STATE OF NORTH CAROLINA
DEPARTMENT OF ADMINISTRATION
PURCHASE AND CONTRACT DIVISION

3416-1E
SEPT 28, 2012
Superseding
3416-EL-ID
MARCH 3, 1995

SPECIFICATION FOR LATHES, ENGINE

(This specification is released for procurement purposes until revised or, rescinded).

SCOPE

This specification covers requirements for engine lathes in the sizes listed. It is not intended to cover all sizes that may be commercially available, but only those that are most frequently used by educational institutions and primarily for instructional purposes.

I. CLASSIFICATION

Lathes covered by this specification are classified by swing diameter size: 11, 13, 14, 15, and 16 inches. Characteristics for each size are given in Table 1.

II. APPLICABLE STANDARDS

The following documents of issue in effect on the date of the Invitation for Bids shall form a part of this specification:

ANSI B5.8 - Chucks and Chuck Jaws
ANSI B5.10 - Machine Tapers, Self-holding and Steep Taper
Series refer to spec. include ANSI B5.16
ANSI B5.16 - Accuracy of Engine and Tool Room Lathes
American National Standards Institute (ANSI)
1430 Broadway
New York, NY 10018

Federal Occupational Safety and Health Act (OSHA)
U.S. Department of Labor
200 Constitution Ave., N.W.
Washington, DC 20210

III. REQUIREMENTS

A. GENERAL

1. Standard Products

The lathe shall be essentially the standard product of the manufacturer's current offering to the public differing therefrom only in respects necessary to meet special requirements. The component parts of the unit need not be the product of the same manufacturer. The lathe offered shall be new and a standard production model of latest design, equipped with accessories as herein after specified.

TABLE 1

ENGINE LATHE SIZES AND CHARACTERISTICS

MACHINE CHARACTERISTICS (All requirements are minimum)		SIZES (All Dimensions Are In Inches)			
	11 Inch	13 Inch	14 Inch	15 Inch	16 Inch
CAPACITIES					
Swing Over Bed & Carriage	11	13	14	15	16
Wings	6	7 5/8	8 3/4	8 3/4	9
Swing Over Cross Slide					
Center Distance Range, Tailstock	20-48	20-48	20-60	29-60	29-80
Flush with Bid. To be specified in the Invitation for Bids	6 ½	8	9	11	11
Bed Width					
HEADSTOCK					
Type Spindle Nose	Camlock D1-3"	Camlock D1-4"	Camlock D1-4"	Camlock D1-6"	Camlock D1-6"
Alternate	Taper Key L-00	Taper Key L-0	Taper Key L-0	Taper Key L-1	Taper Key L-1
Bar Capacity Through Spindle (Dia)	1 1/8	1 3/8	1 ½	2"	2
Center Size, Morse Taper (ANSI)*	No. 3	No. 3	No. 3	No. 4	No. 4
Spindle Speed Changes	9 or variable	12 or variable	12 or variable	12 or variable	12 or variable
Spindle Speed Range	55-2000	55-1800	55-1800	45-1800	30-1600
Drive Motor HP**	1 ½	3	5	7 ½	7 ½
CARRIAGE					
Cross Slide Travel	6 ¼	6 ½	7 ½	8 ¼	9
Compound Rest Travel	2 ¼	3	3 ¼	3 3/4	5
Leadscrew Diameter	3/4	3	1	1 1/8	1 ¼
Longitudinal Feed Range, i.p.r.	0.002 or less	0.002 or less	0.002 or less	0.002 or less	0.002 or less
Thread Changes (Number of)	32	32	32	32	32
Thread Per Inch, American Standard Series	4-56	4-56	4-56	3-56	2-56
Metric Thread Range (Min.) MM	.5-7	.5-7	.5-7	.5-9	.5-9
TAILSTOCK					
Center Size, Morse Taper (ANSI)	No. 3	No. 3	No. 3	No. 4	No. 4
Spindle Travel	3	4	4 ½	5	5
Spindle Diameter	1 ¼	1 ½	1 3/4	1 15/16	2 1/8
Set Over	½	½	½	½	½

* The spindle shall be equipped with a removable tapered sleeve with an outside taper not less than one size larger than the center taper size.

