DFP-425C
12 March 2004

US ARMY ARDEC
COMBAT MAINTENANCE SYSTEM ENGINEERING
DESCRIPTION FOR PURCHASE
LATHE, ENGINE, 13-INCH, MOUNTED ON A CABINET BASE
NSN 3416-01-030-8195

1. SCOPE

1.1 Scope. This Description for Purchase describes the minimum Government requirements for a 13-inch engine lathe with a cabinet base.

2. APPLICABLE DOCUMENTS

2.1 Government Documents.

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

STANDARDS

FEDERAL

FED-STD-376 - Preferred Metric Units for General Use by Federal Services

MILITARY

MIL-STD-129 - Marking for Shipment and Storage

SPECIFICATIONS

FEDERAL

OO-M-340 - Milling, Grinding, Drilling and Slotting Attachment

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

OFFICE OF THE FEDERAL REGISTER

CFR 29 Parts 1900 to 1910	- Code of Federal Regulations - Regulations Relating to Labor, Chapter XVII - Occupational Safety and Health Administration, Department of Labor
CFR 49 Parts 100-180	- Code of Federal Regulations – Regulations Relating to Hazardous Materials – Occupational Safety and Health Administration, Department of Labor

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

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B5.1	- T-slots - Their Bolts, Nuts, Tongues, and Cutters
ANSI B5.8	- Chucks and Chuck Jaws
ANSI B5.9	- Spindle Noses for Tool Room Lathes, Engine Lathes, Turret Lathes, and Automatic Lathes
ANSI B5.10	- Machine Tapers
ANSI B11.6	- American National Standard for Machine Tools - Lathes - Safety Requirements for Construction, Care, and Use
ANSI B5.16	- Accuracy of Engine and Toolroom Lathes

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

NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION (NEMA)

MG-1	- Motors and Generators

(Application for copies should be addressed to the National Electrical Manufacturers Association, 155 East 44th Street, New York, NY 10017.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA-70	- National Electrical Code
NFPA-79	- Electrical Standard for Metalworking Machine Tools and Plastics Machinery

(Application for copies should be addressed to National Fire Protection Association, Battery March Park, Quincy, MA 02269.)

AMERICAN GEAR MANUFACTURERS' ASSOCIATION (AGMA)

AGMA 390.03a	- Gear Handbook - Gear Classification, Materials and Measuring Methods for Bevel, Hypoid, Fine Pitch, Worm-gearing and Racks Only as Unassembled Gears
AGMA 2000-A88	- Gear Classification and Inspection Handbook

(Application for copies should be addressed to American Gear Manufacturers' Association, One Thomas Circle, Washington, DC 20005.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.1	- Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B1.13M	- Metric Screw Threads – M Profile
ASME B1.21M	- Metric Screw Threads – MJ Profile R

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

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 1708	- Acceptance Conditions for General Purpose Parallel Lathes - Testing of the Accuracy
ISO 1101	- Technical Drawings - Geometric Tolerancing - Tolerancing of Form, Orientation, Location and Run-out - Generalities, Definitions, Symbols, Indications on Drawings –
ISO 230-1	- Test Code for Machine Tools – Part 1: Geometric Accuracy of Machines Operating Under No-Load or Finishing Conditions

(Application for copies should be addressed to the International Organization for Standardization, 1 rue de Varmebe, Geneve, Switzerland.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM –D4169	- Standard Practice for Performance Testing of Shipping Containers and Systems

(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pa 19428-2959)

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

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

3. ENGINEERING REQUIREMENTS

3.1 Performance Inspection and Evaluation. When specified in the contract or purchase order, a sample shall be subjected to performance inspection and evaluation testing.

3.2 Design. The lathe shall be new and one of the manufacturer's current commercial models and design. The cabinet base mounted lathe and all components shall be so designed that a drilling, milling, slotting, and grinding attachment, (reference Federal Specification OO-M-340), can be readily conjoined to the lathe, and operated, without additional modifications to the lathe, the lathe components, or the milling, drilling, slotting, and grinding attachment. The lathe shall be rigidly designed for mounting in a small truck bed, a mobile van or trailer, an ocean going vessel, or transportable shelters. The lathe shall have the capability to withstand the stresses and strains of mobile field travel and maintain the accuracy tolerances as specified in Table II. The lathe shall be designed and constructed to provide convenient and safe operation for the machine operator. All parts subject to wear, breakage, or distortion shall be readily accessible for adjustment, repair, or replacement without the use of special tools and fixtures. The lathe bed shall be so designed to prevent chips and shavings from collecting inside any cavities or crevices. The lathe shall have a ferrous metal, hinged end gear cover. The end gear cover shall be designed to withstand the rigors of field military transporting and shall provide rigid support of the indexing fixture of the milling, drilling, slotting, and grinding attachment. All gears, pinions, and spindle drive components shall be capable of operating for 10,000 hours or five years, whichever comes first, without failure or wear, which cannot be compensated for by adjustments, and would cause the engine lathe to lose its inherent accuracy. All machine ways, feed screws, feed screw nuts, bearings, and bearing and oil seals shall not structurally fail or exhibit wear that cannot be compensated for by adjustment for 10,000 hours of operation or five years, whichever comes first.

3.2.1 Measuring and Indicating Device Calibrations. The US customary system of Units (US) or the International System of Units (SI) shall be used in the design and construction of the lathe. Whichever of the two systems are chosen for use in the machine, at the manufacturer's option, that system shall be incorporated throughout the machine except as specified in paragraph 3.2.2. In this specification, all measurements, dimensions, sizes, and capacities are given in the US system. The measurements may be converted to the SI System through the use of the conversion factors and methods specified in FED-STD-376.

3.2.2 Dials. Dials shall be graduated in the US and metric SI systems of measurement. Dial graduations, indicating stock removal or tool movement, shall be in increments of not more than 0.001 inch and 0.02 mm. Dial graduations shall be easily read from the machine operators normal working position. Graduations shall be permanently and legibly etched or engraved on a contrasting non-glare background. Dials that require more than one revolution to indicate their full range shall be calibrated such that the last dial graduation progresses into and is continuous with the first graduation as the dial is rotated through the zero position for successive revolutions. Dual scale feed adjustment devices shall have independent zero

adjustments for the US and Metric graduations on the same devices. Dials shall be accurate indicators for adjustment of tool and lathe component movement.

3.2.3 Hardness Integrity Requirement. When hardness of gears, machine components, or ancillary equipment is required, hardness shall be achieved by the appropriate heat treatment method for the base material. The machine part or component shall be ground or machined to the necessary size, configuration and finish as dictated by the mechanical application. Except as specified herein, gears, machine components, or ancillary equipment shall not be hard plated to achieve the specified size or hardness levels.

3.2.4 Gears. All gear and pinion designs selected for use in the lathe or its components shall be steel, manufactured in accordance with AGMA 390.03a, and AGMA 2000-A88. All back gears, gears in the headstock area, gears in the quick change gear box, and gears in the drive train shall be steel, hardened to no less than Rockwell C-48. The required back-lash between mating teeth shall be determined in accordance with AGMA 390.03a, Part I, Section 8. The gears shall be of the proper width and size to transmit full rated torque and horsepower throughout the speed ranges without failure for the extended life of the machine.

3.2.5 Threads. All machined threads shall conform to ASME B1.1 for Unified Inch Threads and ASME B1.13M or B1.21M for Metric Threads.

3.2.6 Lubricating Systems. All bearings (except sealed for life, permanently lubricated type), matching gears, and all other moving parts shall be provided means to assure adequate lubrication. Re-circulating systems shall include filters, which are cleanable or replaceable. Each lubricant reservoir and gearbox shall be clean and totally free of all metal particles and debris and shall have means for determining fluid levels. All oil holes, grease fittings, and filler caps shall be so located as to be readily accessible. The supplier shall include and install all lubricants, fluids, greases, and other compounds in the lathe, in accordance with the best commercial practices of the lathe industry. Vent openings in the lubrication systems shall be temporarily capped or plugged to prevent loss of lubricants during shipment. Tags, warning that "ALL TEMPORARY CAPS OR PLUGS MUST BE REMOVED BEFORE START-UP OR USE OF THE ITEM", shall be attached to all temporary caps or plugs intended to be vented to the atmosphere. These warnings shall also be included in the instruction manual. In the event a lubricant reservoir cannot be covered and sealed, the appropriate lubricant shall be provided in a sealed container and shipped with each lathe. A warning tag shall be placed in a conspicuous place near the filling area, warning the user to install the furnished lubricant before operation of the equipment. The operator's manual shall also reflect the above warning and procedure.

3.2.7 Reclaimed Materials. The lathe may contain reclaimed materials provided the materials will not jeopardize the machine's intended use or performance. The reclaimed materials shall have been reprocessed, remanufactured, or recycled in a manner which will restore them to the same chemical composition and physical properties as the materials originally selected for use on the lathe.

3.2.8 Operating Controls. All operating controls for the lathe shall be directly mounted on the lathe in a location convenient to the machine operator's normal working position.

