintenance down time.

3.7 Performance. A complete vehicle, loaded with rated payload and towed load and serviced with standard products shall meet performance requirements specified herein. Vehicle, serviced and equipped for the appropriate climatic conditions, shall operate as specified herein. Unless otherwise specified, performance shall be demonstrated on relatively level, smooth, hard-surfaced roads free of loose material.

Rationale

Performance testing shall be conducted to ensure compliance with the requirements of this specification.

Guidance

The vehicles selected for testing performance requirements shall have been serviced, properly adjusted and passed inspection.

Lessons Learned

APPENDIX A

4.7 Performance. The vehicle shall be verified as suitable for the intended use by satisfactorily completing the specified performance requirements. Vehicles submitted for acceptance shall pass the inspections and tests. The vehicles shall be completely assembled, including required kits, and shall be properly adjusted and serviced for operation.

Verification Rationale

Verification performance testing will assure that the vehicles either meet the specified requirements or that there are deficiencies that must be corrected.

Verification Guidance

Government proving ground personnel shall review the vehicle requirements and plan appropriate tests, course, and position payloads as specified.

Verification Lessons Learned

Complete and accurate test records provide an excellent source of information for the use in future development efforts. Failure analysis are especially useful as guidance for design changes to correct and reduce component failures or performance inadequacies.

3.7.1 Vehicle loading. Vehicle performance requirements shall be demonstrated with the specific vehicle loaded as specified (see table I) with full complement of fuel, lubricant, and coolant; with driver and assistant driver or equivalent weight of 892 N each; with winch assembly of _____ kg equivalent weight; mounted at the front of the vehicle to simulate mounting of winch; with soft top cab and with full vehicular equipment. Gross vehicle weight (GVW) shall not include tire chains, metal cab enclosures or special equipment kits.

Rationale

Load limits specified shall be implemented to assure performance data recorded during testing accurately reflects user requirements.

Guidance

Insert the weight of the winch assembly in the blank space (kilogram). Review the load requirements for the specific vehicle to be tested and position the simulated loads accordingly.

Lessons Learned

APPENDIX A

4.7.1 Vehicle loading. Vehicle performance shall be demonstrated with the vehicle loaded as specified in 3.7.1 and table I, over highway, and crosscountry operation (see 3.6.1.1, 3.6.1.2, and 3.6.1.3).

Verification Rationale

Vehicles shall be properly loaded to obtain test data which reflects design and performance requirements.

Verification Guidance

Verification of proper positioning of loads shall be ascertained prior to testing.

Verification Lessons Learned

3.7.2.1 High speed. The vehicle transporting its rated payload and towed load, limited to a maximum gross combination weight of _____ N, shall operate at a sustained high speed of not less than _____ km per hour (km/h).

Rationale

To assure rapid high speed deployment of material, and to ascertain that the vehicle speed is adequate for expressway travel.

Guidance

Insert the gross combination weight figure in the first blank space and the figure for the high speed in the second blank space. Proper mating of the engine, transmission, and axles will assure that the minimum high speed will be attained.

Lessons Learned

4.7.2.1 High speed verification. The trucks shall be loaded with the rated payload and if applicable a trailer with its rated payload shall be attached. The vehicle shall be operated on a smooth, dry, relatively level concrete roadway for a distance of not less than _____ kilometers at a sustained speed of not less than _____ km/h.

APPENDIX A

Verification Rationale

Vehicles shall be capable of maintaining sustained speeds on relatively level paved roads. Rapid deployment of material is essential. Peacetime use of expressways mandate high sustained speeds.

Verification Guidance

Insert the data for distance to be tested and the speed to be attained. Verify that vehicles are properly loaded with the rated payloads as specified, and that the vehicles have been adjusted for optimum performance.

Verification Lessons Learned

3.7.2.2 Low speed. The vehicle with its rated payload and towed load shall be capable of operating at a sustained low speed of _____ km/h without causing any damage to the vehicle.

Rationale

When the vehicle is in the speed range wherein the engine is operating at maximum torque, the lubrication and cooling systems are functioning under extreme performance conditions. The oil pumps and liquid cooling pumps are operating at relatively low revolutions per minute (rpm) and therefore bearings and other moving parts i.e., pistons are receiving minimal lubrication and cooling. Failures of components during this mode of operation are usually higher than at normal to high speed operation.

Guidance

Insert the figure for the low speed operation. Proper oil and coolant levels must be maintained to lessen the element of component failure.

Lessons Learned

4.7.2.2 Low speed verification. With the engine operating in the speed range which delivers maximum torque, the vehicle with its rated payload and towed load shall operate at a sustained low speed of not more than _____ km/h without damage to the vehicle, for not less than _____ km and/or _____ minutes.

APPENDIX A

Verification Rationale

With the vehicle operating at low speed the engine, transmission, transfer case, differential, power take off etc. shall be provided with adequate cooling and lubrication to prevent damage to any component.

Verification Guidance

Insert performance data in the blank spaces. Prior to conducting the low speed test, all fluid and lubrication levels shall be checked. Necessary fluid shall be added prior to the test to the safe operating levels indicated.

Verification Lessons Learned

3.7.3 Fording operation. The vehicle shall transport the rated payload and towed load, when fording hard bottomed crossings of fresh or salt water not less than _____ mm in depth, for a 15 minute period without requiring addition of special equipment, or adjustments. For air-brake systems, the brake actuation and release times required by FMVSS 121 will not be compromised.

Rationale

Military vehicles shall have the capability of fording water covered areas without deleterious effect on those parts of the vehicle that are submerged while transporting the rated payloads. Mission requirements mandate the ability to deliver material to many areas that are inaccessable to commercial type vehicles.

Guidance

Insert the data for water depth. Design and construction shall require maximum utilization of non-corrosive materials and seals shall be used wherever water could enter into bearing areas, or into lubricants.

Lessons Learned

APPENDIX A

4.7.3 Fording test. To determine conformance to 3.7.3, the vehicle shall operate in a minimum of _____ mm of water for at least 15 minutes. Immediately following the fording test, the wheel hubs shall be removed and examined for water contamination. Oil samples shall be taken from the engine, transmission, transfer transmission and front, intermediate and rear differentials. Water contamination in excess of one percent by volume shall be cause for rejection. For air-brake systems, the brake actuation and times required by FMVSS 1212 will not be compromised.

Verification Rationale

Verification of the vehicles capability to operate in water for limited periods of time without damage or contamination of lubricants shall be determined by disassembling to the extent necessary for inspection.

Verification Guidance

Insert required data for water depth. Following disassembly of wheel hubs, examine all internal areas for evidence of water contamination. Take oil samples from the engine, transmission, transfer case, differentials. The oil samples shall be delivered to a laboratory approved by the Government for analysis.

Verification Lessons Learned

3.7.3.1 Deep water fording. With the deep water fording kit installed, vehicles shall ford hard-bottomed, fresh or salt water crossings, remaining immersed for a period of 30 minutes. While still submerged, the engine shall restart after being stopped for 3 minutes and then operated for an additional 15 minutes, without damage to the vehicle. The expansible van truck shall ford water up to the bottom of the floor. All other models shall ford water up to a depth of _____ mm, including wave height. With the fording kit installed, the vehicle shall operate continuously on land, before and after fording operations, without damage to the vehicle. At the conclusion of such operation, a maximum of one percent water contamination by volume in the lubricating oil is permissible.

