

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

MECHANICAL STAMPING PRESSES

NOTE: The following standard is an updated version of the prior standard, and serves as an interim standard until the new global standard is published".

1.0 SCOPE

1.1 The text herein contained shall apply to mechanical stamping presses for use in the Ford Motor Company. All presses shall conform to the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) Standards Section 1910.217, Mechanical Power Presses, and state and local ordinances.

1.2 These standards apply to the following:

- A. Single Action Presses of 50 Tons or More Capacity
- B. Multiple Action Presses
- C. Automatic Blanking, High Speed, and Progressive Die Presses
- D. Portable Presses
- E. Transfer Presses

1.3 These standards shall also apply, where appropriate, to the following related equipment:

- A. Hydro-Pneumatic, Pneumatic, Hydraulic, and Die Cushions
- B. Guillotine Shears
- C. Square Shears
- D. Die Spotting and Tryout Presses
- E. Press Brakes
- F. Air Storage and Surge Tanks

1.4 These standards do not apply to the following:

- A. Hydraulic Presses
- B. Powdered Metal Compacting Presses
- C. Pneumatic Presses
- D. Forging Presses
- E. Presses of Less than 50 Tons Capacity

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

1.5 The following type presses are classified "Portable" by the Ford Motor Company:

- A.** Two-Point Floor Mounted Single Action Presses up to and Including 250 Tons
- B.** Open Rack Inclined Presses
- C.** Adjustable Knee Presses, Either One or Two Point
- D.** Solid Cap Presses, Either One or Two Point

1.6 Presses listed in paragraph 1.5, but equipped with any type of strip or coil stock feeder, are not classified as "portable".

2.0 PROPOSAL PHASE

2.1 This Standard shall be adhered to by suppliers receiving Purchase Orders from the Ford Motor Company for new and refurbished presses and related equipment, unless waivers are granted in writing by the Division of the Ford Motor Company which is procuring the equipment.

2.2 In addition to the requirements of the Ford Motor Company's "Machinery and Equipment Guidelines", the following preliminary information shall be furnished by the supplier with each proposal:

- A.** Firm delivery timing from receipt of Purchase Order. When extra costs are required to meet requested delivery timing, these costs shall be quoted separately.
- B.** Completed specification form indicating for each item whether the quoted item agrees with the specification or not (see Section 5.1 and 5.1A). Suppliers are encouraged to quote alternate equipment where improvements in cost, productivity, reliability, safety, delivery, or serviceability will result, however, the specified equipment must be the basis for the base bid. Failure to quote directly to the base specification may result in disqualification of the proposal.

NOTE: Any line item for which an alternate is proposed must reference the line, state the logic and the cost indicating an increase or decrease in base price. In any case, the original specification request must be adhered to and remain the basis for the base bid.

- C.** A complete list of the deviations and proposed substitutions from this DR-10 standard and/or written requirements.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- D. Itemize on separate line items each separate cost for all custom clearances, import duties and taxes as applicable.
- E. General arrangement drawings indicating overall lengths, widths, heights, approximate weights and clearances required to assemble or disassemble the equipment.
- F. Locations of any and all remote equipment.
- G. Die space drawings.
- H. A motor list showing the types, horsepower, frame and RPM of all motors
- I. Motion and tonnage capacity curves displaying crank angle, tonnages, speeds, distances and relationship of all slides.
- J. A timing chart created in Microsoft Project displaying suppliers implementation schedule in weeks duration.

2.3 Pricing - the supplier shall show separate prices summarized for:

- A. Base machine complete as specified F.O.B. Receiving Plant.
- B. Break out costs for:
 - 1. Base machine
 - 2. Feeder (if required) - mechanical vs. electrical
 - 3. Engineering and design
 - 4. Link-drive
 - 5. Die cushion
 - 6. Slide Lock(s)
 - 7. Press controls
 - a. Main Operators Station (MOS)
 - b. Main Bolster Operators Station (MBOS)

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- c. Light Operators Station (LOS)
 - d. Oil Fill Station (OFS)
 - e. Pendant Operating Station (POS) / Master Operators Console (MOC)
 - g. Slide Operators Station (SOS)
- 8. Main motor and slide adjust motors
 - 9. Micro-inch motor (if required)
 - * If any D.C. motors are quoted, include the motor controller.
 - 10. Installation supervision and start-up assistance
 - 11. Itemize each separate cost for equipment built in foreign locations to include loading, freight, insurance, and unloading free on board inland carrier at port of entry. Port of entry must be identified.
 - 12. As required by specification detailed requests.