** When a 2-speed motor is furnished, the min. HP specified above shall be the lowest HP rating of the motor

2. Castings

All castings and forgings shall be free from defects, scale, and mismatching. Processes such as welding, plugging, filling with solder or paste shall not be used to reclaim any defective part. Welding, brazing, or soldering shall be employed only where included in the original design.

All surfaces of castings, forgings, molded parts, stampings, and welded parts shall be cleaned and free from sand, dirt, fins, sprues, scale, flux, and all other harmful or

extraneous materials. External surfaces shall be smooth and all edges shall be either rounded or beveled, unless sharpness is required to perform a necessary function.

3. Fastenings

All screws, pins, bolts, and similar fasteners shall be installed with a means to prevent loss of tightness. Such parts subject to removal or adjustment shall not be swaged, peened, staked, or otherwise permanently installed.

4. Manufacturer's Nameplate

A nameplate with at least the following information shall be attached to the lathe in a prominent place:

a) The lathe manufacturer's name and address.
b) Model or catalog number and serial number.
c) Operating voltage, frequency, phase and amperage of the motor.

The lathe shall be a completely assembled and operational machine supplied by the manufacturer whose nameplate is 642 mixed to the lathe.

5. Workmanship

All materials shall be new, suitable for the intended purpose and free from any defect that may affect the serviceability and appearance of the machine. There shall be no sharp edges or corners. The final painting shall provide adequate coverage, a smooth surface and be free of any emerging rust spots, chipping or peeling.

6. Safety of Mechanical and Electrical Equipment

The lathe shall be equipped to meet safety requirements of "General Requirements for all machines" as written in Occupational Safety and Health Standards 1910-212 and 1910-219e. The electrical installation shall meet requirements of local and national electrical codes.

7. Accuracy

The lathe shall be capable of meeting all accuracy requirements of ANSI-B5.16. When specified in the Invitation for Bids, a certified copy of a laboratory report verifying compliance of the lathe offered with this standard shall be furnished.

B. BED

The lathe bed shall be made of cast iron, or of a high quality alloy cast iron designed, tested, and approved for use in industry. It shall have integral cross ribs, and be stress relieved during manufacture to provide stability. All bedways shall be hardened to minimum of Rockwell C-50, and precision ground to provide the alignment accuracy specified in ANSI B5.16. Provisions shall be made for securing and leveling the base on a foundation.

C. HEADSTOCK

The lathe shall have a headstock that supports and aligns the spindle axis parallel with the bed ways. The headstock shall be mounted rigidly on the left-hand end of the bed and shall house the gearing for the spindle drive and power take-off source for the feed mechanism.

The headstock shall be constructed to support the spindle operating and cutting loads. All headstock gears and shafts shall be hardened and ground. The headstock shall be an oil tight unit and shall provide a means of lubricating all bearings and gears that require continuous lubrication. The headstock shall include necessary controls for selecting and changing spindle speeds.

1. Headstock Spindle

The headstock spindle shall be supported by preloaded, precision, antifriction, ball or roller bearings. To facilitate set up, chucking, and inspection operations, the spindle shall be easy to rotate manually.

2. Headstock Spindle Drive

The headstock spindle shall be driven by an electric motor, through a series of V-belts, flat belts, cog belts, gears, or any combination thereof. The drive shall include a braking method to stop the spindle. Spindle speeds, except for the infinitely variable type, shall be in approximate geometric progression throughout the complete range. All speed shift mechanisms shall be constructed so that a speed change cannot occur unintentionally. The spindle speed change mechanism as specified in the Invitation for Bids, shall be one of the following types:

- -- Manual Belt Change
- -- Lever or Dial Set - Manual
- -- Infinitely Variable

Manual Belt Change - This simple speed change mechanism consists of series of step pulleys. To change spindle speeds, the operator stops the motor and moves the drive belt from one set of pulleys to another. Positions and speeds shall be indicated on a conveniently located chart.

Lever or Dial Set - Manual - With this type of speed change mechanism, spindle speed changes shall be made by positioning a series of levers or dials that shift the gears or clutches in the spindle drive mechanism. Speed settings shall be provided on a conveniently located chart.

