

INCH-POUND

MIL-T-53033A
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SUPERSEDING
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MILITARY SPECIFICATION

TRACTOR, WHEELED, ALL WHEEL DRIVE WITH ATTACHMENTS

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

1. SCOPE

1.1 Scope. The specification covers a pneumatic tired, diesel-engine-driven, all wheel drive tractor with attachments for excavation of small emplacements, material handling, and other tasks with tactical mobility over rough terrain as well as highways. The basic tractor shall be classified as a construction and material handling vehicle, type VI as described in MIL-STD-1180, and as a self propelled working machine, group 1.1 per SAE J1116.

1.2 Classification. The tractors shall be of the following types as specified (see 6.2):

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| Type I | - Small emplacement excavator (SEE). Tractor equipped with front loader attachment, rear backhoe attachment and the following hydraulic auxiliary tools: hammer, percussive; hammer rotary percussive and chain saw. |
| Type II | - High mobility materials handler (HMMH). Tractor equipped with front forklift attachment, rear crane attachment and the following hydraulic auxiliary tool: impact wrench. |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development, and Engineering Center, ATTN: STRBE-TSE, Fort Belvoir, VA 22060-5606 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document.

AMSC N/A

FSC 2420

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1.3 General use. Both tractors must be capable of operating on and off road and must be capable of withstanding the strain, vibrations and other detrimental conditions incident to off road travel and operation of the functional attachments and auxiliary tools.

1.4 International standardization agreement. Certain provisions of this specification (see 3.4.6.1 and 3.4.6.2) are the subject of international standardization agreement (STANAG 4250). When amendment, revision, or cancellation of this specification is proposed that will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement or make appropriate accommodations.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

FEDERAL

- | | |
|----------|---|
| A-A-1108 | - Extinguisher, Fire, Vaporizing, Liquid. |
| GC-P-455 | - Plates and Foils, Photographic (Photosensitive Anodized Aluminum). |
| VV-P-800 | - Fuel Oil, Diesel. |
| ZZ-H-428 | - Hose, Non-Metallic and Hose, Preformed, (for the Coolant Systems of Automotive and Other Liquid Engines). |

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| MIL-P-116 | - Preservation, Method of. |
| MIL-V-173 | - Varnish, Moisture-and-Fungus-Resistant (for the Treatment of Communications, Electronic, and Associated Electrical Equipment). |
| MIL-C-450 | - Coating-Compound, Bituminous Solvent Type, Black. |
| MIL-T-704 | - Treatment and Painting of Materiel. |
| MIL-P-514 | - Plate, Identification Instruction and Marking Blank. |
| MIL-C-1283 | - Can, Gasoline, Military 5 Gallon. |
| MIL-L-2104 | - Lubricating Oil, Internal Combustion Engine, Tactical Service. |
| MIL-L-2105 | - Lubricating Oil, Gear, Multipurpose. |

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- MIL-T-3351 - Tractor, Full Tracked, Low Speed, Tractor Wheeled, Agricultural, and Tractor Wheeled, Industrial and Their Attachments, Packaging of.
- MIL-G-3859 - Grease Gun, Hand Operated, Lever, Push and Screw Type.
- MIL-M-7866 - Molybdenum Disulfide, Technical, Lubrication Grade.
- MIL-G-10924 - Grease, Automotive and Artillery.
- MIL-I-14511 - Insulation Sheet, Cellular, Plastic: Thermal.
- MIL-G-23827 - Grease, Aircraft and Instrument, Gear and Actuator Screw.
- MIL-S-40626 - Sign Kit, Vehicle Class.
- MIL-S-43926 - Suit, Chemical Protective.
- MIL-G-43976 - Glove Set, Chemical Protective.
- MIL-F-43987 - Footwear Cover, Chemical Protective (Outerboots).
- MIL-A-46153 - Anti-Freeze, Ethylene Glycol, Inhibited, Heavy Duty, Single Package.
- MIL-R-46164 - Rustproofing for New and Fielded Military Equipment.
- MIL-L-46167 - Lubricating Oil, Internal Combustion Engine, Arctic.
- MIL-C-46168 - Coating, Aliphatic Polyurethane, Low Reflective, Chemical Agent Resistant.
- MIL-B-46176 - Brake Fluid, Silicone, Automotive All Weather, Operational and Preservative.
- MIL-F-46736 - Filter Element, Air Cleaner, Intake Dry Type.
- MIL-M-51282 - Mask, Chemical Biological, Field, M171A1.
- MIL-H-51291 - Hood, Chemical Biological Mask M6A2.
- MIL-E-52649 - Engine Cold Starting Aids, Ether Fuel Primers.
- MIL-C-53039 - Coating, Aliphatic, Polyurethane, Single Component, Chemical Agent Resistant.
- MIL-A-62048 - Air Cleaners, Automotive Heavy Duty, Dry Type (for Internal Combustion Engines).
- MIL-H-62217 - Hose and Hose Assemblies, Non-Metallic, Silicone, Polyester and Wire Reinforced.
- MIL-T-62314 - Test Equipment (Simplified) for Internal Combustion Engine - Reprogrammable (STE/ICE-R) Test Set.
- MIL-V-81940 - Valve, Sampling and Bleed, Hydraulic Type Systems.
- MIL-T-83133 - Turbine Fuel, Aviation, Kerosene Type, Grade JP8.

STANDARDS

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-193 - Paint Procedures and Marking for Vehicles, Construction Equipment, and Material Handling Equipment.
- MIL-STD-209 - Sling and Tiedown Provisions for Lifting and Tying Down Military Vehicles.
- MIL-STD-461 - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference.

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- MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement of.
- MIL-STD-642 - Identification Marking of Combat and Tactical Transport Vehicles.
- MIL-STD-669 - Loading Environment and Related Requirements for Platform Rigged Airdrop Material.
- MIL-STD-810 - Environmental Test Methods and Engineering Guidelines.
- MIL-STD-814 - Requirement for Tiedown, Suspension and Extraction Provisions of Military Material for Airdrop.
- MIL-STD-889 - Dissimilar Metals.
- MIL-STD-1179 - Lamp, Reflectors and Associated Signaling Equipment for Military Vehicles.
- MIL-STD-1180 - Safety Standards for Military Ground Vehicles.
- MIL-STD-1366 - Material Transportation System Dimensional and Weight Constraints.
- MIL-STD-1410 - Methods for Selection of Industrial Engines for End Item Application.
- MIL-STD-1472 - Human Engineering Design Criteria for Military Systems, Equipment and Facilities.
- MIL-STD-1474 - Noise Limits for Army Materiel.
- MIL-STD-1791 - Design for Internal Serial Delivery in Fixed Wing Aircraft.
- MS24207 - Coupling, Grease Gun, Hydraulic Type Nozzle.
- MS35647 - Padlock, Key Operated.
- MS51113 - Switch, Vehicular Lights, 24-Volt DC, (Waterproof).
- MS51118 - Pintle Assembly, Towing: 40,000 Pounds Capacity Release.
- MS52125 - Composite Light Tail, Stop, Turn and Marker.
- MS52126 - Composite Light Front, Turn, Park, and Marker.
- MS52131 - Connector, Plug, Electrical Intervehicle Power Cable.
- MS52149 - Battery, Storage, Lead Acid, (Low Maintenance).
- MS53015 - Mirror Assembly, Rearview.
- MS53052 - Bracket, Assembly, Liquid Container, 5 Gallon.
- MS75021 - Connector, Receptacle, Electric, 12 Contact, Intervehicular, 24-Volt, (Waterproof).

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

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

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DRAWINGS

ME

13229E8015 - Rifle Mounting Bracket.

TACOM

12258941 - STE/ICE-R Diagnostic Connector.
12258955 - Vehicle Test Card.
12360910 - Headlight: Blackout, 24 Volt, Waterproof.

REPORT

CR 82-588-003 - STE/ICE Design Guide for Vehicle Diagnostic Connector.

(Copies of other drawings and publications required by contractors in connection with specific acquisition should be obtained from the contracting activity or as directed by the contracting officer.)

NORTH ATLANTIC TREATY ORGANIZATION (NATO)

STANAG 4250 - NATO Reference Mobility Model (NRMM)

(Copies of the NATO STANAG required by contractors in connection with specific acquisition functions should be obtained from the US Army Tank Automotive Command, ATTN: AMSTA-RYA, Warren, MI 48397-5000 or the contracting officer.)

DEPARTMENT OF AGRICULTURE (DOA)

Forest Service Standard 5100-1 - Standard for Spark Arrestors

(Application for copies should be addressed to the Department of Agriculture, Equipment Development Center, San Dimas, CA 91733.)

DEPARTMENT OF TRANSPORTATION (DOT)

Federal Motor Vehicle Safety Standards (FMVSS)
Federal Motor Carrier Safety Regulation (FMCSR)

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

DEPARTMENT OF LABOR (DOL)

OSHA Standard for Construction Equipment.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

Rule 442 - Usage of Solvents.

(Application for copies should be addressed to the South Coast Air Quality Management District, 9150 Flair Drive, El Monte, CA 91731.)

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

ASSOCIATION OF AMERICAN RAILROADS (AAR)

Rules Governing the Loading of Department of Defense Material on Open Top Cars.

(Application for copies should be addressed to the Association of American Railroads, American Railroads Building, 50 F Street, NW, Suite 7702, Washington, DC 20001.)

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

- ANSI B93.28 - Method for Calibration of Liquid Automatic Particle Counters Using "AC" Fine Dust Test.
- ANSI B30.22 - Articulating Boom Cranes.
- ISO 6722 - Road Vehicles; Unscreened Low Tension Cables.

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ISO Code Level of Contamination.

(Application for copies should be addressed to the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017.)

AMERICAN WELDING SOCIETY (AWS)

- AWS D14.3 - Earthmoving and Construction Equipment, Specification for Welding.

(Application for copies should be addressed to the American Welding Society, 550 NW LeJune Road, P.O. Box 351040, Miami, FL 33135.)

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SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE Handbook

- J31 - Hydraulic Backhoe Lift Capacity.
- J38 - Lift Arm Support Device for Loaders.
- J49 - Specification Definitions - Hydraulic Backhoes.
- J53 - Minimum Performance Criteria for Emergency Steering of Wheeled Earthmoving Construction Machines.
- J98 - Safety for Industrial Wheeled Equipment.
- J154a - Operator Enclosures Human Factor Design Considerations.
- J163 - Low Tension Wiring and Cable Terminals and Splice Clips.
- J185 - Access Systems for Off-Road Machines.
- J209 - Instrument Face Design and Location for Construction and Industrial Equipment.
- J231 - Minimum Performance Criteria for Falling Object Protective Structure (FOPS).
- J276 - Steering Frame Lock for Articulated Loaders and Tractors.
- J287 - Driver Hand Control Reach.
- J296 - Excavator Hoe Bucket Rating.
- J318 - Air Brake Gladhand Service (Control) and Emergency (Supply) Line Couplers - Trucks, Truck-Tractors, and Trailers.
- J350 - Spark Arrester Test Procedure for Medium Size Engines.
- J381 - Windshield Defrosting System Test Procedure - Trucks, Buses, and Multipurpose Vehicles.
- J382 - Windshield Defrosting Systems Performance Guidelines - Trucks, Buses, and Multipurpose Vehicles.
- J404 - Chemical Composition of SAE Alloy Steels.
- J514 - Hydraulic Tube Fittings.
- J516 - Hydraulic Hose Fittings.
- J517 - Hydraulic Hose.
- J518 - Hydraulic Flanged Tube, Pipe, and Hose Connections, 4-Bolt Split Flange Type.
- J524 - Seamless Low Carbon Steel Tubing Annealed for Bending and Flaring.
- J525 - Welded and Cold Drawn Low Carbon Steel Tubing Annealed for Bending and Flaring.
- J534 - Lubrication Fittings.
- J536b - Hose Clamps.
- J553 - Circuit Breakers.
- J557 - High Tension Ignition Cable.
- J678 - Speedometers and Tachometers - Automotive
- J680 - Location and Operation of Instruments and Controls in Motor Truck Cabs.
- J688 - Truck Ability Prediction Procedure.
- J689 - Approach, Departure, and Ramp Breakover Angles - Passenger Car and Light Duty Trucks.
- J695 - Turning Ability and Off Tracking - Motor Vehicles.

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J729	- Nomenclature and Specification Definitions - Dozers.
J732	- Specification Definitions - Loaders.
J742	- Capacity Rating - Loader Bucket.
J744	- Hydraulic Pump and Motor Mounting and Drive Dimensions.
J753	- Lubrication Chart - Construction and Industrial Machinery.
J818	- Rated Operating Load for Loaders.
J821	- Electrical Wiring Systems for Construction, Agricultural and Off-Road Machines.
J833	- USA Human Physical Dimensions.
J849	- Connection and Accessory Location for Towing Multiple Trailers.
J872	- Drawbar Test Procedure for Construction, Forestry, and Industrial Machines.
J898	- Control Locations for Off-Road Work Machines.
J899	- Operator's Seat Dimensions for Off-Road Self-Propelled Work Machines.
J917	- Marine Push-Pull Control Cables.
J925	- Minimum Service Access Dimension for Off-Road Machines.
J941	- Motor Vehicle Driver's Eye Range.
J985	- Vision Factors Considerations in Rear View Mirror Design.
J994	- Alarm-Backup-Electric - Performance, Test, and Application.
J1040	- Performance Criteria for Rollover Protective Structures (ROPS) for Construction, Earthmoving, Forestry, and Mining Machines.
J1050a	- Describing and Measuring the Driver's Field of View.
J1116	- Categories of Off-Road Self-Propelled Work Machines.
J1127	- Battery Cable.
J1165	- Reporting Cleanliness Levels of Hydraulic Fluids.
J1176	- External Leakage Classification for Hydraulic Systems.
J1195	- Cylinder Rod Wiper Seal Ingression Test.
J1234	- Specification Definitions - Off-Road Work Machines.
J1349	- Engine Power Test Code - Spark Ignition and Diesel.
J1503	- Performance Test for Air Conditioned, Heated, and Ventilated Off-Road Self Propelled Work Machines.

(Applications for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.)

TIRE AND RIM ASSOCIATION (TRA)

Yearbook.

(Application for copies should be addressed to the Tire and Rim Association Inc., 3200 W. Market Street, Suite 304, Akron OH 44313.)

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DEUTSCHES INSTITUTE FUR NORMING (DIN)

- DIN 71412 - Lubrication Fittings.
- DIN 72551 - Electrical Wiring with Plastic Coating, Not for Ignition.

(Application for copies should be addressed to Deutsches Institute Fur Norming e.v., Burggratenstr 4-10, D-1000 Berlin 30, Germany T 26011).

(Non-Government standards and other publications are normally available from the organizations that prepare or 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 document and the references cited herein, (except for related associated detail specifications, specification sheets or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. For purposes of identification, the type I tractor shall be in accordance with category 1, of SAE J1116, and the type II tractor shall be in accordance with category 1 and 6. The fully equipped tractor (see 3.3.7) with attachments and accessories shall be comprised of components, parts and accessories as specified herein. The term tractor shall be used to designate type I and II fully equipped tractors. The tractor and all of its components shall be used within currently published rated capacities for both on and off road usage. All powertrain components shall be compatible with and properly matched with all related or affected components (see 6.12). The tractor shall have front and rear mounting provisions for the required attachments. The front and rear attachments shall be capable of being removed and installed on the mounting provisions without removal of any tractor component or attachment.

3.2 First article. Unless otherwise specified (see 6.2), sample tractors shall be subjected to first article inspection (see 6.5) in accordance with 4.3.

3.3 General requirements.

3.3.1 MANPRINT. (See 6.6.3).

3.3.1.1 Safety. Both tractors with attachments and accessories shall comply with all applicable Federal Motor Vehicle Safety Standards (FMVSS), Federal Motor Carrier Safety Regulations (FMCSR) as stated for type I vehicles in MIL-STD-1180 in effect on the date of vehicle manufacture. The tractor shall comply with the Occupational Safety and Health Administration (OSHA)

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Standards for Construction Equipment. The tractor with all attachments shall conform to SAE J98. The safety characteristics of the tractors shall also meet the following requirements:

- a. When a manual transmission is provided, the starting system shall be such that the transmission must be placed in neutral or the clutch depressed to engage a neutral start switch before the engine can be started.
- b. Provisions shall be included to protect maintenance and operating personnel from rotating or reciprocating parts, from electrical shock, from parts subject to high temperatures and pressures, and from parts inherently hazardous.
- c. Exhaust discharges shall be directed so as not to endanger personnel and shall be directed away from the operator's positions for all attachments.
- d. All platforms, steps and pedals shall have non-skid surfaces. Access/egress to all working platforms shall conform to SAE J185.
- e. Non-functional sharp edges and projection points shall be eliminated.
- f. If articulated or hinged frame steering is furnished, a decal shall be located in the area of articulation, warning of danger to operating or maintenance personnel during articulation. A steering lock conforming to SAE J276 shall be provided.
- g. If a liquid cooled engine is provided, a burn or scald warning hazard decal shall be permanently attached on or near the radiator cap.
- h. These tractors shall not contain asbestos nor radioactive materials.
- i. An emergency shut down capability will be provided, and when activated, will stop the engine.
- j. A Coast Guard approved fire extinguisher bracket shall be mounted in the operator's cab or vicinity and be compatible with a 5 pound Halon 1211 fire extinguisher conforming to A-A-1108, type B.

3.3.1.2 Human factors engineering. The tractor shall conform to all applicable commercial human factors engineering standards, including but not limited to SAE J154a, J185, J680, J833, J898, J925, J941, J985, J1050. Instruments and gauges may be grouped in area 1 or 2 per SAE J680 if all are easily visible to the operator. Military applications not covered by commercial standards, shall conform to MIL-STD-1472. The tractor shall be operable and maintainable by the full range of personnel small (5th percentile) female through large (95 percentile) male, wearing the full range of clothing including arctic clothing and NBC protective clothing.

3.3.1.3 Maintainability. Provisions shall be made for inspection, adjustment, servicing, or replacement of parts and components. Items requiring periodic or preventative maintenance such as filters, bolt tensioning devices, drain plugs, etc., shall be accessible without requiring removal of other components. When access openings are used on the exterior of the tractor, the edge of the opening shall be smooth and shall be provided with a removable or hinged cover whenever it is required. Dimensions of hand or arm access openings shall be in accordance with SAE J925 for arctic clothing.

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3.3.2 Noise limits. Noise levels produced by the tractor shall comply with the requirements of MIL-STD-1474, except as indicated herein.

- a. The noise level at the operator's position and at one meter from the perimeter of the tractor at all other locations shall not exceed Category D of Table I (85 dB(A)). MIL-STD-1474, 5.1.1.2, 5.2, 5.3 and 5.4 shall not apply. Compliance and non-compliance with the required noise limits shall be documented based upon test requirements of 4.5.2.4 and the data requirements of MIL-STD-1474, 5.5.
- b. The following table I shall be used in lieu of table IIa, contained in MIL-STD-1474.

TABLE I. Steady-state noise limits (dB) for personnel-occupied areas.

Limit Category						
A-weighted Limit [dB(A)]	A*	B*	C*	D*	E**	F**
	108	100	90	85	75	65

3.3.3 Rollover protective structure (ROPS) and falling objects protective structure (FOPS). Tractors shall be equipped with combination ROPS and FOPS structure which may be integral with the fully enclosed cab (see 3.5.10). The ROPS and FOPS shall conform to OSHA Standards for Construction Equipment. The ROPS and FOPS shall meet the requirements of SAE J1040 and SAE J231, respectively. Quick disconnect fittings (electric, etc.) shall be provided as applicable if ROPS and FOPS structure or ROPS/FOPS cab is removable. The tractor shall be capable of being driven as a motor vehicle as specified herein if the integral ROPS/FOPS cab is removed for height reduction. Lifting eye(s) conforming to the dimensional and strength requirements of MIL-STD-209 shall be provided for ROPS and FOPS structure or ROPS/FOPS cab removal.