Rationale

With the deep water fording kits installed vehicles shall be capable of operating while submerged in water up to the depths specified without deleterious effects on any part of the vehicle. Under emergency conditions it may be necessary to move materials or personnel through flood waters or across rivers or streams where there are no bridges or where it is impractical to travel to a bridged area.

APPENDIX A

Guidance

Insert the required deep water fording data in the blank space provided. To preclude damage to the vehicle, it is imperative that the deep water fording kit be properly installed. Connections must be properly fitted and clamping devices securely tightened.

Lessons Learned

4.7.3.1 Deep water fording test. With deep water fording kit installed, the vehicle shall operate normally on land or in water to a depth of _____ mm, for a minimum of 30 minutes. Vehicle shall meet all performance requirements of 3.7.3.1. At the conclusion of test, examination for contamination shall be conducted as in 4.7.3.

Verification Rationale

Same as that stated in 4.7.3.

Verification Guidance

Same as that stated in 4.7.3.

Verification Lessons Learned

3.7.4 Gradeability. The vehicle shall demonstrate gradeability operations on prepared grades having the minimum percentage specified without stalling, slipping, overheating, or upsetting. The vehicle while transporting its payload, with and without towed load, shall ascend the specified grades at the speeds indicated, and shall transverse side slopes in two directions. As a result of this operation there shall be no evidence of faulty lubrication, leakage or other malfunction. The engine shall perform satisfactorily during all of the operations specified with the oil level at the full and at the add level conditions as indicated on the dipstick.

Rationale

Gradeability is the measure of the vehicle ability to negotiate hilly off-road grades in a manner that permits timely accomplishment of mission within the limits of its design. It is of paramount importance to any mission that support equipment function to expectation without damage or unstable operating conditions that would delay, prevent or otherwise jeopardize successful accomplishment of the mission.

APPENDIX A

Guidance

Vehicles shall be designed for optimum center of gravity and weight distribution keeping in mind the necessary ground clearance for off-road use. The center of gravity must be as low as possible to enhance stability on sharp turns and on side slopes. The drive train shall be of adequate size, strength and harmonious compatibility to successfully complete mission accomplishments.

Lessons Learned

4.7.4 Grade and slope operation. To determine conformance to grade and slope operation as specified in 3.7.4, 3.7.4.1, 3.7.4.2, and 3.7.4.3, vehicle shall be loaded and operated as specified. During operation on slopes and grades, any evidence of stalling, slipping, overheating or upsetting will be cause for rejection. During specified test, the engine shall be shut-off and restarted a minimum of two times in each direction, with a minimum of two minutes during shutdown, except that no shutdown will be performed on the two percent ascent grade. Oil pressure shall be carefully observed during test. If pressure falls below the minimum pressure indicated for safe operation, test shall be aborted. Any evidence of faulty lubrication, cooling, fuel supply, leakage, or other malfunction during or following tests, shall be cause for rejection.

Verification Rationale

Certain levels of performance have been established for support equipment as being essential to the successful accomplishment of military missions. They are based upon experience with support equipment worldwide and under every conceivable environment during both peacetime and wartime operations. To ensure adequate field performance, these standards for testing mobile support equipments have been established based on analyses of conditions likely to be encountered throughout their service life. Insofar as possible, the tests reflect concentrated operations based on the permise that a large percent of time will be spent on improved and unimproved surfaces.

Verification Guidance

The specified mobility tests are minimum standards. Any deviations from these tests must be supported by sound engineering principles and approved by the acquisition activity.

APPENDIX A

Lessons Learned

The most common error made by inexperienced designers of military equipment is their underestimation of the military environment, or their assumption that the operating environments of commercial and military vehicles are comparable. This misunderstanding of the military environment is brought to light by those who contend that some of the specified mobility tests are destructive by nature and do not truly represent conditions to which the equipment will be exposed in service. In reality, military equipment is often subjected to emergency operations by persons under severe stress that prevents all of the precautions needed to ensure that the equipment is always operated within its design limits. It is therefore difficult, if not impossible, to exactly duplicate all of the conditions to which an individual item of military support equipment will be exposed throughout its service life. Not unlike the commercial automotive industry, military vehicles are tested on worst case bumpy surfaces to determine if individual structural and suspension components will combine to yield an acceptable service life. Experience has shown that equipment designed to withstand the specified mobility tests have a high probability of performing satisfactorily in service. The opposite is true of equipment not designed for, nor subjected to these tests.

3.7.5 Braking ability. The vehicle, fully equipped and loaded with rated payload and towed load, shall be decelerated, held, and controlled by use of the service brakes, under the conditions specified. Road surface shall be smooth, dry concrete. Application of service brakes shall stop, hold and control the vehicle when ascending and descending 60 percent grades. On relatively level roadway, application of service brakes shall bring the vehicle to a complete stop, from a speed of _____ km/h, within _____ m, measured from point of brake application. Application of the hand brake shall hold vehicle motionless on a dry concrete 40 percent grade, when headed up and down grade, with rated payload less towed load. The vehicle braking system will be designed to meet all the performance and configuration requirements of FMVSS 105 or 121, whichever is appropriate for the type of brake system installed in addition to the requirements stated herein.

Rationale

Service brakes shall be adequate to bring a fully loaded vehicle to a complete stop within the specified distance from the point of application while traveling at the speed indicated. The vehicle shall stop without losing stability, overturning or swerving out of a 3.7 meter wide roadway lane. The brakes shall stop the vehicle without any unusual performance such as grabbing, noise characteristics, wheel skid or uncontrollable braking action. Parking brakes shall be adequate to hold the vehicle when it is loaded with its rated payload while headed up or down the specified grade in accordance with MIL-STD-1180. The parking brake shall hold the vehicle motionless while on grades for loading or unloading during off road mission support activities.

APPENDIX A

Guidance

Parking brakes may be interconnected with service brakes, e.g. connected to the same brake shoes or it may provide a clamping action on the drive shaft or transmission output shaft. Depending on the braking energy required, parking brake control may be actuated by various means, e.g. hand levers and foot pedals. The emergency brake system shall be able to stop the vehicle and be capable of being modulated by the service brake control and shall include a means of providing adequate stopping in the event of a trailer breakaway.

Lessons Learned

Inadequate braking system will result in damage to equipment and injury or death to personnel.

4.7.5 Braking ability. To determine conformance to 3.7.5, and provide verification of braking ability. The vehicle shall be inspected to determine compliance with part drawing and specification requirements. Service brake tests shall be conducted on smooth dry concrete or macadam surface that is free of loose material. Parking brake tests shall be conducted on up and down grades as specified above. The vehicle shall be loaded with specified payloads and driven at the minimum specified speeds. Upon application of the brakes the vehicle shall come to a complete stop within the specified stopping distance. The brake test shall be repeated for 40 consecutive stops. The service brake operations shall be smooth and uniform and locking up (skidding) of vehicle wheels shall be avoided.

Verification Rationale

Insofar as safety is concerned, there is perhaps no single feature more important than the service brakes to control and prevent injury and accidents during vehicle operation. The brakes must be capable of maintaining safe vehicular control in all braking situations, including panic stops, and must deliver the required performance over repeated applications when required. The emergency brakes should be able to stop the vehicle with use of the service brake control.