3.3 Construction. The lathe shall be of strong and durable construction and securely mounted on a rigid metal cabinet base. The lathe specified herein is intended for mobile field travel and use. The lathe shall be capable of withstanding stresses and strains resulting from floor movement associated with the described application without encountering adverse effects. All parts and materials used in the construction of the lathe shall be new and of the necessary quality to produce a machine conforming to the safety, accuracy and construction requirements specified herein. The construction of the lathe shall be free from any characteristics or defects, which may render the lathe unsuitable or inefficient for the purpose intended. The lathe and its equipment shall be complete so that when connected to the proper power source, the lathe can be used for any operation for which it is intended.

3.3.1 Interchangeability. All parts of the end item shall be manufactured to definite standards and tolerances that will provide for the interchangeability of respective parts between end items of the same model. All parts of the lathe shall be interchangeable with their respective replacement parts.

3.3.2 Repair Part Manuals. Repair parts and accessory identification in repair part manuals shall include the prime contractor's name, nomenclature and part number. Repair part identification in repair part manuals shall also include the original equipment/part manufacturer's (OEM) (actual part manufacturer's) name, Commercial and Government Entity (CAGE) Number, nomenclature, and part number of the part used in the end item, along with the prime contractor's part identification. Items with high mortality rates shall be so identified.

3.3.3 Safety and Health Requirements. Covers, guards, or other safety devices shall be provided with the lathe. The devices shall not interfere with the operation of the lathe. The safety devices shall prevent unintentional contact with the guarded part, and shall be removable to facilitate inspection, maintenance and repair of the parts. All machine parts, components, mechanisms and assemblies furnished on the lathe, whether or not specifically required herein, shall comply with all of the requirements of Code of Federal Regulations (CFR) 29, Labor, Parts 1900 to 1910 and ANSI B11.6 that are applicable to the lathe itself.

3.3.3.1 Guarding. In addition to the safety and health requirements specified in 3.3.3, the machine shall be furnished with a full-length splashguard, a swing away chuck guard mounted on the headstock, and a transparent chip guard mounted on the carriage to confine flying chips.

3.3.4 Protective Finish. The protective finish, unless otherwise specified, shall be paint. All surfaces to be painted shall, immediately prior to painting, be cleaned and dried and free of all foreign matter. The protecting paint coating shall be at least 2.0 MIL in thickness. The paint adhesion shall be such that no paint can be peeled by fiberglass tape applied over two intersecting cuts of not less than 2 inches to expose the base metal. The surface hardness of the paint shall be between the industrial standards of H to HB pencil lead. Where no protective finish is utilized (such as bed-ways, machine guide surfaces, etc.) the natural finish of the

material or the finish obtained from heat treatment is permissible provided the surfaces are free from scale or corrosion.

3.3.5 Castings and Forgings. Finished castings and forgings shall be free of fins, scale, inclusions, cold shuts, voids, cracks, thermal ruptures, laps, folds, mismatching, etc. No processes, such as welding, peening, plugging, soldering, or pasting shall be used for repairing, reworking, or improving cosmetic appearance.

3.3.6 Fastening Devices. Fastening devices and methods shall be chosen to serve the need while providing necessary adjustability for service, maintenance, or repair. Fasteners shall be installed to prevent loss of tightness and shall not loosen in service.

3.3.7 Welding, Brazing, and Soldering. All welding, brazing, and soldering shall be free of defects and of a quality, which shall sustain all requirements of the welded, brazed, or soldered parts. Defects shall include but are not limited to such things as bubbles, cracks, gouges, holes, insufficient material used, etc. All flux or other such materials used during these operations shall be thoroughly removed (cleaned), from the part(s) immediately upon completion of the operation. These operations shall not be employed as repair measures for defective parts.

3.3.8 Machine Ways. The machine ways shall be adequately protected to prevent chips, dirt, coolant, and other hazards from causing damage or resulting in inaccurate functioning of any interfacing surface members of the lathe. The machine ways shall be hardened in accordance with the requirements specified herein. The finish on the machine ways shall be not more than 32 micro-inches aa.

3.4 Dimensions and Characteristics. The dimensions and characteristics shown in Table I are the established minimum Government requirements and shall be met or exceeded for the lathe specified herein.

3.4.1 Government Furnished Equipment. The lathe compound slide and cross slide shall accommodate the mounting of the milling, drilling, slotting, and grinding attachment. Special adapters, required to mount the attachment on the compound slide and cross slide, shall be furnished with each lathe, by the lathe manufacturer. The attachment shall mount on the lathe so that the mid travel of the attachment is centered on the lathe spindle. The attachment identification is Size 1, Light Duty, of Federal Specification OO-M-340 is not required to be furnished by the lathe manufacturer. Within 15 days after award of the contract, the contractor shall order all Government furnished equipment from the contracting officer. The milling, drilling, slotting, and grinding attachment will be loaned to the awarded contractor and must be returned, at the completion of the contract, in the same or better condition as issued by the Government and received by the contractor.

3.4.2 Overall Physical Dimension Limitations. The lathe, with the cabinet base, shall not exceed an overall length of 68 inches, an overall width of 38 inches, or an overall height of 52 inches. The lathe shall be not less than 25 inches between centers.

TABLE I
DIMENSIONS AND CHARACTERISTICS
Dimensions are shown in inches unless otherwise stated

CHARACTERISTIC	SIZE
Swing over bed and carriage wings	Not less than 13; not more than 14.5
Swing over cross slide	Not less than 7-3/4
Width of Bed	Not less than 8
Distance between centers	Not less than 25
Hole thru headstock spindle	Not less than 1-3/8
Spindle nose, size and type	American Standard D1-4 Camlock
Number of spindle speed changes	Not less than 12, or infinitely variable
Spindle speed range, revolutions per minute(RPM)	55 or less to 1800 or more
Number of thread and feed changes	Not less than 35
Threads per inch	4 or less to 56 or more
Longitudinal Feed Range, inches per revolution (IPR)	0.001 or less to 0.035 or more
Cross feed range (IPR)	0.0005 or less to 0.020 or more
Number of thread changes, metric	20 or more
Thread range, lead in millimeters	0.2 or less to 4.0 or more
Carriage bearing length on bed ways	Not less than 11
Width of cross slide	Not less than 6
Cross slide travel	Not less than 7
Compound rest travel	Not less than 3-1/8
Lathe centers, ANSI taper size	No. 3
Tailstock spindle diameter	Not less than 1-9/16
Tailstock set-over	Not less than 1/2
Tailstock spindle travel	Not less than 4
Tailstock reducing sleeve	MT#3 to MT#2
Chuck, 4-jaw, independent, diameter	Not less than 10
Chuck, 3-jaw, universal, diameter	Not less than 8
Drive plate, diameter	Not less than 6-1/2
Face plate, large diameter	Not less than 12
Steady rest capacity	3/8 to 3
Follow rest capacity	3/8 to 3
Finish of machine ways	Not more than 32 microinch
Main Drive Motor, hp	Not less than 2

3.5 Components. The lathe shall consist, basically, of the following components.

3.5.1 Cabinet Base. The steel cabinet base shall be constructed sufficiently strong and rigid to support the lathe in a firm and stationary manner during lathe operations. The cabinet base shall be capable of withstanding the stresses and strains associated with mobile field travel as explained in paragraph 3.3. The cabinet shall be constructed with a chip pan on top and designed for floor mounting. The storage cabinet shall be of sufficient size for storage of all

tools, equipment, attachments, accessories, and wrenches furnished with the lathe and shall contain the accessory equipment in such a manner as to prevent damage to the accessory equipment during mobile field travel. Storage areas may be either drawers or compartments with shelves, or both. All drawers or compartment doors, including, if required, an underneath main drive motor compartment, shall be provided with locks. The same key shall operate all locks of each cabinet, but not be interchangeable with locks of other cabinets. Not less than three keys shall be furnished with each lathe. Inserts or liners shall be durable and fastened in the drawers or on the shelves to securely retain all tools, equipment, attachments, accessories, and wrenches during mobile field travel. When a foot brake pedal is provided, the storage cabinet shall be designed so that, when opened, the door or drawer will not interfere with the lathe operator's ability to reach a foot brake pedal. The storage cabinet shall be designed so that when opened, the door shall remain open without the assistance of the machine operator or other external devices (devices not provided with and integral to the cabinet design).

3.5.2 Bed. The bed shall be a one piece ferrous casting with integral cross ribs, and shall have sufficient strength and rigidity to support all of the components in alignment, as specified in Table II, after the lathe has been subjected to the mobile field transport requirement. The surfaces of the guide ways shall have a hardness of not less than Rockwell C-50. A self-contained means of lubrication shall be provided for the guide ways. The lathe shall be designed to utilize a taper attachment. The bed shall have two V-ways and two flat ways or three V-ways and one flat way for guiding and supporting the carriage and tailstock.

3.5.3 Headstock. The headstock shall have either an infinitely variable speed spindle drive or a spindle drive providing not less than 12 spindle speeds. Speed variation shall be accomplished through the use of mechanical or electrical shifting techniques, or combinations of these methods, which meet the requirements stated herein.