3.0 REVIEW OF PRELIMINARY DRAWINGS AND DIAGRAMS

3.1 Within six weeks of receipt of the purchase order, or specified time on supplier's quote, the supplier shall furnish not less than the following reproducible drawings and/or diagrams to the requisitioning activity. All drawings to contain the standard Ford Motor Co. title block. Approval drawings are to be submitted in both AutoCad (on disk), and reproducible format. Unless otherwise agreed to, supplier is to submit a minimum of three (3) hard copies of all submissions. Supplier drawings to note ALL parts NOT supplied by the press manufacturer. All drawings shall be in the metric measurement system with the inch system in parenthesis.

- A.** Plan and the four (4) elevation views of the General Arrangement, floor space requirements the relative location of all accessories and the accessibility for maintenance. The foot mounting bolt size, length and spacing for anchoring presses shall also be shown.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- B.** Upright drawings for equipment arrangement. Include sectional view for wireway arrangement.
- C.** Complete General Assembly drawings, including a separate print showing all clearances required for the removal of all press component parts.
- D.** Die space drawings to include the following drawings where applicable:
 - 1. Slide face(s)
 - 2. Bolster face(s)
 - 3. Scrap chute arrangements
 - 4. Adapter plates
 - 5. Upper and lower die clamps
 - 6. Press Shut Height
 - 7. Die Shut Height
- E.** Motion curves.
- F.** Tonnage (capacity) and velocity curves at requested strokes per minute, at midrange of spm capacity.
- G.** Micro inch tonnage curve forward and reverse, where applicable, at midrange of spm capacity.
- H.** Read-outs per one degree of crank angle for tonnage capacity, slide and feed bar velocities, slide to transfer position thru 360 deg. for each parameter requested, at midrange of spm capacity.
- I.** Available energy in inch-tons (reference Appendix 'A', Press Energy Calculation) at midrange of spm capacity.
- J.** Chart in one (1) p.s.i. increments for counter balance capacities and separate diagram of counter balance with sequence of operation and trouble shooting techniques for the automatic and manual systems, at midrange of spm capacity.
- K.** Cushion general arrangements - closed and extended.

	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- L.** Chart for cushion capacities and separate chart showing relationships between the cushion tonnage, the cushion stroke and the press speed.
- M.** Exit conveyor and destacker pickup station relative to press and transfer feed bars.
- N.** Bolster carriage to include a 3D pictorial drawing..
- O.** Bolster carriage track layout and installation details
- P.** All transfer feed bars (rails) general arrangement and layouts
- Q.** Electrical diagrams in accordance with Ford Manufacturing Standard EX-3, and Section 10 of this standard, shall be submitted by the electrical equipment supplier designated by the Ford Motor Company.
- R.** Pneumatic diagrams in accordance with ISO Standard 4414. Pneumatic circuits and components shall also comply with Section 9 of this standard.
- S.** Lubrication Systems and diagrams in accordance with SAE Standard 1751 and ISO Standard 5170. The type and amount of lubrication required and the time intervals of application shall be shown on the diagrams.
- T.** Hydraulic Systems and diagrams in accordance with ISO Standards.
- U.** Piping line layouts (pneumatic, lubrication and hydraulic)
- V.** Sequence of operations - press controls (flow chart)
- W.** Sequence of operations - die set rnodes (flow chart)
- X.** A separate index listing all prints, diagrams and read-outs displaying print or document number, heading, date stamp, date submitted, date of return, date approved or not approved and final approval date.
- Y.** ECPL Blacklines layout to be submitted at 50% design review for staff/plant approval.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- 3.2** The requisitioning activity will review the drawings and diagrams in accordance with this standard and the press specification data sheet attached to the purchase order. Approval should be shown on the copy returned to the supplier. If changes are found necessary, they shall be shown on the copy returned to the supplier.
- 3.3** Upon receipt of returned copies, the supplier shall modify the original drawings within two weeks in accord with changes requested by the procuring division, and copies of the modified drawings or diagrams forwarded for approval of the particular item or circuit involved. Upon review to assure inclusion of all changes, the drawing will be approved and returned to the supplier. This process will continue until approved drawings are achieved. Any revisions and/or changes shall be noted by symbols and the date and must be recorded in the change column. Any corrections, deletions additions or changes to a drawing shall constitute the drawing as not approved for build.
- 3.4** Progress reports shall be submitted every four (4) weeks from time of firm purchase order. The seller shall furnish a schedule denoting the start and actual finish dates with percentage complete for all major components and the items as identified on the vendor implementation schedule form.
- 3.5** Compliance - Ford Motor will reserve the right to "hold-back", not less than 10 % of contracted delivery price until final acceptance at receiving plant.