Verification Guidelines

Safety necessitates a need for thorough testing of service and parking brakes to ensure their effectiveness and dependability. Ambient temperatures can have an effect on braking, therefore brake tests should be conducted at ambient temperatures between 5 degrees Celsius (°C) and 32°C.

Verification Lessons Learned

APPENDIX A

3.7.6 Cramping angle. Front wheel cramping angle shall be not less than _____ degrees, measured at the wheel on the inside of the turning circle. Angle stops shall be provided, and adjusted (within a tolerance of plus _____ degree, minus _____ degree) to provide the maximum safe cramping angle. When adjusted, axle stops shall be so set that the angle adjustment cannot be readily altered and shall positively limit the cramping angle to the maximum angle of the stop adjustment.

Rationale

The front wheel cramping angle shall provide the smallest diameter turning circle without damaging the steering linkage or geometry as is possible, and without the inside face of tires rubbing on any part of the underbody structure.

Guidance

Insert the turning angle in degrees including the required tolerance. The steering linkage and gearbox shall be protected from excessive force by providing heavy duty stops that prevent the wheels from turning too far. The stops shall also be positioned such that the tires will not contact the vehicle frame.

Lessons Learned

4.7.6 Cramping angle test. To determine conformance to 3.7.6, the front wheels shall be turned to maximum right and left positions and, to assure that the _____ degree turning angle is met, there shall be no clearance between the faces of the axle stops. Faces of stops must contact each other simultaneously.

Verification Rationale

The wheels when turned right and left from stop to stop shall turn freely and smoothly without interference. When the axle stops make contact, verify and assure that the tires do not contact the body or chassis. Body or chassis contact shall be avoided to prevent excessive stresses on the steering linkages and tire wear.

Verification Guidance

Insert the required turning angle in blank space. To facilitate wheel turning operations, position the vehicle on a smooth, level surface, inflate the tires to the recommended operating pressure, and verify that the payload is properly positioned.

APPENDIX A

Verification Lessons Learned

3.7.7 Cruising range. Vehicle with payload shall operate for not less than _____ km, at average road speed of _____ km/h on hard surfaced roads over an average rolling terrain, without refueling.

Rationale

Certain levels of performance have been established for support equipment as being essential to the successful accomplishment of military missions. They are based upon experience with support equipment worldwide and under every conceivable environment. To ensure adequate field performance the cruising range of the vehicles must be known and the performance verified.

Guidance

Insert the distance and road speed in the blank spaces. The proper mating of the engine, transmission, differentials and wheel and tire sizes must be a harmonious match to assure successful performance and mission capability.

Lessons Learned

4.7.7 Cruising range. To determine conformance to 3.7.7, the vehicle loaded with the rated payload and rated towed load shall be driven on hard surface roads, over average rolling terrain, at an average road speed of _____ km/h for a distance of not less than _____ km without refueling.

Verification Rationale

The vehicle shall demonstrate a capability to perform satisfactorily in service by achieving the required mileage at the speeds indicated. The vehicle shall be closely monitored for lossening of parts, leakage of fluids or lubricants, overheating of components, ease of handling, braking characteristics, and performance in general.

Verification Guidance

Insert the road speed and distance in the blank spaces. To ensure adequate field performance, this standard for testing vehicles has been established based on analysis of military mission requirements. Insofar as possible, the test reflects the military need for a support vehicle to complete a mission.

APPENDIX A

Verification Lessons Learned

3.7.8 Ground clearance. The vehicle with rated payload shall have a ground clearance of not less than _____ centimeters (cm).

Rationale

The specific ground clearances are necessitated by obstacles and ground conditions commonly encountered in areas where the vehicle must operate i.e., ditches, underbrush, soft ground, sand, and uneven crosscountry terrain in general.

Guidance

Insert the minimum ground clearance figure in the blank space. Load the vehicle with the rated payload prior to checking for ground clearance.

Lessons Learned

4.7.8 Ground clearance. To determine conformance to 3.7.8 and with the rated payload, measure the distance from the lowest part of the vehicle to the ground excluding the wheels and tires. The clearance shall not be less than _____ mm.

Verification Rationale

Stationing the equipment on a level, hard surface will provide for accurate height measurement by establishing a uniform relationship of all under carriage components with the ground. Position the rated payload to obtain maximum load conditions to reflect the minimum road clearance caused by compressive forces on springs, tires, shock absorbers and other components of the suspension system.

Verification Guidance

Insert the minimum clearance dimension in the blank space and with the payload properly positioned measure the ground clearance from the lowest point of the undercarriage.

Verification Lessons Learned

3.7.9 Ramp angle. The vehicle (without front mounted winch) and with rated payload shall be capable of ascending, and advancing over the crest and descending a _____ degree ramp surface connecting two horizontal surfaces (upper and lower) without any part of the vehicle, except the tires, touching the ground.

Rationale

To ensure user mission requirements for off road performance the vehicles shall have the ability to climb over and descend earth mounds, ditches, rough terrain, and also loading ramps associated with the transportation of the vehicle by land, air or sea.

Guidance

Vehicle design must consider user requirements and incorporate the ramp angle into the vehicle construction.

Lessons Learned

4.7.9 Ramp negotiation. To determine conformance to 3.7.9, the vehicle shall ascend, advance over the crest and descend a _____ degree ramp surface without any part of the vehicle, except the tires, touching the ground.

Verification Rationale

The ramp angle capability must be verified by operating the vehicle with the rated payload over a prepared ramp corresponding to the angle of incline desired. The vehicle shall negotiate the ramp while ascending or descending without any part of the vehicle contacting the ground, except for the tires.

Verification Guidance

Insert the ramp angle required in the blank space.

Verification Lessons Learned

3.8 Environmental operation. The vehicle shall operate in an ambient air temperature of 49°C to minus 32°C (1.2 to 1.8 m above ground). With special equipment installed, vehicle shall operate in an ambient air temperature of minus 32°C to minus 46°C (1.2 to 1.8 m above ground) to minus 54°C (ground surface temperature). The complete vehicle when in storage shall

withstand climatic extremes as specified in MIL-STD-210, without deterioriation that may cause failure of any component part of vehicle.

Rationale

Military requirements demand vehicles that are ready and capable to perform mission requirements in a wide range of ambient temperatures, including arctic temperatures when the arctic kits are installed.

Guidance

Vehicles shall be designed and constructed with components which will perform in ambient temperatures from tropical high humidity areas to arctic without deleterious effect on any part. All fuels and lubricants used shall meet the requirements of the specification.

Lessons Learned

4.8 Environmental operation. To determine conformance to high and low temperature operation of 3.8, the vehicle fully loaded shall meet the performance requirements of 3.7 through 3.7.2.2 at ambient temperatures of plus 49°C to minus 32°C (1.2 to 1.8 m above ground). With special equipment installed, the vehicles shall meet the performance requirements at an ambient temperature of minus 32°C to minus 46°C (1.2 to 1.8 m above ground), to minus 54°C ground surface temperature. The vehicle shall be placed in storage and be subjected to the temperature extremes specified in MIL-STD-210, for ground equipment, without deterioration that may cause failure of any component part of the vehicle.

Verification Rationale

Vehicles must be tested following exposure (soaking) to the ambient temperatures specified. Required performance of these temperatures must be affirmed prior to fielding the vehicles.

