

MILITARY SPECIFICATION

PRESS, CONNECTING ROD STRAIGHTENING, HYDRAULIC

This specification is approved for use by the US Army Armament Research and Development Center, Department of the Army, and is available for use by all Departments and Agencies of The Department of Defense.

1. SCOPE

* 1.1 Scope. This specification covers a 12.5 ton, manually operated, bench mounted, hydraulic press for straightening connecting rods of internal combustion engines.

2. APPLICABLE DOCUMENTS

* 2.1 Government documents.

* 2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-B-566	- Box, Folding, Paperboard.
PPP-B-601	- Boxes, Wood, Cleated-Plywood.
PPP-B-621	- Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636	- Boxes, Shipping, Fiberboard.
PPP-B-640	- Boxes, Fiberboard, Corrugated, Triple-Wall.
PPP-C-843	- Cushioning Material, Cellulosic.
PPP-F-320	- Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.
PPP-T-60	Tape, Packaging, Waterproof.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research and Development Center, ATTN: SMCAR-ETS (R), Rock Island, IL 61299-7300 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MILITARY

- MIL-P-116 - Preservation, Methods of.
- MIL-B-121 - Barrier Material, Greaseproofed, Waterproofed, Flexible.
- MIL-C-5501 - Caps and Plugs, Protective, Dust and Moisture Seal.
- MIL-H-5606 - Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance.
- MIL-H-6083 - Hydraulic Fluid, Petroleum Base, For Preservation and Operation.
- MIL-F-17111 - Fluid, Power Transmission.

STANDARDS

FEDERAL

- FED-STD-H28 - Screw-Thread Standards for Federal Services.

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-889 - Dissimilar Metals.
- MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking and Waterproofing; With Appropriate Test Methods.

* 2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herien.

US DEPARTMENT. OF LABOR

- OSHA 2206 - General Industry, OSHA Safety and Health Standards (29 CFR 1910).

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

* 2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- B40.1 - Gage, Pressure Indicating, Dial Type, Elastic Element.

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D3951-82 - Standard Practice for Commercial Packaging

(Application for copies should be addressed to the American Society for testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical group and using Federal agencies.)

* 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. REQUIREMENTS

3.1 First article. When specified (see 6.2.1), the contractor shall furnish one complete press for first article inspection. The first article may be either a preproduction model or an initial production item which conforms to the requirements of this specification. In either case, the approved first article and the production items shall be identical and in accordance with the terms of the contract. Approval of the first article shall not relieve the contractor of the responsibility to furnish equipment in accordance with the requirements of this specification.

* 3.2 Design. The press shall be new and of the manufacturer's latest design meeting the performance requirements specified herein. It shall be a bench mounted, manually operated, hydraulic press designed for correcting bends, twists, and offsets in all connecting rods within the range of 3.75 through 15.50 inches center to center length between the crankshaft center line and the piston pin center line.

3.2.1 Maintainability. Item configuration and adjustment features shall be designed to reduce maintenance operations to simple procedures needing a minimum of maintenance skills and using common hand tools. The operation and maintenance manual shall contain clear and concise instruction for disassembly, repair, adjustment, replacement of parts, and reassembly.

* 3.2.2 Safety and health requirements. The press shall comply with the general safety and health requirements promulgated under OSHA 2206 that are applicable to the press itself. Exceptions and additional requirements for safety and health shall be as specified in the contract (see 6.2.1 and 6.4).

3.3 Construction. All parts and materials used in fabrication of the press shall be new and free of defects. In no event shall patching processes be used for reclaiming defective parts. All surfaces shall be clean and free of extraneous materials. External surfaces shall be free of sharp edges. All screws, pins, and similar parts shall be installed to prevent loss of tightness. Parts subject to removal or adjustment shall not be deformed.

* 3.3.1 Material. Materials not specifically designated herein or in the contract shall be of a quality commensurate with commercial practice within the producing industry, shall be suitable for the intended purpose in the design of the end item, and shall meet all requirements specified herein. Materials shall

be free from defects which would adversely affect the performance or maintainability of the individual components or the overall assembly. When dissimilar metals are used in contact with each other, suitable protection against galvanic corrosion shall be applied in accordance with MIL-STD-889.