3.5.3.1 Infinitely Variable Drive. The infinitely variable speed headstock shall provide spindle speed selections for all speeds within the range of the lathe (see Table I). Speed selections shall be made by suitable controls such as push buttons or a variable speed selector switch with infinitely variable speeds. All speed selection options shall include a speed indicator showing actual revolutions per minute. Speed adjustments shall be possible while cutting, to obtain the optimum speed/feed ratio under various cutting conditions. The variable speed headstock shall be designed and constructed to eliminate the need to run the lathe through its speed range to prevent sticking of the spindle.

3.5.3.2 Twelve-Speed Drive. A 12-speed headstock drive may consist either of all gears, all belts and pulleys, or any combination of gears, belts and pulleys, and an infinitely variable drive. Belt and pulley power transmission drives shall incorporate a non-slip design. The 12-speed headstock shall provide a manual speed change system with selected speeds as specified in Table I. The 12 spindle speeds shall be in an approximate geometric progression. The spindle shall operate in both directions of rotation throughout the entire speed range of the lathe. Headstock drives which combine pulley and belt drives with gear drives shall have a belt drive in the high speed range and gear drives in the intermediate and low speed ranges. An identification plate shall indicate shift lever positions for designated spindle speeds. The identification plate shall be readily visible from the operator's normal working position. Belt

driven headstocks shall have means for changing, adjusting, and maintaining proper belt tension while maintaining spindle alignment or adjustment.

3.5.3.3 Headstock Structure. The headstock shall be semi-permanently affixed to the lathe bed by means of keys or pins and bolts, (an adjustable headstock shall not be acceptable) and shall be oil tight. The spindle shall be supported by tapered roller bearings (see 3.5.3.7). The headstock shall be constructed to rigidly support the spindle and gear shafts in a secure manner to prevent deflection that would affect work part accuracy under all headstock spindle speeds and full power cutting loads.

3.5.3.4 Spindle Drive Gearing. Spindle drive gears shall have a surface hardness of not less than Rockwell C-48. Easy access to the gears in the drive mechanisms shall be provided. During setup operation, the spindle shall be free to rotate manually, and there shall be provisions for retaining the spindle in any desired position to facilitate the mounting or operations of chucks, face-plates, and other spindle mounted attachments. Headstock spindle locking devices shall have an interlock safety mechanism to prevent power application while the spindle is locked.

3.5.3.5 Headstock Lubrication System. The headstock shall be clean and totally free of all metal particles and debris and shall be provided with a self-contained lubrication system with a means for determining fluid levels. The headstock lubrication system shall provide positive means of delivering oil to bearings, gears, and sliding or rotating parts that require lubrication. Splash systems, if used, shall have a provision for assuring adequate lubrication of all bearings and parts requiring lubrication. Gearing for the headstock transmission shall run in a bath of oil with provisions for checking and maintaining the oil level in the headstock transmission. When the headstock contains a combination of belts, pulleys and gears, a positive separation or barrier shall be provided between the lubricated gear chamber and the belt and pulley compartment to prevent gear lubrication from contaminating the belts and pulleys.

3.5.3.6 Headstock Accuracy. The headstock shall meet or exceed the accuracy requirements of Table II.

3.5.3.7 Headstock Spindle. The headstock spindle shall be designed for using draw-in collets, chucks, and faceplates, which in turn support and provides rotation of the work-piece. The lathe shall be furnished with a functional spindle brake. The brake shall completely stop the spindle when the control lever is placed in the off position and when the emergency stop is actuated. When actuated, the brake shall slow the spindle rotation from at least 1800 rpm to zero rpm in no more than five seconds, while a chuck and work piece are mounted on the spindle. The spindle shall be supported by tapered roller bearings located in the front and rear positions of the spindle. (Spindle designs incorporating three spindle bearings are acceptable.) Thrust bearings shall have means for adjustment. The spindle nose shall be the D1-4 Cam-lock type as specified in Table I and shall conform to ANSI B5.9. The spindle nose shall provide locating surfaces for lathe centers, face-plates, and chucks. The inner and outer surfaces of the spindle nose, on which work holding devices are mounted, shall have a surface hardness of not less than Rockwell C-50. The headstock spindle shall meet or exceed the accuracy requirements of Table II.

3.5.4 Power Feed. Power feeds and thread leads shall be provided by a feed rod and a hardened lead screw, through a totally enclosed, quick-change gear box and the geared feed mechanism contained within the carriage apron. The lead screw shall be hardened to not less than Rockwell C-38. The longitudinal feed shall be by a rack, mounted on the underside of the front guide ways, and meshing pinions on the apron. The rack and pinion teeth shall be designed to impart the most wear to the component most easily replaced. The longitudinal and cross feeds shall be in both directions of travel with right and left hand threading capability. A separate feed rod and a lead-screw shall be used and the feed motion shall be accomplished without use of the threads to retain threading accuracy. Automatic lubrication shall be provided for the quick-change gearbox gearing. A shear pin shall protect the feed mechanism from damage by accidental overload. An interlock shall prevent simultaneous engagement of the thread and feed controls. A feed and thread chart shall be printed in the American-English language and shall be readily visible to the operator's normal working position to show control settings. The half nut(s) shall be of a compatible material such that the half nut(s) shall wear more quickly than the lead screw.

3.5.5 Combination US and SI Gear Box. The lathe shall be equipped with a selective type, combination English and Metric, quick-change gear box to provide a full range of US and SI feeds and threads as specified in Table I, without the use of transposing gears. The lathe shall cut standard inch and metric threads as defined by ASME Standards B1.1, B1.13M, and B1.21M. If gear selection is by lever action, the lever must be metallic with a chrome-plated handle or knob. The cross slide feed screw and the compound slide feed screw shall each be equipped with dials graduated to indicate measurements in both US and SI systems.

3.5.6 Carriage. The carriage shall support the apron, cross slide and compound rest. The carriage, cross slide, and compound rest shall be accurately fitted, in accordance with Table II, to the mating bed-way surfaces providing smooth, constant feed motion under power and shall have adjustable gibs to permit compensation for wear. A carriage-clamping device shall securely lock the carriage in any position along the bed when cross feeding. A carriage reversing mechanism shall allow feed movement in both directions without changing direction of the headstock spindle rotation. The reversing control shall be easily operated and positive acting, located within easy reach from the operator's normal work position. Way wipers shall be provided on the carriage wings to prevent chips and abrasives from entering between the carriage and bed-ways. The carriage shall be provided with the necessary means for attaching accessories such as follow rests and a taper attachment.

3.5.7 Cross Slide and Compound Rest. The cross slide shall be fitted to the carriage with full-length adjustable gibs to compensate for wear between the saddle cross slide and compound rest ways. The cross slide ways or the carriage ways meeting with the cross slide shall be hardened to not less than Rockwell C-48. A built-in cross feed stop shall permit quick withdrawal of the tool to a stop position and repositioning to the last depth of cut when threading. The compound rest shall consist of a swivel base and a top slide. The top slide and swivel base shall be attached to the cross slide by means of an accurately fitted swivel bearing and with means for securely locking the swivel in any desired position. The compound rest shall swivel through 360 degrees for positioning. The compound rest swivel base shall be

graduated in one degree increments, with numbers each 10 degrees, to not less than 90 degrees each side of the zero mark as aligned perpendicular to the bed ways. The one-degree graduations shall be permanently and legibly metal stamped, embossed or etched on the outside diameter of the compound rest swivel base. The top of the compound tool-slide shall have a standard size T-slot, meeting the requirements of ANSI B5.1.

3.5.8 Cross Feed Screws. Threads of the cross slide and compound rest feed screws shall have a surface hardness of not less than Rockwell C-45. Brass nuts shall be used, and mated, with the hardened feed screws. The cross slide and the top slide feed screw threads shall be ACME or square form and shall be protected from chips and other foreign matter by the construction of the cross slide or by a suitable guard. The cross slide feed screw shall be supported by anti-friction thrust bearings and shall have an adjustment for backlash. The feed screws shall be fitted with direct reading micrometer dials graduated in increments of not more than 0.001 inch and 0.02 mm and numbered each 10 graduations. The feed screw micrometer dials shall be accurate indicators of tool movement and stock removal.

3.5.9 Apron. The apron shall contain the feed mechanism, threading mechanism, operating controls, and the lubrication system for the apron and carriage components. The apron shall be double wall construction providing inboard and outboard supports for gear shafts and studs. Gearing in the apron shall provide hand and power operation in both the longitudinal and cross feed directions. A selector lever shall be provided on the front of the apron for engaging the cross and longitudinal feeds. An interlock shall be incorporated in the apron to prevent engagement of the feed and half nut at the same time. The hand-wheel shall automatically disengage to assure non-rotation while the carriage is under power. The feed rod and lead-screw shall be separate units. Rotating shafts shall be supported at both ends by ball or roller bearings. The reversing control for the spindle shall be located on the apron. A lock shall be provided to prevent apron movement during facing and cutoff operations.

3.5.9.1 Lead-screw Reverse. The lead-screw reverse shall be provided for thread cutting. The operator's lead-screw control device shall be conveniently located to the operator's normal work-station. The lathe's lead-screw reverse control device and mechanism shall accommodate reversing the direction of the carriage movement without disengaging the lead-screw half-nut, and without reversing or stopping the headstock spindle.