Verification Guidance

The vehicles shall be soaked at the extreme ambient temperatures for 24 hours prior to conducting an operational performance test.

Verification Lessons Learned

3.9 Electromagnetic interference. Each vehicle shall be radio-interference suppressed in accordance with tactical vehicle requirements, class C1 of MIL-STD-461.

APPENDIX A

Rationale

MIL-STD-461 defines requirements for electromagnetic compatibility for the class of equipment specified.

Guidance

Not applicable.

Lessons Learned

4.9 Verification of electromagnetic interference. The contractor's compliance with the requirements of 3.9 for establishing electromagnetic compatibility requirements shall be verified at design and drawing reviews required by the contract. Requirements have been established for each item which shall be subjected to appropriate tests, including first article testing, in accordance with MIL-STD-462.

Verification Rationale

MIL-STD-462 contains standard test procedures for verifying the requirements of MIL-STD-461.

Verification Guidance

Not applicable. Requirements and testing are at item level and will be established at design review.

Verification Lessons Learned

3.10 Wood treatment. All wood parts for vehicles furnished shall be cleaned and treated in accordance with the requirements of MIL-STD-193.

Rationale

MIL-STD-193 defines requirements for cleaning, treating, and painting wood parts.

Guidance

Not applicable.

APPENDIX A

Lessons Learned

4.10 Wood treatment. To determine conformance to 3.10, a laboratory analysis shall be provided to the Government, upon request, to ascertain that all requirements of MIL-STD-193 have been met.

Verification Rationale

MIL-STD-193 contains standard test procedures for verifying the requirements specified.

Verification Guidance

Not applicable.

Verification Lessons Learned

3.11 Painting. The vehicle, body(s) and components shall be cleaned, treated, and painted in accordance with MIL-STD-193, as specified for the appropriate service (see 6.2). Painted surfaces shall be free of sags, runs, and thin areas.

3.11.1 Engine treatment and painting. The engine and its accessories shall be prepared and treated in accordance with good commercial practice, and painted any dark color that is non-brilliant. The engine spare parts and components shall be conditioned, primed and painted in accordance with MIL-STD-193.

Rationale

Cleaning, treating and painting shall be processed in accordance with MIL-STD-193. The application of paint on surfaces shall be uniform in coverage without thin or unpainted areas, not only for quality appearance but to prevent rust and corrosion.

Guidance

Not applicable.

Lessons Learned

4.11 Painting. To determine conformance to 3.11 and 3.11.1, painted surfaces shall be inspected for sags, runs, and thin areas. Vehicle, body(s) and components shall be cleaned, treated and painted in accordance with MIL-STD-193.

Verification Rationale

MIL-STD-193 contains standard test procedures for verifying the requirements specified.

Verification Guidance

Not applicable.

Verification Lessons Learned

3.12 Marking. Vehicle marking shall be in accordance with MIL-STD-642. Letters and numbers shall be black lusterless paint and/or decals having equivalent infrared reflectance specified in MIL-E-52798 or MIL-E-52835.

Rationale

Vehicle marking shall be accomplished to provide readily visible identification. Life cycle control and vehicle maintenance actions are based on the registration number.

Guidance

Comply with the requirements of MIL-STD-642, MIL-E-52798 or MIL-E-52835.

Lessons Learned

4.12 Marking examination. Vehicle markings shall be inspected for conformance to MIL-STD-642. Letters and numbers shall be black lusterless paint having equivalent infrared reflectance of MIL-E-52798 or MIL-E-52835.

Verification Rationale

See 3.12.

Verification Guidance

See 3.12.

APPENDIX A

Verification Lessons Learned

3.12.1 Data plates. Data plates conforming to type III, composition A, class 2 of MIL-P-514 shall be used.

3.12.2 Engine data plates. The engine data plates furnished shall be installed on engine block in location(s) readily visible to personnel performing maintenance on the engine.

Rationale

Data plates are intended for general use on military equipment to provide special identification, instruction, designation and other miscellaneous data. In order to protect personnel and equipment, provide warning and/or precautionary data plates in a visible location.

Guidance

Special data is to be provided by the design activity of the equipment.

Lessons Learned

4.12.1 Data plates. To determine conformance to 3.12.1 and 3.12.2, data plates shall be properly located and meet all requirements of applicable drawings.

Verification Rationale

Data plates shall be inspected for conformance to MIL-P-514, type III, composition A, class 2, and shall provide the special data as provided by the acquisitioning agency. The data plates shall be readily visible as specified in 3.12.2.

Verification Guidance

Verify data specified on the plates against the data required by the acquisitioning activity. Assure that the plates are clearly visible and are securely attached to the vehicle or engine as required.

Verification Lessons Learned

APPENDIX A

3.13 Rustproofing. Vehicles shall be rustproofed in accordance with MIL-R-46164.

Rationale

Apply corrosion preventative compounds to the sheet metal areas as specified in MIL-R-46164. When properly applied, such compounds shall prevent rusting in severe environmental areas.

Guidance

Workmanship shall be of such quality to assure that application of corrosion preventative compound(s) to all vehicles under contract, shall conform to the rustproof drawings and technical documents referenced in the contract and to requirements of the specification. Particular attention shall be paid to the requirement of an evenly applied coating with no running, sagging, or excessive build-up. Any overspray of material on body finish, trim, windows, or upholstery shall be removed without causing damage to any component or material (paint, rubber, plastic, etc.). Any overspray that may accumulate in prohibited areas shall be removed with a clean cloth and solvent, such as naphtha. A minimum amount of solvent should be used to remove deposits of compound from the upholstery. Necessary precaution shall be taken to assure that the selected solvent does not cause damage to rubber padding, upholstery, adhesives, and any prohibited areas.

Lessons Learned

4.13 Rustproofing examination. When rustproofing is specified, vehicle(s) shall be examined for conformance to 3.13. The contractor shall provide, for Government approval, a written description of a quality assurance rustproofing plan, prior to initiation of the rustproofing process.

Verification Rationale

To assure proper coverage and adequacy of the rustproofing for military vehicles. A currently written description of contractor process and details for each specific type of vehicle to be treated, shall be submitted to the contracting officer for approval, prior to initiation of the rustproofing process. Sample specimens shall be prepared for all boxed in areas. They shall be made from the same materials used in production. The sample specimens shall be rustproofed as if they were part of a complete vehicle. The specimens shall then be sectioned and inspected to determine the extent of coverage and thickness that the rustproofing process has achieved. The contractor shall notify the Government and obtain prior approval of any subsequent change to the submitted procedures, prior to implementing the change into the system.

APPENDIX A

Verification Guidance

The contractor shall include a plan (in-process control procedures) to assure that rustproofing application personnel are knowledgeable in accordance with the rustproofing application requirements, and have demonstrated the technical capability in operating the rustproofing equipment. The contractor shall maintain a current written record of certification tests which shall be made available to the Government upon request. Unless otherwise specified, illustrated rustproofing instructions covering the vehicle to be rustproofed shall be prepared and maintained by the contractor in technical manual form. The manuals shall specify required tools, materials, procedures, and application for proper rustproofing of the specific vehicle. The manual shall be used by trained rustproofing personnel.