* 3.3.2 Reclaimed materials. The contractor is encouraged to use reclaimed materials for fabricating new parts without jeopardizing the chemical and physical properties, design integrity, and intent of the materials originally selected or specified. The reclaimed materials shall have been reprocessed, remanufactured, or recycled in a manner that shall restore them to the same chemical composition and physical properties as the materials originally selected for use. It shall not be permissible to use reclaimed parts as is, or rebuilt from scrap or other used equipment.

* 3.3.3 Interchangeability. Replacement parts shall not require any modification of the replacement part, other parts or components, higher assemblies, or the end item for installation. The replacement parts shall provide the same, or better, form, fit, function and performance as the parts initially provided in the press. When industry or government standards are applicable, replacement parts shall conform to those standards.

3.3.4 Castings and forgings. All castings and forgings shall be free from defects. Strength and other essential physical and chemical properties of the castings and forgings shall be adequate to meet the performance requirements specified herein.

* 3.3.5 Welding, brazing, and soldering. Welding, brazing, and soldering shall be of a quality which shall sustain the performance requirements of the welded, brazed, or soldered part. However, these operations shall not be employed as repair measures for defective parts.

* 3.3.6 Painting. Unless otherwise specified (see 6.2.1), painting and finishing shall be in accordance with the best commercial practice in the industry. Before painting, all surfaces shall be clean and be free of all foreign matter detrimental to painting. At least one coat of primer (or a phosphate or chromate base) and one coat of enamel, or equivalent (i.e., epoxy enamel), shall be applied.

* 3.3.7 Threads. Threads shall conform to FED-STD-H28 and the applicable Detailed Standard section referenced therein.

3.4 Performance and product characteristics.

* 3.4.1 Hydraulic load. The press shall have a capacity of not less than 12.5 tons. The manually actuated hydraulic pump shall develop sufficient force to provide a proof load of 16 tons. The hydraulic pump shall be a closed hydraulic system. The hydraulic system shall require no more than 50 pounds of force, two inches from the end of the pump handle, applied in the direction of gravity to develop a force equal to the specified load of 12.5 tons.

* 3.4.2 Proof load. The press shall withstand a proof load of 16 tons, applied for a period of five minutes, without showing visual evidence of leaks, breaks, creepage, permanent deformation, or loss of pressure.

* 3.4.3 Jig fixture. Each press shall be supplied with one jig fixture and two adjustable work support members (see 3.5.7). The jig fixture and work support members shall be reversible and adjustable to accept and straighten connecting rods that are twisted 0° to 20° , bent 0° to 8° , and offset (both twisted and bent) the same number of degrees.

3.5 Details of components.

* 3.5.1 Body. The body shall be fabricated steel or cast iron with provisions for mounting the oil reservoir and ram cylinder. The ram cylinder and reservoir shall be of cast iron or cast steel and may be an integral unit or individual units. At the option of the manufacturer, the body, oil reservoir, and ram cylinder may be an integral iron or steel casting. The cylinder bore finish shall be sufficient to prevent leakage or seepage when subjected to the proof load of 3.4.2. The body shall be constructed to provide for a space that is not less than a three inch opening between the jig fixture and work support members when the press is in a fully open position. Provision shall be made for bench mounting the press.

* 3.5.2 Ram. The ram piston shall be fabricated of either steel or cast iron and shall be finished on its circumference to a surface finish sufficient to prevent leakage or seepage when the press is subjected to the proof-load of 3.4.2. Means shall be incorporated to prevent over-travel of the ram piston. The ram shall be provided with a rapid hydraulic advance to close the gap and a manually operated rod to open this gap.

* 3.5.3 Hydraulic seals. The hydraulic ram shall have those seals necessary to retain pressure without leakage and without creating friction on the ram. The seals shall be comparable with the hydraulic fluid used (see 3.7.2).

3.5.4 Hydraulic pump. A manually actuated hydraulic pump shall be provided to maintain the rated capacity of the press. The hydraulic pump shall constitute a closed hydraulic system.

* 3.5.5 Pressure gage(s). A dial type hydraulic pressure gage(s), not less than two inches in diameter with screw on bezel, conforming to ANSI B40.1, grade B construction, shall, be connected to the hydraulic cylinder of the press. The gage(s) shall be located in full view of the press operator. The total range of the gage(s) shall be 0 to 15 tons. The dial shall be provided with a dual scale marked to indicate tons of ram force or pounds of ram force and pressure per square inch of hydraulic pressure. The allowable error in indicated force or pressure shall be two percent of the scale range for the middle half of the scale and three percent for each end quarter of the scale. Pressure relief hole(s) shall be provided in the back of the gage case(s).