4.0 FINAL DRAWINGS AND DIAGRAMS

- 4.1** Scope - The following paragraphs pertain to drawings, circuit diagrams, and data required for installation and maintenance of stamping equipment by the plant procuring the equipment. All such final information, including maintenance manuals, shall be forwarded to the requisitioning activity no later than the shipping date.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- 4.2** Supplier Responsibilities - Copies of all final drawings and circuit diagrams of the equipment "as-built" and a disk in the latest version of Autocad will be forwarded no later than two weeks after the equipment has been accepted at suppliers plant for dismantling and shipping. This set is for the receiving plant. A complete set of the latest electrical drawings shall be shipped with control enclosures and disks of all control programs. In addition, two (2) sets of mechanical drawings, which includes lubrication, pneumatics, and hydraulic layouts are to be submitted on aperture cards to the requisitioning activity.

The final drawings and diagrams shall be identified with the Purchase Order number, serial number(s), 18 and 17ZM drawing numbers and a full description which will identify the particular equipment to which the prints and diagrams pertain to. If any field changes are required, the changes shall be recorded and new reproducible copies of the changed drawings shall be forwarded for replacements by the press suppliers.

- 4.3** Final reproducible electrical diagrams, layouts, and electric motor data shall be forwarded by the affected suppliers before delivery of the equipment.

Latest copy of all control programs shall be shipped to requisitioning activity before starting of the installation. The final copy of all programs, after receiving plant¹s acceptance, must be submitted to receiving plant and requisitioning activity.

- 4.4** Maintenance and Operators Manuals - The supplier shall furnish a preliminary copy of these manuals for approval and scope. After approval and not later than shipping date, the suppliers shall furnish two (2) copies to the receiving plant (to use during installation) and one (1) set to division Staff. The manuals shall contain, but not be limited to, the following data:

- A.** Ford purchase order number, equipment serial number(s) and identification.
- B.** Equipment specifications showing all capacities and adjustments.
- C.** Reduced copies of all prints and diagrams.
- D.** A list of commercially available parts with original manufacturer's catalogue. Drawings displaying the location of these parts will be included.
- E.** A list of parts manufactured by the press suppliers and prints showing their location.
- F.** Preventative maintenance recommendations and testing procedures.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- G.** Prints for all wear strips, plates and inserts.
- H.** Recommended spare parts list,
- I.** An illustrated description of the operation and instructions for a step by step procedure for equipment operation - during automatic and manual operating modes.
- J.** Lubrication, pneumatic, hydraulic and electrical equipment layouts each separately superimposed on elevation plan and detail drawings as required to show the location of all pertinent equipment.
- K.** All lubrication points superimposed on elevation plan and detail drawings as required to display type of lube, frequency and how performed.
- L.** I.O. list, control manuals, documentation and disks.
- M.** A complete list of perishable items, including: all bearings, seals, packings, O-rings, wear strips and wear plates with sizes and locations.
- N.** Detailed assembly drawings of clutch and brake applications. These drawings shall be supplied by the clutch/brake manufacturer.
- O.** Press assembly installation procedures.
- P.** Approved ECPL package.
- Q.** Procedure on changing packings: clutch, counter-balance, overloads, cushion, biasing cylinders, etc.

5.2 General Mechanical Specifications

5.2.1 Quotations, design and documentation's shall be in conformance with the Machinery and Equipment Guidelines dated September 1989, the Ford DR-10 and any supplements as attached.

5.2.2 All purchased items shall be selected from Ford Manufacturing Standards Approved Source Lists. It is the supplier's responsibility to procure the latest published Standards.

5.2.3 It is expected that presses supplied to this standard will provide a working life of at least 30 years operating on a 3 Shift, 5 days per week system with proper usage and maintenance.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

5.2.4 Any and all peripheral equipment mounted on bed must be displayed on a drawing for location and interference's. An area must be kept clear of any interference's for a scrap conveyor.

5.2.5 Energy - Available press energy supplied shall be equal to or greater than that calculated as shown in Appendix A. Graph to be plotted and completed by vendor.

5.2.6 All sheaves shall contain taper lock bushings and shall be V-grooved and statically and dynamically balanced.

5.2.7 All rotating components shall be equipped with complete covers with easy access openings and removable covers for inspection or disassembly as required. The forward direction of the rotating part shall be permanently identified on cover. Painted markers are not acceptable. Provisions must be made for easy access for maintenance purposes. Provide cover at bottom of larger guards for dropped tool retrieval.