Verification Lessons Learned

3.14 Safety. No condition shall exist which may create a safety hazard to operating or maintenance personnel.

Rational

To provide a military vehicle which incorporates all possible safety devices and equipment to prevent injury to the operating and maintenance personnel.

Guidance

This requires consideration of safety provisions during all design reviews. Such reviews shall include efforts to identify and eliminate safety problems in addition to those which have generated the customary safety devices, features and design practices.

Lessons Learned

4.14 Safety examination. To determine conformance to 3.14, all exposed parts which are electrically energized shall be located, insulated, fully enclosed, or guarded to prevent hazards to operating personnel and function of equipment. All moving parts which are considered to be a hazard to operating or maintenance personnel, shall be enclosed or guarded. Protective devices shall not impair operation functions. If vertical exhaust stacks are used, heat shields shall cover the pipes to prevent accidental burns by the crew when entering or exiting the vehicle.

APPENDIX A

Verification Rationale

The effectiveness of safety provisions shall be determined during first article testing.

Verification Guidance

Recommended changes to correct any safety related hazard discovered during testing should be reported to the contracting officer.

Verification Lessons Learned

3.14.1 Noise. The vehicle shall comply with both the exterior and interior noise limits specified herein. Exterior noise - The vehicle shall comply with the exterior noise requirement as specified in MIL-STD-1474. Interior noise - The steady state noise levels in personnel occupied areas shall be below 85db(A) when measured for maximum noise as specified in MIL-STD-1474. The personnel occupied areas shall be each operator or crew positions.

Rationale

MIL-STD-1474 establishes noise limits for Army materiel and prescribes the testing requirements and measurement techniques for determining conformance to the noise limits. The standard is intended to reduce hearing loss among personnel exposed to noise caused by Army materiel, improve speech communications in the noise environment and, when appropriate, decrease possibility of aural (hearing) detection of Army materiel by the enemy. This standard is also intended to cover typical operational conditions and is applicable to design of all new systems, subsystems, equipment and facilities which emit acoustic noise to personnel areas.

Guidance

The problem of noise within closed vehicles became serious with the introduction of new construction methods, new materials, and high vehicle speeds. It usually arises from the vibration of surfaces in contact with air. Body or hull panels may be major source of noise in thin-skinned vehicles. Noise with the vehicle interferes with communication: and if the sound levels are high enough and continuous, the efficiency of the personnel is adversely affected. As in temperature and humidity considerations, there are physiological and physiological boundries to noise tolerance. The reaction to a range of noise varies from physical discomfort to actual physiological damage. Pain and illness may result from exposure to noise. The amount of noise that can be tolerated by the average person depends on several factors. The sound pressure level, the frequency, and the duration of the noise are some of the factors which determine the reaction to various sounds. In general, shrill, high-pitched, irregular sounds are judged less pleasant than low-pitched, regular sounds.

4.14.1 Noise. The vehicle shall comply with both the exterior and interior noise limits specified herein. Exterior Noise - The vehicle shall comply with the exterior noise requirements as specified in MIL-STD-1474. Interior Noise - The steady state noise levels in personnel occupied areas shall be below 85db(A) when measured for maximum noise as specified in MIL-STD-1474. The personnel occupied areas shall be each operator or crew position.

Verification Rationale

Vehicles shall comply with both the exterior and interior noise limits outlined in MIL-STD-1474. The exterior sound level limits shall not be exceeded when measured according to the test procedure. The steady-state interior noise levels in personnel occupied areas shall not be exceeded when measured by MIL-STD-1474 with a steady-state noise Category of D. The personnel occupied areas shall be the following: Each operator and crew position, and occasionally occupied positions.

Verification Guidance

The standard establishes the test procedure, environment, and instrumentation for determining the maximum exterior and interior sound level for trucks. A suitable test site shall consist of a level open space free of large reflecting surfaces, such as parked vehicles, signboards, buildings, or hillsides location within 30 m (100 ft) of either the vehicle path or the microphone. It is strongly recommended that technically trained personnel select the equipment and that tests are conducted only by qualified persons trained in the current techniques of sound management.

3.4.12 Windshield wiper system. The windshield wiper system shall meet the requirements specified in SAE J198.

Rationale

SAE J198 establishes uniform test procedures and minimum performance requirements for windshield wiping systems and wiper blades based on current engineering data.

4.14.2 Windshield wiper system. The windshield wiper system shall meet the requirements specified in SAE J198.

Verification Rationale

SAE J198 contains the uniform test procedures for verifying the specified requirements. Uniform terminology of windshield wiper system characteristics and phenomena may be found in SAE J903, which also includes guides for the use of engineering layout studies to evaluate system performance.

APPENDIX A

3.15 Servicing and adjustment. Unless otherwise specified (see 6.2), the contractor shall service the vehicles for operational use prior to delivery. Such servicing fit and adjustment shall include, as a minimum, the focusing of lights, the proper adjustment of the engine, electrical system, brake system, seats, doors, windows, windshield, and windshield wipers, horn, hood, tailgate, front wheel alignment and tire pressure. The chassis, engine and all running gear shall be serviced with lubricants of the proper grade for the climatic conditions at the delivery point. Engine cooling system shall be serviced with a solution of ethylene glycol and water in equal parts by volume.

Rationale

Unless otherwise specified (see 3.15 and 6.2), vehicles shall be delivered in a ready to use condition. Facilities and qualified personnel are not always available at the delivery point.

Guidance

Final Inspection Records (FIRs) should be utilized covering all inspections and adjustments to be made to the vehicle, and shall include provisions for the adjuster to indicate that the adjustment(s) has been made by signing or initialling the FIR for each condition(s) and an inspectors signature, initials or stamp verifying the adjustment(s) or condition(s) are correct according to specified requirements.

Lessons Learned

4.15 Servicing and adjustment. To determine conformance to 3.15, vehicles shall be inspected and serviced for fit, adjustments, and functional adequacy. Records of inspection and adjustment shall be recorded on a final inspection record for each vehicle inspected. Subject records shall be maintained, at source, for a period of four years.

Verification Rationale

Final inspection of the vehicle will ensure that servicing has been accomplished, components are securely attached and fit properly, components such as horn, lights, windshield wipers, brakes, steering, etc., function properly and that the servicing, adjusting and inspection thereof has been recorded on the FIR to ensure that the vehicle is operationally safe and ready for missions support activity.

Verification Guidance

Review the FIR to verify that all the required inspections, adjustments, and functional operations have been made.

APPENDIX A

Verification Lessons Learned

3.16 Transportability. Vehicle shall be equipped with towing device and lifting and tiedown provisions which shall be adequate for highway, rail, sea and air transport in accordance with MIL-STD-209 and MIL-A-8421.

Rationale

MIL-STD-209 establishes dimensional limits, design considerations, and positioning requirements for slinging and tiedown provisions for lifting and tying down vehicles and military equipment. MIL-A-8421 establishes the general design and performance requirements of military equipment for air transportability on fixed wing Air Force aircraft.

3.16.1 Lifting eyes. Two lifting eyes shall be installed on the front and two on the rear of the vehicle. Each lifting eye and its mounting shall withstand a load of at least _____ kg without failure or permanent deformation when the load is applied at an angle up to _____ degrees from the longitudinal axis.