3.3.4 Fenders. Fenders or equivalent protection shall be provided for all wheels. A continuous fender (front to rear) on each side of the tractor is also acceptable. Adequate clearance for vehicle maintenance and installation and removal of wheels, tires and tire chains shall be provided. If fenders provide support for operator or maintenance personnel, the fenders shall support a 500 pound load without permanent damage or deformation.

3.3.4.1 Wheel splash and stone throw protection. Mud flaps shall be provided to prevent mud and debris from being thrown onto mirrors, back of the cab, tractor body, and all lights. An antisail flexible mud flap to the rear of rear wheels shall be installed. Mud flap installations at the rear wheels shall provide maximum protection from throwing debris while meeting the requirement of 3.3.8.3. Mud flaps on the tractor shall be mounted to react passively without damage to flaps or towed equipment in turning situations, and shall also be removable using only common hand tools (see 3.5.12.3).

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3.3.4.2 Brush and stone protection. Head lamps, working lamps, radiator and tail lamps will be guarded against thrown stones and damage by contact with vegetation.

3.3.5 Backup alarm. A backup alarm conforming to SAE J994, type C shall be provided. The backup alarm shall be automatically disabled when operating in the blackout mode (see 3.5.2.2.3). The backup alarm signal shall be audible above, and distinguishable from the surrounding noise level and other onboard tractor alarms.

3.3.6 Horn. An operator controlled horn shall be furnished. The horn shall be 20 dB(A) above the normal tractor operating sound level at a distance of 50 feet from the front of vehicle.

3.3.7 Fully equipped tractor. The type I fully equipped tractor shall be defined as the tractor equipped with a loader front attachment (see 3.6.1.2), a rear mounted backhoe (see 3.6.2.2), heavy duty rock bucket (see 3.6.2.2.1), radio equipment (see 3.5.10.3) (if required see 6.2), specified portable auxiliary tools (see 3.7), hose reel (see 3.7.5), ROPS and FOPS, other equipment (see 3.5.12.3), and spare tire. The type II fully equipped tractor shall be defined as the tractor equipped with a forklift front attachment (see 3.6.1.3), a rear mounted crane (see 3.6.2.3), specified portable auxiliary tools (see 3.7), hose reel (see 3.7.5), ROPS and FOPS, other equipment (see 3.5.12.3), and spare tire.

3.3.8 Dimensions.

3.3.8.1 Overall width. Overall tractor width shall not be more than 96 inches for highway travel.

3.3.8.2 Height. The fully equipped tractor (see 3.3.7), less exhaust and air intake stacks, shall not exceed 102 inches. To allow for air drop (see 3.4.7.5), the height shall be reducible to 90.5 inches or less. Reducible height shall be accomplished utilizing only common hand tools (see 3.5.12.3). Deflation of tires or removal of tires and rims is not permissible to reduce height.

3.3.8.3 Overall clearances. The angles of approach and departure for the tractor shall not be less than 30 degrees. The tractor shall be capable of negotiating, in forward and reverse gear, and 18-inch vertical step without assistance of the front or rear attachments.

3.3.8.4 Length. The length of the tractor and attachments shall be such that two tractors shall be transportable in C130 aircraft with a minimum of disassembly (see 3.4.7). Length of the air frame is 480 inches. Front and rear attachments may not be removed in the allowed disassembly for air transportability.

3.3.8.5 Weight. The weight of the fully equipped tractor (see 3.3.7) with a three quarter full fuel tank and all other reservoirs filled to operating level minus radio where equipped shall not exceed 16,000 pounds.

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3.3.9 Fuel and lubrication. The tractor shall be operable with applicable standard military fuels and lubricants, MIL-T-83133, VV-F-800, MIL-L-46167, MIL-L-2105, MIL-L-2104, MIL-G-10924, MIL-M-7866 and MIL-G-23827, without adverse effect on vehicle components or warranty. Scheduled maintenance and lubrication intervals required by the component manufacturers shall be required not more often than every fifty hours, except before and after operation checks. Military lubricants shall be used for initial fills.

3.3.10 Material.

3.3.10.1 Material deterioration prevention and control. The tractor shall be fabricated from compatible materials, inherently corrosion resistant or treated to provide protection against the various forms of corrosion and deterioration that may be encountered in any of the applicable operating and storage environments to which the tractor may be exposed.

3.3.10.2 Dissimilar metals. Dissimilar metals shall not be used in intimate contact with each other unless protected against galvanic corrosion. Dissimilar metals and methods of protection are defined and detailed in MIL-STD-889.

3.3.10.3 Identification of materials and finishes. The contractor shall identify the specific material, material finish or treatment for use with component and subcomponent, and shall make information available upon request to the contracting officer or designated representative.

3.3.10.4 Recovered materials. For the purpose of this requirement, recovered materials are those materials which have been collected from solid waste and reprocessed to become a source of raw materials, as distinguished from virgin raw materials. The components, pieces and parts incorporated in the tractor may be newly fabricated from recovered materials to the maximum extent practicable, provided the tractor produced meets all other requirements of this specification. Used, rebuilt or remanufactured components, pieces and parts shall not be incorporated in the tractor.

3.3.10.5 Tire material. Tires shall not exceed 4 calendar quarters in age from date of cure of the rubber to date of manufacture of the tractor.

3.3.10.6 Rubber hose material. Hoses furnished to the Government shall be not more than 4 calendar quarters old from the date of cure of the rubber to date of manufacture of the equipment. Rubber hose material shall be compatible with the chemical characteristics of the type of fuel, coolant, and hydraulic oil used.

3.3.11 Nuclear-biological-chemical (NBC) environment. The tractor shall be operable by personnel in accordance with 3.3.1.2, wearing the following complete protective ensemble:

- a. Chemical-biological mask, MIL-M-51282 (NSN 4240-00-926-4200).
- b. Chemical-biological hood, MIL-H-51291 (NSN 4240-00-999-0420).
- c. Chemical protective suit, MIL-S-43926 (NSN 8415-00-407-1062).

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- d. Chemical protective glove set, MIL-G-43976 (NSN 8415-00-033-3519).
- e. Chemical protective footwear, MIL-F-43987 (NSN 8430-01-021-5978).

The operator shall be capable of actuating and operating all controls (i.e., levers, switches, pedals, knobs, handles, attachments, and auxiliary tools) without interference caused by the ensemble that precludes performance of the mission. The protective ensemble, as listed above, will be furnished by the Government as loaned equipment in order to permit performance of the tests required in 4.5.2.8 (see 3.10).

3.3.12 Vehicle weight classification sign kit. The contractor shall apply the Government furnished vehicle weight classification numbers to each tractor utilizing a vehicle weight classification number kit conforming to MIL-S-40626 (see 3.9 and figure 2). The kit shall be located on the front of the tractor in a location approved by the contracting officer. The contracting officer shall assign the classification number to be displayed on the vehicle. Instructions for changing the number based on the tractor configuration shall be provided in the operator's manual.

3.3.13 Stenciling. Stenciling of the appropriate service registration numbers as specified by the contracting activity and other markings shall be applied in accordance with MIL-STD-642. Registration numbers shall be furnished by the contracting officer (see 6.2). The markings shall be painted with lusterless black conforming to MIL-C-46168 or MIL-C-53039. For camouflage pattern painted tractors, markings on black or brown segments shall be camouflage green conforming to MIL-C-46168 or MIL-C-53039. All lifting and tiedown points shall be marked "Lift", "Tiedown", or "Lift and Tiedown". Tiedown and slinging provisions shall be clearly stencilled on the tractor. The tire pressure, as specified by Tire and Rim Association Yearbook, shall be stencilled above each tire as "TP (specify) LBS". All stencilling shall conform to MIL-STD-1472, 5.5, but shall be a minimum of 1-inch high.

3.3.14 Instruction, caution, identification, operating, and data plates. Instruction, caution, identification, operating and data plates shall be in accordance with MIL-P-514, type III, composition C (GG-P-455, type I, grade A, class I) material. Unless otherwise specified (see 6.2), model number, nomenclature, national stock number (NSN), contract number, date of manufacture, manufacturer's serial number and the appropriate service registration numbers as specified by the contracting activity shall be imbedded or embossed on an additional metal identification plate and installed in the vehicle cab in a readily visible location. The identification plate shall also be marked "CARC/Month/Year" with the month and year the vehicle was painted with paint conforming to 3.3.16. The tractor shall be equipped with plates containing instructions; plates or diagrams, including warnings and cautions describing any special or important procedures to be followed in assembling, operating, or servicing the fully equipped tractor (see 3.3.7). A lubrication data plate in accordance with SAE J753 shall be mounted on the vehicle, identifying military lubricant and applicable temperature ranges for operation. All labeling shall conform to MIL-STD-1472, 5.5.

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3.3.15 Ease of maintenance. All components requiring drainage provisions shall not drain on other components. Drainage provisions shall allow for drainage of fluids into a suitable container. Drain holes shall be provided wherever liquids may accumulate, and deterioration may occur. Drain plugs installed in engine, transmission, transfer case, axles and hydraulic reservoirs shall be of the permanent magnet type and at the lowest point. If the transmission oil pan must be removed to change the filter, a permanent magnet attached on the inside of the oil pan is acceptable in lieu of the magnetic drain plug.

3.3.15.1 Lubrication fittings. Lubrication fittings shall conform to SAE J534 or DIN 71412. Fittings shall be in a protected, accessible location. Fittings shall be accessible by all grease guns conforming to MIL-G-3859, equipped with a hydraulic coupler conforming to MS24207 and a 10-inch flexible extension. Accessibility to fittings shall be provided without removal or adjustment of accessories or parts. Accessibility shall be in accordance with 3.3.15.

3.3.16 Treatment and painting. All interior and exterior portions of the tractor that are normally painted and all exposed surfaces that require protection from the environment shall be cleaned, treated and painted in accordance with MIL-T-704 type F or G. Unless otherwise specified (see 6.2), top coat color shall be camouflage green 383 conforming to MIL-C-46168 or MIL-C-53039. When specified (see 6.2), the tractor shall be overcoated in accordance with the Government furnished camouflage pattern with MIL-C-46168 or MIL-C-53039 top coat of the colors specified in the camouflage patterns except the first article may be camouflage green 383. All surfaces of the tractor which exceed 400 °F during operation shall not be primed or painted as specified above but shall be painted in the appropriate color of the base coat or camouflage pattern scheme if applicable with heat resisting paint identified in MIL-STD-193. All hardware not normally painted shall be treated to provide limited reflectivity. The entire tractor including the underside and under the hood except for the engine and transmission as noted below shall be painted in accordance with paint conforming to MIL-C-46168 or MIL-C-53039. The engine and transmission if unexposed shall be painted or provided a non-reflective surface; if exposed, the engine and transmission shall be painted in accordance with MIL-C-46168 or MIL-C-53039. There shall be no exposed unpainted ornamental trim.

3.3.16.1 Camouflage pattern data. When specified (see 6.2), the contractor shall provide camouflage pattern data.

3.3.17 Fungus and moisture resistance. Electrical circuitry, including all components and connections except as specified below, shall be protected from the effect of fungus growth and moisture by an overall treatment with a varnish conforming to MIL-V-173, composition specified in 3.3.17.1.

- a. Components or circuit elements which are inherently fungus and moisture resistant or which are hermetically sealed need not be treated.

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- b. Components of circuit elements whose functions will be adversely affected by the varnish coating shall not be treated.

When used, the varnish shall be applied by spray, brush, or a combination of both to give complete coverage to component or element surfaces previously cleaned and prepared so that the surfaces are free from all foreign matter that would interfere with the adherence or function of the varnish.

3.3.17.1 Composition. Composition II shall be used only in the case when local air pollution regulations governing the application of varnish precludes the use of composition I. When composition II is used, the contractor shall provide evidence to the Government that the use of composition II is required, and shall certify that the composition II material complies with Rule 442, South Coast Air Quality Management District.

3.3.18 Decontamination unit. A bracket assembly conforming to MS53052 shall be furnished and mounted by the contractor. The location of the bracket shall be such that it is accessible to personnel and provides clearance to remove and emplace a 5 gallon container conforming to MIL-C-1283 with a maximum weight of 54 pounds. The bracket shall be located away from heat sources.

3.3.19 Rustproofing. The tractor shall be rustproofed in accordance with MIL-R-46164.

3.3.20 Workmanship. The tractor, attachments and auxiliary tools shall be free from defects such as poor welds, rust, cracks, and other defects that could impair its operation or serviceability.

3.3.20.1 Castings and forgings. All parts, components, and assemblies of the tractor which include castings and forgings shall be clean of harmful extraneous material such as sand, dirt, sprues, scale, and flux. Rework material shall meet typical mechanical properties of new casted or forged material and not affect fit or function.

3.3.20.2 Metal fabrication. Metal used in fabrication shall be free from kinks and sharp bends. The straightening of material shall be done by methods that will not cause injury to the material. All bends shall be made with controlled means to insure uniformity of size and shape. Precaution shall be taken to avoid overheating. External surfaces shall be free of burrs, sharp edges, and corners; except when sharp edges or corners are required or where they are not detrimental to safety.

3.3.20.3 Welding and welders. Welding procedures, welding procedures qualification, and welder qualification shall be in accordance with AWS D14.3. In the event of poor welds, the Government reserves the right to require retesting of any welding personnel. All test results, welding procedures and procedure qualification records shall be made available to the contracting officer or representatives upon request.

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3.4 Performance.3.4.1 Gradeability and speeds.

3.4.1.1 Gradeability. On a 60 percent grade free of loose material, the tractor shall be capable of starting on and ascending and descending the grade.

3.4.1.2 Tractor speeds. The tractor shall maintain speeds on dry class I good roads (per SAE J688 and J1349) as follows:

- a. Tractor (see 3.3.7) on a 3 percent grade: 30 miles per hour (mph).
- b. Tractor with 13,500 pound GVW towed pneumatic tired trailer (M796A1) on a 3 percent grade: 20 mph.
- c. Tractor with 13,500 pound GVW towed pneumatic tired trailer (M796A1) on a 30 percent grade: 3.5 mph.

3.4.1.3 Maximum speed. The tractor shall be capable of maintaining sustained speeds on level dry class I good roads (per SAE J688) of not less than 40 mph when operated with the engine at governed speed.

3.4.2 Reserve tractive ability. The tractor shall develop a reserve tractive force (drawbar pull) of not less than 11,000 pounds at 2.0 ± 0.1 mph, on a dry level concrete surface with no more than 15 percent slip, in accordance with SAE J872.

3.4.3 Curb clearance circle. The tractor curb clearance circle when measured as specified in SAE J695 shall be no greater than 38 feet.

3.4.4 Side slope travel. The tractor, with attachments in the prescribed travel position, without towed load shall be capable of negotiating side slopes, packed surface free of loose material, up to 30 percent with each side of the tractor up slope without any wheel leaving the ground. As a result of the operation, no evidence of faulty lubrication, leakage, or other malfunction shall be found.

3.4.5 Fording. The tractor, without prior preparation, shall ford hard-bottom water crossings to a depth of 30 inches plus turbulence caused by movement through water for not less than 15 minutes duration at 15-minute intervals for a 2-1/2 hour period without damage or additional maintenance prior to further operation, and without contamination of lubricants in those enclosures which are designed to exclude contamination.

3.4.6 Cross country mobility. The fully equipped tractor shall be capable of cross country operation to enable employment over varied terrain ranging from firm ground to soft soil, sand, mud and snow. The mobility characteristics must equal or exceed those quantified in STANAG 4250.

3.4.6.1 Mobility rating speeds. The tractor shall demonstrate the following cross country performance when executed through STANAG 4250, tactical standard level.

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<u>Terrain</u>	<u>Scenario</u>	<u>Percent NO GO</u>	<u>V 80 (MPH)</u>
West Germany Fulda Quad	Dry	17	13
Middle East MAFRAQ Quad	Dry	12	13
Middle East MAFRAQ Quad	Dry-Sand	17	7

3.4.6.2 Vehicle cone index (VCI). The tractor at full operational weight (GVW) shall possess a single pass vehicle cone index (VCI) fine grained of not greater than 31, when defined in accordance with STANAG 4250.

3.4.6.3 Ride quality. The tractor shall be capable of traveling at a speed of 20 mph over a 1.0-inch root mean square (RMS) and 12 mph over a 1.5-inch RMS course while sustaining a maximum of 6 watts vertical absorbed power at the driver's station with tires at normal cross country inflation pressure. The tractor shall be capable of traveling at not less than 40 mph over a four-inch half round obstacle without transmitting a vertical shock load in excess of 2.5 g's to the driver.

3.4.7 Transportability. The tractors shall be capable of being transported worldwide by highway, rail, marine, and air modes in C130 and C141 aircraft and medium lift helicopter. The applicable transportability criterion is as set forth in MIL-STD-1791 and MIL-STD-1366 (see 6.13). The tractor shall withstand impact forces encountered in rail and air shipments without damage or permanent deformation. The tractor shall not exceed the Gabarit International De Chargement (GIC) clearance dimensions shown in figure 1 for rail transport. The vehicle slinging and tiedown provisions shall withstand all forces to be encountered during loading or transportation (see 4.5.2.23). Preparation for internal air transport and reassembly after transport in C130 and C141 aircraft shall be accomplished in 60 minutes or less using only common hand tools (see 3.5.12.3).

3.4.7.1 Slinging provisions. The tractor shall be provided with four slinging provisions conforming to MIL-STD-209, type II equipment class 1 or 3. The provisions shall enable the tractor to be lifted in the normal traveling or operating position. Parachute suspension provisions (see 3.4.7.3) may be used as slinging provisions if they meet the requirements of MIL-STD-209.

3.4.7.2 Tiedown provisions. The tractor shall be provided with integral provisions to permit tiedown of the tractor to the floor or deck of the transportation medium or the airdrop platform. The tiedown provisions shall conform to MIL-STD-209, type II equipment class 2 or 3. The type I tractor shall conform to MIL-STD-814 for both low velocity airdrop and low altitude parachute extraction system (LAPES).

3.4.7.3 Parachute suspension provisions. The type I tractor shall be provided with four parachute suspension provisions conforming to MIL-STD-814.

3.4.7.4 External helicopter transport. The fully equipped tractor (see 3.3.7) minus the radio (see 3.5.10.3) shall be capable of being externally transported by medium lift helicopter.

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3.4.7.5 Airdrop. The type I tractor shall conform to MIL-STD-669 for airdrop from C130 and C141 aircraft without breakage or permanent deformation of any structural member or component, or loss of the tractor to perform all functions specified herein. When rigged for airdrop in accordance with MIL-STD-669, the tractor shall meet the established tipoff curves for the C130 and C141 aircraft as defined in MIL-STD-1791. Disassembly and reassembly for low velocity airdrop and LAPES shall be accomplished in a combined time of not more than 60 minutes by no more than 2 people. Tires or wheels shall not be removed for airdrop. The suspension system and tires shall be capable of withstanding four-inch vertical travel upon impact when sitting on six inches of honeycomb material.

3.4.7.5.1 Extraction parachute provisions. A single fitting shall be provided for attachment of the parachute extraction system for low velocity airdrop. The fitting shall conform to MIL-STD-814 and shall withstand stresses in the amount and direction of pull specified without weld failure or permanent deformation of the vehicle or the provisions. LAPES extraction fittings shall be provided unless vehicle design permits platform extraction as specified in MIL-STD-814.

3.4.7.6 Rail impact. The tractor shall satisfactorily complete the rail impact test in accordance with 4.5.2.21.

3.4.8 Reliability. The specified mean time between failures (MTBF) for types I and II tractors shall be 70 hours when tested in accordance with 4.5.2.31.