5.2.8 Gear and shaft enclosures shall be leak-proof and equipped with drain plugs and sight gages wherever lubricant is present. Must use gaskets, not sealants. Enclosed gear boxes shall have a sight gage and fill port.

5.2.9 Straight Keys will be used for alignment of feet, bed, uprights, crown and any component part. Keys shall be bolted in place with socket head screws counterbored in the key and bolted to lower face.

5.2.10 Die space lighting shall be provided, shielded, and recessed in uprights.

5.2.11 The press supplier shall install a name plate on all valves, regulators and gages. All devices shall be identified to their proper operating pressure settings and program addresses. All devices will have identification plates describing its purpose with electrical I/O as applicable and will be permanently installed on press nearest to the devices.

5.2.12 Teflon Tape will not be used on any threaded connection.

5.2.13 All gages to be liquid filled and be dual face (PSI and Bar)

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

5.3 Tonnage Ratings and Shut Height

- 5.3.1** Maximum tonnage for double action presses shall be rated one inch from the bottom of the inner slide stroke and one half inch from the bottom of the outer slide stroke.
- 5.3.2** Maximum tonnage of single action straight side presses, either two or four point, top drive, or under drive, pit or floor mounted, shall be rated at one inch from the bottom of the stroke.
- 5.3.3** Maximum tonnage of blanking and gap presses shall be rated at one quarter inch from the bottom of the stroke.
- 5.3.4** With fixed bolsters, Slide Shut Heights are specified from the top of the bed to the bottom face of the slide, stroke down and slide adjustment up. When sliding bolsters are used, slide shut height is specified from the top of the bolster. When adapter plates are specified, die shut height is measured from the face of the adapter plate. Slide shut height shall be die shut height plus thickness of adapters.

5.4 Bed

- 5.4.1** Machining and drilling of bed shall conform to Ford Vehicle Operations Standards DR-1 through DR-6. Add a machined centerline Front to Back, and Left to Right.
- 5.4.2** Deflection - Deflection at the center of the die space shall not exceed .0015" per foot of die space over the specified right to left dimension. To test for deflection, the press bed minus the bolster shall be loaded symmetrically about the die space centerline on the third points with the rated tonnage. Each of the third-points is located 1/3 of the distance from the end of the die space (the load jacks divide the die space into three equal sections).

Bed deflection readings shall be taken at the press center from a straight edge, which spans the bed width. For all deflection tests, hydraulic jacks must be used and tonnage load chart at 25 % increments must be submitted to Ford Motor Company.

Double Action Presses full tonnage (inner slide and outer slide tonnage) must be used for deflection tests.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

5.4.3Foot mounting anchor bolts shall be provided by the press supplier. Presses to be designed for mounting on Ford standard steel press beams. All steel leveling plates and their installation hardware will be provided by press manufacturer. Press supplier's representative will be on-site for the installation of these plates.
(AS.20)

5.5 Slide

5.5.1Machining and drilling of slide shall conform to Ford Vehicle Operations Standards DR-1 through DR-6. Add a machined centerline Front to Back, and Left to Right. Grip strut sectioned platform will be bolted into slide to create a maintenance platform.

5.5.2Slides of all presses shall be fully contained in gibbing when the slide is down and adjusted to the lowest position. The gibbing shall be removable for maintenance purposes. When moving bolsters are requested, the slide(s) shall be removable in direction of bolster travel.

5.5.3All services to the slide must be in a Ford approved "Power-track".

5.5.4Deflection, Slide - To meet or exceed bed requirements.

5.5.5Slide perpendicularity shall be within 0.001" per 12" of slide stroke.

5.5.6Ram Parallelism - Ram parallelism to bed shall be .001" per foot of bed dimension left to right and front to back at the Bottom Dead Center (BDC) position with adjustment up and down under the counterbalance pressure setting for zero die weight. Parallelism at other positions shall be .002" per foot left to right and front to back under the same measurement conditions as BDC. All readings shall be taken under counterbalance pressure for zero die weight, with jack pressure applied below each plunger assembly or pitman on the press slide. The hydraulic overloads should be pressurized at 10% over the press tonnage prior to taking any readings.

Ram parallelism readings shall be submitted to requisitioning activity (30 deg. Increments and must include BDC, CSP, Mid-stroke up, and Mid-stroke down).