Infinitely Variable - This type of speed change mechanism shall provide an infinite selection of spindle speeds, without gaps, throughout the complete range. Spindle speeds shall be selected with a conveniently located control. Optimum speeds shall be obtained by gear range selection located control. Optimum speeds shall be obtained by gear range selection and by variable speed adjustment within the range. It shall be possible to adjust speeds within a gear range while running. Revolutions per minute shall be shown on a convenient dial.

D. CARRIAGE

The carriage shall be constructed to provide rigid support for the cutting tool. The carriage ways shall be accurately fitted to the bedways, and provide smooth and consistant feed motion. Carriage ways shall have adjustable tapered gibs to compensate for wear. Wipers shall be provided on the carriage wings to prevent small chips and abrasives from entering between the carriage and the bedways. A clamping mechanism shall be provided to securely lock the carriage to the bed in position when cross feeding. The carriage shall have provisions for a follow rest and a taper attachment.

1. Carriage Apron

The carriage apron shall be of the double wall construction type, and providbearing support for both ends of the gear shafts within it. The apron shall be equipped with an oil reservoir and lubricating system for the gears, cross feed, and carriage ways. A safety interlock shall be provided to prevent engaging both the feed and half nuts at the same time. All 15 and 16 inch
lathes shall have a spindle start/reverse control on the carriage apron.

2. Carriage Feed

Manual and power feed movement of the carriage shall be transmitted through an accurately fitted rack and pinion gear. A carriage reversing mechanism shall allow feed movement in both directions, without changing the direction of spindle rotation. The reversing control shall be easily operated, positive acting, and located within easy reach of the operator's normal work position.

When a separate feed rod is included, a feed safety clutch shall be provided. All 13, 14, 15, and 16 inch lathes shall have separate feed and thread rods and safety clutch. Feed and thread rods shall be supported on precision bearings.

The thread cutting feed shall be provided by a precision leadscrew, when engaged by accurately fitted half nuts in the apron. The leadscrew shall have Acme threads and shall be engaged only for threading operations. The half nuts shall be engaged and disengaged by a lever on the apron that is easy to operate. A thread chasing dial indicator that engages the leadscrew and indicates the half nut engaging positions, shall be attached to the carriage apron. An instruction plate shall be attached in a prominent place telling when to engage half nut for different threads. The leadscrew shall be protected by friction clutch or shear pin against damage due to jamming or overload. When shear pins are used, they shall be located outside the gear enclosure and easily accessible for replacement.

The lathe shall cut in inch threads the full range of National Coarse and National Fine threads form ¼" through 1". It shall also cut metric threads when specified in the Invitation for Bids.

E. QUICK CHANGE GEAR BOX

The feed and threading selections shall be made by shifting gears in an enclosed quick change gear box. The gears shall provide the full range of feed and thread selections. A feed and thread chart, that shows control settings, shall be provided
in a convenient location.

F. END GEARING

The end gearing, connecting the headstock spindle drive with the quick change gear box, shall be designed to prevent slipping or disengaging of gears when the lathe is operating. The end gears shall be enclosed by a suitable safety cover. When specified in the Invitation for Bids, a lever operated quick change mechanism for changing from English to Metric or special threads shall be supplied.

G. CROSS SLIDE AND COMPOUND REST

The cross slide shall be fitted to the carriage, and full length tapered adjustable gibs shall be provided to compensate for wear and to maintain adjustment of the slides. The compound rest shall consist of a swivel base and top slide. The swivel base shall be attached to the cross slide by means of an accurately fitted swivel bearing, and shall be arranged to allow the top slide to be pivoted 360° on the swivel base. The swivel base shall be graduated in one degree increments, from 0° to 90°, in both directions.

The cross slide and top slide feed screw shall have Acme threads, and shall be protected from chips and abrasive material. The feed screws shall be fitted with reset type micrometer dials that show tool movement or stock removal in increments of 0.001". When metric capabilities are specified, dual inch/metric micrometer dials shall be provided. The cross feedscrew shall be designed to permit the use of a taper attachment.