3.5.10 Tailstock. The lathe shall have a tailstock, which is accurately fitted to the bed-ways of the lathe. The tailstock shall be easily moved along the bed-ways and shall have a quick acting clamp for locking the tailstock in all locations along the bed-ways. The tailstock shall meet the alignment and accuracy requirements stated in Table II. The tailstock shall have alignment markings, which show proper center position for straight turning, and for measurement of the set-over distance, when turning tapers without the aid of a taper attachment. The amount of set-over shall conform to the requirements of Table I. The alignment markings shall have a zero point, shall extend each side of zero to the set-over distance specified in Table I, and shall be marked in increments not greater than 1/16 of an inch. A means shall be provided to lock the tailstock spindle in place at any point of spindle travel. The tailstock spindle lock shall prevent movement between the tailstock spindle and the tailstock housing. The tailstock housing lock shall prevent movement between the tailstock and the bed-way. Tailstock spindle

travel shall be accomplished by a hand-wheel, without jamming, when either fully extended or fully retracted. The total distance, between the fully extended and fully retracted positions of the tailstock spindle shall meet the travel requirements of Table I. The inside of the spindle shall be taper bored to hold the tailstock center, drill chuck, or other tapered, tang type tools. These tang type tools shall conform to the applicable specifications of ANSI B5.10 and Table I. The tailstock spindle shall be hardened to a hardness of not less than Rockwell C-48 and shall be graduated in increments not greater than 1/16 inch for measuring spindle travel. The lathe design shall provide for the lubrication of the surface between the tailstock and the tailstock bed-ways. The design shall also provide for lubrication between the tailstock spindle and the tailstock.

3.6 Electrical System. The electrical system shall conform to the applicable requirements of the National Fire Protection Association NFPA-70 and NFPA-79. A disconnect switch shall be provided to disengage all incoming power and shall be separate from the machine's on/off switch. The machine shall be capable of operating on 120/240 volts, single phase, 50/60 Hertz power and shall be initially wired to operate on 120 volts. An identified terminal shall be provided suitable for connecting the proper sized grounding conductor in accordance with the requirements for the specified power source.

3.6.1 Motor. The main drive motor shall be not less than 2 horsepower with permanently lubricated and sealed ball or roller bearings rated for continuous duty operation and shall meet the requirements for a drip-proof enclosure. Motors shall conform to the requirements of the National Electric Manufacturers Association (NEMA) Standard MG-1.

3.6.2 Identification of Electrical Circuits. The conductors in the electrical system shall be identified at each termination to correspond with the identification on the wiring diagrams and schematics. Conductors shall be color coded and identified in accordance with NFPA 79. The electrical system diagrams/schematics provided with each lathe shall be an exact duplication of the electrical system and wiring in the lathe. Diagrams/schematics shall clearly identify the individual, point-to-point, wire and wire termination points location in the electrical system.

3.6.3 Electric Power Supply Cable. An electrical power supply cable shall be installed on each machine. The electrical power supply cable shall be not less than 10 feet in length and shall terminate in not less than one inch of tinned wire, without a receptacle plug. The electrical power supply cable shall include proper sheathing/covering in accordance with the National Electric Code, NFPA-70 and OSHA. The electrical power supply cable shall have a voltage/potential and ampere/current carrying capacity exceeding that required by the electric power consuming devices, including electric motors of the lathe in accordance with the NEC.

3.6.4 High Voltage Requirement. The entire electrical system of the lathe shall withstand, without damage, malfunction, breakdown, arcing, surface or air discharge, at least 2500 volts peak, 60 Hertz, sinusoidal wave electrical energy at standard temperature and pressure. The electrical energy shall be applied instantaneously at full voltage and shall be maintained for at least 15 seconds. Each circuit shall be isolated from other circuits and all circuits shall be isolated from electrical ground. Solid-state control components may be damaged as a result of high voltage and is not cause for rejection. Damage to solid-state control components may be

avoided by wiring around or by passing them, terminal to terminal. No arcing or discharge from solid-state control components is acceptable.

3.7 Accuracy and Alignment Tolerances. The lathe shall be rigidly constructed and shall maintain the accuracy and alignment tolerances as specified in Table II and as explained and diagrammed in ISO 1708, after being subjected to the mobile field transportation simulation tests as specified in paragraphs 4.6.1. Testing for the face-plate and chucks is described and diagrammed in ANSI B5.16.

TABLE II -- ACCURACIES

Requirements	Tolerance
Bed (Verification of Leveling of Slideways)	
Longitudinal Verification (In vertical Plane)	0.0008" (Convex)
Local Tolerance	0.0003"/10"
Transverse Verification (In Vertical Plane)	0.0008"/20"
Carriage (Straightness of Movement in Horizontal Plane)	0.0008"
Parallelism of Tailstock to Carriage Movement	
In the Horizontal Plane	0.0012"
In the Vertical Plane	0.0012"
Local Tolerance (*)	0.0008"/20"
Headstock Spindle	
Periodic axial slip	0.0006"
Camming (**) of the Face Plate Resting Surface	0.0008"
Runout of Spindle Nose Centering Sleeve	0.0006"
Runout of Axis of Center	
At the Spindle Nose of the Housing	0.0004"
At 12 inches from the Spindle Nose	0.0008"
Parallelism of Spindle Axis to Carriage	
Longitudinal Movement on a Length of 12 inches	
In the Horizontal Plane	0.0006" Frontwards
In the Vertical Plane	0.0008" Upwards
Runout of Center	0.0006"
Tailstock	
Parallelism of the Axis of the Outside of Sleeve to Carriage Movement at 4 Inches	
In the Horizontal Plane	0.0006" Frontwards
In the Vertical Plane	0.0008" Upwards
Parallelism of Taper Bore of Sleeve to Carriage	
Movement at 12 inches	
In the Horizontal Plane	0.0012" Frontwards
In the Vertical Plane	0.0012" Upwards
Centers (Difference of Height Between Headstock and Tailstock Centers)	0.0016"
Upper Slide (Parallelism of the Slide Longitudinal Movement to the Spindle Axis)	0.0016"/12"

Cross Slide (Squareness of the Transverse Movement of the Slide to the Spindle Axis)	0.0008"/12" at 90 Degrees
Leadscrew	
Periodic Axial Slip	0.0006"
Cumulative Error of the Lead Screw	
For any Measured Length of 12 Inches	0.0016"
For any Measured Length of 2-1/2 or 3 Inches	0.0006"
Face plate runout,	
On outside Diameter	0 to 0.001"
On Face at Nominal Diameter	0 to 0.0015"
Three-Jaw Chuck Runout,	
Face and Periphery	0.0006"
Face of Steps	0.0008"
Bar test 3 inches from End of Jaw with the Test Bar Diameter the Same as the Spindle Hole	0.0012"
Four-Jaw Chuck Runout,	
Face and Periphery	0.0006"
Face of Steps	0.0008"
Bar test 3 inches from end of Jaw with the Test Bar Diameter the Same as the Spindle Hole	0.0012"
Collet Chuck, Runout, 1 inch from Collet Chuck	0 to 0.0008"

A general discussion of local tolerances is provided in paragraph 2.322.4 of ISO 230/1. Camming is defined in ISO 230/1, paragraph 5.63.

3.8 Performance. The lathes, its components, operator's controls, equipment, and safety devices shall function properly when meeting or exceeding the following specified requirements.

3.8.1 Round Rod Turning Requirement. The lathe shall develop the power required to perform rough and finish cutting operations under the conditions stated herein. The turning operation shall be performed on a round, low carbon, steel (1020) bar, no less than 2.00 inches in diameter, no less than 6 inches long, and mounted in the 3-jaw chuck supplied with the lathe.

3.8.1.1 Rough Cutting Requirement. The rough cut shall be no less than 0.040 inches deep and no less than 3.00 inches long. The cut shall be made at a feed rate of not less than 0.010 inches per revolution at a spindle speed of not less than 700 revolutions per minute (rpm). The rough turned diameter shall show no evidence of chatter and shall meet a total tolerance requirement of 0.0005 inches or less for both out-of-round and taper per foot.

3.8.1.2 Finish Cutting Requirements. Finish cutting operations shall be performed on the same steel bar as the rough cut. The finish cut shall be no less than .020 inches deep and no less than 3.00 inches long. The finish cut shall be made at a feed rate of not less than 0.005 inches per revolution at a cutting speed of not less than 1,000 rpm. The finished turned diameter shall meet a total tolerance requirement of 0.0005. The finish of the machined diameter shall be no less than 63 micro-inches aa.