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

5.5.61 Spring Constant is the distance that a press can push apart under the press rated capacity. This test shall be performed with parallels placed on top of the bolster located under the slide drives. After a force of 40Tons is made off the parallels, the slide adjust will be lowered in 0.030" increments. When necessary make the final adjustments somewhat less as required to meet press capacity. This data will be placed into a table as directed by the requestor. This test is required to indicate how unbalanced tonnage might affect Slide Tilt.

5.5.62 Slide Tilt Simulation will follow after determining the Spring Constant. The slide adjust will be returned to the setting exerted by 40 Tons at the beginning of the Spring Constant Test. A 0.125" shim will be placed under the drive on the left side of the press. Several readings will be taken as directed by Ford personnel. The parallels with the shim will be moved as directed by Ford personnel. The movements will go from a point determined by Ford from the outside of the slide to the center of the slide. This data will be placed in a table as directed by Ford. This test is required to indicate how movement of loads affect Slide Tilt.

5.5.63 Simulated Unbalanced Contact with dies and how this affects slide tilt will follow the Slide Tilt Simulation test. The slide adjust will be returned to the position where the 40 tons was recorded in the last two (2) tests. Recordings are to be taken at BDC. The parallels (or parallel) shall be removed from one side and a 0.125" shim shall be placed under the drive on the other side of the slide. Recordings will be taken at BDC. All data to be placed into a table as directed by Ford.

5.5.7 Gibbing - Eight-way adjustable box gibbing shall be supplied on straight side and gap presses. Each gib shall have two removable wear strips, one mounted on the slide for front to back adjustment and one mounted on a gib block for right to left adjustment. The box gib shall be designed compactly so that it extends a minimum interference to the production operator. The gibs shall be removable on all corners for convenient rain removal. Gibbing for outer slides shall be eight-way adjustable box type. Inner slide gibbing shall be independent and be tight-way adjustable box type. Other designs require approval of the procuring division. Interchangeable bronze wear strips shall be used. The opposing wear surface shall be a heat treated (38-42-Pic) steel wear strips. Bronze wear strips shall be attached with bronze or brass hardware.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

5.5.8 Lubrication to slide gibbing shall be on the recirculating oil system. The oil troughs shall not interfere with die clearances and shall have a screen to protect from foreign matter entering drain. All drain lines shall be contained in uprights.

5.5.9 Hydraulic Overloads - Hydraulic overload protection shall be provided on all presses.

- A.** All slides shall be equipped with overload protection devices under each connection point. An overload, whether uniform or concentrated under one corner, will simultaneously relieve the hydraulic pressure in all connections of that slide and stop the press. A key switch shall be provided to reset and purge overloads.
- B.** All Slide overload pistons under each connection on single and multiple action presses shall have 1" or more of piston travel. A minimum of 1" clearance is required between top of the slide and bottom of the crown (including any attached components) with slide adjustment up (maximum), press stroke up, and overload fully dumped.
- C.** In the event of an overload, the system shall be capable of being recharged within 2 minutes.
- D.** The hydraulic overload pressure control valves for all slides shall be adjustable from 70 % to 110% of the rated slide capacity using a maximum of **65 PSI** of air. A non-adjustable pressure regulator or relief shall be furnished in the slide to prohibit more than the 110 % capacity rating to be attained. A data plate shall be permanently affixed to the inside of the panel door on the upright containing the adjustable regulator within.

It shall display the air pressure required and the resultant capacities every 10 % starting at 70 % press capacity thru 110 %,

- E.** An approved shutdown air over oil pump shall be supplied to maintain overload pressure and is to be actuated with main press power off or loss of power to hydraulic pump unit.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- F. Tonnage Monitor Calibration: Test results at 50%, 75%, 100%, and 110% of press capacity shall be submitted to the requisitioning activity on the tonnage monitor supplier's form. Hydraulic Overloads shall be set and tested at 110% of press capacity.
- G. Hydraulic relief valve pressure vs. tonnage chart shall be permanently mounted