3.4.9 Component durability. The tractor shall complete the first article tests specified herein (see 4.3.2) without failure of internal components of the engine, transmission, transfer case, axle assembly or primary hydraulic pumps. Failure to meet this requirement shall require complete retest. Retest, if required, may be accomplished with reworked or new tractors at the option of the contractor. In the event the contractor elects to use reworked tractors, previous test hours will not be considered in any way.

3.4.10 Maintenance ratio. The ratio of maintenance man hours to operating hours for all scheduled and unscheduled maintenance (exclusive of daily crew checks and services) specified herein shall not exceed 0.36.

3.4.11 Environmental condition. Without the use of any external means, the engine shall start within 5 minutes and the tractor, including all attachments and all auxiliary tools shall operate under full-load conditions within fifteen minutes after engine start in any ambient temperature from -25 to +120 °F. The tractor, all attachments and all auxiliary tools, shall be capable of being stored for extended periods in temperatures ranging from -30 to +160 °F without damage. Cold start aids must be integral with the tractor and aids which rely upon external support such as an electrical power source shall not be used. Hand-held aerosol cans are not permitted. The tractor shall be capable of operating in hot, humid tropical environments and dry dusty environments.

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3.4.12 Electromagnetic interference. The electromagnetic interference emission characteristics of the tractor shall meet the limits specified in MIL-STD-461, part 8, class C1, group II, except that a 20 dB relaxation is permitted in the emission limits. The operator's horn is exempt from electromagnetic interference requirements.

3.4.13 High altitude electromagnetic pulse (EMP). Schematic and electrical diagrams detailed to the component level (i.e., resistors, capacitors, filter, transistors, and silicone controlled rectifiers) shall be furnished to assist the Government in performing the EMP evaluation. These diagrams shall include the value of all of the components. The vehicle shall be furnished to the Government and shall be evaluated to determine the necessary protection devices for protection against EMP.

3.4.14 Trailer towing. The tractor, with the front and rear attachments in the travel position, shall negotiate a 20 percent side slope towing a 13,500 pound GVW pneumatic tired trailer (M796A1). The tractor with the attachments in the travel position shall be capable of full turn steering lock to lock without any interference with or damage to the trailer with the lunette fully extended.

3.5 Chassis components. The tractors shall retain a common tractor design between each type.

3.5.1 Engine. The diesel engine shall be selected in accordance with MIL-STD-1410 and shall be of the liquid cooled or air cooled compression ignition type. For the purpose of selecting the engine, the tractor shall be classified as a class II end item in accordance with MIL-STD-1410. The tractors must conform to the EPA standards of MIL-STD-1410 (1.4.1.2.b), or be granted the necessary exemptions by the EPA. A full flow oil filter system shall be provided. A label in accordance with MIL-STD-1472 specifying filter type shall be placed near the point of filter installation.

3.5.1.1 Cooling system.

3.5.1.1.1 Water cooled engine. The cooling system shall maintain the top tank coolant at a temperature approved by the engine manufacturer when operated under the condition specified herein. The cooling system shall provide adequate cooling to the engine, in an ambient air temperature of 120 °F, at 85 percent of the rated horsepower. If the radiator cooling system is used to cool the retarder and transmission system, the cooling system shall be capable of adequately cooling the transmission in addition to the engine as described. All coolant hoses shall conform to MIL-H-62217 and ZZ-H-428 and be secured with corrosion resistant steel bands with corrosion resistant saddles and screws in accordance with SAE J536, type F, style 4. Initial fill of the cooling system shall be in accordance with 5.1.2. If required, the coolant system shall include a de-aeration system of sufficient capacity to handle coolant draw down as required by the engine manufacturer or a coolant recovery reservoir of not less than 5 percent of the total coolant system capacity.

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3.5.1.1.2 Air cooled engine. The air cooled engine shall provide adequate cooling in an ambient air temperature of 120 °F at 85 percent of the rated horsepower. The thermal conditions of the engine will be indicated by a cylinder head temperature gauge and warning light.

3.5.1.1.3 Fan clutch. If a thermostatically controlled clutch for vehicle cooling system fan is provided, it shall be equipped with a positive lock-up in case of failure. The tractor shall be capable of the performance specified with the fan clutch engaged. The fans shall not operate when the engine is shut off.

3.5.1.2 Governor. The engine governor shall be sealed to prevent tampering. Governor control linkage (foot throttle) shall be adjustable to permit variable adjustment of engine rpm (revolutions per minute) up to governed speed. The accelerator control system shall conform to Federal Motor Vehicle Safety Standard (FMVSS) 124.

3.5.1.3 Engine air induction system. The engine air induction system shall be furnished complete and installed from the air inlet silencer to the engine assembly intake opening. The induction air ducts shall not require disassembly for normal vehicle maintenance or element servicing. The air ducts shall be heavy duty, reinforced molded contour air ducts or heavy duty ridged material ducts. Any portion of the air induction system below the 30 inch fording height (plus turbulence caused by vehicle movement through water) shall be sealed against water entry. Hose clamps where required, shall be austenitic or 300 series stainless steel bands with austenitic or 300 series stainless screws in accordance with SAE J536b, type F, style 4.

3.5.1.4 Air cleaner. The tractor will be equipped with a dry type air cleaner provided with a safety element and an inertial type pre-cleaner in accordance with MIL-A-62048. The air cleaner shall be so located that removal for transportation in any mode as specified herein shall not be required. An automatic dust ejector shall be provided. An air cleaner restriction indicator, visible from the drivers seat, shall be provided.

3.5.1.5 Engine starting. An ether injection system or a glow plug fixed preheating system capable of operation from the operator's station shall be provided. The ether system shall conform to MIL-E-52649, type III. The system shall be non-functional when the engine is warm or running. A charged primer cylinder shall be provided.

3.5.1.6 Oil sampling valves. Oil sampling valves conforming to MIL-V-81940 shall be provided on the engine, transmission (if a hydrostatic or powershift transmission is furnished) and hydraulic systems with capacities over 5 gallons. The valves shall be located in such a way as to insure that personnel will not be exposed to danger when taking oil samples with the engine running. The location of the oil tap shall be such that when samples are taken, it shall be a true representation of oil that is flowing while the engine is running. Sampling valves shall be labeled (in accordance with MIL-STD-1472), "crankcase", "transmission", or "hydraulic" system, whichever is appropriate to indicate the type of oil sampled.

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3.5.2 Electrical system. A 24-volt electrical system shall be furnished in accordance with Federal Motor Carrier Safety Regulations (FMCSR) 393.27 through 393.33. The alternator shall provide sufficient amperage to operate all electrical components of the tractor simultaneously as well as charge the battery. This shall include radio power when specified (see 6.2). The system shall incorporate reverse polarity protection and means to prevent starter engagement with engine running. A wiring harness and connector to mate the tractor with the electrical system on a towed vehicle shall be furnished. The connector shall be in accordance with MS75021 and shall be furnished with matching 4 bolt spring loaded cover. The connector receptacle shall be mounted in accordance with SAE J849. The connector shall be labeled "TRAILER CONNECTOR". All electrical switches shall be protected from water entry and freezing.

3.5.2.1 Slaving components. The tractor shall be equipped with a 24-volt slave receptacle conforming to MS52131. The slave receptacle shall permit charging of the batteries and slave starting of the engine from an external power source and shall also provide a power source for charging and slaving other equipment. The slave receptacle shall be installed on the exterior of the tractor near the battery enclosure and shall be accessible to personnel standing on the ground. The slave receptacle shall be labeled "SLAVE, 24 VOLTS".

3.5.2.2 Lighting. All tractor lights, reflectors, and wiring shall be in accordance with 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. Polycarbonate lens shall be provided in all lights except sealed beam headlights and service lights. The tractor shall be equipped with a light switch conforming to MS51113 which controls service lights, blackout lights and instrument panel lights. All external lights shall be inoperable when the blackout lights are used. Interior lights, instrument gauge lights and warning lights shall meet the requirements of 3.5.2.2.4.

3.5.2.2.1 Implement working flood lights, front. Two universally adjustable front mounted working flood lights with shock mounted sealed beams shall be provided, mounted forward of the operator's compartment/cab. These lights shall illuminate the front attachment and the work plane in front of and on both sides of the tractor. The higher intensity light pattern shall be directed approximately parallel to the longitudinal axis of the tractor to provide illumination for the work plane. The lights shall serve as headlights when traveling on and off road if the front attachment blocks illumination of the front headlights furnished in accordance with 3.5.2.2. In the event the lights are to function as headlights, they shall meet illumination requirements of 11,000 candle power for low beam and 24,000 candle power for high beam. All front lights shall be controlled from the operator's compartment.

3.5.2.2.2 Implement working flood lights, rear. Two universally adjustable flood lights with shock mounted sealed beam shall be provided and mounted on the rear of the tractor. The higher intensity light pattern of the type I

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tractor shall be directed approximately parallel to the longitudinal axis of the tractor to provide illumination for the work plane to the rear of and on both sides of tractor. Two universally adjustable flood lights shall be mounted on the type II tractor boom to illuminate the hook block and for use as ground illumination. All rear lights shall be controlled from the rear operator controls.

3.5.2.2.3 Blackout lights. The tractor shall be equipped with the following secure blackout lights:

- a. One left front light conforming to Drawing 12360910.
- b. Two front marker lights conforming to MS52126.
- c. Two rear stop/tailights conforming to MS52125.

The front blackout headlight shall be mounted on the left front of the plan outline of the tractor, positioned to provide illumination when the front attachments are in the travel position. The blackout headlight shall be adjustable. The two blackout stoplights/ tailights shall be mounted adjacent to the rear tailights, and provided with guards. The blackout stoplight/ tailight lens face shall be recessed not less than 1/2-inch behind the hole or guard. The two blackout front marker lights shall be mounted on the front, one on each side of the vertical centerline of the tractor, at the same level, and as far apart as practicable.

3.5.2.2.4 Interior lighting. The tractor shall be equipped with gauge lighting or indicators which are readily visible to the full range of personnel (see 3.3.1.2). The gauges and instruments lighting shall be adjustable from 0.1 (FT.C) (foot-candles) to 2.0 FT.C for the initial 50 percent rotation, and from 2.0 FT.C to 5.0 FT.C for the remaining 50 percent control rotation. Interior lights, gauges and instruments, to include warning lights, shall not emit energy outside of the 380-700 nanometer wavelength range.

3.5.2.2.5 Turn signals. The tractor shall be equipped with turn signals and emergency flashers. Emergency flashers, when activated, shall be overridden by the vehicle brake lights when the service brakes are applied, and shall not become operational again until the service brakes are released.

3.5.2.3 Wiring. Weatherproof wiring and connectors in accordance with SAE J557/J163, or made to ISO 6722 requirements with DIN 72551 specification wire shall be provided. Wires shall be numbered in accordance with SAE J821. All wiring shall be routed in a protected location.

3.5.2.4 Battery. Battery shall be size 6TL, 12 volt in accordance with MS52149.

3.5.2.5 Battery disconnect switch. A battery disconnect switch shall be furnished to disconnect all electrical power to the tractor. The switch shall be installed in an inconspicuous location inside the cab as near the battery ground connection as practical and labeled for identification as well as designating between the on and off positions.

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3.5.2.6 Battery mounting. Battery mounting shall be in a compartment above the fording depth (see 3.4.5) and be accessible for battery removal and servicing without removing any component except the quick-release battery box cover if a battery box is furnished. Battery supports, holddowns, and battery box (if provided) shall be protected with a coating conforming to MIL-C-450. The battery shall be mounted in such a manner as not to interfere with access to engine components (accessories). Battery mounting shall provide for complete support over the entire base of the battery and shall be in such a position that the level of the electrolyte is directly visible without removing the battery from its mounting bracket or requiring the use of tools. Battery restraining clamps shall be provided to hold the battery in a fixed position. The battery compartment shall have provision for drainage and provision for gas venting at or near the top of the compartment. Cover and positioning shall be protected against short circuiting. Ungrounded cable shall be protected by rubber grommets or insulated passages at entry to the battery box. Battery cables conforming to SAE J1127 shall be furnished with insulated terminal covers. Positive and negative cable terminals shall be identified with a red sleeve, labeled "+" and a black sleeve, labeled "-", respectively and corrosion-resistant SAE bolts and nuts provided. Negative ground shall be provided.

3.5.2.7 Diagnostic connector assembly (DCA). Unless otherwise specified (see 6.2), the tractor shall incorporate an easily accessible DCA in the operator's cab for interface with the Government's Simplified Test Equipment/Internal Combustion Engines Reprogrammable (STE/ICE-R) specified in MIL-T-62314. All requirements for the DCA shall be in accordance with STE/ICE-R design guide for Vehicle Diagnostic Connector Assemblies, Report No. CR-82-588-003, revision 1. The DCA shall be in accordance with Drawing 12258941 and shall be labeled "Diagnostic Connector Assembly". As a minimum, the DCA shall be capable of monitoring the functions defined in table 2-2 of Report No. CR-82-588-003 revision 1. Additional test "parameters" to be monitored in either the DCA or transducer kit (TK) mode shall be as follows: fuel return pressure, starter solenoid voltage, and transmission oil pressure. Test points identified to monitor functions in the TK mode shall be accessible without the removal of other components and installed attachments. Those additional test parameters which are inaccessible for monitoring in the TK mode shall be monitored in the DCA mode. Fittings/adapters required for interface with the STE/ICE-R test set when monitoring in the TK mode, shall be permanently installed on the tractor to assure that adapters in the STE/ICE-R test set readily mate with TK mode test point locations. A separate wiring harness shall be provided for the DCA and shall include all wiring and necessary hardware to perform required capabilities. A fuel shut-off method shall be provided for conducting compression unbalance checks. The contractor shall also provide STE/ICE-R vehicle test cards in the format identified in Drawings 12258955 addressing DCA and TK mode measurements and shall incorporate the test cards into the tractor technical manuals.

3.5.2.8 Circuit breaker. Each electrical circuit shall be protected with a circuit breaker in accordance with SAE J553 and shall have labels which describe the function served by the circuit breaker. Fuses are not acceptable.

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3.5.3 Fuel system. Fuel system shall conform to FMCSR 393.65 and 393.67.

3.5.3.1 Fuel system components. The fuel system shall include a fuel strainer, water separator with provisions for draining sediment, fuel filters in accordance with the engine manufacturer's recommendation, and a fuel injection pump including provisions for priming or self priming. The fuel strainer or fuel filters shall be between the fuel tank and the transfer pump and shall be readily accessible for inspection and replacement.

3.5.3.2 Fuel tanks. All tractors shall be equipped with corrosion protected fuel tank(s) and shall conform to the special finish requirements of MIL-STD-193. The type I tractor shall have adequate fuel tank(s) capacity to provide for 10 hours of backhoe excavation per 4.5.2.45 with the engine at the recommended engine operating speed. The type II tractor shall have adequate fuel tank(s) capacity to provide for 10 hours of forklift operation (see 4.5.2.49). When more than one tank is furnished, means shall be provided to assure equalized fuel level and draw in both tanks. Manual shut-off valve(s) shall be furnished between the two tanks and at the tank(s) on the fuel supply line before the fuel filter(s). The valves shall be labeled "SHUT-OFF" and shall be provided with double ended arrows showing the direction of operation and the functional result (i.e. open, off, etc.). Fuel tank(s) will be provided with safety type tank filler cap or caps not less than 3 inches in diameter. The fuel fill port shall be labeled "Diesel Fuel" with cast or embossed letters unless a data plate, in accordance with 3.3.14, is furnished near the fill pipe marked with "Diesel Fuel" and not less than 1-inch letter height. Filler caps shall be located to preclude mud build up and captive chained to filler neck. Removable strainers are required. The fuel system design shall be such that fuel spilled during refueling shall not contact any part of the exhaust or electrical system. A sealed filler cap and vent shall be furnished if the tank is below the fording depth or wave action while fording. The tank shall accept fuel from a 5 gallon can conforming to MIL-C-1283 by a person standing on the ground or a surface on the tractor suitable for standing. The fuel tanks shall be equipped with a drain plug at the lowest point of the tank. The drain plug shall be removable with hand tools without the removal of any other component. The fuel tank shall be protected by position or otherwise from external damage. The tractor shall be able to operate under all conditions herein with 10 percent of the total fuel remaining.

3.5.4 Exhaust system. The exhaust system joints shall be leakproof. The exhaust pipe location shall not create a toxic, thermal, or nauseous hazard to operators or maintenance personnel who must perform tasks when engine is operating. The exhaust pipe(s) shall be configured or equipped to prevent entry of rain water when vehicle is not operating. Exhaust mufflers and tail pipes shall use corrosion-resistant steel to provide long lasting corrosion protection. A wire mesh protective screen will be placed around the vertical exhaust pipe in order to protect the user from burns resulting from incidental contact. The exhaust system shall be provided with a spark arrestor conforming to Forest Service Standard 5100-1 when tested in accordance with SAE J350.

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3.5.5 Drive assembly.

3.5.5.1 Transmission. The vehicle shall be equipped with either a manual or automatic/powershift transmission. When furnished, automatic or powershift transmissions shall be protected from damage when the operator moves or attempts to move the directional control to the opposite direction while the tractor is in motion. The transmission fluid of tractors equipped with automatic or powershift transmissions shall have filter(s) with replaceable elements. The transmission housing shall have a protective measure installed to prevent possible damage from debris caused by cross country movement.

3.5.5.1.1 Automatic/powershift transmissions. If provided, the automatic/powershift transmission shall provide controlled application of the clutches to provide smooth shifting, limiting slippage which would damage the clutches. All transmission gears shall be constant mesh. Oil pressure for actuation of the transmission clutches, for torque converter supply, and for transmission lubrication shall be supplied by a mechanically driven pump. The transmission shall be capable of withstanding maximum stall operation for a minimum of 30 seconds without damage or permanent deformation and without exceeding the fluid temperature limit of 250 °F. A neutral start switch shall be provided. A downshift inhibitor system that prevents driver shift control action from overspeeding or damaging the engine, transmission, or drive train components shall be provided.

3.5.5.1.2 Manual transmissions. All manual transmission gears shall be fully synchronized.

3.5.5.1.2.1 Clutch. A clutch properly matched to the tractor's power train shall be provided with the manual transmission.

3.5.5.2 Power take-off (PTO) provisions. Heavy duty PTO openings shall be provided and shall be utilized for the purpose of driving tractor mounted hydraulic equipment. The PTO shall have a positive lock in the neutral position to prevent accidental engagement. The PTO must turn in direct proportion to engine speed.

3.5.6 Frame. The frame strength, stiffness and torsional flexibility shall be such to prevent weld failure damage or permanent deformation during on and off road operations specified herein.

3.5.7 Axles and suspension.

3.5.7.1 Torque limiting differentials. An off-highway commercial traction control device or positive direct drive to each wheel shall be required in each axle or wheel of the tractor with minimum effect to vehicle steering. The traction control shall insure that power is transmitted to the wheel having traction when the opposite wheel loses traction and may be of an automatic type or direct drive. If a full locking or controllable biasing traction control device is utilized, it shall feature a manual engagement and disengagement control. The all wheel drive and lock-up provision shall be

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capable of being engaged or disengaged while under power in the travel mode without stopping the tractor. A warning light shall be installed and labelled "Differential Locked Out" (in accordance with MIL-STD-1472) in a position clearly visible to the operator and shall be illuminated when engaged.

3.5.7.2 Axles. All axles shall be powered.

3.5.7.2.1 Interaxle differential. Interaxle differential where required by traction design shall be equipped with a lock-up device (see 3.5.7.1). If provided, interaxle differentials in the locked-up mode shall have automatic disengagement above 10 mph. Individual axle differentials shall be lubricated so as to guard against seizure in case of spinout. Differentials, axles and brake components shall be interchangeable from front to rear within design constraints. Wheel offset shall be the same on all axles to allow interchangeability of mounted wheels and tires. Axle torque rating will not be exceeded due to inter and intra-axle differential action. All axles shall be properly vented and equipped with lubricated wheel bearings and seals adequate to meet fording requirement (see 3.4.5).