3.8.2 Cylindrical Turning Requirement. The lathe shall machine cylindrical diameters, on a low-carbon, steel (1020) bar, no less than 2.00 inches in diameter and no less than 15 inches long. The bar shall be held in the 4-jaw chuck and supported by a live tailstock center. The lathe shall machine no less than three diameters on the bar, as illustrated in test P1 of ISO Standard 1708. The L, dimension of test P1 shall be no less than 12 inches. The machined diameter shall be no less than 0.250 inches less than the D diameter. The test piece shall be machined at a spindle speed of not less than 700 revolutions per minute, a cutting depth of no less than 0.020 inches, and a feed rate of not less than 0.005 inches per revolution. A single point carbide-cutting tool shall be used. The variation in the machined diameter, at the tailstock end of the test piece, shall be not greater than 0.00025 inches. No less than four readings shall be taken. See clause 14.3 of ISO Standard 1101 for a definition of circularity tolerance. The variation between machined diameters at either end of the test piece shall be not greater than 0.0005 inches, measured in a single axial plane. Any taper noticed in the test piece shall have the major diameter near the headstock end of the test piece. The general testing guidance provided in ISO 230/1, clauses 3.1, 3.22, 4.1, and 4.2, is applicable to this requirement. The lathe shall machine a finish cut across the collars of the test piece machined as stated herein. The across-the-collars machine cut shall be made at a lathe spindle speed of no less than 1500 rpm, a cutting depth of no less than 0.002 inches, and a feed rate of no less than 0.002 inches per revolution. The cut shall be made with a single point carbide-cutting tool. The variation in the three machined collar diameters shall be not greater than 0.0004 inches. The finish cut shall have a surface finish of no less than 20 micro-inches aa.

3.8.3 Threading Requirement. The lathe shall machine threads on a steel test bar. Two threads, at least four inches long, shall be cut, a 1/2-13 UNC thread and a 1/2-32 UNF thread as defined by ASME B1.1. The machined threads shall meet the size and shape requirements of ASME B1.1.

3.9 Equipment. The following attachments and accessories shall be supplied with each lathe and shall all be capable of operating at full load and the highest speed capacities of the lathe.

3.9.1 Thread Chasing Dials. The thread-chasing dial, engaging the lead-screw, shall be attached to the carriage apron. The thread-chasing dial shall be graduated to indicate the half nut engaging positions when threading inch threads.

3.9.2 Drive Plate. The drive plate shall be of steel, for mounting on the spindle nose, and shall have not less than one radial slot for driving a lathe dog. The drive plate shall be not less than 6-1/2 inches in diameter.

3.9.3 Center Sleeve. One headstock center sleeve shall be provided for adapting the taper in the spindle nose to the taper of the headstock spindle center supplied. Concentricity shall be within 0.0002 inches total indicator reading. Tapers shall be in accordance with ANSI B5.10 for self-holding tapers.

3.9.4 Lathe Centers. Two lathe centers shall be furnished, one headstock spindle center and one tailstock spindle center. All centers shall conform to ANSI B5.10. The centers shall be

hardened to Rockwell C-62 to C-68 and ground to within 0.0002 inch total indicator reading for concentricity.

3.9.5 Quick Change Tool Post. A quick-change tool post, with sliding tapered gibs, shall be provided with each lathe. Each tool post shall have sliding gibs for two tool holders. The tool post shall mount on the T-slot of the lathe tool slide and shall have means to extend the gibs, tightening them into the mating slots of the tool holder. Means shall also be provided to tighten the tool post in the lathe T-slot. The tool post shall be manufactured from steel.

3.9.6 Face Plate, Large. The large face plate shall be of steel, of ribbed construction and fitted to the spindle nose. The face plate shall have an outside diameter of not less than 12 inches and shall have four or more T-slots in accordance with ANSI B5.1 for through slots.

3.9.7 Indicator Carriage Stop. The carriage stop shall have an indicator dial or micrometer graduated in increments of not less than 0.001 inches. The carriage stop shall include an adjustable stop rod for accurate carriage positioning.

3.9.8 Chuck, 4-jaw, Independent. The chuck body shall be steel and shall fit to the spindle nose without adapters other than as a part of the chuck. Reversible step jaws with adjusting screws and wrench shall be included with each chuck. All working parts of the chuck shall be heat-treated. The total indicator reading on the periphery of the chuck, face of chuck body, and the face of the jaw steps shall be in accordance with the requirements of Table II and ANSI B5.8. The chuck shall be of medium duty and shall have an outside diameter of not less than 10 inches. A self-ejecting chuck key shall be provided with each chuck. The chuck shall be of a suitable material and construction to operate and function at spindle speeds up to the lathe's highest RPMs.

3.9.9 Chuck, 3-jaw, Universal. The chuck shall be steel, universal geared, and self-centering. All working parts shall be heat-treated. Run out of the chuck periphery, face of the body, and jaw steps shall be in accordance with the requirements of Table II and ANSI B5.8. The chuck shall be of medium duty and shall fit the spindle nose without the use of adapters. The universal 3-jaw chuck shall have an outside diameter of not less than 8 inches. A self-ejecting chuck key shall be provided with each chuck. The chuck shall be of suitable material and construction to operate and function at spindle speeds up to the lathe's highest RPMs.

3.9.10 Spindle Nose Collet Chuck. The collect chuck shall mount directly on the spindle nose of the lathe. The chuck shall be the draw-bar type, operated from the back of the headstock, and shall be of hardened and ground steel construction. The collets shall be the Hardinge 5C type, manufactured from alloy steel. A complete set of 17 collets shall be furnished, covering a range of 1/16 inch to 1-1/16 inch, in increments of 1/16 inch. The collets shall be boxed in a suitable container. The spindle nose collet chuck shall meet or exceed the accuracy requirement of Table II.

3.9.11 Steady Rest. The steady rest shall be fitted to the ways of the lathe. The steady rest shall be of the hinged type with three adjustable jaws. Adjusting and locking screws for each

of the three jaws shall be furnished. Means shall be provided for clamping the steady rest to the bed ways.

3.9.12 Follow Rest. One follow rest arranged for quick attachment and removal shall be provided with each lathe. The follow rest shall be equipped with two jaws, each with locking and adjusting screws.

3.9.13 Work Light. The work light shall be mounted on the lathe. The work light shall have an adjustable or flexible arm and shall take a lamp of not less than 100 watts.

3.9.14 Cross Feed Stop. The cross feed stop shall be a single or multiple stop fitted to the cross feed to permit quick retracting of the tool from the cut when threading and returning to the previous setting for feeding into the next depth of cut. The cross feed stop shall be designed to permit normal use of the cross feed screw when the stop is not in use. The cross feed stop shall have a repeatability accuracy of not more than 0.0025 inches. The cross feed stop shall be operable from the front of the machine, in the operators normal working position.

3.9.15 Drill Chuck. The drill chuck shall be of the key type design. The drill chuck shall have 1/2 inch capacity and shall be capable of holding a drill as small as No. 70 (.028). The drill chuck shall be for mounting in the tailstock spindle of the lathe and shall be furnished complete with key and mounting arbors of the proper size for the tailstock spindle.

3.9.16 Center, Tailstock, Live. The live center shall be the ball bearing type for mounting in the tailstock spindle of the lathe. The live center shall be hardened and ground to not less than Rockwell C-50.

3.9.17 Center Tailstock, Live, Pipe. The pipe live center shall be the ball bearing type for mounting in the tailstock spindle of the lathe with a 3 inch inside diameter pipe capacity. The pipe live center shall be hardened and ground to not less than Rockwell C-50.

3.9.18 Dog, Set, Lathe. The set shall consist of six bent, clamp type, lathe dogs, one each of the following capacities: 1/2 inch, 3/4 inch, 1 inch, 1-1/4 inch, 1-1/2 inch, and 2 inch. The 2-inch capacity lathe dog shall accommodate stock diameter of 7/8 to 2 inches and shall be the double screw type. The 1/2 through 1-1/2 inch lathe dogs shall be the single screw type.

3.9.19 Lathe Tool Holder Sets. Lathe tool holders, as required herein, shall be provided with each lathe. The holders shall mate with the tool post specified in 3.9.5 and shall accommodate the tooling specified in3.9.19.1 through 3.9.19.5. The tool holders, while mounted in the tool posts, shall meet or exceed the performance requirements of 3.8.

3.9.19.1 Knurling Tool. The knurling tools furnished shall have a diamond pattern in fine, medium, and coarse knurls.

3.9.19.2 Cut-off Tool. Cut-off tools, fitting the supplied holders, shall be furnished. Six high speed steel (HSS) tools or bits are required.

3.9.19.3 Turning Tool. High speed turning tools, fitting the supplied holders, shall be furnished. Six HSS tools or bits are required.

3.9.19.4 Boring Bars. The boring bars shall have one 90 degree square tool bit on one end and one 45 degree square tool bit on the other end. The tool bits shall be no less than 3/16 inch square. Six HSS boring bits shall be furnished with each bar.

3.9.19.5 Threading Cutter. The threading cutter shall be a 60 degree, HSS tool bit.

3.9.20 Taper Attachment. The taper attachment shall be a telescoping screw type for mounting in any working position on the rear of the lathe bed. It shall be graduated for setting in both degrees and inches of taper per foot. Turning capacity shall be not less than 9 inches in length in one setting and 16 degrees included angle. The attachment shall not interfere with the normal lathe operations when the taper attachment is not in use. The taper attachment shall be rigid enough to limit tool deflection to not more than 0.0008 inches over a length of 9 inches when the attachment is being used to remove a 0.062 inch thickness of material. Angular settings shall be clearly and legibly marked in one degree increments with numeric identification every fifth degree.

3.10 Information Plates. All information plates specified herein, see 3.10.1 to 3.10.3, shall be written in the English language and shall be clearly and legibly etched, stamped, embossed, or engraved in bold face on a contrasting background on a corrosion resistant metallic composition and shall be securely attached to each lathe in a location visually convenient to the machine operator's normal work station. All plates shall be permanently secured to the lathe with fasteners such as screws, bolts, and rivets.