5.5.10 Adjustment System

- A. The slides of all single and double action presses, including the blankholder mechanism shall be provided with motorized adjustment comprised of an electric motor, drive shafting gears to give an adjustment speed of 2in. per minute, and be sufficiently powered to operate throughout its full range of adjustment with the counterbalance air pressure set within 20 psi of its correct pressure to balance the slide and attached die weight. All slides shall be equipped with a positive indication of position of shut height adjustment.
- B. The adjusting system shall be guarded against creep by means of a brake on the motor, which shall be automatically applied when the motor is at rest.
- C. Adjustment screws must be guided so as not to be subjected to side forces from the connecting rod. The slide adjustment screw shall be of steel, adjustment nuts of solid bronze with detachable worm gear driven by a hardened worm shaft supported on anti-friction bearings. A motion detection device will be located at each slide adjust nut housing at worm shaft to detect rotation. Any one detection device not monitoring motion during any slide adjustment will immediately drop out slide adjust motor.
- D. The extreme range of the slide adjustment shall be protected by limit switches. Limit switches to be normally open, held closed.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- E. On multiple action presses, the separation between slide and blankholder faces must not be less than ten (10") inches without adapter plate, and five (5") inches with adapter plate. The separation must be controlled through all adjustment ranges so that if the relative position of slide to blankholder should be less than ten (10") inches without adapter plate, and five (5") inches with adapter plate at any position of stroke, it will be impossible to set the press in motion.
- F. The separation monitoring device shall be of the electrical type actuated from the slide adjustment mechanism.

5.5.11 Slides to be machined for die mounting holes and machine surface on top of slide flanges to accommodate a 3-1/8" square steel washer.

5.5.12 Upper Die Clamps - When automatic upper die traveling clamps are requested, each clamp shall have 25% effective travel into die space and the clamp must clear maximum die space by 25 mm when retracted. The amount of clamps and their locations shall be determined by requisitioning activity but under all circumstances the application shall meet or exceed the Ford Manufacturing DR Standards for die fastening.

All upper die clamps whether traveling or not shall be on at least a dual alternating unclamp circuit, alternating opposite sides of die cavity. At no time shall a false, an inadvertent act or a signal allow any clamp to be released. Die clamps shall retain pressure with all power off for not less than 300 hours, when pressure is reduced the clamp shall not be permitted to move greater than vertical clamp stroke or shall it be permitted to lose retention of die. It shall be possible to pre-select clamps to be used. Services shall be provided to determine clamp positioning such as retracted, extended, clamped or unclamped.

5.5.13 Slide Locks - see section 5.16 (Safety) of this specification book.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

5.6 Crown

- 5.6.1** Drives - The clutch brake assembly shall be arranged for removal and replacement as a unit and should be removable without disturbing the drive timing. The drive system shall be sized to allow intermittent operation at 100% of rated variable strokes per minute at rated tonnage and continuous operation at rated variable strokes per minute. Intermittent cycle time requirements do not apply to presses designed to run continuously.
- 5.6.2** Full eccentric type drive is preferred over crank type drive. All spool and crank type drives must have written consent of requisitioning activity and be identified as such in press suppliers quotes. Eccentric type drive presses shall be designed with full eccentrics and one piece upper eccentric straps. Pressure applied to wrist pins, not to connection seat.
- 5.6.3** Main drive units for like presses furnished by one supplier on a single purchase order shall be completely interchangeable.
- 5.6.4** All top drive presses shall be designed so that no part of the clutch, motor or other component extends beyond the perimeter of the crown. Maintenance platforms shall be provided if any crown mounted equipment which requires maintenance and / or monitoring is part of supplier's design concept. Crown layout shall be approved by the requisitioning activity.
- 5.6.5** When a mechanical link slow down is requested, the slide(s) uniform velocity shall not exceed (25) meters per minute thru bottom dead center at midpoint of rated spm from 25 % of stroke up from bottom dead center unless otherwise specified.
- 5.6.6** "Vee" belts for like presses, furnished by one supplier, shall be of like size and furnished in matched sets. Main motor drive belts shall be solid back banded type "Vee" belts.
- 5.6.7** Main motor drive belts' tensions must be checked and verified according to the belt manufacturer's recommendations. Belt tensioning instruction plates shall be permanently mounted.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

5.6.8 Main drive motor sheave shall be jack-shaft mounted with an exposed bolt flanged coupling to the motor and have two pedestal bearing block supports with the outside block having a removable filler block for ease of belt replacement. The pedestal blocks, filler block and the hearing blocks shall be keyed for positive alignment to motor shaft.

5.6.9 Belts shall be completely enclosed and guarded per OSHA requirements to assure protection of all personnel in the area of press operations. Guards shall be designed for manual removal for belt replacement and / or adjustment and provisions for Preventive Maintenance Procedures.

5.6.10 Deflection, Crown - Test procedures and acceptable deflection levels to be determined. Deflection of Crown test under full press capacity will be recorded at time of press checkout at the press suppliers facility. Finite Element Analysis test will be used to determine the life of the Crown.