3.5.7.3 Suspension. Damping shall be provided on all axles. The type II tractor shall be equipped with a front suspension lockout. The lockout shall be capable of being engaged and disengaged by the operator seated in the cab. A warning light shall be installed and labelled "Front Suspension Locked Out" (in accordance with MIL-STD-1472) in a position clearly visible to the operator and shall be illuminated when engaged.

3.5.8 Wheels and rims. The tractor shall be equipped with single tire and wheel assemblies on each axle. The rims shall not be of the multi-piece type. Rim ratings shall conform to Tire and Rim Association recommendations for the type and size of tire furnished. All rims and wheels shall be identical.

3.5.8.1 Tires. The tractor shall be equipped with multi-purpose all traction tread tubeless radial tires. Tire ratings shall conform to Tire and Rim Association recommendations for the type and size of tire furnished. Valve caps shall be provided. All tires must be equipped with adequate valve extensions and be so designed and mounted as to permit checking tire pressure and inflation using only standard passenger vehicle size valve bore pressure gauge (see 3.5.12.3). Hydroinflation or ballasting of the tires is not permissible.

3.5.8.2 Spare tire and wheel assembly. A spare tire and wheel assembly identical to those provided on the axles shall be provided mounted on a spare tire carrier mounted in a readily accessible location.

3.5.8.3 Tire and wheel assembly balance. All tire and wheel assemblies shall be balanced.

3.5.9 Service brakes. The tractor shall be equipped with a complete dual brake system conforming to MIL-STD-1180, and applicable FMVSS 105 and 121. Brake fluid shall conform to MIL-B-46176. The brakes shall conform to FMCSR 393, subpart C, Brakes. The fully equipped tractor shall be capable of making

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a straight line full stop from a road speed of 20 mph within a distance of 30 feet on dry level pavement and shall make a full stop from a vehicle speed of 40 mph at an average deceleration rate of 14.4 ft/sec². An automatic load sensing variable proportioning brake system shall be provided to regulate the braking power in proportion to gross axle loads. The service brakes shall also stop and hold the fully equipped tractor on a 60 percent grade on dry concrete, pointed either uphill or downhill. The force that the operator must apply to the brake while making the above listed stops and holds shall not exceed 37 pounds. In the event of power assist failure, the brakes shall be operable with a force not to exceed 70 pounds with the tractor on a level surface. When disc brakes are furnished, a disc pad wear indicator system, shall be provided, warning the operator that inspection/maintenance of disc pads is required.

3.5.9.1 Parking brake. A parking brake system shall be furnished and shall conform to FMCSR 393.41, except that it shall hold on a 40 percent grade pointing either up hill or down hill. The force required by the operator to apply the parking brakes as described above shall not exceed 24 pounds for hand actuated parking brakes or 57 pounds for foot actuated parking brakes.

3.5.9.2 Air storage reservoir tanks(s). The air storage reservoir tanks capacity shall be in accordance with FMVSS-121 requirements. The tank shall be equipped with a drain valve, safety valve, and check valve, between compressor and last reservoir tank.

3.5.9.3 Air system accessories. When an air service brake system is provided, the following accessories shall be furnished:

- a. Foot control-suspended or treadle type brake pedal.
- b. Air pressure gauge visible to the driver.
- c. Low air pressure warning buzzer and light.
- d. Alcohol evaporator with shatter resistant translucent container or air dryer system with automatic drain valve. This requirement shall be applicable to any air system which may be supplied for operation of the tractor.
- e. The wet tank shall be equipped with a drain valve that is readily accessible from the side of the vehicle.
- f. Air control valves.
- g. Air brake service and emergency line couplers conforming to SAE J318 on the front of the tractor. A relay emergency valve shall also be provided.

3.5.9.4 Trailer brake control system. A complete trailer brake control system shall be furnished that includes the following:

- a. Identification of emergency and service lines, as well as noninterchangeable connectors.
- b. Coincident control of trailer brakes with tractor foot control.
- c. Independent hand control for trailer brakes.
- d. Tractor mover protection valve with dash control and automatic break-away feature.

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- e. Trailer stoplight operative with foot brake and with hand control for trailer brakes.
- f. A wiring harness and connector to mate with the electrical system on the towed trailer. The interface shall occur at the same location as the air brake line interface. The interface connector will be in accordance with SAE J849, 12 pin, 24-volt plug and receptacle (see 3.5.2).
- g. Controls shall be located in conformance to SAE J680, convenient to operator and access to right hand operation.
- h. Two "glad hands" quick connectors to supply air to the trailer brakes.

3.5.9.5 Brake hoses. The hoses furnished for the brake system shall conform to the requirements of MIL-STD-1180 and FMVSS 106.

3.5.10 Cab and operator's compartment. The tractor shall be equipped with an insulated weather type, 2 person metal cab. The cab shall be equipped with opening doors on each side for operator and passenger ingress and egress. Glazing in accordance with FMCSR 393.60, 393.61a and 393.62 shall be provided in the tractor windshield, the opening windows in each door and the rear of the cab. The cab shall provide ventilation to the operator with windows rolled up. Door locks and retention components shall be in accordance with MIL-STD-1180. The tractor shall be air transportable without removing the cab for transport in the C130 and C141 aircraft. The operator's compartment shall be furnished with an upholstered, individually adjustable driver's seat and an upholstered passenger seat. The driver's seat shall be adjustable fore and aft and up and down. The range of adjustments shall be sufficient to accommodate the full range of military drivers (see 3.3.1.2). Type 2 seat belt restraints as defined in MIL-STD-1180, anchors, and retractors complying with FMVSS 208, 209 and 210 shall be furnished. Cab and operator's compartment design shall comply with 3.3.1.2.

3.5.10.1 Gauges and instruments. The tractor shall be equipped with the following instruments and gauges readily visible to the full range of military operators seated in the driver's seat. All gauges and instruments shall be identified according to function.

- a. Voltmeter or ammeter.
- b. Fuel gauge.
- c. Engine oil pressure gauge. A low pressure red indicator light or low pressure alarm shall be furnished in addition to the gauge. Means shall be provided to check operation of the light or alarm. The red indicator light or alarm may be common to the engine coolant indicator light or alarm.
- d. Engine coolant temperature gauge if water cooled or cylinder head temperature gauge if air cooled, and a high temperature red indicator light or alarm shall be furnished in addition to the gauge. Means shall be provided to check operation of the light or alarm.
- e. Torque converter or hydrostatic transmission temperature gauge and high temperature red indicator light or alarm shall be furnished in addition to the gauge. Means shall be provided to check operation of the light. Manual transmissions shall not require a temperature gauge.

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- f. Air pressure gauge with an audible alarm to indicate low air pressure.
- g. Speedometer with odometer.
- h. Engine tachometer.
- i. Hourmeter which registers the number of engine operating whole hours with a minimum of 9999.
- j. Illuminated inclinometer shall be marked in percent slope and the scale shall indicate a minimum of 40 percent slope to the left and to the right of center. It shall be marked with a maximum of 5 percent increments. A single decal shall in accordance with 3.3.14 shall be provided in the vicinity of the inclinometer identifying the slope limitation of all tractors (see 1.2).
- k. Disc pad brake wear indicator (see 3.5.9).

3.5.10.2 Accessories. The tractor shall be equipped with the following accessories:

- a. Two exterior rearview mirrors. The mirrors shall be adjustable both horizontally and vertically. Right and left mirrors conforming to MS53015 shall have not less than 50 square inches unit magnification. Each outside mirror assembly shall be equipped with a convex mirror with not less than 25 square inches of reflective surface conforming to MIL-STD-1180. The exterior mirrors shall be shock resistant mounted and be capable of folding against the cab and retract upon impact.
- b. Windshield washers and dual multi-speed windshield wipers conforming to MIL-STD-1180, requirement 104.
- c. A personnel heater with defroster system and blower. The blower shall be operable independent of the heater. The system shall be capable of providing heat and window defogging in the operating environment (see 3.4.11) in accordance with SAE J1503 and SAE J382 without road load test condition.
- d. Visors for both driver and passenger shall be provided.

3.5.10.3 Radio mounting provisions. The tractors shall have sufficient area and provisions to mount a radio set, mounting assembly, and external antennae mount as specified by the contracting officer (see 6.2). The Government will supply a sample radio as a Government-loaned equipment. This will be used in order to determine the correct mounting procedures. The radio mounting shall be positioned to enable the passenger to operate the radio. Antenna and power cable access shall be provided with rubber grommets.

3.5.10.4 Rifle mounting provisions. The tractors shall be equipped with a rifle mounting bracket conforming to drawing number 13229E8015. The bracket will be mounted within reach of the operator's position at the rear of the tractor. It will be placed in a location suitable for mounting the M16A1, M16A2, and M4 carbine. It is incumbent upon the contractor to position the bracket in a place that neither hampers the operator's movements, nor prevents the vehicle from operating in the prescribed manner.

3.5.11 Steering. A power assisted mechanical steering or hydraulic steering system shall be furnished. The steering wheel, either a full or

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partial circle, shall be used for steering. If hydraulic steering is provided, it shall be powered by a separate hydraulic system or circuit, or shall have a priority circuit.

3.5.11.1 Emergency steering. Emergency steering conforming to SAE J53 shall be provided for retaining steering control in the event of engine failure when traveling at any speed to the maximum speed.

3.5.12 Toolbox(es). Stowage space shall be furnished of sufficient size to hold the specified equipment listed in 3.5.12.3 and the auxiliary hydraulic tools specified for type I and II tractors (see 3.7). The box(es) shall be of heavy duty construction and be capable of withstanding all operational shock and vibration without deformation or damage under operating and transportation conditions specified herein. The tool box(es) shall be securely fastened to the tractor in a protected position above the fording depth and shall have provision for drainage of liquids. The box(es) shall be designed to preclude entry of water; constructed of material treated for corrosion resistance and; equipped with a hinged door, a minimum of two tension type hook latches with strikers, and a hasp and padlock with a 3/8-inch shackle. The tool box(es) shall be accessible and so located as to be capable of being loaded or unloaded by the full range of personnel (see 3.3.1.2). The tool box(es) shall be capable of supporting a 500 pound load centrally located without damage or permanent deformation.

3.5.12.1 Tool box insert. An insert or integral provision shall be provided to provide lateral restraint to the auxiliary hydraulic tools and accessories specified herein. The insert or other provision shall be constructed of a material which shall be capable of withstanding all operational shocks and stresses without damage or deformation under operating and transporting conditions specified herein and during removal and replacement of the hydraulic tools and accessories.

3.5.12.2 Restraining straps. Restraining provisions shall be provided to retain the auxiliary tools specified per type of tractor (see 3.7) and accessories in the insert or integral provision to prevent damage during on and off road travel and air transportation as specified herein.

3.5.12.3 Other equipment. The contractor shall provide one set of the following items on all production tractors.

- a. Wheel-nut lug wrench, with handle and jack for wheel removal and installation.
- b. Tire pressure gauge, self-contained (10 to 120 psi) suitable for checking tire pressures.
- c. Pneumatic hose, tire inflator, 25 feet long with quick disconnect coupling and necessary fittings to inflate the tractor and trailer tires using the chassis air system.
- d. Common hand tools required by operator or crew for performance of operator/crew level maintenance procedures and operation of the attachments (see 3.6) and hydraulic tools (see 3.7). The contractor

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shall provide a recommended list (see 6.2) of tools for approval by the Government.

All exterior storage areas shall be furnished with padlocks conforming to MS35647. If more than one padlock is furnished with each vehicle, then the padlocks shall be operated by the same key.

3.5.13 Controls and operating mechanisms. Instruments, controls and control mechanisms shall be identified as to their function by means of symbols. Push pull cables, not inherently incorporated in a component such as a heater or defroster, shall be of waterproof, heat resistance, antifriction type, conforming to requirements for marine cables specified in SAE J917. All exposed parts of the control cables shall be fabricated of corrosion-resistant steel. The cable shall be covered with a polyethylene jacket.

3.5.14 Fuel, air, hydraulic lines, and fittings. All fuel, air, hydraulic lines, and fittings shall be internally clean, prior to and after making connections, and shall be free from leaks. All lines and fittings shall be secured in such a manner to prevent rubbing on adjacent lines or tractor appendages. Fuel and air lines shall not be compatible nor interchangeable.

3.5.15 Hydraulic system. The tractor shall be equipped with a hydraulic system for operation of front attachments (see 3.6.1), rear attachments (see 3.6.2), and portable auxiliary tools (see 3.7). The system shall provide for simultaneous operation of the portable auxiliary tools and attachments which are operated with the tractor in a stationary position. All components of the system shall be applied within the component manufacturer's approved rating for pressure, temperature, flow and speed. The operating temperature of the hydraulic system shall not exceed 100 °F above the ambient temperature.

3.5.15.1 Fluid. The systems, including all components, shall be compatible with and operate on fluid conforming to MIL-L-2104, grade 10 except that fluid conforming to MIL-L-46167 may be used for low temperature operation.

3.5.15.2 Ports, fittings, and connections. All ports, fittings and connections for sizes larger than 1-inch shall be of the 4 bolt split flange type conforming to SAE J518. For sizes 1-inch or less:

- a. Ports shall be the straight thread O-ring type in accordance with SAE J514.
- b. Tube fittings shall be 37-degree flared type in accordance with SAE J514, except straight thread O-ring fittings (also in accordance with SAE J514) shall be used when directly connecting to a port.
- c. Hose fittings shall be the 37-degree flared swivel type in accordance with SAE J516. Port, fitting, and line sizes shall be limited to 1/4, 5/16, 3/8, 1/2, 3/4, 1, 1-1/4, 1-1/2, and 2-inch. Pressure tube fittings shall have a minimum burst pressure 3 times the maximum operating pressure.

3.5.15.3 Hydraulic lines. Hydraulic lines shall consist of tubing, flexible hose and steel fittings. Hose or a combination of hose and tubing

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shall be used between components that are not mounted to a nonflexing, rigidly connected structural member or rigidly connected subassembly. All lines shall be routed to provide the minimum number of bends, ease of maintenance, maximum protection and provision shall be made to prevent damage of lines due to chafing. The hose installation, such as angle of fitting, and location, shall cause no stress concentration on the hose at the fitting, and the hose shall be supported, when necessary, to eliminate sagging at the fitting. All lines, other than suction lines, and cylinder bleeder lines, shall be considered pressure lines.

3.5.15.3.1 Hose. Hose and hose assemblies, except suction lines, shall conform to the minimum requirements of SAE J517 type 100R1, 100R2, and 100R10. Hose shall have a rated operating pressure not less than the relief valve pressure in the circuit to which it is applied. Minimum bend radii of hoses shall not be less than that specified in SAE J517. Suction lines shall conform to SAE J517, 100R4.

3.5.15.3.2 Tubing. Tubing shall be in accordance with SAE J524, SAE J525, or be annealed alloy steel conforming to SAE J404, SAE No 4130. Tubing shall have a burst pressure not less than 3 times the relief valve setting of the circuit to which it is applied.

3.5.15.4 Quick disconnect couplings. Quick disconnect couplers shall be used on all hydraulic lines where separation is required to remove front and rear attachments and auxiliary tools. Couplers shall seal both ends of lines.

3.5.15.4.1 Attachment couplings. After 50 connections and disconnections, the couplers shall seal the lines without leakage. Loss of fluid when disconnecting for the fiftieth time shall not exceed 1/2 fluid ounce. Coupler halves shall be identified with permanently and securely attached metal identification plates, metal tags, or metal bands. Each coupler half shall be provided with a captive chained cap to protect the opening when the coupler is disconnected. If hydraulic return and supply line coupler halves can be connected together when front and rear attachments are removed, captive chained caps are not required on these lines. The caps of the mating coupler halves shall fit together when the coupler is engaged.

3.5.15.4.2 Auxiliary tool couplings. Flush face quick disconnect couplers shall be furnished for all hydraulic lines required to change auxiliary tools and associated equipment. Both halves shall seal when disconnected.

3.5.15.5 Hydraulic pump. The mounting flanges and shafts of the main hydraulic pump shall conform to SAE J744. The hydraulic pump shafts shall be positively driven. A secondary pump, if required, is acceptable. The pump shall have a 1000-hour Omega rating which is less than the filter Beta 10 rating.

3.5.15.6 Hydraulic oil filter. The replaceable filter shall have a Beta Ratio as specified or approved by the pump manufacturer for this application. The filter shall be so located that the filter may be easily changed without removal of components other than the cap and without spilling or draining oil

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from the reservoir. Proof pressure of the housing shall be not less than maximum normal operating pressure to which it is exposed. The housing shall be equipped with a pressure relief by-pass to prevent filter collapse. A clearly visible change indicator shall be provided to show when the filter requires changing.

3.5.15.7 Reservoir. The filler neck shall have an opening not less than 3 inches in diameter and shall contain a positively retained strainer of sufficient size and construction to allow a gravity fill rate of not less than 10 gallons per minute with oil at a temperature of not more than 70 °F. The top of the filler neck shall extend at least 1 inch above the top of the reservoir and shall be so located as to allow for filling from a standard 5-gallon oil container. Breathers shall be equipped with filters. The filler cap shall be captive chained to the reservoir. If the reservoir is sealed, the cap or neck shall provide for equalization of reservoir pressure with atmospheric pressure prior to final disengagement of the cap. A sight glass shall be provided to check oil level and shall have markings to indicate "Full" and "Add" for both hot and cold conditions when the tractor is level and the attachments are in the normal parked position. The fill port shall be labeled "HYDRAULIC FILL" in 1-inch high letters.

3.5.15.8 Hydraulic control valves. Control valves shall be so designed and so mounted as to prevent instability of the control levers or valves because of shock and vibration. A detented float position for operation of the front attachments (see 3.6.1.1) shall be provided.

3.5.15.9 Relief valves. Relief valves shall be provided to protect all circuits and components from damage due to overpressure. All valves shall be adjustable with a positive lock or retention of the adjustment.

3.5.15.9.1 Main relief valve. Only one main (pump) relief valve shall be provided for each pump, located in the pump control valve circuit with preference to location in the inlet of one of the control valves. Over-pressure flow shall return to the reservoir on reservoir return lines.

3.5.15.9.2 Auxiliary relief valves. Auxiliary relief valves shall be provided at downstream from the control valve outlet for protection when sub-circuits that are intended to operate at less than main circuit relief valve pressure; or to protect circuits that require protection when cut off from the main circuit relief valve.

3.5.15.10 Cylinders. The rated working pressure shall be defined as the relief valve pressure of the circuit or sub-circuit to which the cylinder is applied. All cylinders shall be pin, socket or gamble mounted, each being self aligning with lubrication by fittings conforming to SAE J524.

3.5.15.11 Diagnostic port. A 3/8-inch diagnostic port shall be provided for each separate circuit at the pump outlet or valve inlet.

3.5.15.12 Contamination level. The particulate matter in hydraulic fluid removed from the system directly upstream of the filter shall not exceed the

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ISO Code level of 19/16 in accordance with SAE J1165 after completion of assembly of the tractor.

3.5.15.13 External leakage. After completing tests specified in 4.5.2.42 the degree of external hydraulic system leakage shall not exceed a class 4, for dust-free conditions and a class 4D for dusty conditions of SAE J1176. External hydraulic system leakage shall not exceed a class 3 for production tractors under normal operation.

3.5.16 Pintle. A towing pintle at the rear of the tractor shall be furnished. The pintle assembly shall be of the swivel type and conform to the size and strength described in MS51118. The mounting of the pintle assembly shall be in accordance with SAE J849 and shall be of sufficient strength to withstand without permanent deformation or damage, the loads specified herein.