Rationale

Insert the minimum load capacity of each lifting eye in the first blank space and the maximum angle in the second space. Military vehicles are generally transported from their place of manufacturer to the place where they will be used, rather than being driven under their own power. In the course of this transport, it is often necessary to lift or hoist the vehicles abroad various carriers by means of cranes or similar equipment. To facilitate these hoisting operations and to minimize the risk of damage to the vehicles, suitable lifting eyes (slinging eyes) must be provided as an integral part of each vehicle. These may be in the form of lugs or pad eyes, and may include a shackle or a ring as an integral part. Their function is to provide a means of attaching a hook, sling eye, or shackle to the vehicle to permit safe lifting.

Guidance

Good design practice is to provide a minimum of four points for lifting on all vehicles. In order to minimize the total number of attachment eyes on a vehicle, the locations and designs of lifting eyes, eyes for tying down the vehicle, and towing lugs should be coordinated for multipurpose use wherever this is practicable. Lugs and eyes must be located for maximum accessibility to them. The working load upon which the designs of all lugs and eyes should be based is the maximum resultant static load imposed on the eye under the service conditions

anticipated and considered with the leg of the lifting or tiedown device acting at an angle of 45° from the vehicle. The working stress upon which the design of all lugs and eyes should be based on the maximum combined stress that is developed in the lug or eye by the application of the working load. The ratio of the ultimate stress of the material used for the lugs or eyes to the working stress (factor of safety) should be a minimum of 5.

3.16.2 Pintle. A towing pintle at the rear of the vehicle shall be provided. The pintle assembly shall be of the swivel type and conform to the size and strength described in Drawing _____. The assembly shall be furnished with mounting flanges and lubrication fitting. The pintle assembly mounting surface shall be not more than _____ mm forward of the rear most part of the vehicle. The mounting of the pintle assembly shall include reinforcements to transfer pintle loads directly to the web of the chassis frame. Provision for attachment of trailer safety chains shall be provided. Pintle height shall be _____ mm.

Rationale

Insert the pintle drawing number in the first blank space, the distance of the mounting surface in the rear in the second blank and the pintle height in the third space. A pintle assembly is a towing hook equipped with a hinged latch across its opening to retain the eye of a tow bar.

Verification Rationale

Most pintle assemblies are of a rotatable type, i.e., they are made to swivel about their longitudinal axis. Some vehicles are generally equipped with nonrotatable pintle assemblies to meet a definite military requirement to prevent small, narrow-tread, towed loads from overturning in rough cross-country operations. Pintle assemblies are normally mounted at the center of the rear end of the vehicle in a manner that will transfer the towed load directly to the vehicle frame. The pintle height should be compatible with the height of the towing lugs or lunettes of the vehicle to be towed. Pintles should be positioned to allow the most favorable draw line for towing trailers and other vehicles. The mounting must be sufficiently strong to withstand the shock loads associated with start up and with operations over rough terrain. The pintle location should be free of interferring brackets, braces, or body structure that can hamper coupling or uncoupling operations or limit relative motions between the towing and towed vehicles.

3.16.3 Tiedowns. Complete diagrams and instructions for lifting and tying down the vehicle for the various transport modes shall be provided. Instructions shall be included for complete removal when required for transport. Stencil or decal markings shall be applied to the vehicle at each lifting and tiedown point conforming to MIL-STD-209. The tiedowns shall permit tiedown of the vehicle to the floor (or deck) of the transport medium in such a manner as to prevent shifting or movement in any direction.

APPENDIX A

Rationale

Tiedowns are hardware item mounted on all military vehicles for the purpose of providing a means of attaching lashings, chains, cables, or other retaining devices to the vehicle. They are required for securing the vehicle retaining devices to the vehicle. They are required for securing the vehicle on board carriers during vehicle shipment by road, rail, water, or air; they are required for securing cargo to the vehicle; and they are required for securing canvas protective covers over the cargo holds of open vehicles.

Varification Rationale

Tiedown hardware is generally in the form of lugs, rings, eyes, shackles, and cleats. A minimum of four points should be provided for securing a vehicle on board a carrier. These must be positioned to keep the vehicles stable against vertical loads as well as loads in the longitudinal and lateral directions.

3.17 Certification. The supplier and his component sub-suppliers shall certify that the vehicle conforms to the requirements of MIL-STD-1180.

Rationale

Although vehicles and equipment manufactured for, and sold directly to the Armed Forces of the United States in conformity with contractural specifications, are specifically exempted from the provisions of the Federal Motor Vehicle Safety Standards (FMVSS), it is the established policy of the Army to comply with the intent of those standards as long as compliance does not degrade essential military characteristics. With the same limitation, compliance with applicable provisions of Federal Motor Carrier Safety Regulations (FMSCR) is an Army requirement. MIL-STD-1180 provides guidance to assure that proper safety characteristics associated with FMVSS are designed into military vehicles in a consistent manner.

Guidance

It is the contractual responsibility of the supplier, where certification of a component is specified, to provide products that comply with the applicable safety standards requirements cited in MIL-STD-1180. A certification does not necessarily guarantee acceptability of components delivered under a contract. The user is responsible to ascertain periodically by inspection and test the validity of a certification. Any known or suspected nonconformance should be promptly reported to the contracting officer. Use only those parts and assemblies that comply with the applicable safety standards.

Lessons Learned

Use of nonconforming components may result in premature failure and would jeopardize successful completion of the mission or pose a significant risk to life or property.

4.17 Certification. To determine conformance to 3.17, the supplier and his sub-suppliers shall certify that the vehicle conforms to the requirements of MIL-STD-1180.

Verification Rationale

Assure that the supplier performs in accordance with the contractual obligations to deliver product(s) that comply with all applicable safety standards requirements.

Verification Guidance

Perform an in depth review and conduct Government surveillance, initial or periodic, to assure that the supplier exercises and maintains adequate process and product quality control.

3.18 Workmanship. The workmanship displayed in the fabrication and assembly of the vehicle(s) shall meet performance requirements under all applicable environmental conditions. The quality of workmanship shall assure delivery of vehicles which are free from defects, improper manufacturing or assembly practices, and which meet or exceed requirements. Defective components or parts and assemblies which have been repaired or modified to overcome deficiencies shall not be furnished.

Rationale

Quality workmanship will ensure a quality vehicle.

Guidance

See 3.18.

Lessons Learned

4.18 Workmanship. Vehicles shall be examined to determine conformance to 3.18. In process inspections shall be conducted during all phases of manufacture and assembly to ensure that the workmanship is of the highest quality.

Verification Rationale

Quality cannot be inspected into a vehicle, it can only be built into it.

APPENDIX A

Verification Guidance

Follow 3.18.

Verification Lessons Learned

APPENDIX B

SYSTEM FAILURE DEFINITION/SCORING CRITERIA
(Guidelines for classification of test incidents)

10. SCOPE

10.1 Scope. This appendix details the guidelines to be used to classify test incidents under the following categories: No-test, unscheduled and scheduled maintenance, system failures, and tactical mission failures. The impact of equipment failure characteristics is reduced through planned maintenance and servicing, which is developed prior to the test. It is necessary, therefore, to distinguish between test incidents resulting from programmed maintenance, and test incidents requiring unprogrammed maintenance. With established guidelines, it must be recognized that incidents requiring performance vary from no effect to catastrophic failure. It is not possible to have hard rules for evaluating all incidents, therefore, judgement will have to be exercised in the classification of some incidents.