* 3.5.6 Relief valve. An adjustable overload relief valve, set to function at not less than 12.5 tons and not more than 14.5 tons, shall be connected to the hydraulic pressure chamber and arranged to discharge into the oil reservoir. The relief valve adjustment mechanism used shall be the type that shall require special access or adjustment techniques that the press operator will not have readily available.

* 3.5.7 Jig fixture and work support members. A reversible and adjustable jig fixture and two adjustable work support members shall be provided (see 3.4.3). These parts shall be fabricated of steel which has been hardened and drawn to withstand all operating stresses without distortion or failure, when subjected to the proof load requirements specified in 3.4.2.

* 3.6 Hydraulic oil. There shall be sufficient hydraulic oil (see 3.7.2) to operate the press ram to full travel under a full load, with enough excess oil in the reservoir to prevent air from entering the hydraulic system.

3.7 Product identification. The press may be provided with either one information plate or with three separate plates. When one information plate is used, it shall contain the following information:

Manufacturer's name
 Manufacturer's model designation
 National Stock Number (NSN)
 Contract Number
 Information specified in 3.7.1 and 3.7.2

The information plate(s) shall be fastened in a permanent manner in a location visually convenient to the operator. The plate shall be a corrosion resistant metallic plate, with permanent and legible characters in the English language.

* 3.7.1 Refill instruction plate. The refill instruction plate, when used, shall clearly state the manufacturer's recommended method of refilling the hydraulic reservoir of the press.

* 3.7.2 Hydraulic fluid identification plate. When used, a hydraulic fluid identification plate shall indicate MIL-H-5606, MIL-H-6083, or MIL-F-17111 as the applicable hydraulic fluid to be used for initial filling and refilling of the hydraulic pump. If the hydraulic pump uses hydraulic fluid meeting the requirements of MIL-H-5606 or MIL-H-6083, the following message shall be attached in a conspicuous location near the filler plug, or plugs, of the reservoir.

CAUTION
 USE NO FLUID OTHER THAN
 MIL-H-5606 OR MIL-H-6083

If the hydraulic pump uses hydraulic fluid meeting the requirements of MIL-F-17111, the following message shall be attached in a conspicuous location near the filler plug, or plugs, of the reservoir.

CAUTION
 USE NO FLUID OTHER THAN
 MIL-F-17111

* 3.8 Workmanship. Standards of workmanship shall assure that the press shall have the stability, strength, safety, and efficient operating characteristics found in the best commercial units and as specified in Section 3.

4. QUALITY ASSURANCE PROVISIONS

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

4.2 Classification of inspection. 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. First article inspection shall be applied to the preproduction model or initial production item (see 3.1). Unless otherwise specified (see 6.2.1), 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. Unless otherwise specified (see 6.2.1), quality conformance inspection shall be applied to production items offered for acceptance under the contract. Unless otherwise specified (see 6.2.1), quality conformance inspection shall consist of (a) through (e) below. Failure of any item to pass an examination or test shall be cause for rejection of the item.

- (a) Examination (see 4.5).
- (b) pressure gage accuracy test (see 4.6.1).
- (c) Relief valve test (see 4.6.2).
- (d) Rated capacity test (see 4.6.3).
- (e) packaging inspection (see 4.7).

* 4.4.1 Sampling. Sampling for quality conformance inspection shall be performed in accordance with MIL-STD-105 using the following:

<u>Inspection test</u>	<u>Level</u>	<u>AQL</u>
Examination (see 4.5)	II	1.5
Pressure gage accuracy test (see 4.6.1)	100% inspection	
Relief valve test (see 4.6.2)	100% inspection	
Rated capacity test (see 4.6.3)	100% inspection	
Packaging inspection (see 4.7)	S-4	4.0

* 4.5 Product examination. The press shall be examined to determine compliance with the requirements of Section 3 and the contract. As a minimum, the following characteristics shall be examined:

<u>CHARACTERISTICS</u>	<u>REQUIREMENT PARAGRAPH</u>
Design	3.2
Maintainability	3.2.1
Construction	3.3
Material	3.3.1
Reclaimed materials when applicable	3.3.2
Interchangeability	3.3.3
Welding, brazing, and soldering	3.3.5
Painting and finishing	3.3.6
Threads	3.3.7
Performance and product characteristics	3.4
Hydraulic load	3.4.1
Proof load	3.4.2
Jig fixture	3,4.3

Components	3.5
Body	3.5.1
Ram	3.5.2
Hydraulic seals	3.5.3
Hydraulic pump	3.5.4
Pressure gage(s)	3.5.5
Relief valve	3.5.6
Jig fixture and work support members	3.5.7
Hydraulic oil	3.6
Product identification	3.7, 3.7.1, and 3.7.2
Workmanship	3.8

A certificate of conformance may be used to satisfy examination requirements when more than a visual or dimensional verification would be required.

4.6 Tests.

4.6.1 Pressure gage accuracy test. The pressure gage(s) shall be tested in accordance with paragraph 6.0 of ANSI B40.1, for grade B construction, as applicable to gages over 100 pounds per square inch gage. Accuracy shall be in accordance with 3.5.5. The calibration or test gage pressure shall be multiplied by the cross sectional area of the ram to verify both pounds per square inch and tonnage in pounds-force readings indicated on the gage dial(s) (see 3.5.5).

4.6.2 Relief valve test. With the relief valve installed in the press, the ram shall be blocked and pressure applied with the pump to indicate between 12.5 to 14.5 tons on the gage. If the relief valve fails to open and cannot be adjusted to open between 12.5 and 14.5 tons gage pressure, the press under test shall be rejected (see 3.5.6).

* 4.6.3 Rated capacity test. The ram shall be blocked and a load applied by operating the pump until the pressure gage indicates the rated load of 12,5 tons. This test shall be performed at half stroke and near full stroke of the press using a force not greater than 50 pounds two inches from the end of the handle. Failure to develop the required indicated load capacity or evidence of leaks, breaks, permanent distortions, or failure of handle actuation with a maximum 50 pound force shall be cause for rejection (see 3.4.1, 3.5.3, and 3.5.4).

* 4.6.4 Proof load test. The relief valve shall be removed and the opening plugged for this test. Replace the pressure-tonnage gage(s) of 3.5.5 with a pressure gage(s) equivalent to at least 30 tons pressure. The ram shall be blocked at nearly full travel and sufficient pressure applied with the pump to indicate the maximum gage load of 16 tons. The press shall be allowed to stand under this load for a period of five minutes. Any evidence of pressure loss, leaks, breaks, creepage, or permanent distortion shall be cause for rejection (see 3.4.2, 3.5.1, and 3.5.7).

4.6.5 Bend and twist test. With the anvil and work support members in place, and using not less than four various size connecting rods between 3.75 to 15.5 inches long, the press shall be tested as follows:

- (a) Deform the connecting rods in the following manner and use a connecting rod alignment indicator to determine the degree of deformation.

- (b) Clamp journal end of number one rod in a vise and insert a steel bar through the wrist pin end. Twist the rod between 5° and 10° out of alignment about the longitudinal axis of the rod.
- (c) Using the rod press, lay number two rod on rockers with journal end closer to anvil and bend rod from 2° to 4° out of alignment in relation to the centerline of the pin end and journal end diameters. Turn rod over and, near the pin end, bend the same amount. This will provide the offset condition.
- (d) Twist number three rod as in b above, then twist near center of the rod and apply one bend as in c above. This will combine bend and twist.
- (e) Offset number four rod as in c above. Twist as in b above. This will combine offset and twist.

Align rods in press visually. After completing visual alignment, use connecting rod alignment indicator to determine when exact point of alignment has been reached. Repeat on all rods until all four rods have been aligned. Failure of the press to correct the deformations shall be cause for rejection (see 3.2 and 3.4).

* 4.7 Packaging inspection. Packaging inspection shall be conducted before and after packaging to determine compliance with the requirements of Section 5.

5. PACKAGING

5.1 Disassembly. The press may be disassembled to the extent necessary to assure that all surfaces requiring a preservative are accessible for processing, to assure minimum cube for packing, and to permit reassembly without special skills or tools. Disassembly, when applicable, shall be as specified in MIL-STD-1186.

* 5.2 Preservation. Preservation shall be Level A or Industrial. Unless otherwise specified (see 6.2.1), Industrial preservation shall be provided. When military (Level A) preservation is required, it shall be so specified in the contract.