3.5.17 Trailer safety chain provisions. Provision for the attachment of trailer safety chains shall be provided in accordance with SAE J849.

3.6 Attachments. The tractor shall be equipped with attachments as specified. All attachments shall be compatible with and properly matched to the tractor to meet the requirements specified herein. All attachments shall be standard commercial products.

3.6.1 Front attachments. Front attachments (see 3.6.1.2 and 3.6.1.3) shall be removable means of a quick hitch attachment permanently attached to the tractor chassis and shall utilize a common hydraulic system and controls. Front attachments shall be capable of being installed/removed within 15 minutes with 2 persons utilizing common hand tools. The inherent capabilities of the tractor, especially the hydraulic system, may be used in the operation.

3.6.1.1 Front attachment controls. The controls for the front attachments shall be permanently mounted in the operator's cab. The controls of each attachment shall be operable only from the operating position and shall conform to 3.3.1.2.

3.6.1.2 Loader. The type I tractor shall be provided with a front mounted loader equipped with a general purpose bucket with a replaceable cutting edge. The bucket shall be equipped with not less than 6 bolted on, replaceable (pin retained) teeth. The loader shall be attached in accordance with 3.6.1. The loader design shall preclude spillage on the operating compartment in the full range of operation. The loader shall be designed for construction and excavation tasks such as digging, lifting, dumping and craning. The loader's hydraulic lines shall be routed to protect against normal working environments; a positive lock for holding the loader bucket in the transport position shall be provided; and the necessary features required to permit rapid attachment and detachment of the loader shall be provided.

3.6.1.2.1 Loader performance. The front mounted loader attachment shall have the following capabilities in accordance with SAE J732 and SAE J742.

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3.6.1.2.1.1 Bucket capacity. The loader bucket capacity shall be not less than 3/4-cubic yard.

3.6.1.2.1.2 Dump angle. The loader dump angle shall be not less than 45 degrees.

3.6.1.2.1.3 Dump height. The loader dump height shall be not less than 98 inches.

3.6.1.2.1.4 Loader reach. The loader reach fully raised shall be not less than 30 inches.

3.6.1.2.1.5 Operational load. The rated operational load shall be not less than 3300 pounds, but shall not exceed 50 percent of the tipping load as defined in SAE J818.

3.6.1.2.1.6 Breakout force. The loader breakout force shall be not less than 6600 pounds.

3.6.1.2.1.7 Raise time. The loader raising time with rated bucket load shall not exceed 6 seconds from ground level to the maximum lift height.

3.6.1.2.1.8 Lowering time. The loader lowering time with an unloaded bucket shall not exceed 6 seconds from the maximum height to ground level.

3.6.1.2.1.9 Digging depth. The loader digging depth shall be not less than 4 inches.

3.6.1.2.1.10 Tipping load. The loader tipping load shall be not less than 6600 pounds.

3.6.1.2.1.11 Bucket width. The loader bucket width shall be a minimum 1 inch wider than the tractor tires whichever is greater to facilitate excavation of slot trenches to a minimum depth of 3 feet.

3.6.1.2.1.12 Lift arm safety device. A lift arm safety device in accordance with SAE J38 shall be provided.

3.6.1.2.1.13 Stability. The tractor with the backhoe in the travel position, and the loader bucket with the rated operational load (see 3.6.1.2.1.5) on firm ground, and without any tire leaving the surface shall be capable of the following:

- a. Negotiate a 4-inch pothole at a speed between 3.5 and 5 mph with the bucket positioned 12 inches off the ground, and at the maximum lift height.
- b. Negotiate a 20 percent longitudinal grade in both directions with the bucket positioned in the travel position.
- c. Negotiate a 15 percent side slope in both directions with the bucket positioned in the travel position.

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- d. Negotiate an 8 inch deep wheel rut at a speed of 5 mph with the bucket uniformly loaded with 1500 pounds with the bucket positioned 12 inches off the ground. The wheel rut will be crossed at an angle of not more than 30 degrees.

3.6.1.3 Forklift. The type II tractor shall be provided with a front mounted forklift having folding forks that are at least 48 inches in length. The operator shall be able to see the tip of at least one fork at any lift height without leaving his seat with no load on the forks. A travel lock shall be provided to secure the forks in the folded position. The forklift shall be designed for loading and unloading palletized material on and off trucks and other transport means. The forklift's hydraulic lines shall be routed to protect against normal working environments and the necessary features required to permit rapid attachment and detachment of the forklift shall be provided.

3.6.1.3.1 Forklift performance. The forklift attachment shall have the following capabilities.

3.6.1.3.1.1 Lift capacity. The forklift shall lift not less than a 4000-pound load at a 24-inch load center throughout the lift range.

3.6.1.3.1.2 Lift height. The forklift shall have a minimum lift height of 102 inches.

3.6.1.3.1.3 Fork rotation. The forklift shall have fork carriage rotation of at least 15 degrees to the left and 15 degrees to the right.

3.6.1.3.1.4 Mast tilt. The forklift shall have a mast tilt of not less than 8 degrees forward and 10 degrees back from the vertical.

3.6.1.3.1.5 Fork overload. The forks shall withstand 300 percent of the rated load on the forks at the applicable load center.

3.6.1.3.1.6 Stability. The tractor with the crane in the travel position, front suspension lockouts engaged, and the forklift with the rated load shall be capable of the following on firm ground without any tire leaving the surface:

- a. Negotiate a 4-inch pothole at a speed between 3.5 and 5 mph with the forks positioned 12 inches off the ground.
- b. Negotiate a 12 percent uphill longitudinal grade with the forks positioned 12 inches off the ground and a downhill grade in reverse.
- c. Negotiate a 12 percent side slope in both directions with the forks positioned at a minimum height.

3.6.2 Rear attachments. Rear attachments shall be capable of being installed/removed as complete integrated units within 30 minutes with 2 persons utilizing common hand tools. The inherent capabilities of the tractor, especially the hydraulic system, may be used in the operation.

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3.6.2.1 Rear attachment controls. The controls for the rear attachments shall be located in such a manner to provide for a safe operation of the tractor and attachment during operation and shall conform to 3.3.1.2. The controls for the attachment shall be operable only from the proper operating position. Adequate lighting shall be provided for the operator's controls and shall be switched at the operator's control station.

3.6.2.2 Backhoe. The backhoe on the type I tractor shall be equipped with stabilizer outriggers which shall be hydraulically operated. The backhoe shall be capable of excavating 27 cubic yards per hour when tested in accordance with 4.5.2.45. The backhoe shall be designed for construction and excavation tasks such as digging, lifting, dumping, and craning. The backhoe shall be complete with operator's console; adjustable seat; operator's controls; hydraulic cushion swing stops effective during last 10 degrees of swing; rigid box beam boom construction; hydraulic lines routed to protect against normal working environments; and a positive lock for holding the backhoe in the transport position.

3.6.2.2.1 Heavy-duty rock bucket. Unless otherwise specified, the backhoe shall be equipped with a 24-inch wide heavy duty rock type bucket with a rated capacity of not less than 7 cubic feet. When specified (see 6.2), the backhoe shall be equipped with a 24-inch wide heavy duty ripper type bucket with one removable ripper shank with pin replaceable tooth in the back of the bucket and a rated capacity of not less than 7 cubic feet. All backhoe buckets shall be equipped with a minimum of four replaceable (pin retained) teeth. Wherever the bucket teeth can make contact with the boom or dipper stick, a striker plate shall be provided which will adequately protect the basic dipperstick structural members from damage.

3.6.2.2.2 Backhoe performance. The rear mounted backhoe attachment shall have the following performance capabilities as defined in SAE J31, J49, and J296.

3.6.2.2.2.1 Digging depth. The backhoe digging depth shall be greater than 14 feet.

3.6.2.2.2.2 Loading height. The backhoe loading height shall be greater than 132 inches.

3.6.2.2.2.3 Digging force-bucket cylinder. The actual backhoe digging force using the bucket cylinder shall be greater than 8000 pounds.

3.6.2.2.2.4 Digging force-dipperstick cylinder. The actual backhoe digging force using the dipperstick cylinder shall be greater than 4000 pounds.

3.6.2.2.2.5 Boom lift capacity. The boom lift capacity shall be greater than 2500 pounds when measured in accordance with SAE J31.

3.6.2.2.2.6 Dipperstick lift capacity. The dipperstick lift capacity shall be greater than 2900 pounds when measured in accordance with SAE J31.

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3.6.2.2.2.7 Swing arc. The backhoe swing arc about the tractor centerline shall be greater than 160 degrees, 80 degrees right and left of the tractor centerline.

3.6.2.2.2.8 Stability. The backhoe with the rear stabilizers and loader bucket lowered removing the weight of the tractor from the wheels shall be capable of the following without raising a stabilizer or loader bucket from the ground:

- a. Operate on 30 percent longitudinal grades with the tractor positioned with the backhoe positioned up the grade; the backhoe bucket filled with the maximum load based on the rated capacity and positioned 4 feet off and parallel the ground, the backhoe extended to two-third of its maximum reach and rotated smoothly through its full swing arc.
- b. Operate on a 15 percent side slope with the tractor positioned in both directions; the bucket filled with the maximum load based on the rated capacity and positioned 4 feet off and parallel the ground; the backhoe extended to two-third of its maximum reach and rotated smoothly from position directly in line with the tractor's centerline to the uphill side of the tractor back to the tractor's centerline.

3.6.2.3 Crane. The type II tractor shall be provided with a knuckle boom, hydraulic crane. The crane shall be equipped with hydraulically positioned and extended outriggers. All load holding cylinders shall be equipped with integral mounted holding and counter balance valve to prevent collapse in event of hose breakage or hydraulic system failure. The crane will also include a positive locking mechanism that will insure that the crane is fully erected before being able to operate it.

3.6.2.3.1 Crane performance. The crane attachment shall have the following capabilities.

3.6.2.3.1.1 Lift capacity. The crane shall lift a 6000 pound load at an 8 foot radius about the center line of rotation.

3.6.2.3.1.2 Lift height. The lifting height of the crane shall be not less than 25 feet (as specified in ANSI B30.22).

3.6.2.3.1.3 Rotation. The crane shall have a minimum 270 degree rotation, minimum 135 degrees left and right of the crane's centerline of rotation.

3.6.2.3.1.4 Reach. The reach from the centerline of rotation shall be not less than 19 feet (as specified in ANSI B30.22).

3.6.2.3.1.5 Stability. The crane with the front suspension lockouts engaged, outriggers set to level the tractor to the maximum extent practicable, be capable of full crane rotation at an 8-foot radius with 6000 pounds on 9 percent longitudinal grade and side slopes with the tractor in both directions without a tire or outrigger leaving the ground.

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3.7 Portable auxiliary tools. Each tractor shall be furnished with portable auxiliary hydraulically driven tool set consisting of the tools specified for each type of tractor, tool stowage (see 3.5.12) and hose reel (see 3.7.5). The hydraulic tools shall be powered by the tractor's hydraulic system. All tools shall be the manufacturer's standard or optional commercial product which meets or exceeds the requirements specified herein. The operating temperature of handles and other gripping surfaces shall not exceed 120 °F. The tools shall operate at 2,500 psi and accept up to 250 psi back pressure at the tool outlet. The tools shall be equipped with a standard dual pigtail or whip hoses a minimum of 8 inches long and a variable speed control valve. The type I tractor shall be furnished with the following tools: percussive hammer (see 3.7.1), rotary percussive hammer (see 3.7.2) and chain saw (see 3.7.3). The type II tractor shall be furnished with an impact wrench (see 3.7.4).

3.7.1 Percussive, hydraulic, portable hammer. A hand held hydraulically powered percussive concrete and pavement hammer shall be furnished.

3.7.1.1 Operating frequency. The hammer shall produce up to 1600 blows per minute (bpm), at approximately 45 foot-pounds per blow.

3.7.1.2 Work positions. The hammer shall be capable of working in all positions required to perform construction tasks for this type of tool.

3.7.1.3 Accessories. The following accessory tools shall be provided with the hammer:

- a. 5-1/2-inch clay spade.
- b. Moil point, 14 inch.
- c. 3-inch chisel point, 14 inch.

3.7.2 Hammer, rotary percussive, hydraulic, portable. A hand held, hydraulically powered, rotary-percussive hammer drill shall be furnished. The hammer drill shall be utilized in drilling with both carbide tipped fluted drills and core bits in rock and various other aggregate materials.

3.7.2.1 Operating frequency. The rotary percussive hammer drill shall produce a minimum of up to 2000 blows per minute at 300 rpm.

3.7.2.2 Rotating motor. The rotational motor shall be integral with the drill and be capable of independent adjustment permitting both forward and reverse rotation, and control of bpm/rpm.

3.7.2.3 Lubrication. All internal moving parts of the rotary percussive hammer drill shall be sealed and continuously lubricated via the fluid of the hydraulic system and not require additional lubrication.

3.7.2.4 Accessories. The following accessories shall be provided with the rotary percussive hammer drill.

- a. Carbide bit 1-inch diameter x 24-inch long.

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- b. Carbide bit 3/4-inch diameter x 18-inch long.
- c. Carbide bit 2-inch diameter x 24-inch long.

3.7.3 Chain saw, hydraulic, portable. A standard model, commercially produced, hand held hydraulically powered chain saw shall be furnished. The saw shall be equipped with a 15-inch bar without a nose sprocket. The saw shall be equipped with a positive locking device on the chain adjustment assembly and an antikickback feature on the bar to limit the potential for kickbacks while operating.

3.7.3.1 Chain speed. The chain saw speed shall be a minimum of 3000 feet per minute at a maximum flow.

3.7.3.2 Chain lubrication. The saw chain shall be automatically lubricated from the hydraulic system.

3.7.3.3 Chain saw accessories. A sheath shall be provided with the chain saw. A standard chain sharpening (or maintenance) kit shall be provided. The kit shall include a depth gauge, flat and rounded file (as required), file guide, file holder, clamp, wingnut and wrench.

3.7.4 Impact wrench, hydraulic, portable. A standard commercially produced, 3/4-inch square drive hydraulic portable impact wrench shall be furnished. The impact wrench shall have a variable speed control valve and shall produce enough torque to remove or replace the equipment listed in 3.7.4.1.

3.7.4.1 Impact wrench accessories. Additional 3/4-inch drive sockets shall be provided with the impact wrench in order to remove or replace the tires, ROPS and FOPS, ROPS/FOPS cab, as well as any sockets necessary to replace or add trencher teeth or extend the trencher lengths.

3.7.5 Hydraulic hose reel. A standard commercial hose reel with not less than 35 feet of dual hydraulic lines shall be provided to enable the auxiliary hydraulic tools (see 3.7) to be operated remotely from the tractor. The reel shall be equipped with a self locking assembly to allow for pulling out various lengths of hose and a spring return. The hose reel assembly shall be mounted in a protected location to prevent damage from obstacles which may be encountered during off-road operation.

3.8 Winterized tractor. When specified (see 6.2), a quantity of tractors shall be winterized to permit starting and operation in arctic climates at ambient temperatures to -50 °F and storage at ambient temperatures to -60 °F. The contractor shall furnish one tractor for examination and demonstration to prove prior to starting production that his production methods and choice of design detail will produce winterized tractors that comply with the requirements of this specification.

3.8.1 Winterization kit. The kit shall consist of the components for preheating tractor engine coolant and battery box(es); also, insulated cab, hot water personnel heater equipped with one or more shut-off valve(s) in the

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coolant lines, to stop and to vary the flow of coolant to the heater, defrosting system for cab windows, radiator winterfront, insulated engine and radiator compartments, insulated and heated battery box(es), finned battery connectors, and an alcohol evaporator when air brakes are furnished. Winterization components shall not affect the performance of the tractor.

3.8.2 Heater and heat exchanger. The Eberspacher "Swingfire" heater, part no. 26-9002, or equal, shall be utilized for preheat purposes. When specified (see 6.2), a quantity of Swingfire heaters, or equal, shall be furnished. The Eberspacher heat exchanger (water jacket), part no. 26-9013, or equal, compatible with the Swingfire heater shall be provided for heating the engine/coolant. The heat exchanger shall be located near the engine compartment for easy accessibility for insertion of heater. The heater unit starting operation shall be provided by the tractor's 24-volt electrical system using a wiring harness with Bosh Receptacle, part no. 135050012, or equal, compatible with the heater starter cable connector. After heater start and insertion into heat exchanger, preheating of the engine coolant shall be provided by thermo-siphon action. The heater exhaust hot air shall be routed to the battery box(es) to the atmosphere. The hot air flow shall not be impeded by excessive back pressure or leakage. To retain the hot air, the system shall be insulated and heat shielded, as required.

3.8.3 Insulation. Insulation shall comply with MIL-I-14511. Adhesive for bonding the insulation shall retain its adhesive properties at ambient temperature to -60 °F.

3.8.4 Performance. The winterization kit shall be of such design that the following criteria can be met when the tractor has been cold soaked for 24 hours at a temperature of -50 °F:

- a. Engine start within 5 minutes after preheating engine coolant and battery box(es) for 90 minutes.
- b. Within 1 hour after personnel heater start, the heater shall have raised and stabilized the cab temperature to a desired +40 °F in the area occupied by the seated operator's torso.
- c. Within 1 hour after personnel heater start, the defrosting system shall have cleared sufficient glassed area for safe operation of the tractor and visibility of the tractor attachments and work area normally seen when there is no frost on the windows.
- d. All tractor controls to include all attachments and auxiliary tools shall be operational.
- e. The transmission and brake controls shall be functional.

3.9 Government-furnished property. When specified (see 6.2), the following property will be furnished by the Government (see 6.7).

<u>Item No.</u>	<u>Description</u>
1.	Vehicle weight classification sign kit (see 3.3.12).
2.	Camouflage paint pattern (see 3.3.16.1).

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3.10 Government-loaned property. When specified (see 6.2), the following property will be loaned by the Government (see 6.8).

<u>Item No.</u>	<u>Description</u>
1.	One Nuclear-Biological-Chemical (NBC) protective ensemble (see 3.3.11).
2.	One STE/ICE-R, NSN 4910-00-124-2554 (see 3.5.2.7, 4.5.2.61, and 4.5.2.61.1).
3.	One radio set, mounting assembly, and antennae mount when radio mounting provisions are required (see 3.5.10.3).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure 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 ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this 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 Component and material inspection. The contractor is responsible for insuring that components and materials are manufactured, examined, and tested in accordance with referenced specifications and standards, as applicable.

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

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).
- c. Inspection comparison (see 4.6).
- d. Inspection of packaging (see 4.7).

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4.3 First article inspection.

4.3.1 Examination. Prior to testing, the tractors shall be subjected to the examinations marked "X" in column 1 of table II. Presence of one or more defects shall be cause for rejection.

4.3.2 Tests. Upon successful completion of the examinations specified in 4.3.1, first article tests shall be conducted in accordance with tests marked "X" in column 1 of table III. Both first article tractors, types I and II shall be tested in accordance with 4.5.2.3, 4.5.2.5, 4.5.2.26, 4.5.2.42, 4.5.2.61, and 4.5.2.61.1 prior to conducting any other tests. One first article tractor is required to be tested in accordance with 4.5.2.4, 4.5.2.6 through 4.5.2.25, 4.5.2.34 through 4.5.2.41, 4.5.2.43, 4.5.2.56, 4.5.2.58, 4.5.2.59, 4.5.2.60, and 4.5.2.62 for all tractor types. In addition, the type I tractor shall be tested in accordance with 4.5.2.44, 4.5.2.46, 4.5.2.52, 4.5.2.53, and 4.5.2.54. The type II tractor shall be tested in accordance with 4.5.2.48, 4.5.2.50, and 4.5.2.55. Four first article tractors per type shall be tested in accordance with 4.5.2.31 and shall be evaluated for compliance with 4.5.2.32 and 4.5.2.33. Testing in accordance with 4.5.2.9, 4.5.2.10, 4.5.2.11, 4.5.2.12, and 4.5.2.59 shall be reconducted utilizing fuel conforming to MIL-T-83133. Fuel conforming to MIL-T-83133 shall also be utilized as specified in 4.5.2.31.