3.10.1 Nameplate. The nameplate and other information plate(s) can be incorporated into one or more plates at the manufacturer's option. The nameplate shall include the following information:

Nomenclature
National Stock Number (NSN)
Manufacturer's name
Manufacturer's model number
Manufacturer's serial number
Contract number
Date of manufacture.

3.10.2 Lubrication Plate. The following information shall be included on the lubrication plate:

Points of application
Service interval
Type of lubricant
Viscosity
Military or Federal Specification number and NSN of the lubricants.

3.10.3 Instruction Plates. Instruction plates shall be clear and concise in their meaning and application, with a special emphasis placed on removing any ambiguous terminology which may confuse or misdirect the machine operator as to the lathe's functions, operations, or capacities. All instruction plates shall be located on the machine in a position that the lathe operator can readily and easily receive (read) the necessary instructions from the working station where the lathe operator will be required to position himself/herself to engage the lathe or the lathe settings.

3.11 Workmanship. The quality of workmanship imparted to the lathe and all its components shall be equal to or exceed the quality of the current commercial lathe(s) manufactured by producers of the type of lathe addressed herein. Where the requirements herein exceed commercial requirements the requirements herein shall take precedence. The neatness, safety, sharp edges, structural integrity, (seams, laps, steps, etc.), material soundness, (no cracks, deformations, structural weakness, etc.), brazing and soldering, painting, welding, etc., of the lathe shall equal or exceed the workmanship requirements as stated herein. The quality of workmanship shall be such as to eliminate degradation of the form, fit, function, performance and appearance as specified herein.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Responsibility for Compliance. All items must meet all requirements of Sections 3 and 5. The inspections set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective materiel, either indicated or actual, nor does it commit the Government to acceptance of defective materiel.

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)

4.3 First article Inspection. Unless otherwise specified, first article inspection shall be applied to the pre-production model or initial production item (see 3.1). First article inspection shall consist of the examination in 4.5 and all tests under 4.6. Failure of the first article to pass the examination or any of the tests shall be cause for rejection.

4.4 Quality Conformance Inspection. Quality conformance inspection shall be applied to production items offered for acceptance under the contract. Quality conformance inspection shall consist of (a) through (j) below. Failure of any item to pass an examination or test shall be cause for rejection of the item.

(a) Product examination (see 4.5)
(b) Alignment accuracy tests (see 4.6.2)
(c) Center sleeve concentricity (see 4.6.3)
(d) Lathe center concentricity (see 4.6.4)
(e) Hardness tests (see 4.6.5)
(f) Paint test (see 4.6.6)
(g) Performance tests (see 4.6.7)
(h) High voltage requirement test (see 4.6.9)
(i) Packaging inspection (see 4.7)
(j) Packaging validation test (see 4.8)

4.4.1 Sampling. Sampling for quality conformance inspection shall be performed as listed with all samples selected randomly.

Inspection or Test	Lot or Batch Size	Sample Size
Product examination (4.5)	-	100 percent
Alignment accuracy tests (4.6.2)	1-50	13
Center sleeve concentricity (4.6.3)	1-50	13
Lathe center concentricity (4.6.4)	1-50	13
Hardness tests (4.6.5)	1-50	5
Paint test (4.6.6)	1-50	5
Performance tests (4.6.7)	1-50	5
High voltage requirement test (4.6.9)	1-50	5
Packaging inspection (4.7)	1-50	3
Packaging validation test (4.8)	*	-

The lots shall not exceed the maximum sizes indicated above. If lot size is less than or equal to sample size, 100 percent inspection is required. Each lot shall be accepted with no defects and rejected if one or more defects are found.

*The packaging validation tests shall be conducted on one of the packaged items selected from the first lot submitted for quality conformance inspection and tests.

4.5 Product Examination. Visually, manually and dimensionally examine the lathe to determine conformance with the requirements of 3.2 through 3.6.3, and 3.9 through 3.11. Visual examination shall include verification of completeness of manufacture and assembly, conformance to specified standards, adequacy of markings, proper cleaning, and freedom from identified defects. Manual examination shall include the operation of movable parts by hand to assure proper functioning. Dimensional examination shall include verification that the lathe meets all specifications and characteristics listed in Table I and Table II. The examination provisions may be applied at the earliest practical point in manufacture at which it is feasible to

inspect for acceptance without risk of change in the characteristic by subsequent operations. Failure of the contractor to provide objective evidence that the lathe has passed the visual, manual and dimensional verifications prescribed for it by the contractor's inspection system shall be cause for rejection. In addition, failure of the contractor to provide objective evidence that all parts are manufactured to definite standards, clearances and tolerances so that no replacement part will degrade the form, fit or function of the end item (see 3.3.1), shall be cause for rejection.

4.6 Tests. Type and accuracy of measuring instruments used in performing the following tests shall be considered satisfactory if these instruments can prove acceptability and indicate rejection of the product. Calibration shall be traceable to the National Bureau of Standards. The product will be considered acceptable if it can be proven to be within its specified limits, by any adequate means of inspection.

4.6.1 Transportability Test. To determine compliance with 3.2, 3.3 and 3.5.1, the lathe shall be securely mounted in the upright position on the bed, or to the main supporting frame of a truck having a load carrying capacity of no more than five tons. All accessory equipment shall be stored in the proper place in the lathe cabinet base. The truck shall then be driven over the following surfaces at the indicated speeds and distances:

(a) On a paved road at speeds up to 50 mph, with an average speed of 40 mph for a distance of 5 miles.
(b) On a gravel road at speeds up to 40 mph, with an average speed of 30 mph for a distance of 30 miles.
(c) On off-road terrain at speeds up to 10 mph, with an average speed of 5 mph for a distance of 3 miles.

At the end of the road test, the lathe shall be examined. Any deformation, cracked welds or damaged members shall be cause for rejection. If there is no damage, the lathe shall then be subjected to the accuracy test of 4.6.2.

4.6.2 Alignment Accuracy Tests. The lathe shall be examined for conformance to the measurements listed in Table II. Where applicable, the methods of measurement shall be as explained in ISO 1708, but the tolerance limits shall be as specified in Table II. Failure of the lathe to conform to all requirements of Table II shall be cause for rejection (see 3.7).

4.6.3 Center Sleeve Concentricity. The center sleeve shall be inserted in the headstock and shall be checked for internal concentricity. Failure of the concentricity to be within the limits specified in 3.9.3 shall be cause for rejection.

4.6.4 Lathe Center Concentricity. The two lathe centers supplied with the lathe shall be inserted in the headstock and tailstock and checked for concentricity over their entire surfaces (centers contacting work-piece). Failure of the centers to be concentric within the limits specified in 3.9.4 shall be cause for rejection.

4.6.5 Hardness Tests. Rockwell C hardness tests shall be performed on the components of the lathe listed below, or on test samples processed concurrently with the components. Failure of the component or sample to meet the hardness number shown for that component shall be cause for rejection. A Certificate of Conformance (COC) may be accepted for a component in lieu of the test, provided the COC is written in the Americanized English language and is signed by a responsible officer of the original equipment manufacturer of that component.

Component	Rockwell C No. (min)	Ref Para.
Gears (as specified)	48	3.2.4
Bed ways	50	3.5.2
Headstock spindle nose	50	3.5.3.7
Lead screw	38	3.5.4
Ways, cross and carriage	48	3.5.7
Cross feed screws	45	3.5.8
Spindle, tailstock	48	3.5.10
Spindle Drive Gear	48	3.5.3.4
Centers, lathe	62 to 68	3.9.4
Center, tailstock live	50	3.9.16
Center, tailstock live pipe	50	3.9.17

4.6.6 Paint Test. The hardness, adhesion and thickness of the paint used on the lathe shall be checked as follows (3.3.4):

(a) The graphite point of a sharpened HB lead pencil shall be pressed at a right angle into a painted area of the lathe until the graphite crumbles. Failure of the surface to withstand the test, as evidenced by a pitting of the paint, shall be cause for rejection.

(b) A test sample of the same metal, painted with the same process and at the same time as the lathe, shall have a sharpened H lead pencil pressed into the paint as in (a). Failure to penetrate the surface of the paint down to the base metal, (paint too hard), shall be cause for rejection.

(c) Two, two-inch intersecting lines shall be cut through the paint to the base metal of the test sample. A strip of 1/2 inch wide fiberglass tape shall be firmly pressed over the intersection and then pulled from the surface. Adhesion of any paint to the tape shall be cause for rejection.

(d) Using a paint thickness measuring instrument, or by masking a portion of the test sample during painting, measure the thickness of the paint. Failure of the paint to be at least 2.0 MIL in thickness shall be cause for rejection.

4.6.7 Performance Tests. The lathe shall be subjected to the following turning tests after the machine has reached operating temperature. Failure of any test shall be cause for rejection.