5.2.1 Level A.

5.2.1.1 Cleaning and drying. The press shall be cleaned and dried in accordance with the applicable procedures of MIL-P-116.

5.2.1.2 Preservative application. Preservatives specified herein and procedures for application shall conform to MIL-P-116. Immediately after cleaning and drying, open the oil cup, remove pressure gage(s), and fog interior of press with type P-10, grade 10 preservative oil. Exercise and extend ram piston and hydraulic rod and coat exposed surfaces with type P-2 preservative. All exterior noncritical surfaces, which have not been painted or plated, shall be coated with type P-1 or type P-19 preservative.

* 5.2.1.3 Unit packaging. Each press shall be packaged in accordance with method I of MIL-P-116. The hydraulic rod and ram piston shall be secured in a closed position. Surfaces preserved with type P-2 preservative shall be covered with barrier material conforming to MIL-B-121, type I, grade A, class 2. The pressure gage(s) shall be wrapped with cushioning material conforming to PPP-C-843, type II, class B. Secure barrier and cushioning material in place with tape conforming to PPP-T-60, type optional. The oil cap and pressure gage openings

shall be sealed with tape conforming to PPP-T-60, type IV, or caps or plugs conforming to MIL-C-5501. Package the pressure gage(s) in accordance with method IC-2 of MIL-P-116, using a box conforming to PPP-B-566 as the unit container. The complete press, including the pressure gage(s), shall be placed in a fiberboard box conforming to PPP-B-636, grade W5c. The press shall be immobilized within the unit container by applying fiberboard pads or cut shapes conforming to PPP-F-320, class weather-resistant. Box closure shall be accomplished in accordance with the box specification.

5.2.2 Industrial. Industrial preservation shall be as specified in ASTM D3951-82.

* 5.3 Packing. Packing shall be Level A, Level B, or Industrial. Unless otherwise specified (see 6.2.1), Industrial packing shall be provided. When military (Levels A and B) packing is required, it shall be so specified in the contract.

5.3.1 Level A. A quantity of unit packaged presses shall be packed in an exterior shipping container conforming to PPP-B-601, overseas type, or PPP-B-621, class 2. The gross weight of the container shall be governed by the limitations of the applicable container specification. Closure and strapping of the container shall be in accordance with the applicable box specification. Blocking, bracing, and cushioning shall be in accordance with MIL-STD-1186.

5.3.2 Level B. Presses shall be packed as specified in 5.3.1 except shipping containers shall conform to PPP-B-640, class 2.

5.3.3 Industrial packing. Industrial packing shall be as specified in ASTM D3951-82.

* 5.4 Marking. Marking shall be Level A, Level B, or Industrial. Unless otherwise specified (see 6.2.1), Industrial marking shall be provided. When military (Levels A and B) marking is required, it shall be so specified in the contract.

* 5.4.1 Level A and B marking. Level A and B marking shall be as specified in MIL-STD-129.

* 5.4.2 Industrial marking. Industrial marking shall be as specified in ASTM D3951-82.

6. NOTES

6.1 Intended use. The press covered by this specification is intended for use in correcting bends, twists, and offsets in connecting rods of internal combustion engines. It is of the hydraulic type and has a minimum capacity of 12.5 tons. It is manually operated and bench mounted. The press is normally used in shops equipped with connecting rod alignment indicators.

6.2 Ordering data.

* 6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) First article when required (see 3.1).

- (c) Exceptions and additional safety/health requirements when required (see 3.2.2 and 6.4).
- (d) painting and finishing if different (see 3.3.6).
- (e) First article inspection if different (see 4.3).
- (f) Quality conformance inspection if different (see 4.4).
- (g) Level of preservation, packing, and marking if different (see 5.2, 5.3, and 5.4).

6.3 Contract data requirements. Required technical data, such as operator's manuals, parts lists, and other instructions for operation and maintenance, as identified on a DD Form 1664, should be specified on a DD Form 1423 incorporated in the contract.

* 6.4 Safety and health requirements. In order that equipment integrated into the user's operational environment will comply with OSHA limitations and control of noise levels, radiation, electromagnetic emission, noxious vapors, heat, etc, as applicable, specific requirements concerning such points of operation, and other health and safety requirements, should be specified by the user.

6.5 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and suppliers are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

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