4.4 Quality conformance inspection.

4.4.1 Examination. After successful completion of all tests specified in 4.4.2, each production tractor shall be subjected to the examinations marked "X" in column 2 of table II. Presence of one or more defects shall be cause for rejection.

4.4.2 Tests. Each production tractor shall be subjected to the tests marked "X" under column 2 of table III. Quality conformance testing shall be conducted with fuel conforming to either MIL-T-83133 or VV-F-800. Failure of any test shall be cause for rejection.

4.5 Inspection schedule.

4.5.1 Examination. The examination shall be in accordance with column 2 of table II.

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TABLE II. Examination schedule.

First Article	Quality Conformance	Defect	Requirement Paragraph
1	2	3	4
CRITICAL			
X		1. Tractor width not as specified.	3.3.8.1
X	X	2. Tractor height not as specified.	3.3.8.2
MAJOR			
X	X	101. Starting system not as specified.	3.3.1.1(a)
X	X	102. Protection from moving parts, electrical shock, high temperature, high pressures and hazardous parts not as specified.	3.3.1.1(b)
X	X	103. Exhaust discharges not as specified.	3.3.1.1(c)
X	X	104. Non-skid surfaces not as specified.	3.3.1.1(d)
X	X	105. Elimination of sharp edges or points not as specified.	3.3.1.1(e)
X	X	106. Warning decals not as specified, if applicable.	3.3.1.1(f)(g)
X		107. Steering lock not provided, if applicable.	3.3.1.1(f)
X		108. Asbestos requirements not met.	3.3.1.1(h)(g)
X	X	109. Emergency shut down not as specified.	3.3.1.1(i)
X	X	110. Fire extinguisher bracket not as specified.	3.3.1.1(j)
X	X	111. Noise caution plate missing, if required.	3.3.2
X	X	112. ROPS and FOPS not as specified.	3.3.3
X	X	113. Lifting eye not as specified.	3.3.3
X		114. Fenders not as specified.	3.3.4
X	X	115. Wheel splash and stone throw protection not as specified.	3.3.4.1
X		116. Brush and stone protection not as specified.	3.3.4.2
X	X	117. Backup alarm not as specified.	3.3.5
X	X	118. Horn not as specified.	3.3.6
X		119. Overall clearances not as specified.	3.3.8.3
X		120. Tractor length not as specified.	3.3.8.4
X		121. Tractor weight not as specified.	3.3.8.5
X		122. Fuel and lubricants not as specified.	3.3.9
X		123. Material not as specified.	3.3.10
X		124. Ease of maintenance not as specified.	3.3.15
X		125. Drain holes not as specified.	3.3.15

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TABLE II. Examination schedule - continued.

First Article	Quality Conformance	Defect	Requirement Paragraph
1	2	3	4
X		126. Drain plugs not as specified.	3.3.15
X	X	127. Treatment and painting not as specified.	3.3.16
X	X	128. Color(s) or camouflage pattern, if required, not as specified.	3.3.16
X	X	129. Fungus and moisture resistance not as specified.	3.3.17
X	X	130. Decontamination unit not as specified.	3.3.18
X	X	131. Rustproofing not as specified.	3.3.19
X	X	132. Workmanship not as specified.	3.3.20
X		133. Castings and forgings not as specified.	3.3.20.1
X		134. Metal fabrication not as specified.	3.3.20.2
X	X	135. Welding and welding personnel qualifications not as specified.	3.3.20.3
X		136. Schematics and diagrams not as specified.	3.4.13
X		137. Engine not as specified.	3.5.1
X	X	138. Coolant hoses and clamps not as specified.	3.5.1.1.1
X		139. Fan clutch not as specified.	3.5.1.1.3
X	X	140. Oil filter not as specified.	3.5.1
X	X	141. Governor not as specified.	3.5.1.2
X	X	142. Air duct not as specified.	3.5.1.3
X	X	143. Hose clamps not as specified.	3.5.1.3
X	X	144. Restriction indicator not as specified.	3.5.1.4
X	X	145. Air cleaner not as specified.	3.5.1.4
X	X	146. Engine starting system not as specified.	3.5.1.5
X	X	147. Oil sampling valves not as specified.	3.5.1.6
X	X	148. Tachometer drive not as specified (when required).	3.5.1.6
X	X	149. Electrical system not as specified.	3.5.2
X	X	150. Slaving components not as specified.	3.5.2.1
X	X	151. Lighting not as specified.	3.5.2.2
X	X	152. Front working lights not as specified.	3.5.2.2.1
X	X	153. Rear working lights not as specified.	3.5.2.2.2
X	X	154. Blackout lights not as specified.	3.5.2.2.3
X		155. Interior lighting not as specified.	3.5.2.2.4
X	X	156. Turn signals not as specified.	3.5.2.2.5
X	X	157. Wiring not as specified.	3.5.2.3
X	X	158. Batteries not as specified.	3.5.2.4
X	X	159. Battery disconnect switch not as specified.	3.5.2.5
X	X	160. Battery mounting not as specified.	3.5.2.6
X	X	161. Diagnostic connector assembly not as specified.	3.5.2.7

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TABLE II. Examination schedule - continued.

First Article	Quality Conformance	Defect	Requirement Paragraph
1	2	3	4
X	X	162. Circuit breaker not as specified.	3.5.2.8
X	X	163. Fuel system components not as specified.	3.5.3.1
X	X	164. Fuel tanks not as specified.	3.5.3.2
X	X	165. Exhaust system not as specified.	3.5.4
X		166. Transmission housing guard not as specified.	3.5.5.1
X		167. Automatic/powershift transmission not as specified (when furnished).	3.5.5.1.1
X		168. Clutch not as specified (when furnished).	3.5.5.1.2.1
X		169. Power take-off provisions not as specified.	3.5.5.2
X		170. Differentials not as specified.	3.5.7.1
X		171. Axle venting not as specified.	3.5.7.2.1
X		172. Interaxle differential not as specified (when furnished).	3.5.7.2.1
X	X	173. Suspension not as specified.	3.5.7.3
X		174. Wheels and rims not as specified.	3.5.8
X	X	175. Tires not as specified.	3.5.8.1
X	X	176. Spare tire and wheel assembly not as specified.	3.5.8.2
X	X	177. Tire and wheel assembly not balanced.	3.5.8.3
X		178. Service brakes not as specified.	3.5.9
X		179. Parking brake not as specified.	3.5.9.1
X		180. Air storage reservoir not as specified.	3.5.9.2
X	X	181. Air system accessories not as specified.	3.5.9.3
X	X	182. Trailer brake control system not as specified.	3.5.9.4
X	X	183. Brake hoses not as specified.	3.5.9.5
X		184. Cab and operator's compartment not as specified.	3.5.10
X	X	185. Gauges and instruments not as specified.	3.5.10.1
X	X	186. Accessories not as specified.	3.5.10.2
X	X	187. Radio mounting provisions not as specified.	3.5.10.3
X		188. Steering not as specified.	3.5.11
X		189. Toolbox not as specified.	3.5.12
X		190. Toolbox insert not as specified.	3.5.12.1
X		191. Restraining straps not as specified.	3.5.12.2
X	X	192. Other equipment not as specified.	3.5.12.3
X		193. Controls and operating mechanism not as specified.	3.5.13
X		194. Lines and fittings not as specified.	3.5.14

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TABLE II. Examination schedule - continued.

First Article	Quality Conformance	Defect	Requirement Paragraph
1	2	3	4
X	X	195. Hydraulic fluids not as specified.	3.5.15.1
X		196. Ports, fittings, and connections not as specified.	3.5.15.2
X		197. Hydraulic lines not routed as specified.	3.5.15.3
X	X	198. Hydraulic hose and hose assemblies not as specified.	3.5.15.3.1
X		199. Hydraulic tubing not as specified.	3.5.15.3.1
X		101a. Quick disconnect couplings not as specified.	3.5.15.4
X		102a. Attachment couplings not as specified.	3.5.15.4.1
X		103a. Auxiliary tool couplings not as specified.	3.5.15.4.2
X		104a. Hydraulic pump flanges and shafts not as specified.	3.5.15.5
X		105a. Hydraulic oil filter not as specified.	3.5.15.6
X	X	106a. Hydraulic reservoir not as specified.	3.5.15.7
X		107a. Hydraulic control valves not as specified.	3.5.15.8
X		108a. Float position not as specified.	3.5.15.8
X		109a. Hydraulic relief valves not as specified.	3.5.15.9
X		110a. Hydraulic pump main relief valve not as specified.	3.5.15.9.1
X		111a. Auxiliary relief valves not as specified.	3.5.15.9.2
X		112a. Cylinders not as specified.	3.5.15.10
X		113a. Diagnostic port not as specified.	3.5.15.11
X	X	114a. Contamination level not as specified.	3.5.15.12
X		115a. Pintle not as specified.	3.5.16
X	X	116a. Trailer safety chains provisions not as specified.	3.5.17
X		117a. Attachments not as specified.	3.6
X		118a. Auxiliary tools not as specified.	3.7
X		119a. Hydraulic hose reel not as specified.	3.7.5
X	X	120a. Winterized tractor not as specified (when furnished).	3.8
<u>MINOR</u>			
X		201. Vehicle Weight Classification Sign Kit not as specified.	3.3.12
X	X	202. Stenciling not as specified.	3.3.13
X	X	203. Instruction, caution, identification, operating, and data plates not as specified.	3.3.14

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4.5.2 Tests.

4.5.2.1 Test conditions. Prior to test, the tractor(s) shall be lubricated with oils and greases specified in 3.3.9. Oils shall be those designated for use in the ambient temperature at the place of test. Unless otherwise specified, tests shall be performed without shelter and at the climatic conditions existing at the time and place of test. All lights shall be turned on during all operational tests. Only that maintenance established by the contractor and submitted as scheduled maintenance prior to commencement of the tests, shall be performed during the tests. Unless otherwise specified herein, the test area shall be examined to determine that there are not obstructions which may cause interference to raising any attachment to its maximum height in any position. Prior to and throughout the testing, the safety, health and human factors aspects of the tractor shall be evaluated. The tractor shall be checked prior to and during the tests to determine the following:

- a. That coolant and lubrication systems are full.
- b. Adjust clutches and brakes in accordance with the manufacturer's instruction manual. Inspection shall be made to insure that there is no dragging of the clutches or brakes with the controls in the disengaged position.
- c. Examine all rotating parts, attachment linkages and attachment transport locking devices to insure that there is not rubbing interference.

4.5.2.2 Test schedule. Tests shall be conducted in accordance with 4.3.2 and 4.4.2.

TABLE III. Test schedule.

First Article	Quality Conformance	Defect	Test Para.	Requirement Para.
1	2	3	4	5
X	X	Production run-in.	4.5.2.3	
X		Noise level.	4.5.2.4	3.3.2
X		Horn sound level.	4.5.2.4	3.3.6
X	X	Dimensions.	4.5.2.5	3.3.8.5
X	X	Overall clearance.	4.5.2.6	3.3.8.3
X		Curb clearance circle.	4.5.2.7	3.4.3
X		Nuclear-biological-chemical (NBC) environment.	4.4.2.8	3.3.11
X		Reserve tractive ability.	4.5.2.9	3.4.2
X		Tractor speeds.	4.5.2.10	3.4.1.2
X		Maximum speed.	4.5.2.11	3.4.1.3
X		Gradeability.	4.5.2.12	3.4.1.1
X		Side slope operation.	4.5.2.13	3.4.4

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TABLE III. Test schedule - continued.

First Article	Quality Conformance	Defect	Test Para.	Requirement Para.
1	2	3	4	5
X		Service brakes.	4.5.2.14	3.5.9
X		Parking brake.	4.5.2.15	3.5.9.1
X		Fording.	4.5.2.16	3.4.5
X		Parachute suspension provisions.	4.5.2.17	3.4.7.3
X		Tiedown provisions.	4.5.2.18	3.4.7.2
X		Extraction provision.	4.5.2.19	3.4.7.5.1
X		Slinging provisions.	4.5.2.20	3.4.7.1
X		Rail impact.	4.5.2.21	3.4.7.6
X		Internal transport.	4.5.2.22.1	3.4.7
X		External helicopter transport.	4.5.2.22.2	3.4.7.4
X		Rail transport.	4.5.2.23	3.4.7
X		Airdrop.	4.5.2.24	3.4.7.5
X		Emergency steering.	4.5.2.25	3.5.11.1
X	X	Break-in.	4.5.2.26	
X	X	Loader break-in.	4.5.2.27	3.6.1.2
X	X	Backhoe break-in.	4.5.2.28	3.6.2.2
X	X	Forklift break-in.	4.5.2.29	3.6.1.3
X	X	Crane break-in.	4.5.2.30	3.6.2.3
X		Reliability.	4.5.2.31	3.4.8
X		Maintainability.	4.5.2.32	3.4.10
X		Durability.	4.5.2.33	3.4.9
X		Cold start.	4.5.2.34	3.4.11
X		Electromagnetic interference.	4.5.2.35	3.4.12
X		Electromagnetic pulse.	4.5.2.35	3.4.13
X		Cooling test.	4.5.2.36	3.5.1.1
X		Air cleaner.	4.5.2.37	3.5.1.4
X		Fuel consumption.	4.5.2.38	3.5.3.2
X		Powershift transmission.	4.5.3.39	3.5.5.1.1
X		Attachment couplings.	4.5.2.40	3.5.15.4.1
X		System filtration.	4.5.2.41	3.5.15.6
X	X	Contamination level.	4.5.2.42	3.5.15.12
X	X	Hydraulic leakage	4.5.2.42	3.5.15.13
X		Cylinders.	4.5.2.43	3.5.15.10
X		Backhoe performance.	4.5.2.44	3.6.2.2.2 thru 3.6.2.2.2.8
X		Backhoe reliability.	4.5.2.45	
X		Loader performance.	4.5.2.46	3.6.1.2.1 thru 3.6.1.2.1.13
X		Loader reliability.	4.5.2.47	

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TABLE III. Test schedule - continued.

First Article	Quality Conformance	Defect	Test Para.	Requirement Para.
1	2	3	4	5
X		Forklift performance.	4.5.2.48	3.6.1.3.1 thru 3.6.1.3.1.6
X		Forklift reliability.	4.5.2.49	
X		Crane performance.	4.5.2.50	3.6.2.3.1 thru 3.6.2.3.1.5
X		Crane reliability.	4.5.2.51	
X		Hydraulic percussive hammer test.	4.5.2.52	3.7.1
X		Hydraulic rotary percussive hammer test.	4.5.2.53	3.7.2
X		Hydraulic chain saw test	4.5.2.54	3.7.3
X		Hydraulic impact wrench test	4.5.2.55	3.7.4
X		Mobility.	4.5.2.56	3.4.6
X		Travel mode reliability.	4.5.2.57	3.4.6
X		Cab heater and defroster.	4.5.2.58	3.8.2 and 3.5.10.2
X		Cold test (when winterized tractor is specified).	4.5.2.59	3.8
X		Fenders.	4.5.2.60	3.3.4
X	X	DCA not as specified.	4.5.2.61 and 4.5.2.61.1	3.5.2.7
X		Radiometric spectral test.	4.5.2.62	3.5.2.2
X		Human factors test.	4.5.2.63	3.3.1.2
X		Trailer towing test.	4.5.2.64	3.4.14

4.5.2.3 Production run-in. Start and operate each tractor for not less than one-half hour to assure operation of all components and to allow for minor adjustments. Start and stop the engine not less than five times. Operate all attachment controls for five minutes. Hold each hydraulic control in the actuation position until the hydraulic system reaches relief valve pressure at least five times. Make not less than five abrupt panic stops from a speed not less than 25 mph using the service brakes. Operate the tractor at least two times through a figure eight steering course at the maximum safe speed. Release and reapply the parking brake not less than five times. Turn on all implement working lights for the duration of the run-in. Evidence of any deficiency, need for adjustment or maintenance, malfunction of any control or evidence of leakage of fuel, lubricants, or hydraulic fluid shall be cause for rejection of the tractor by the Government until corrected to the contracting officer's satisfaction. The Government may require additional

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run-in after deficiencies are corrected. Any defect found during production run-in shall be prima facie evidence that tractors previously accepted are similarly defective unless evidence, satisfactory to the contracting officer, is furnished by the contractor that they are not similarly defective.

4.5.2.4 Noise level test. Noise levels shall be measured in accordance with MIL-STD-1474 requirements and reported in the format indicated by MIL-STD-1474, figure 7. As a minimum, noise levels shall be measured when equipment is operating under full load. MIL-STD-1474, 5.1.2.1.4 contours shall be taken at not fewer than 12 equal (horizontal) arc increments; one increment shall include data from the noisiest position. Additionally, the noise level at the typical operating position shall be provided as dB(A) level. Failure to comply with MIL-STD-1474 provisions shall constitute failure of this test.

4.5.2.5 Dimensions. The dimensions of the tractor shall be determined in accordance with SAE J1234. The weight of the tractor shall be measured with a scale calibrated within six months of the test. Nonconformance to the requirements of 3.3.8 shall constitute failure of this test.

4.5.2.6 Overall clearance. The angle of approach and angle of departure shall be tested in accordance with SAE J689. A tractor shall be tested by climbing and 18-inch step in both forward and reverse directions. The vertical step shall be negotiated without damage to any portion of the tractor. Nonconformance to the requirements of 3.3.8.3 shall constitute failure of this test.

4.5.2.7 Curb clearance circle. The curb clearance circle of the tractor per SAE J695 shall be determined. Nonconformance to 3.4.3 shall constitute failure of this test.

4.5.2.8 Nuclear-Biological-Chemical (NBC) environment. Wearing the protective ensemble specified in 3.3.11, functionally operate all the tractor, attachment and auxiliary tool controls. Nonconformance to the requirements of 3.3.11 shall constitute failure of this test.

4.5.2.9 Reserve tractive ability. The reserve tractive ability of the tractor shall be tested in accordance with SAE J872. Nonconformance to 3.4.2 shall constitute failure of this test.

4.5.2.10 Tractor speed. The travel speed of the tractor shall be determined by a fifth wheel. Drive the tractor with and without a towed load on a dry class I good road (per SAE J688 and J1349) on a 3 percent grade. Nonconformance to the requirements on 3.4.1.2 shall constitute failure of this test.

4.5.2.11 Maximum speed. The travel speed of the tractor shall be determined by a fifth wheel. Drive the tractor on a level surface to obtain and maintain top speed. One run shall be conducted in each direction. The travel speed shall be the average of the two test runs. Nonconformance to the requirements of 3.4.1.3 shall constitute failure of this test.

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4.5.2.12 Gradeability. Drive the tractor forward up and forward down the required longitudinal slope. Drive the tractor forward on the slope and stop, hold the tractor and then continue on the slope. Nonconformance to the requirements on 3.4.1.1 shall constitute failure of this test.

4.5.2.13 Slide slope operation. Drive the tractor with all attachments in the travel position straight across the required side slope for at least three tractor lengths, then turn the tractor in various degrees of direction up and down while crossing the slope. Stop the tractor, then drive the tractor back across the slope. Repeat this test with the opposite side of the tractor up hill. Nonconformance to the requirements of 3.4.4 shall constitute failure of this test.

4.5.2.14 Service brakes. The service brakes shall be tested in accordance with MIL-STD-1180. Nonconformance to the requirements of 3.5.9 shall constitute failure of this test.