H. TAILSTOCK

The tailstock shall be easy to move along the bedways, and shall be designed to permit setting the compound rest parallel to the bedways when the units are operated close together. The tailstock spindle shall have permanent vertical alignment with the headstock spindle, and a screw adjustment shall be provided on the base of the tailstock for accurate horizontal adjustment or set-over of min. ½". Witness marks shall be provided to facilitate alignment and for a reference. A clamping mechanism shall lock the tailstock to the bed and the spindle to the housing, without disturbing the alignment.

The tailstock spindle shall be made of steel, and precision ground to fit the spindle housing. The spindle shall be operated by a handwheel and shall not bind when fully extended, retracted, or anywhere in between. An inch/metric dial or scale shall be provided to indicate the spindle movement in increments of 1/16" or 1mm or less.

I. DRIVE MOTOR

The main drive motor shall be of the ball bearing continuous duty type, fan cooled, single or variable speed, and shall meet the requirements of a dripproof enclosure. Motor controls shall be forward, reverse, and stop.

The drive motor starter shall be the magnetic type, include a reversing switch, and meet the safety requirements for protection against overload, low voltage and automatic restart.

J. LUBRICATION

All gears, moving parts, and bearings shall be provided with a means for adequate lubrication. Each reservoir shall be equipped with an oil level indicator, and all oil holes, grease fittings, and filler caps shall be easily accessible.

A lubrication chart or plate shall be securely attached to the lathe. If a chart is furnished, it shall be placed in a transparent folder, or permanently sealed between clear plastic sheets. The chart or plate shall contain the following information:

--Points of application
--Service interval
--Type of lubricant
--Lubricant viscosity

K. STANDARD OR INCLUDED EQUIPMENT

The following equipment shall be supplied with each lathe:

1. Chip and Coolant Pan

   The chip and coolant pan shall be constructed to drain coolant into a screened reservoir. The pan may be cast as part of the lathe base or may be fabricated of heavy gage sheet steel. It shall be arranged to facilitate chip removal and draining.

2. Drive Plate

   The dog plate or drive plate shall have two or more equally spaced driving slots.

3. Lathe Centers

   One solid and one live center shall be provided. The live center for use in the tailstock spindle shall be equipped with not less than two bearings. The centers shall be in accordance with ANSI B5-10.

4. Tool Post, Round

   The tool post shall be the round, single screw, rocker base type.

5. Graduated Compound Rest

   A graduated compound rest shall be provided to accurately adjust the depth of cut on the work.

6. Thread-Chasing Dial Indicator

   A thread-chasing dial indicator shall be provided and marked to indicate correct engagement of the leadscrew and half-nut when cutting threads. A thread-chasing stop shall be provided on the lead screw.

7. Center Sleeve

   The outside diameter of the headstock center sleeve shall be tapered to fit the spindle and shall have an interior taper to receive the lathe center. The dimensions and tolerances shall be in accordance with ANSI B5.10.

8. Wrenches

   Any special wrenches or tools required for operation or maintenance of the lathe normally provided by the machine tool builder shall be furnished.

L. OPTIONAL OR ACCESSORY EQUIPMENT

The following equipment shall be supplied with each lathe when called for in the Invitation for Bids:

1. Coolant Systems

   A complete coolant system shall be furnished including reservoir, oil resistant hoses, strainer, pump with necessary tubing, operating control valve, and a universal delivery tube nozzle. The reservoir shall be equipped with a drain plug.

2. Chuck, 3-Jaw

The chuck body shall be of ferrous material, universally geared, self-centering, conforming to ANSI B5.8 for medium duty, wrench operated type. It shall be mounted to the spindle nose without the use of adapters. The chuck shall be furnished with jaws to hold work both internally and externally and one wrench for operating chuck jaws.

3. Chuck, 4-Jaw

The chuck body shall be of ferrous material and shall fit the spindle nose of the lathe without use of adapters. The chuck and jaws shall conform to ANSI B5.8 for medium duty, wrench operated type. The front face of the chuck shall have a progression of concentric circles marked to facilitate chucking the workpiece. The chuck shall have stepped, reversible, independent jaws. One wrench for operating chuck jaws shall be furnished.

4. Faceplate, Large

The faceplate shall be of cast iron or steel. It shall have two or more T-slots in accordance with ANSI B5.1 and four or more radial slots, equally spaced around the plate. The runout of the face plate shall be in accordance with ANSI B5.16 for the engine lathe as applicable. The size shall be matched to the capacity of the lathe unless otherwise specified in the Invitation for Bids.