20. DEFINITIONS

20.1 No-test. Test incidents that are not related to hardware performance, typically will involve pre-test operations, test site limitations, test item abuse, unrealistic operating conditions, accidents, improper operation and maintenance procedures, modification kit installation, or engineering evaluation, are defined as “No-test”.

20.2 System failure. A system failure shall be as defined in 40.

30. SCORING PROCEDURES

30.1 Test evaluation. Test incident will be evaluated in accordance with the previous definitions, and classified in accordance with the chart contained in Appendix C. All unscheduled corrective maintenance actions will be evaluated for severity, and may be charged as system failures.

30.2 RAM characteristics. For the purposes of determining the RAM characteristics, the original scoring of incidents will be subjected to periodic review predicted on institution of corrective actions. The basis for eliminating failures or maintenance time, in order to arrive at adjusted values, will be scoring conference consensus that a given modification was satisfactory, and would therefore, have either precluded the failure (or maintenance time) or substantially reduced the failure rate for the component.

40. SYSTEM FAILURE

40.1 Definition of system failure. A system failure is defined as any actual or incipient malfunction of the end item (subject to the exclusions in 40.2.1) that required corrective action which could not have been deferred:

a. Until the next scheduled maintenance (exclusive of lubrication services) if unit maintenance is prescribed for correction or
b. For the remainder of its specified life before overhaul, replacement, rebuild or salvage (as applicable).

40.2 Amplification of system failure definition. Diagnostic and corrective action is not considered deferable if the malfunction caused (or would have caused if not corrected, i.e. incipient malfunction) one of the following:

a. Inability to commence operation, cessation of operation, or reduction in performance capability to the extent that a prescribed system function is either lost or significantly degraded.
b. A critical or catastrophic hazard to personnel or equipment, as defined by MIL-STD-882.
c. Prescribed unit level corrective actions deferred, or deferable, to the scheduled maintenance, are to be accomplished without charging a system failure. Incipient malfunctions of the end item, detected during prescribed inspections connected with a scheduled maintenance, will also be corrected without charging a system failure, unless higher level maintenance is prescribed for the corrective action. In this event, a system failure will be charged if the corrective action was not deferable as described in 40.2.1(e). A system failure will also be charged if a malfunction of a subsystem of the end item was detected during the scheduled maintenance, that would have been previously considered a system failure of the end item, if an attempt has been made to operate the affected subsystem prior to the scheduled maintenance (e.g., malfunction of a night vision device during daylight vehicle operation prior to scheduled maintenance).
d. If an incipient malfunction of the end item was detected during the correction of another malfunction, two system failures will be charged, proved that; the malfunctions were totally unrelated, maintenance was performed to prevent progression of the incipient malfunction, and both malfunctions comply with the stated definition of “system failure”. However, if the malfunctions were related (e.g., secondary damage caused by primary component malfunction), only the primary malfunction will be considered a system failure.
e. When the occurrence of more than one actual malfunction is subsequently traced to a common cause which is positively isolated, corrected by maintenance action, and verified, only one malfunction in the series will be scored as a system failure (if otherwise qualified). Diagnostic and unscheduled maintenance time associated with all malfunctions will be chargeable.

40.2.1 Exclusions. Incidents which comply with the above stated definition of "system failure" but which will not be used in the determination of system MTBF or system reliability are:

a. Actual or incipient malfunctions detected or corrected during initial technical inspection.
b. Actual or incipient malfunctions for which corrective action is authorized or prescribed as an operator/crew function, and can be accomplished within 60 minutes using only authorized controls, tools and spare parts incorporated in, or carried with, the end item.
c. Actual or incipient malfunctions resulting from not following the prescribed operational or maintenance procedures dictated by the equipment manuals, or which can be directly attributed to improper replacement of components or omission of prescribed scheduled service or inspections. This exclusion does not apply if the malfunction is attributable to improper design of the test item, unclear instructions in the operator/maintenance manuals, or inadequacy of any other element of the maintenance test package.
d. Actual or incipient malfunctions resulting from test item abuse, unrealistic operating conditions, non-valid test, or accident.
e. Malfunctions deferred to, and corrected during, the final technical inspection, except those which caused test termination or which would have been previously considered a system failure if an attempt had been made to operate the affected subsystem prior to final inspection.

APPENDIX C

Decision tree flow chart

STEPS	GUIDELINES		CLASSIFICATION
1	Does the incident concern RAM?	- NO	Non-RAM Oriented
	YES		
2	Was the incident detected during initial inspection?	- YES	No-test
	NO		
3	Did incident result from test item abuse, unrealistic operating conditions, accident, or not following prescribed maintenance or operating procedures?	- YES	No-test
	NO		
4	Was the incident a kit installation, authorized MOD, engineer evaluation, or a manual/maintenance evaluation?	- YES	No-test
	NO		
5	Was the incident detected during an inspection or operation for which no action, or only authorized scheduled crew maintenance was required?	- YES	No-test
	NO		
6	Was incident a scheduled replacement/ service?	- YES	Scheduled maintenance
	NO		
7	Was incident caused by another incident?	- YES	Unscheduled maintenance
	NO		
8	Was the incident an incipient malfunction detected during scheduled unit maintenance or detected during operations for which correction can be deferred to a scheduled maintenance corrected at that level?	- YES	Unscheduled maintenance

APPENDIX C

STEPS	GUIDELINES		CLASSIFICATION
9	Could malfunction have been corrected within 60 minutes by operator/crew using authorized OEM tools, spare parts, etc.?	- YES	Unscheduled maintenance
	NO		
10	Was incident an actual malfunction for which maintenance could have been deferred to the next scheduled unit maintenance and corrected at that level or deferred to end of test?	- YES	Unscheduled maintenance
	NO		
11	Could tactical mission of 75 miles be completed without any degradation to the mission essential functions?	- YES	Unscheduled maintenance and system failure
	NO		
12	Was the incident an incipient malfunction detected during scheduled maintenance which required direct support or higher level corrective action?	- YES	Unscheduled maintenance and system failure
	NO		
13	Did the incident concern a warn out component that would give ample warning prior to failure?	- YES	Unscheduled maintenance and system failure
	NO		
14	Classify as system failure, and unscheduled maintenance.		

APPENDIX D

SUPPLEMENTAL INFORMATION REQUIRED
(INDEX TO PARAGRAPHS REQUIRING SUPPLEMENTARY DATA)

This index is a quick reference to the preparing activity to locate the paragraphs that require specific engineering data to complete the specification.

Paragraph Number	Data Required
3.1	- Vehicle nomenclature.
3.4.1.1.1	- Engine coolant heater kit drawing number.
3.4.1.1.2	- Radiator and hood cover kit drawing number.
3.4.1.1.3	- Personnel heater kit drawing number.
3.4.1.1.4	- Soft top kit drawing number.
3.4.1.1.5	- Insulated cargo area cover kit drawing number.
3.4.1.1.6	- Cargo area personnel heater kit drawing number.
3.4.1.1.7	- Hard top kit drawing number.
3.4.1.2	- Deep water fording kit drawing number.
3.4.1.3	- A-frame kit drawing number.
3.4.1.4	- Vehicle rear lifting kit drawing number.
3.4.1.5	- Lifting kit drawing number.
3.4.1.6	- Bow and tarp kit (long cargo body) drawing number.
3.4.1.7	- Bow and tarp kit (drop side cargo body) drawing number.
3.4.1.8	- Bow and tarp kit (short cargo body) drawing number.
3.4.1.9	- Tarpaulin extension kit drawing number.
3.4.1.10	- Gun-ring mounting kit drawing number.
3.4.1.11	- Automatic alarm kit drawing number.
3.4.1.12	- Electric brake kit drawing number.
3.4.1.13	- Hand air brake kit drawing number.