5.6.11 Gearing On straight side presses, the clutch drive pinion and all intermediate gears shall be of full tooth steel double-helical construction and hardened according to acceptable industry standards. It will be the press supplier's responsibility to accept all cost accrued for replacement of gearing that fails due to incorrect specification or manufacture. All gearing shall have distinctive permanent stamped timing marks and the maintenance manual must include gear mating position (crank angle) when stamped.

5.6.12 Shafts - All drive and intermediate shafts shall be mounted on anti-friction bearings. All shafts 8" in diameter or greater, and rotating at 200 rpm or more, shall be statically and dynamically balanced for the rated rotational speed unless otherwise approved by requisitioning activity. All press drive shafts less main pins shall be on anti-friction bearings. The bearings shall be installed in cartridges and so arranged that any one shaft may be removed for maintenance without disturbing any other.

5.6.13 Clutches and Brakes

- A.** Clutches shall be capable of intermittent operation at BDC at 100% of rated capacity.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- B. Clutches and related controls shall be designed so that no overlap of clutch and brake operation can occur. Due to overlapping maintenance concerns, a combined clutch / brake unit is preferred. The use of separate clutch / brake units must be justified and approved by the requisitioning activity.
- C. The press shall be equipped with a dual solenoid actuated air valve to control clutches or brakes. The dual valve must be fail-safe and self-checking with each cycle of the press.

5.6.14 Flywheel brake(s) for air friction type clutch/brakes must be provided, which will be capable of stopping the flywheel within 15 seconds. For eddy current type clutch/brakes, stopping time shall be within 20 seconds. When the manual flywheel-brake valve is operated, or the clutch, main motor, lubrication system malfunctions or when power is lost to the press, the flywheel comes to a stop automatically. A minimum of two (2) opposing flywheel brake shoes are to be designed into the brake system.

5.6.15 Flywheel brake shoe on straight side presses will be designed so that it is readily and easily removable for replacement without dismantling the complete flywheel brake assembly. It shall also be constructed so that it will withstand (2) full stops per hour of operation and will not require lining replacement for a period of (2) years under these conditions.

5.6.16 All critical bearings and/or bushings located in bed and press for underdrives, or crown and press for top drives shall have thermocouples for overheat protection. A warning and a fault indication shall be provided in M.O.S.

5.6.17 Main drive couplings must be open bolt-flanged type with body bolts.

5.6.18 Top drive presses or other presses requiring employees to perform maintenance functions while standing on top of the press shall be provided with a railing which complies with OSHA requirements. Unless otherwise specified, top drive press maintenance platforms shall include a toe-board and a telescoping counterweighted access ladder with provision to lock in the up position.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

Spiral Stairs - Spiral stairs when requested shall be prefabricated by an approved supplier. The Ford approved supplier shall furnish all material, labor and equipment necessary to complete the spiral staircase assembly. This shall include all anchors, bearing, plates, platforms, bracing, and etc. required for a complete installation. Press supplier to submit working shop drawings for approval. Materials shall be steel welded construction and Spiral stairs shall support not less than a one hundred pound per square foot (100 lbs/sq.ft.) live load. Stair width shall be 30" minimum. Stairs shall be bar grating type with abrasive nosing or as approved by requester. Spiral handrail shall be 1-5/16" outside diameter steel pipe.

5.7 Uprights

5.7.1 Tie Rods shall be pre-loaded to not less than 150 % of press capacity. All tie rods and nuts shall have match marks permanently stamped.

Tie rods shall have holes on top to accommodate heaters for expansion purposes and a tapped hole for handling, both at the same end.

Press supplier shall furnish Hydraulic tie-rod nuts and a portable approved air over oil hydraulic pump assembly adequately sized for pre-loading rods.

5.7.2 When removable column spacers are specified, the tie rods shall be threaded to accommodate removal of spacers.

5.7.3 All inside vertical upright openings shall be closed in and guarded with heavy steel gage material. Guards shall be designed to eliminate all pinch points throughout the press stroke and slide adjustment.

5.7.4 Press specifications, belts, motors, cushion information, etc., printed or stamped on plates shall be located on the inside door of the press air compartment left front upright.

5.7.5 The distance between the uprights and any/all component parts mounted on them shall not have less than 50mm clearance per side than the bolster to slide die space area (SDAU).

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

5.8 Microinching

5.8.1 Slide

- A. Micro-inching capabilities (for all presses) shall be for forward and reverse movements of slides. It will be possible to micro-inch the press at any point in the stroke range with a rated capacity of the press 8mm up from bottom dead center at requested micro-inch speed. However, if a Double Action or Link-Drive press is specified, then the press must NOT be allowed to inch in reverse through BDC.
- B. Slide micro-inching for transfer presses - It shall be possible to inch the slide only with the transfer feed rails disengaged and provisions to assure the rails are in a safe position as not to allow any interference's.