4.6.7.1 Round Turning Test. A bar of low carbon steel (1020) not less than 2 inches in diameter and not less than 6 inches long shall be mounted in the 3-jaw chuck supplied with the

lathe. A rough cut shall be made at a tool depth of not less than 0.040 inches with a feed rate of not less than 0.010 inches per revolution and a spindle speed of not less than 700 revolutions per minute (rpm). The rough cut shall be made for a distance of not less than 3 inches along the length of the test bar. Upon completion of the rough cut, with the same cutting tool, a finish cut shall be made at a tool depth of not less than 0.020 inches with a feed rate of not less than 0.005 inches per revolution and a spindle speed of not less than 1000 revolutions per minute (rpm). The finish cut shall be made for a distance of not less than 3 inches along the length of the test bar. The finished turned diameter shall be round within 0.0005 inch (see 3.8.1).

4.6.7.2 Metal Removal Turning Test. A bar of low carbon steel (1020) approximately 5 inches in diameter and 15 inches long shall be held in the 4-jaw chuck supplied with the lathe, and supported by the tailstock center. A cut shall be made for a length of not less than 12 inches using a single point carbide tip turning tool. The metal removal rate shall be at least 1 cubic inch per minute per horsepower rating of the motor. Any chattering or stalling of the lathe shall be cause for rejection (see 3.8.1.1).

4.6.7.3 Cylindrical Turning Test. Using the same test bar as for the round turning test (4.6.7.1), the specimen shall be semi-finished to the configuration shown in Test P1 of ISO 1708. A finish cut shall be taken over the three collars in one pass using a single point carbide tip turning tool and a cutting speed of not less than 350 surface feet per minute. The turned diameters shall conform to the accuracy of P1, ISO 1708. Upon completion of the test, the specimen shall be prepared for turning between centers. A single cut shall be taken over the three collars, and the turned diameters of the three bands shall conform to the accuracy of test P1, ISO 1708 (see 3.8.2).

4.6.7.4 Collet and Drill Chuck Test. A length of 3/16 inch diameter low carbon steel (1020) shall be gripped by an appropriate collet furnished with the lathe. A #70 drill bit shall be inserted in the drill chuck furnished with the lathe, and the chuck inserted in the tailstock. Using the tailstock hand wheel, drill a #70 hole 1/4 inch deep. Remove the collet and drill bit. Install another collet furnished with the lathe and grip a length of 3/4 inch round low carbon steel (1020). Insert a 1/2 inch drill bit in the drill chuck and drill a hole 1 inch deep in the steel. Using the hand wheel, back the drill out of the work until the drill chuck is ejected. Failure of the collets to prevent slippage of the work pieces, failure of the drill chuck to hold the bit securely, or failure of the chuck to eject when the tailstock was retracted shall be cause for rejection (see 3.7).

4.6.7.5 Threading Test. Provide two 1/2 inch bars of low carbon steel (1020) of sufficient length so no less than 4 inches of threads can be cut. Set the lathe to cut 1/2-13UNC threads over a length of at least 4 inches. Repeat cutting 1/2-32UNF threads on the second bar. Failure of the screw threads to meet the acceptability requirements of ASME B1.1, ASME B1.13M, and ASME B1.21 shall be cause for rejection.

4.6.8 Attachment Tests. A milling, grinding, drilling and slotting attachment, in accordance with Federal Specification 00-M-340, Size 1, shall be mounted on the compound and cross slides of the lathe using adapters furnished with the lathe by the contractor. The lathe with the attachments shall meet all test requirements of 4.6.8.1 (see 3.4.1).

4.6.8.1 Keyway Cutting, Horizontal. A bar of low carbon steel (1020), two-inch round stock, 25 inches long shall be mounted between centers of the lathe. Using the milling attachment, a keyway 1/2 inch wide, 1/4 inch deep and 19 inches long shall be cut in the bar in one continuous operation at the rate of 1 3/4 inches per minute. The cut shall be free of chatter be cut in the bar in one continuous operation at the rate of one inch per minute. The cut shall be free of chatter marks and shall not vary from a straight line by more than 0.002 inch per foot.

4.6.9 High Voltage Requirement Test. The electrical circuits shall be subjected to a test voltage of 2500 volts peak at 60 Hertz, sinusoidal wave electrical energy at standard temperature and pressure. This test voltage shall be applied between mutually insulated circuits, between insulated circuits and ground, and between each conductor and the chassis ground. The full test voltage shall be applied immediately and maintained for no less than 15 seconds to each circuit in turn. During the 15 second intervals at the test voltage level, the circuitry shall be observed for flashover (surface discharge), spark-over (air discharge) and breakdown (puncture discharge). Any evidence of flashover, spark-over, breakdown or other damage to the unit due to heat or other effects of the applied voltage, shall be cause for rejection. Damage to solid-state control components can be avoided by wiring around or by-passing them, terminal to terminal. Arcing or discharge from solid-state control components is unacceptable (see 3.6.4).

4.7 Packaging Inspection. Packaging inspection shall be conducted before and after packaging to determine compliance with the preservation, packaging, packing and marking requirements specified in section 5 of this DFP.

4.8 Packaging Validation Tests. After the Quality Assurance inspection and tests have been successfully completed, one lathe, packaged in accordance with the requirements, specified in section 5 of this DFP, shall be selected at random and subjected to the following rough handling tests specified in 4.8.1. If a First Article Test (FAT) is required by the contract, the packaging validation test shall be conducted on the lathe used for the FAT. If a FAT is not required by the contract, then a lathe from the first production lot used for the tests listed in paragraphs 4.4 and 4.4.1 shall be used for the packaging validation tests. The apparatus used shall be as described in 4.8.1. A dummy load shall not be used. All tests are to be conducted under ambient conditions. Environmental temperature/humidity tests are not required. After the test has been completed, the container shall be inspected. Defects in accordance with those described below shall be cause for rejection. The unit shall then be unpacked and again subjected to the Quality Assurance inspections and tests of paragraphs 4.5, 4.6.2, 4.6.3, 4.6.4, 4.6.7, and 4.7 to reaffirm that the lathe meets the requirements specified in section 3 of this DFP . The tests in paragraphs 4.6.5, 4.6.6, and 4.6.9 do not need to be repeated after the packaging validation tests. After all requirements have been met, the unit shall be inspected and repackaged (see 4.7) before submission for government acceptance. After testing, any damage to the packaging shall be replaced prior to acceptance of the lot.

4.8.1 Mechanical Handling Test. Test shall be conducted using ASTM-D4169 Paragraph 10.3.1.1 (forklift truck handling). Acceptance Criteria is listed in Paragraph 7.2 of ASTM-D4169 using Criterion 1,2 and 3.

5 PACKAGING REQUIREMENTS. The preservation, packing, and marking requirements for the item identified above shall be accomplished in accordance with the performance requirements defined herein. The following Packaging requirements shall apply:

5.1 Packaging. Preservation, packaging, packing, unitization and marking furnished by the supplier shall provide protection for a minimum of one year, provide for multiple handling, redistribution and shipment by any mode and meet or exceed the following requirements.

5.1.1 Cleanliness. Items shall be free of dirt and other contaminants which would contribute to the deterioration of the item or which would require cleaning by the customer prior to use. Coatings and preservatives applied to the item for protection are not considered contaminants.

5.1.2 Preservation. Items susceptible to corrosion or deterioration shall be provided protection by means of preservative coatings, volatile corrosion inhibitors, waterproof and/or water vapor proof barriers.

5.1.3 Cushioning. Items requiring protection from physical and mechanical damage (e.g. fragile, sensitive, material critical) or which could cause physical damage to other items, shall be protected by wrapping, cushioning, pack compartmentalization, or other means to mitigate shock and vibration to prevent damage during handing and shipment.

5.2 Unit Package. A unit package shall be so designed and constructed that it will contain the contents with no damage to the item(s), and with minimal damage to the unit pack during shipment and storage in the shipping container, and will allow subsequent handling. The outermost component of a unit package shall be a container such as a sealed bag, carton or box.

5.3 Unit Package Quantity. Unless otherwise specified, the unit package quantity shall be one each part, set, assembly, kit, etc.

5.4 Intermediate Package. Intermediate packaging is required whenever one or more of the following conditions exists:

a. The quantity is over one (1) gross of the same national stock number,
b. Use enhances handling and inventorying,
c. The exterior surfaces of the unit pack is a bag of any type, regardless of size,
d. The unit pack is less than 64 cubic inches,
e. The weight of the unit pack is under five (5) pounds and no dimension is over twelve (12) inches.

Intermediate containers shall be limited to a maximum of 100 unit packs, a net load of 40 pounds, or a maximum volume of 1.5 cubic feet, whichever occurs first.

5.5 Packing.

5.5.1 Unit Packages. Unit packages and intermediate packages not meeting the requirements for a shipping container shall be packed in shipping containers. All shipping containers shall be the most cost effective and shall be of minimum cube to contain and protect the items.

5.5.2 Shipping Containers. The shipping container (including any necessary blocking, bracing, cushioning, or waterproofing) shall comply with the regulations of the carrier used and shall provide safe delivery to the destination at the lowest tariff cost. The shipping container shall be capable of multiple handling, stacking at least ten feet high, and storage under favorable conditions (such as enclosed facilities) for a minimum of one year.