4.5.2.15 Parking brake. The parking brake shall be tested for compliance with FMCSR 393.41. Nonconformance to the requirements of 3.5.9.1 shall constitute failure of this test.

4.5.2.16 Fording. Prior to the test, warm the tractor to its normal operating temperature. Oil samples shall be taken from all lubricant reservoirs below the fording line. Analyze these samples for water content. Drive the tractor into a water reserve. Drive the tractor in the water to the specified depth (see 3.4.5). Drive the tractor forward and reverse slowly for 15 minutes, then drive the tractor from the water and operate on land in high gear for 15 minutes. Repeat this cycle five times. Stop and start the engine at least two times while in the water during the last cycle. Upon completion of the fording, the tractor shall be parked for one hour, then oil samples shall be taken from all lubricant reservoirs below the fording line. Nonconformance to the requirements of 3.4.5 shall constitute failure of this test.

4.5.2.17 Parachute suspension provisions. Each parachute suspension provision shall be tested to prove conformance to 3.4.7.3. Weld failure or permanent deformation of the tractor or its suspension provision shall constitute failure of this test.

4.5.2.18 Tiedown provisions. Each tiedown provision shall be tested to prove conformance to 3.4.7.2. Weld failure or permanent deformation of the tractor or the tiedown provisions shall constitute failure of this test.

4.5.2.19 Extraction parachute provision. The extraction parachute provision shall be tested to prove conformance to 3.4.7.5.1. Weld failure or permanent deformation of the tractor or the extraction provision shall constitute failure of this test.

4.5.2.20 Slinging provisions. Each slinging provision shall be tested to prove conformance to 3.4.7.1. The test procedure shall be as follows:

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- a. Lift the tractor and hold in suspension in its normal travel position using slings that converge not more than 24 feet above the lowest extremity of the tractor. Determine the force and angles of application for each provision. Measure the clearance between each sling and the tractor.
- b. Restrain the tractor by anchoring the main frame and subject each slinging provision to a force equal to the working load specified in MIL-STD-209. This force shall be applied in the direction as determined in (a) above. Hold each load for a minimum of 90 seconds.

Nonconformance to 3.4.7.1, weld failure, or permanent deformation of the tractor or the slinging provisions shall constitute failure of this test.

4.5.2.21 Rail impact test. The tractor shall be tested in accordance with MIL-STD-810 to prove conformance to 3.4.7.6. The rail cars are to be equipped with standard friction draft gears as defined by the AAR, (without coupler cushioning devices), and conventional underframes. Inability to meet the requirements of 3.4.7.6, any permanent deformation or failure or inoperability after test, shall constitute failure of this test.

4.5.2.22 Air transport.

4.5.2.22.1 Internal transport. The tractor shall be measured to prove conformance to 3.3.8. Disassembly and reassembly of the tractor shall be in accordance with the contractor's instructions. Nonconformance to the requirements of 3.4.7 and 3.4.7.5 shall constitute failure of this test. Aircraft load testing shall be conducted if necessary to verify conformance to 3.3.8.4.

4.5.2.22.2 External helicopter transport. The tractor shall be tested to the requirements of 3.4.7.4. Nonconformance to 3.4.7.4 shall constitute failure of this test.

4.5.2.23 Rail transport. The tractor shall be tested to prove conformance to 3.4.7. Load the tractor on a railroad flat car in accordance with 3.4.7, and pass the railroad car through a mock-up of the Gabarit International De Chargement gauge, see figure 1. Inability to pass the tractor through the gauge without interference shall constitute failure of this test.

4.5.2.24 Airdrop. The tractor shall be subjected to simulated airdrop impact test in accordance with MIL-STD-669 to prove conformance to 3.4.7.5. This test will be conducted by the Government at a Government facility, however, acceptance of the first article models will be dependent of the successful completion of this test. The test shall consist of the following:

- a. Rig the tractor in accordance with MIL-STD-669 and confirm that the rigged weight and dimensions conform to the requirements of MIL-STD-1791.
- b. Drop test the tractor in accordance with MIL-STD-669.

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- c. After the first drop, the tractor shall be de-rigged, examined, started, and driven forward and backward a few feet, and all controls shall be actuated.
- d. Re-rig and drop test the tractor a second time in accordance with MIL-STD-669.
- e. After de-rigging, tractor shall be demonstrated for 8 hours performing its intended function(s).

Failure to meet the weight and dimensional requirements of MIL-STD-1791, weld failure, leakage, permanent deformation of any structural member or component, inability to reassemble to components removed for airdrop, or inability of the tractor to perform its intended functions shall constitute failure of this test.

4.5.2.25 Emergency steering. The tractor shall be tested in accordance with SAE J53. Nonconformance to the requirements of 3.5.11.1 shall constitute failure of this test.

4.5.2.26 Break-in. Each type I tractor shall successfully complete 4.5.2.27 and 4.5.2.28 prior to reliability and quality conformance testing. Each type II tractor shall successfully complete 4.5.2.29 and 4.5.2.30 prior to reliability and quality conformance testing.

4.5.2.27 Loader break-in. Prior to the start of reliability testing, the loader attachment shall be operated for 1 hour. During this test, any adjustments or corrections of leaks can be made. Only structural failure will constitute failure of this test.

4.5.2.28 Backhoe break-in. Prior to the start of reliability testing, the backhoe attachment shall be operated for 1 hour. During this test, any adjustments or corrections of leaks can be made. Only structural failure will constitute failure of this test.

4.5.2.29 Forklift break-in. Prior to the start of reliability testing, the forklift attachment shall be operated for 1 hour handling the minimum load at a 24-inch load center. During this test, any adjustment or corrections of leaks can be made. Only structural failure shall constitute failure of this test.

4.5.2.30 Crane break-in. Prior to the start of reliability testing, the crane attachment shall be operated for 1 hour lifting the maximum allowable weight at the maximum reach. During this test, any adjustment or corrections of leaks can be made. Only structural failure shall constitute failure of this test.

4.5.2.31 Reliability test. The four first article tractors shall be tested in accordance with the schedules given in tables IV and V as applicable. No more than 32 failures shall be allowed for types I and II tractors. Tractors A and B per type shall go through the testing cycle in tables IV and V five times, accumulating 1/5 of the total hours each time through. Tractors C and D per type shall complete the hours given in each column in tables IV and V as

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applicable before proceeding to the next test in the next column. Tractor A shall be tested utilizing fuel conforming to MIL-T-83133. Tractors B, C, and D shall be tested utilizing fuel conforming to VV-F-800.

TABLE IV. Type I tractors.

Tractor	Test paragraph			Total
	Backhoe 4.5.2.45	Loader 4.5.2.47	Travel 4.5.2.57	
A	450	110	90	650
B	450	110	90	650
C	560	---	90	650
D	---	325	325	<u>650</u> 2600

TABLE V. Type II tractors.

Tractor	Test paragraph			Total
	Forklift 4.5.2.49	Crane 4.5.2.51	Travel 4.5.2.57	
A	450	150	50	650
B	450	150	50	650
C	600	---	50	650
D	---	450	200	<u>650</u> 2600

4.5.2.31.1 Failures. Of the allowed failures per tractor type, no more than 11 failures shall be permitted on any one tractor. No more than 2 occurrences of the same failure shall be permitted on any one tractor and no more than 6 occurrences overall shall be permitted. Failures are defined in 6.6.1.

4.5.2.32 Maintainability. During reliability testing the maintenance ratio shall not exceed 0.36. Connect the STE/ICE-R to record all parameters which are to be measured in the transducer kit (TK) mode. Nonconformance to 3.4.10 or 3.3.15 or inaccessibility of test points in accordance with 3.5.2.7 shall constitute failure of this test.

4.5.2.33 Durability. Replacement or overhaul of any of the following components during the test will constitute a failure of durability (see 3.4.9).

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- a. Engine.
- b. Transmission.
- c. Transfer case.
- d. Differentials.
- e. Primary hydraulic/hydrostatic pumps.

4.5.2.34 Cold start. Service the tractor with antifreeze, lubricants, fuel and hydraulic oil so specified for operation at -25 °F. Subject the tractor to a temperature of -25 °F until the battery temperature has stabilized; then start the engine and operate for 15 minutes to determine conformance to 3.4.11. Failure to start the engine in five minutes or operate all tractor controls to include the attachments and auxiliary tools in 15 minutes shall constitute failure of this test. This test may be conducted in conjunction with the cab heater and defroster test (see 4.5.2.58).

4.5.2.35 Electromagnetic interference. The tractor shall be tested in accordance with MIL-STD-462. Nonconformance to 3.4.12 shall constitute failure of this test.

4.5.2.35.1 Electromagnetic pulse (EMP). The Government will evaluate the schematics and electrical diagrams to determine possible problem areas that may be encountered on the end item. A preproduction tractor shall be subjected to non-destructive EMP testing by the Government at a Government facility.

4.5.2.36 Cooling test. Operate the tractor in ambient air temperature of 120 °F at 85 percent of the rated horsepower, until the temperature in the radiator (water cooled) or cylinder head temperature (air cooled) is stabilized. Nonconformance to 3.5.1.1 shall constitute failure of this test.

4.5.2.37 Air cleaner. The air cleaner element shall be tested in accordance with MIL-F-46736. Nonconformance to 3.5.1.4 shall constitute failure of this test.

4.5.2.38 Fuel consumption. The fuel consumption shall be measured on the type I tractor while backhoe excavating in accordance with 4.5.2.45 and for the type II tractor while testing the forklift in accordance with 4.5.2.49 to prove conformance to 3.5.3.2. Nonconformance to 3.5.3.2 shall constitute failure of this test.

4.5.2.39 Automatic/powershift transmission. With transmission in highest gear, stall the automatic/powershift transmission when running the engine at full rpm for 30 seconds. Nonconformance to 3.5.5.1.1 shall constitute failure of this test.

4.5.2.40 Attachment couplings. The quick disconnect couplings shall be tested to prove conformance with 3.5.15.4.1. Nonconformance to 3.5.15.4.1 shall constitute failure of this test.

4.5.2.41 System filtration. Pressurize the filter housing to not less than the minimum proof pressure (100 psi for return line filters or 1-1/2 times

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maximum system pressure for pressure filters). Hold the pressure for not less than 60 seconds and examine for leaks. Install a new element in the filter housing. Establish maximum flow through the filter at an oil temperature at 150 ± 5 °F. Increase the upstream pressure to 10 psi more than determined above. Observe the DAP indicator. Increase upstream pressure until the indicator enters the bypass area or until bypass flow exceeds 5 percent of the maximum system flow, whichever occurs first. Failure to meet the requirements of 3.5.15.6 shall constitute failure.

4.5.2.42 Contamination levels and leakage. Connect the hydraulic lines at the cylinders to bypass those cylinders whose capacity is less than one-half of the connecting line volume. Run the engine at no-load governed speed, pumping the oil through each circuit for not less than 5 minutes. The particle counter used for evaluation of samples shall be calibrated in accordance with ANSI recommended standard method for calibration of liquid automatic particle counters using "ac" fine test dust (ANSI B93.28). The required counts shall be the average of not less than three consecutive counts. Samples may be taken from the reservoir or upstream of the filter(s) used for cleanup. Connect the counter sensor to the system, using a bypass line and a branch line. The bypass line shall connect to the system; have a flow rate not less than 5 times the sensor. The flow sensor shall tee into the bypass line and shall be not more than 12 inches in length. Any flow restriction devices shall be placed downstream of the particle counter sensor. Start engine and operate at not less than 1000 rpm. Record each function of the system for 5 minutes continuously through full strokes and at maximum rates. Perform the particle count described above. Failure to meet the requirement of 3.5.15.12 shall constitute failure of this test. An external leakage test shall be conducted at the conclusion of the schedule of tests indicated in table III. Observe and record accumulated leakage at practical intervals over a twelve hour period following the test(s). Leakage greater than 3.5.15.13 shall be cause for rejection.

4.5.2.43 Cylinders. The cylinders shall be tested in accordance with SAE J1195. Nonconformance to 3.5.15.10 shall constitute failure of this test.

4.5.2.44 Backhoe performance. The backhoe performance shall be tested in accordance with SAE J31, SAE J49 and SAE J296 to determine compliance with the requirements for digging depth (see 3.6.2.2.3), loading height (see 3.6.2.2.4), digging force-bucket cylinder (see 3.6.2.2.5), digging force dipperstick cylinder (see 3.6.2.2.6), boom lift capacity (see 3.6.2.2.7), dipperstick lift capacity (see 3.6.2.2.8), swing arc (see 3.6.2.2.9), and stability (see 3.6.2.2.10). Nonconformance to the requirements of 3.6.2.2.2. shall constitute failure of this test.

4.5.2.45 Backhoe reliability. The excavating reliability of the tractor as specified in 4.5.2.31 using the backhoe attachment shall be demonstrated by digging trenches in undisturbed soil at maximum depth, one bucket width wide. No trench shall be shorter than 25 feet. The backhoe must achieve a production rate of not less than 27 cubic yards per hour in clay-loam or clay-gravel (class GM and SM) soil.

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4.5.2.46 Loader performance. The loader performance shall be tested in accordance with SAE J732 and SAE J742 to determine compliance with the requirements for bucket capacity (see 3.6.1.2.1.1), dump angle (see 3.6.1.2.1.2), dump height (see 3.6.1.2.1.3), loader reach (see 3.6.1.2.1.4), operational load (see 3.6.1.2.1.5), breakout force (see 3.6.1.2.1.6), raise time (see 3.6.1.2.1.7), lowering time (see 3.6.1.2.1.8), digging depth (see 3.6.1.2.1.9), tipping load (see 3.6.1.2.1.10), bucket width (see 3.6.1.2.1.11), and stability (see 3.6.1.2.1.13). Nonconformance to the requirements of 3.6.1.2.1 shall constitute failure of this test.

4.5.2.47 Loader reliability. The loader shall be tested as follows to determine the loader reliability as specified in 4.5.2.31 while excavating and handling soils.

- a. Seventy percent of test hours per tractor in accordance with 4.5.2.31 shall be digging pits 100 feet long x 8 feet wide x 1-1/2 feet deep in undisturbed soil.
- b. Using bank run gravel or sand, the loader shall load dump trucks, having sideboard height of not less than 86 inches above ground level, for 10 percent of the test hours per tractor in accordance with 4.5.2.31.
- c. Using bank run gravel or sand, the loader shall move stockpiles with capacity loads a distance of not less than 100 feet over an improved surface, for 10 percent of the test hours per tractor, in accordance with 4.5.2.31.
- d. Ten percent of the test hours in accordance with 4.5.2.31 shall be utilized backfilling trenches dug during the backhoe reliability testing.

4.5.2.48 Forklift performance. The forklift performance shall be tested to determine compliance with the requirements for lift capacity (see 3.6.1.3.1.1), lift height (see 3.6.1.3.1.2), fork rotation (see 3.6.1.3.1.3), mast tilt (see 3.6.1.3.1.4), fork overload (see 3.6.1.3.1.5), and stability (see 3.6.1.3.1.6). Nonconformance to 3.6.1.3 shall constitute failure of this test.

4.5.2.49 Forklift reliability. The forklift attachment shall be tested by simulating loading and unloading palletized cargo weighing 4000 pounds for 70 percent of the hours specified in 4.5.2.31 on an improved level surface. Palletized loads of 4000 pounds shall be carried on an improved surface course for the remaining hours.

4.5.2.50 Crane performance. The crane performance shall be tested to determine compliance with the requirements for lift capacity (see 3.6.2.3.1.1), lift height (see 3.6.2.3.1.2), rotation (see 3.6.2.3.1.3), reach (see 3.6.2.3.1.4), and stability (see 3.6.2.3.1.5). Nonconformance to 3.6.2.3 shall constitute failure of this test.

4.5.2.51 Crane reliability. The crane attachment shall be tested by handling the rated loads at different reach and lift heights for the hours specified in 4.5.2.31.

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4.5.2.52 Hydraulic percussive hammer test. The hydraulic percussive hammer shall be operated for 15 engine hours at 70 percent duty cycle (10.5 actual hours). For 5 actual hours the clay spade attachments shall be tested in undisturbed clay or clay gravel soil. For the remaining hours the Moil point accessory shall be used breaking rock or concrete. Nonconformance to 3.7.1 shall constitute failure of this test.

4.5.2.53 Hydraulic rotary percussive hammer test. The hydraulic rotary percussive hammer shall be operated for 15 engine hours at 70 percent duty cycle (10.5 actual hours) drilling holes in rock or concrete using the bits required in 3.7.2.4. Nonconformance to 3.7.2 shall constitute failure of this test.

4.5.2.54 Hydraulic chain saw test. The hydraulic chain saw shall be operated for 15 engine hours at 70 percent duty cycle (10.5 actual hours) sawing hardwood timbers or logs between 6 inches and 15 inches in diameter. Nonconformance to 3.7.3 shall constitute failure of this test.

4.5.2.55 Hydraulic impact wrench test. The hydraulic impact wrench shall be operated for 15 engine hours at 70 percent duty cycle (10.5 actual hours). Nonconformance to 3.7.4 shall constitute failure of this test.

4.5.2.56 Mobility. The tractor shall be operated to prove conformance to 3.4.6. The mobility test will be conducted by the Government. Failure to meet the requirement of 3.4.6 shall constitute failure of this test.

4.5.2.57 Travel mode reliability. A travel mode reliability operation will be conducted. This test will be conducted as follows: 15 percent of hours traveling on primary roads, 15 percent of hours traveling on secondary roads, 35 percent of hours traveling on a level cross-country course and 35 percent of traveling on a hilly cross-country course per tractor in accordance with 4.5.2.31. Failure to meet the requirement of 3.4.6 shall constitute failure of this test.

4.5.2.58 Cab heater and defroster. The cab heater and defroster shall be tested in accordance with SAE J381 and SAE J1503. Failure to meet the requirements of 3.5.10.2 and 3.8.2 shall constitute failure of this test. This test may be conducted in conjunction with the cold start test (see 4.5.2.34).

4.5.2.59 Cold tests. The tractor shall be cold soaked in a temperature controlled chamber to a temperature of -50 °F and demonstrated as follows to prove conformance to 3.8.

a. Preparation.

- (1) Insure that the tractor has been serviced with arctic coolant, fuels, lubricants and hydraulic oils.
- (2) Service Swingfire heater with arctic gasoline.
- (3) Place tractor in temperature controlled chamber.

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(4) Instrument the tractor to record as a minimum the following temperatures:

- (a) Exhaust, engine heater outlet.
- (b) Air, battery box(s), inlet, outlet, and all sides.
- (c) Air, operator's compartment, operator torso (seated positioned).
- (d) Air, operator's compartment, floor, roof, sides, (midway to top).
- (e) Air, hot water heater outlet.
- (f) Electrolyte, all battery(s).
- (g) Coolant, engine block inlet.
- (h) Coolant, engine block outlet.
- (i) Oil, engine sump and gallery.

b. Procedure.

- (1) Subject tractor to a stabilized temperature of -50 °F for 24 hours.
- (2) Bring Swingfire heater into cold chamber. Connect heater to tractor electrical power source and start heater. (After heater start disconnect from power source).
- (3) Insert heater into heat exchanger and preheat engine coolant and battery(s) for 90 minutes.
- (4) Record temperatures continuously or at intervals not greater than five minutes.
- (5) Remove heater from heat exchanger and shut off motor.
- (6) Start engine from tractor battery(s).
- (7) Start personnel heater and defrost fans 30 minutes after engine start.
- (8) One hour after heater start, record operator compartment air temperatures and check defrost.
- (9) Operate tractor steering control for 10 minutes, within the dimensional limits possible within the test chamber.
- (10) Engage and operate transmission and brake system as dimensional limits of test chamber permits.

Nonconformance to 3.8 shall constitute failure of this test.