5. Steady Rest

The steady rest shall be of the hinge type, having at least three jaws adjustable for work diameter. The jaws shall be set and securely locked in the desired position by adjusting and lock screws. The jaw tips shall be roller bearing type.

6. Follow Rest

The follow rest attaches to the carriage and moves with it. It provides support for long slender pieces that must be turned between centers. It shall have two adjustable jaws.

7. Taper Attachment

The taper attachment shall be of the telescoping screw type to accurately turn tapers. It shall be graduated for settings in both degrees and inches per foot. The design and construction shall be such that either right or left hand tapers may be turned. When not in use, the attachment shall not interfere with normal lathe operation.

8. Elapsed Time Meter

The elapsed time meter shall be a digital readout, non-reset type, designed to resist the effects of vibration, voltage fluctuation, temperature and humidity. The meter shall be mounted for ease in reading and shall be wired to record the accumulated operating time of the machine to a total of at least 9,999.9 hours.

9. Micrometer Carriage Stop

The micrometer carriage stop shall be for mounting on and be adjustable along the front bedway. It shall be designed for use on the left side of the carriage. The micrometer dial shall be graduated in increments of 0.001 inch with at least 3/4 inch barrel movement.

10. Worklight

The worklight shall be furnished, of the adjustable arm type with all necessary components, for mounting on the carriage.

11. Draw Bar Collet

The draw bar collet shall use a hollow bar through the spindle hole to draw down the collet. The handwheel or lever operates on the outer end of the spindle.

12. Spindle Nose Collet

This collet attachment shall mount on the spindle nose and have a handwheel or lever to operate at the nose end of the spindle. There is no bar through the spindle hole.

IV. WARRANTY

Under this proposal and agreement, the supplier warrants the lathe to be of good material and workmanship and agrees to promptly replace any part or parts which by reason of defective material or workmanship shall fail under normal use, free of negligence or accident, for a minimum period of 12 months from the date of acceptance. Such replacement shall include all parts, labor and transportation and shall be free of any charge to the State of North Carolina.

V. SPARE PARTS AND MANUALS

At least two complete operators instruction manual(s) shall be furnished with each lathe. The manual(s) shall include complete instructions for the operation, lubrication, adjustment and care of the lathe and accessories. Schematic wiring diagram for motor connections and controls shall be furnished in the instruction manual or permanently affixed in a convenient location on the electrical components housings.

A complete list of parts and accessories including catalog or stock numbers and name and address of source of supply shall be furnished. The designated facility shall maintain a readily available spare parts inventory.

VI. ACCEPTANCE EVALUATION AND QUALITY ASSURANCE

Upon installation, each lathe will be inspected by Quality Assurance personnel to verify conformance with this specification and the appropriate Invitation for Bids. The State of North Carolina may, at any time it deems necessary, test the equipment for compliance with this specification. Rating standards and test procedures shall be according to ANSI B5.16 standard - Accuracy of Engine and Tool
Room Lathes. See accuracy statement under general requirements above. III.A.6.

VII. DELIVERY AND PAYMENT

Delivery of the payment for equipment furnished under this specification shall be in accordance with the terms and conditions stated in the Invitation for Bids. The contractor shall be responsible for any packing, packaging, or protection required to insure delivery in an undamaged condition.

VIII. ORDERING DATA

Purchasers should exercise any desired option offered herein and should specify the following:

1. Title, number, and date of this specification
2. Lathe size, swing diameter and distance between centers
3. Type spindle speed change
4. Metric or other special capabilities
5. Electrical requirements, voltage, frequency (Hertz), and phase
6. Optional accessories required
7. Accuracy certification required
8. Delivery and installation requirements
    a. Furnish and deliver
    b. Unload
    c. Set in place and level
    d. Completely install ready for operation
    e. Demonstrate
    f. Instruct in operation and maintenance, time period to be specified

This interim specification shall, until revised or rescinded, apply as for as practicable in terms and effect to every state purchase of the commodity described herein; however, modifications may be made by the Secretary of Administration prior to the adoption of revisions.