5.6 Unitization. Shipments of identical items going to the same destination shall be palletized if they have a total cubic displacement of 50 cubic feet or more unless skids or other forklift handling features are included on the containers. Pallet loads must be stable, and to the greatest extent possible, provide a level top for ease of stacking. A palletized load shall be of a size to allow for placement of two loads high and wide in a conveyance. The weight capacity of the pallet must be adequate for the load. The preferred commercial expendable pallet is a 40 x 48 inch, 4-way entry pallet although variations may be permitted as dictated by the characteristics of the items being unitized. The load shall be contained in a manner that will permit safe handling during shipment and storage.

5.7 Marking.

5.7.1 Unit Packages. All unit packages, intermediate packs, exterior shipping containers, and, as applicable, unitized loads shall be marked in accordance with MIL-STD-129, Revision P, Date15 Dec 02 including bar coding. The contractor is responsible for application of special markings as discussed in the Military Standard regardless of whether specified in the contract or not. Special markings include, but are not limited to, Shelf-life markings, structural markings, and transportation special handling markings. The marking of pilfer able and sensitive materiel will not identify the nature of the materiel.

5.7.2 Contractors. Contractors and vendors shall apply address markings using a bar coded military shipment label (MSL) for all shipments accept contractor-to-contractor. The MSL will include both linear and 2D bar codes per the standard. The DD Form 250 or the commercial packing list shall have bar coding applied as per Direct Vendor Delivery Shipments in the standard (except for deliveries to DLA Distribution Depots, e.g. New Cumberland, San Joaquin, Red River, Anniston).

5.7.3 Contractor-to-Contractor Shipments. Contractor to contractor shipments shall have the address markings applied to the identification marked side of the exterior shipping container or to the unitized load markings. The following shall be marked "FROM: name and address of consignor and TO: name and address of consignee".

5.7.4 Military Shipping Label. The Army has developed software to create Military Shipment Labels. It's called Computer Automated Transportation Tool Military Shipment Label/Issue Receipt Release Document (CATT MSL/IRRD) and is available to anyone with a contract with the government. The software can be downloaded from the following website main page: http://www.asset-trak.com/catt/catt.htm. Or go directly to the software download page http://www.asset-trak.com/catt/msl_irrd/msl_irrddownload.htm. Be sure to bookmark this page for future releases of CATT MSL/IRRD.

5.8 Hazardous Materials. In addition to the general instructions listed above, hazardous materials or items as defined in CFR Title 49 are also subject to all applicable Department of Transportation regulations for packaging/packing, marking, labeling, container certification, and transport as listed in Code of Federal Regulations Title 49, Parts 100-180. If the shipment originates from outside the continental United States, the shipment shall be prepared in accordance with the United Nations Recommendations on the Transport of Dangerous Goods in a manner acceptable to the Competent Authority of the nation of origin and in accordance with regulations of all applicable carriers.

5.9 Heat Treatment and Marking of Wood Packaging Materials. All non-manufactured wood used in packaging shall be heat treated to a core temperature of 56 degrees Celsius for a minimum of 30 minutes. The box/pallet manufacturer and the manufacturer of wood used as inner packaging shall be affiliated with an inspection agency accredited by the board of review of the American Lumber Standard Committee. The box/pallet manufacturer and the manufacturer of wood used as inner packaging shall ensure tractability to the original source of heat treatment. Each box/pallet shall be marked to show the conformance to the International Plant Protection Convention Standard. Boxes/pallets and any wood used as inner packaging made of non-manufactured wood shall be heat-treated. The quality mark shall be placed on both ends of the outer packaging, between the end cleats or end battens; on two sides of the pallet. . Foreign manufacturers shall have the heat treatment of non-manufactured wood products verified in accordance with their National Plant Protection Organization's compliance program.

5.10 Quality Assurance. The contractor is responsible for establishing a quality system. Full consideration to examinations, inspections, and tests will be given to ensure the acceptability of the commercial package.

5.11 SUPPLEMENTAL INSTRUCTIONS.

5.11.1 Disassembly. When practical, for the protection of components, attachments and accessories from damage, pilferage, and galvanic corrosion or to reduce cubage, items may be disassembled only to a necessary basic degree. Disassembled parts shall be clearly and legibly marked as to identity and proper location on the basic machine. Fasteners removed during disassembly shall be secured in one of the mating parts. A part shall not be removed from an assembly unless it can be reassembled readily in the field without special skills or tools. Disassembled parts shall be marked with instructions to facilitate reassembly. The removed parts and their mating parts on the basic machine shall be marked by stenciling on the part, or by the use of tags. The tags if used and the ink used shall be waterproof. If tags are used the item that they are attached to shall be positively identified on the tag in case the tags come of the item.

5.11.2 General Requirements. Components, accessories, maintenance tools and disassembled parts shall be cleaned, dried, preserved, like the basic machine.

5.11.2.1 Internal Surfaces. All ferrous metal surfaces of the machine, which will be used internally, shall be solvent cleaned followed by fingerprint remover and wiped or drain dried. In addition, to preclude contamination from forming on cleaned surfaces, the surfaces shall be

coated with lightweight preservative oil. Cover with a sheet of chemically neutral paper until assembled.

5.11.2.2 External Surfaces. All external critical ferrous metal surfaces of the machine, its disassemble parts, components, accessories and maintenance tools shall be solvent cleaned followed by fingerprint remover and wiped or drain dried. Non-critical ferrous metal surfaces shall be solvent cleaned and wiped or drain dried. Nonmetallic composites and painted metal surfaces shall be cleaned by wiping with a clean dry cloth. Care must be taken
To prevent cleaning solvents from coming in contact with nonmetallic composites.

5.11.2.3 Steam and Air-lines. Steam and airlines shall be drained of all water accumulation and dried by injecting moisture free air into the lines.

5.11.2.4 Electrical Equipment. Electrical equipment shall be clean and dry. Preservatives shall be applied as required to prevent corrosion or fungus from forming. The preservative applied shall not affect the ability of the parts or connections to carry current, maintain voltage, or to provide the function for which they are designed. Openings shall be sealed with cap-plugs or with waterproof, pressure sensitive tape to protect against the entry of any foreign materials. Electric cable shall be coiled to a minimum safe diameter with no kinking or deformation and secured with cotton tape or twine to prevent uncoiling.

5.11.2.5 Hoses and Fittings. Open ends of all hoses (with or without fittings attached) shall be sealed with plastic caps or plugs or with waterproof, pressure sensitive tape that will protect against the entry of any foreign material. Hoses shall be coiled and secured in three equidistant places to prevent unwinding. Loose fittings shall be placed in a fiberboard box and packaged in a manner that will prevent galvanic corrosion, denting and scratching.

5.11.2.6 Lubricating Systems. Vent openings in the lubrication systems shall be temporarily capped or plugged to prevent loss of lubricants during shipment. Tags, warning that "ALL TEMPORARY CAPS OR PLUGS MUST BE REMOVED BEFORE START-UP OR USE " shall be attached to all temporary caps or plugs intended to be vented to the atmosphere during operation. These warnings shall also be included in the instruction manual. In the event a lubricant reservoir cannot be covered and sealed, it shall be appropriately preserved and the lubricant shall be provided in a metal or plastic sealed container and shipped with each machine. A warning tag shall be placed in a conspicuous place near the filling area warning the user to "INSTALL THE FURNISHED LUBRICANT BEFORE OPERATION OF THE EQUIPMENT". The operator's manual shall also reflect the above warning and procedure.

5.11.2.7 Tools. Sharp edges of tools shall be protected by a fiberboard shield placed on the sharp edge and taped in place. Tools when placed in their container shall be protected from galvanic corrosion and denting and scratching.

5.11.2.8 Drive Belts and Pulleys: Drive belts shall be released from tension until the machine is ready for operation. Machine operators or set up personnel shall be made aware of the released tension.

5.11.2.9 Closed Dial Indicators. Closed dial indictors shall be covered with 1 inch thick uncompressed cushioning material that is non-dusting and non-corrosive and secured in place with waterproof, pressure sensitive tape.

5.11.2.10 Drawers and Door Assemblies. Drawers and door assemblies shall be lubricated with the appropriate lubricant. Secure doors with strapping. Fiberboard pads shall be placed under metal strapping to prevent marring the surface of the machine.

5.11.2.11 Technical Data. Technical data shall be placed in a manila folder or small box the package shall be clearly and legibly marked "TECHNICAL DATA" in bold letters. The data shall be placed in a stowage compartment of the machine or placed in a box containing accessories or disassembled components.

5.11.2.12 Consolidated Packaging. Packaged accessories, maintenance tools, components and disassembled parts shall be placed in drawers and stowage compartments of the machine. When it is not feasible to stow parts as specified above place parts in fiberboard boxes of sufficient strength to handle the weight of the items.

5.11.2.13 Protection of Preservatives. All exposed preserved surfaces of machines which are subject to being disturbed during the packing operation shall be loosely covered with greaseproof barrier material. Not less than two (2) layers of similar type barrier material shall be used to separate the blocking and finished surfaces of the machine.

5.11.2.14 Movable Parts. Mechanical devices incorporated in the machine shall secure Movable parts. The mechanical devices of the machine shall be augmented with appropriate wood blocking, metal tie rods strapping or other means that will immobilize the movable parts.