4.5.2.60 Fenders. The fenders shall be tested to prove conformance to 3.3.4. Each fender which is used as a maintenance platform shall be tested with a 500-pound load moved along the longitudinal centerline. Permanent damage or deformation of the fender or its supporting structure shall constitute failure of this test.

4.5.2.61 DCA capability. The contractor will perform a 100 percent visual inspection of all DCA wiring harnesses prior to installation on the tractor to ensure wire and connection are free of error. After installation on the tractor test the DCA harness (reference chapter 5 of design guide for DCA) on each vehicle with a DCA tester prior to interfacing with STE/ICE-R. Nonconformance to 3.5.2.7 shall constitute failure of the DCA.

4.5.2.61.1 DCA - STE/ICE-R interface. Upon completion of inspection and tests specified in 4.5.2.61, test the DCA for all measurements specified in 3.5.2.7, using STE/ICE-R. After completion of all first article testing, the

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test shall be repeated and the results compared to the first test performed as specified in 4.5.2.2. Nonconformance to 3.5.2.7 or failure of any component or wiring in the DCA harness, which results in inability to obtain the measurements previously recorded with the STE/ICE-R shall constitute failure of this test.

4.5.2.62 Radiometric spectral test. A radiometric spectral test shall be conducted to determine conformance to 3.5.2.2.3. Nonconformance shall constitute failure to this test.

4.5.2.63 Human factors test. The tractors and attachments shall be inspected and tested by a Government human factors engineer to determine if the design is in accordance 3.3.1.2 and the other HFE requirements cited herein. Failure to conform to specified HFE requirements shall constitute failure of this test. The access provisions shall be measured to determine conformance to SAE J185. The location and operation of displays and controls shall be measured to determine conformance to SAE J209, J287, and J680. The operator and maintainer physical dimensions (anthropometric) shall be measured to determine conformance to SAE J833. The workspace dimensions at the operator enclosure shall be measured to determine conformance to SAE J899 and J154a. Dimensions of access openings required for maintenance tasks shall be measured to determine conformance to SAE J925. Visibility from the driver's station shall be measured in accordance with SAE J941 and J1050a. The visibility through the rear view mirror shall be measured in accordance with SAE J985.

4.5.2.64 Trailer towing test. The tractor shall be tested to determine conformance with the requirements of 3.4.14. Nonconformance with 3.4.14 shall constitute failure of this test.

4.6 Inspection comparison. The Government may select tractors at any time during the contract production period and subject these tractors to the examination specified in table II, and to the tests marked "X" in column 1 of table III to determine conformance to the requirements of this specification. The inspection will be performed by the Government, at a site selected by the Government, and will not include the previously inspected initial production tractors. In addition to any test specified as part of the inspection comparison, the Government reserves the right to conduct any and all other tests contained in this specification as part of the inspection comparison and failure of such tests shall have the same effect as failure of those tests specified as inspection comparison.

4.6.1 Inspection failure. Failure of an inspection comparison tractor to meet any requirement specified herein during and as a result of the examination and tests specified in 4.6 shall be cause for rejection of the inspection comparison tractor(s) and shall be cause for refusal by the Government to continue acceptance of production tractors until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiencies. Correction of such deficiencies shall be accomplished by the contractor at no cost to the Government on tractors yet to be produced under the contract. Any deficiencies found as a result of the

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- (4) Instrument the tractor to record as a minimum the following temperatures:

- (a) Exhaust, engine heater outlet.
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- (d) Air, operator's compartment, floor, roof, sides, (midway to top).
- (e) Air, hot water heater outlet.
- (f) Electrolyte, all battery(s).
- (g) Coolant, engine block inlet.
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- (9) Operate tractor steering control for 10 minutes, within the dimensional limits possible within the test chamber.
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4.5.2.61.1 DCA - STE/ICE-R interface. Upon completion of inspection and tests specified in 4.5.2.61, test the DCA for all measurements specified in 3.5.2.7, using STE/ICE-R. After completion of all first article testing, the

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test shall be repeated and the results compared to the first test performed as specified in 4.5.2.2. Nonconformance to 3.5.2.7 or failure of any component or wiring in the DCA harness, which results in inability to obtain the measurements previously recorded with the STE/ICE-R shall constitute failure of this test.

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4.6.1 Inspection failure. Failure of an inspection comparison tractor to meet any requirement specified herein during and as a result of the examination and tests specified in 4.6 shall be cause for rejection of the inspection comparison tractor(s) and shall be cause for refusal by the Government to continue acceptance of production tractors until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiencies. Correction of such deficiencies shall be accomplished by the contractor at no cost to the Government on tractors yet to be produced under the contract. Any deficiencies found as a result of the

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inspection comparison will be considered prima facie evidence that all tractors accepted prior to the completion of the inspection comparison are similarly deficient unless evidence to the contrary is furnished by the contractor and such evidence is acceptable to the contracting officer. Where tractors previously accepted by the Government are determined to be deficient, the contractor will negotiate with the Government to determine the method of correction.

4.7 Inspection of packaging.

4.7.1 Quality conformance pack.

4.7.1.1 Unit of product. For the purpose of inspection, a completed pack prepared for shipment shall be considered a unit of product.

4.7.1.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

4.7.1.3 Examination. Each tractor, prepared for shipment, shall be examined for the following defects.

122a. Preservation not as specified for level A or C (see 5.1).

123a. Packing not as specified for level A, B or C (see 5.2).

124a. Marking incorrect, illegible or missing (see 5.3).

5. PACKAGING.

5.1 Preservation. Preservation shall be level A or C as specified (see 6.2).

5.1.1 Level A. Each complete tractor with components and attachments shall be preserved in accordance with level A preservation and packaging requirements of MIL-T-3351.

5.1.2 Level C. Each complete tractor with components, attachments and all items issued with the tractor shall be preserved in accordance with MIL-P-116, method III. In addition, the following specific requirements shall be accomplished. Items with critical surfaces required for fit or function shall be provided protection by the use of preservative coatings, volatile corrosion inhibitors, or desiccated packs. Items requiring protection from physical damage to surfaces, or which are fragile by nature shall be protected by wrapping, pack compartmentalization, or cartonizing of the individual item. If a liquid cooling system is furnished, the cooling system shall be filled with a fresh clean solution of 50 percent water and 50 percent antifreeze conforming to MIL-A-46153, and a tag attached indicating the temperature to which the cooling system can be subjected before damage. All lubrication reservoirs and sumps, shall be filled to the operating level with the grade of military lubricant designated for use in the temperature range at the shipping destination. A tag shall be attached in a conspicuous location to indicate which military lubricant has been used, the temperature range of lubricant used, and grade of lubricant used. A deprocessing guide shall be furnished

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indicating in detail the preservation materials to be removed and any other servicing required prior to placing the tractor in operation.

5.2 Packing.

5.2.1 Level A. Each complete tractor, preserved as specified in 5.1, shall be packed in accordance with the level A packing requirements of MIL-T-3351, as specified for type II, unboxed (mobile) shipment.

5.2.2 Level B. Each complete tractor, preserved as specified in 5.1, shall be packed in accordance with level B packing requirements of MIL-T-3351, as specified for type II, unboxed (mobile) shipment.

5.2.3 Level C. Each complete tractor, preserved as specified in 5.1, shall be packed in accordance with level C requirements of MIL-T-3351.

5.3 Marking. All markings shall be in accordance with MIL-STD-129, including those specified in the contract or purchase order (see 6.2).

6. NOTES

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

6.1 Intended use. The type I tractor is intended to be used primarily for excavating, digging, locating, stripping, leveling, stockpiling, and transferring of earth and aggregate. The type II tractor is intended to provide a lightweight materials handling capability with the mobility to convoy with supported wheel units.

6.2 Acquisition documents. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. Type of tractors required (see 1.2)
- c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- d. When first article preproduction and initial production inspections are not required (see 3.2).
- e. When the type I tractor is required to be equipped with radio equipment (see 3.3.7).
- f. Registration numbers for stencilling (see 3.3.13).
- g. When identification plate data other than that specified is required (see 3.3.14).
- h. When topcoat color shall not be camouflage green 383 (see 3.3.16).
- i. When the tractor shall be overcoated with camouflage patterns (see 3.3.16).
- j. When camouflage pattern data shall be provided (see 3.3.16.1).
- k. When a tachometer drive is required (see 3.5.10.1).
- l. When radio power is required by the electrical system (see 3.5.2).
- m. When DCA not required (see 3.5.2.7).

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- n. When radio mounting provisions are required (see 3.5.10.3).
- o. When a rifle mounting kit is required (see 3.5.10.4).
- p. Time frame for submission of recommended tool list (see 3.5.12.3d).
- q. When backhoe ripper bucket is required (see 3.6.2.2.1).
- r. When winterized tractor is required (see 3.8).
- s. When Swingfire heater is required (see 3.8.2).
- t. Government-furnished property (see 3.9).
- u. Government-loaned property (see 3.10).
- v. Levels of preservation and packing required (see 5.1).
- w. When powertrain component vendor certification is required (see 3.1 and 6.12).
- x. Any special marking (see 5.3).
- y. When a transportability report is required (see 3.4.7 and 6.12).

6.3 Consideration of data requirements. The following data requirements must be listed, as applicable, on the Contract Data Requirements List (DD Form 1423) when this specification is applied on a contract, in order to obtain the data, except where DoD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference Paragraph</u>	<u>DID Number</u>	<u>DID Title</u>
a. 3.3.16	DI-MISC-80192	Color paragraph prints
b. 3.3.16	DI-MISC-8076	Camouflage line art data
c. 3.3.2	DI-H-1336	Noise Measurement Report

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management System and Data Requirements Control List (AMSDL), must be reached to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 Vehicle weight classification data sheet. The contractor will complete and submit the vehicle weight classification data sheet as shown in figure 2.

6.5 First article. When a first article inspection is required, the item(s) shall be preproduction models, initial production models, or both (see 6.2). The first article should consist of four or more units. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of the first article test results and disposition of the first article tractors. Invitation for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should

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not submit alternate bids unless specifically requested to do so in the solicitation.

6.6 Definitions.

6.6.1 Failure. A failure is defined as any malfunction which cannot be repaired in 15 minutes by the operator with on board tools and equipment which prevents performing backhoe, loader, forklift, crane or travel; or any other unscheduled maintenance action which requires more than one hour to complete. All such malfunctions shall be considered failures except for:

- a. Installation damage.
- b. Accident or mishandling.
- c. Failure of the test facility or test-peculiar instrumentation.
- d. Equipment failures caused by an externally applied overstress condition, in excess of the approved test requirements.
- e. Normal operating adjustments (nonfailures) specified in the approved equipment operating instructions.
- f. Secondary failures within the equipment, which are directly caused by nonrelevant or relevant primary failures. The secondary failures must be proved to be dependent on the primary failure.
- g. Failures caused by human errors.
- h. Normal wearout of cutting edges, teeth, and tires, and flat tires due to puncture. The contractor shall indicate normal wear characteristics prior to testing.

6.6.2 Maintenance ratio. The maintenance ratio is the ratio of active maintenance manhours scheduled and unscheduled, to the total operational test hours.

6.6.3 Manpower integration (MANPRINT). MANPRINT is the comprehensive management and technical program to improve total system (soldier and hardware) performance by the continuous integration of manpower, personnel, training, human factors engineering, system safety, and health hazard considerations throughout the material development and acquisition process.

6.7 Government-furnished equipment. The contracting officer should arrange to furnish the property specified in 3.9.

6.8 Government-loaned equipment. The contracting officer should arrange to loan the property specified in 3.10.

6.9 Component ratings. All components shall be used within the manufacturer's current published ratings for this application. When applicable published ratings are not available, component manufacturer's verification or ratings must be submitted by the prime contractor to the contracting officer of the procuring activity.

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6.10 Subject term (key word) listing.

Backhoe
 Crane
 Excavator
 Forklift
 Loader
 Materials handling equipment
 Wheeled

6.11 Vendor certification. The contracting officer should require the contractor to furnish certification from vendors that all powertrain components are compatible with and properly matched with all related or affected components assembled to meet this specification.

6.12 Transportability report. When specified (see 6.2), the contracting officer should arrange for the contractor to furnish a transportability report in accordance with AR 70-47 and SOP 70-38 for the tractor, 95 days prior to delivery of the first article.

6.13 Noise levels. When the required maximum noise limit(s) are established to be technically infeasible and beyond the state-of-the-art for the item/system being procured, the contracting officer may request additional information on noise sources. As such, documentation shall be furnished to the procuring activity for consideration of whether or not increase of the required limit(s) is justified and how noise levels may be best minimized. Documentation shall contain technically defensible data including technically supported design considerations, technically supported design recommendations for noise reduction, and technically supported predictions of the resultant noise levels. Clearly stated, convincing, and technically/fiscally supported trade-off analyses of noise control benefit against other design requirements such as weight, access, etc., shall be provided.

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

Custodians:
 Army - ME
 Navy - MC

Preparing activity:
 Army - ME

Review activity:
 Air Force - 84

User activity:
 Army - AT

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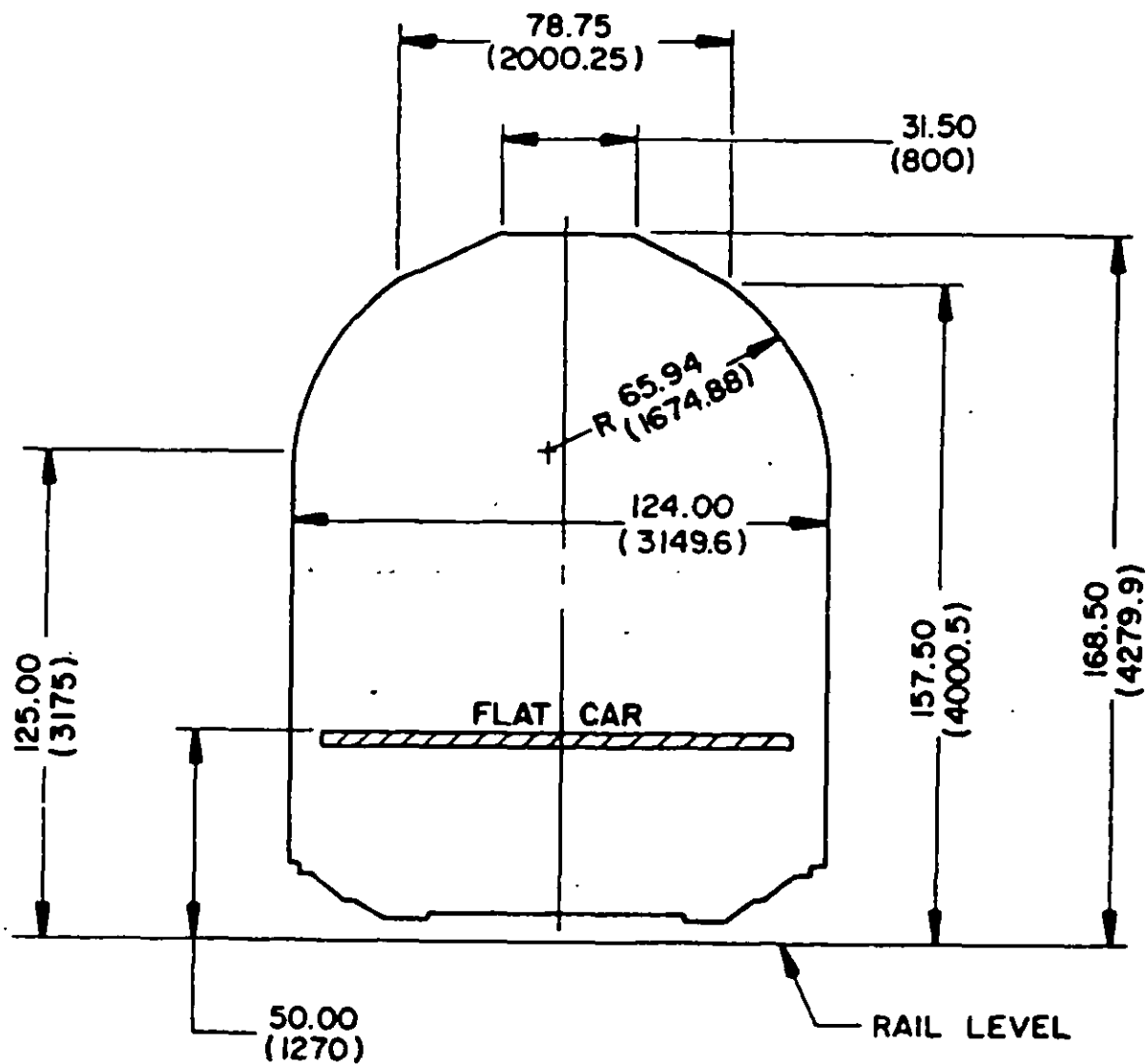
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NOTE: DIMENSIONS SHOWN: INCHES (MILLIMETERS)

X-4093C - Figure 1. Gabarit International De Chargement (GIC) clearance diagram.

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VEHICLE CLASSIFICATION DATA SHEET LOADER/BACKHOE TRACTOR

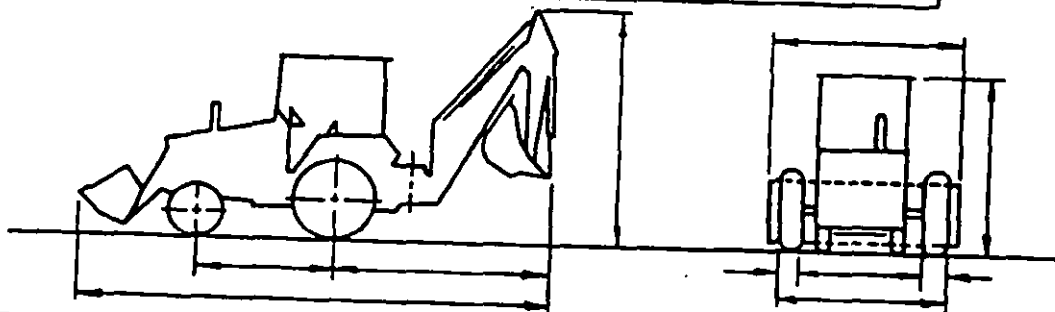
Load Class		
E	C	H

DATA REQUIRED FOR IDENTIFICATION AND LOAD CLASSIFICATION OF SUBJECT VEHICLE

NOMENCLATURE

Mfr	Model No.
NSN	Agency

Traveling Load Category		Total Weight W	Pay Load
Empty	E		
Cross Country or off Highway	C		
Laden or on Highway	H		



Traveling Load Category	Loads On		Front Tires			Rear Tires		
	A	B	No/ axle	size	psi	No/ axle	size	psi
Empty								
Cross Country or off Highway								
Laden or on Highway								

All loads in short tons
All loads to include weight of crew and appurtenances
Class Nos for vehicles over 3,000 lb
Longitudinal dimensions in feet
Vertical and transverse dimensions in inches

X-3172 - Figure 2. Vehicle classification data sheet loader/backhoe tractor.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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RECOMMENDED CHANGE:	1. DOCUMENT NUMBER MIL-T-53033A	2. DOCUMENT DATE (YYMMDD) 910614
3. DOCUMENT TITLE Tractor, Wheeled, All Wheel Drive With Attachments		
4. NATURE OF CHANGE (identify paragraph number and include proposed if possible. Attach extra sheets as needed).		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (LAST, FIRST MIDDLE INITIAL)	b. ORGANIZATION	
c. ADDRESS (Include zip code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (if applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY		
a. Name Carolyn B. Johnson	b. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (703) 664-5717 354-5717	
c. ADDRESS (Include zip code) Belvoir RDE Center ATTN: STRBE-TSE Fort Belvoir, VA 22060-5606	If you do not receive a reply within 45 days, contact: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403 Falls Church, VA 22041-3466 Telephone: (703) 756-2340 AUTOVON 289-2340	