3.4.1.14	- Tie down kit drawing number.
3.4.4	- Linepull capacity for front winch in kilograms. Length of wire rope in meters. Drawing number of rigging block. Drawing number of utility chain.
3.4.5	- GVW rating capacity of vehicle in metric tons. Number of cylinders in diesel engine. Horsepower rating. No load governed engine speed (RPM).
3.4.5.1a	- Net horsepower range, at (specify) RMP $\pm$ percent.
3.4.5.1b	- Peak torque in kilograms.
3.4.5.1c	- Fuel consumption, maximum in kilograms $\pm$ percent.
3.4.5.1d	- Oil consumption in kilograms.
3.4.5.2	- Engine governed speed RPMs.
3.5	- Quantity of vehicles for RAM-D testing. Distance in kilograms. Total distance for all vehicles in kilometers. Number of kilometers that equal one operating hour.
3.5.1	- Mission reliability in percent. Confidence level percent. Distance in kilometers. Number of missions. Number of allowable failures.
3.5.2	- Availability in percent.
3.5.3	- Maintenance ratio (MR).
3.5.4	- Durability, number of allowable failures direct support. Number of allowable failures general support.
3.6.1.1	- Distance in kilometers for testing vehicles except for wreckers, expansible vans and tractors. Percentage of test distance for paved roads, secondary roads, cross country and Belgian block.
3.6.1.2	- Distance in kilometers for testing truck tractors. Percentage of test distance for paved roads, secondary roads, cross country, and Belgian block.

APPENDIX D

3.6.1.3	- Distance in kilometers for testing wreckers and expansible vans. Percentage of test distance for paved roads, secondary roads, cross country and Belgian block.
3.7.1	- Weight of front winch in kilograms.
3.7.2.1	- Gross combination vehicle weight (GCW) in kilograms. Sustained high speed in kilometers per hour (km/h).
3.7.2.2	- Sustained low-speed in km/h.
3.7.3	- Depth of water for fording in millimeters (mm).
3.7.3.1	- Depth of water for deep water fording in millimeters (mm).
3.7.4.1	- GCW in kilograms. Speed in km/h to ascend 2 percent grade. Speed in km/h to ascent 60 percent grades.
Table I	- List model numbers of all vehicles. List maximum gross load allowance for each model. List payload for each model. List towed load for each applicable model.
3.7.5.1	- List speed in km/h for service brake test, and stopping distance in meters.
3.7.6	- List front wheel cramping angle in degrees. List tolerance for $\pm$ degrees.
3.7.7	- List cruising range distance in km and speed in km/h without refueling.
3.7.8	- List minimum ground clearance in centimeters.
3.7.9	- List ramp angle in degrees.
4.1.7	- List number of vehicles for first article inspection.
4.1.8.4	- Specify minimum distance of road test with payload.
4.1.9	- Specify number of kilometers for I.P.P testing, number of days required for testing. Specify the distance in percentages for testing with payload, and without payload and with towed load.

APPENDIX D

Table III	- Specify distance in kilometers and payload in kilograms for testing all models except truck tractors, wreckers and expansible vans.
Table IV	- Specify distance in kilometers and payloads in kilograms for testing truck tractors and semitrailers.
Table V	- Specify distance in kilometers and payload in kilograms for wrecker and expansible van models.
4.1.11	- Specify QCI road test distance in kilometers.
4.1.12.2	- Specify number of vehicles to be consecutively inspected.
4.1.13	- Specify distance in kilometers for road test. Specify distance in kilometers for road test. Specify distance in kilometers for vehicle to back up.
4.1.14	- Specify number of vehicles for control testing and distance in kilometers.
4.1.15	- Specify distance in kilometers (same as in 4.1.13).
Table VII	- Specify distance in kilometers for comparison testing of all models except truck tractor, wrecker and expansible van including payloads in kilograms.
Table VIII	- Specify distance in kilometers for comparison testing of truck tractors including payload in kilograms.
Table IX	- Specify distance in kilometers for comparison testing of wreckers and expansible van models including payloads in kilograms.
4.4.5.2	- Specify maximum governed engine speed in km/h.
4.5	- Specify number of vehicles for RAM-D testing and distance in kilometers. Total distance for all vehicles in kilometers.
4.5.2	- Specify availability in minimum percent acceptable.

APPENDIX D

4.7.2.1	- Insert sustained high speed rate in km/h.
4.7.2.2	- Insert sustained low speed rate in km/h.
4.7.3	- Insert water depth in mm for fording
4.7.3.1	- Insert the deep water fording depth in mm.
4.7.5.1	- Insert speed required for service brake test in km/h and stopping distance in m.
4.7.6	- Cramping angle degree.
4.7.7	- Cruising range average speed in km/h and distance in km.
4.7.8	- Minimum ground clearance in centimeters.
4.7.9	- Ramp angle, degrees.

APPENDIX A

3.4.4	- Winch capacity in kgs. Length of wirerope in meters. Drawing number of rigging block and utility chain.
3.4.5	- Number of cylinders in engine. Governed speed (RPM).
3.4.5.1	- Horsepower, RPM, torque (N m), fuel consumption, oil consumption.
3.4.5.2	- Governed speed (RPM).
4.4.5.2	- Same as 3.4.5.2.
3.5	- RAM-D, number of vehicles for testing, distance in km, total km, number of km that equal 1 operating hour.
4.5	- Same as 3.5.
3.5.1	- Reliability in percent, percent confidence level, distance in km, number of missions, number of failures.
3.5.2	- Availability percentage.
4.5.2	- Same as 3.5.2
3.5.3	- Maintenance ratio.

APPENDIX D

3.5.4	- Durability, number of failures,.
3.7.1	- Weight of winch assembly (kg).
3.7.2	- High speed, GCVW, and speed in km/h.
3.7.2.1	- High speed distance in km, and speed in km/h.
3.7.2.2	- Low speed in km/h.
4.7.2.2	- Low speed, km/h, distance in km, and operating time in minutes.
3.7.3	- Fording depth (mm).
4.7.3	- Same as 3.7.3.
3.7.3.1	- Deep water fording depth (mm).
4.7.3.1	- Deep water fording depth (mm).
3.7.5	- Braking test speed (km/h, and stopping distance m).
3.7.6	- Cramping angle degrees. List tolerance for $\pm$ degrees.
4.7.6	- Same as 3.7.6.
3.7.7	- Cruising range (km), road speed (km/h).
4.7.7	- Same as 3.7.7.
3.7.8	- Ground clearance (cm).
4.7.8	- Same as 3.7.8.
3.7.9	- Ramp angle degree.
4.7.9	- Same as 3.7.9.

Custodian:
Army - AT

Preparing activity:
Army - AT

(Project 2320-A290)