5.9 Counter Balance Cylinders

- A. Counterbalance cylinders shall be of the self-contained type and concealed in the uprights whenever possible, and shall be accessible for maintenance and replacement without dismantling other press members or equipment. For design purposes to minimize upright dimension, surge tanks are permissible, provided they are concealed in the uprights and/or the crown. Surge tanks shall be sized for a 6 to 1 ratio for the counter balances.
- B. Counterbalance cylinder top retaining plates that are exposed in open area from either top or sides of press proper shall be designed to contain the inner piston and rod or any other part or parts from departing from the cylinder proper in case of a piston or piston rod breakage or other rod fastening failures.
- C. Counterbalance system shall not lose air during normal press operation. Counterbalance system shall be leak free both during normal press operation and while sitting idle. Chesterton packings are to be utilized. During checkout, cylinders are to be pressurized for 24 hours during which no loss of air can be seen.
- D. Automatic counterbalance adjusting controls shall be press mounted. Press shall cycle stop if press is +/- 3 psi out of die library setting.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- E. Counterbalance cylinders shall have a common condensate drain system located on the floor level.
- F. Counterbalance air pressure vs. die weight charts (in increments of one (1) psi) shall be permanently mounted on the press. See section 9.4.5(b).
- G. There shall be a counterbalance shutoff disconnect at floor level mounted in the left front upright.

5.10. Bolsters

5.10.1 Machining and drilling of bed shall conform to Ford Vehicle Operations Standards DR-1 through DR-6. Add machined centerline Right-to-Left and Front to Back.

5.10.2 When moving bolsters are specified, they shall be furnished as follows:

- A. Bolster shall be constructed of steel weldment with an 11" thick top plate. Total height should not exceed 24" on presses without a cushion and should not exceed 31" on presses with a cushion, unless otherwise specified in the specification sheet
- B. Bolster shall be powered by a two-speed electric motor as per requesting activity. The drive shall be directly coupled to an enclosed in-line oil bath gear reduction unit. Chain drives will not be accepted.
- C. Bolster travel time to distance shall not be less than six (6) meters per minute (20 feet/minute) not more than nine (9) meters per minute (30 feet/minute) with twice the maximum die weight or total slide assembly weight, whichever is greater.
- D. Bolster lift and unclamp mechanism shall be as approved by the Ford requester with a lifting height which will produce a minimum of 13mm (1/2inch) clearance from all obstructions for bolster carriage travel with maximum die weight. These units shall be easily accessible and detachable from the press bed for maintenance.
- E. Provisions to manually bolt the bolster to the bed shall be provided.

<i>Ford Motor Company</i>	North America Manufacturing Standard	Standard Number	DR10
		Issue Date:	19901101
		Rev:	20010307

- F. Sufficient track shall be supplied to remove the bolsters from press and the entire die space area shall be clear from all press balconies or overhanging structures. Bolster shall clear the outer edge of uprights by a minimum of twenty (20) inches. Positive stops and locating keys shall be provided.
- G. Bolster track shall be 95.25mm (3.75 inches) in height. Top face of tracks shall be replaceable wear strips. The track top face shall be flush with floor line and not have any protrusion above floor line.
- H. All bolsters which have a dimension over 4500mm (177 inches) require a center support wheel for that length.
- I. All services to bolster must be below floor line with cover plates flush with floor rated at 2000lbs/sq. ft. Bolster services shall be provided via "Cat-trac" unless otherwise approved by the requestor.
- J. Bolsters shall not be driven by less than two wheels on separate outside tracks.
- K. Components of the bolster carriage shall be contained within the specified area of the bolster.
- L. Bolster will be supplied with handling devices capable and accessible to lift entire bolster carriage.
- M. Bolster carriages require auto-air connectors for the automation valves and one for a regulated air designated as "air service". All automation valves to be mounted in the right-rear upright (lead station in transfer presses). Lead presses should have five (5) valves, all others shall have three (3) valves.
- N. Manual controls to operate the bolsters shall be in diagonally opposite uprights, to allow clear view of bolster motion as it exits the press.
- O. All pressure pin holes in bolsters shall have an approved hardened pressure pin sleeve design. A full set of pins and caps to fill all pin holes will be provided per bolster. Method of pin removal to be approved by requisitioner. Clearance between pin and sleeve to be between 0.012 inches and 0.024 inches.