



THIS MOLD SPECIFICATION MANUAL IS THE PROPERTY OF UFE INCORPORATED. IT IS ON LOAN TO THOSE WHO HAVE A NEED TO KNOW AND BE FAMILIAR WITH MOLD SPECIFICATION FOR UFE INCORPORATED. IT IS TO BE RETURNED TO UFE INCORPORATED CARE OF SYSTEMS AND DOCUMENTATION CONTROL DEPARTMENT WHEN NO LONGER REQUIRED OR UPON DEMAND. THIS BOOK IS NOT TO BE SHOWN TO THOSE WHO DO NOT HAVE A NEED TO KNOW AND/OR USE IT ON BEHALF OF UFE INCORPORATED.

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ENGINEERING & DESIGN

The intent of this section is to provide engineering data and guidelines to standardize tool building Specifications consistent with manufacturing requirements

TABLE OF CONTENTS-ENGINEERING SECTION

GUIDELINES FOR MOLD SURFACE TREATMENTS

A. GENERAL REQUIREMENTS

1

B. HISTORY

2 & 3

MOLD DESCRIPTION FOR PROCESSIBILITY

4 & 5

PART DESIGN FOR PROCESSIBILITY

6

MOLD AND CAVITY ALIGNMENT MATRIX

7 & 8

LUBRICATION AND PRECLEANING TOOLS

9 & 10

UFE INCORPORATED GUIDELINES FOR MOLD SURFACE TREATMENTS

(Each specific application requires manufacturing approval)

<u>PLATING</u>	<u>APPLICATION</u>
NICKEL	1. Production medical molds; All mold base plates
CHROME	1. Production cavities producing transparent part with visual specifications (non-corrosive polymers). 2. Not intended for lense quality cavities.
ARMOLOY	1. All production mold components using mineral and glass filled materials. 2. High volume cavities using acetal materials. 3. All medical mold cavity details and ejectors.
TITANIUM NITRIDE	1. Slides, wear plates, and core pins with steel to steel contact on high volume molds.

Definitions:

PRODUCTION MOLDS – Volumes in excess of 250,000 annually per cavity.

HIGH VOLUME MOLDS – Volumes in excess of 750,000 annually per cavity.

UFE INCORPORATED GUIDELINES FOR MOLD SURFACE TREATMENTS

PLATINGS

Electroless Nickel

History -- Plating thickness is difficult to maintain within tenths of thousands. Generally .0005 to .001 is typical for plater's tolerances. Also, thickness is controllable in this range. Electroless nickel characteristically deposits to the same depth on all surfaces, grooves, slots and blind holes will receive the same thickness of plating as the rest of the part. Surface hardness is 45 Rc. Parts are exposed to 200 deg. F during plating, and will withstand 700 deg. F upon completion.

Applications:

- ☐ Non cavity surfaces.
- ☐ Mold plates exposed to water -- water lines, o-rings between plates.
- ☐ Emergency build-up for cavity resizing. Can be built-up to .010 inch. Not intended for a permanent correction, as polymers will wear away nickel.
- ☐ Mold plates for medical molds.
- ☐ High volume molds (ease of maintenance)

Chrome

History -- Chrome is hard and brittle. As it builds in thickness it develops a pattern of tiny cracks because the stresses become greater than the strength of the coating. These cracks form patterns that interlace and sometimes extend to the base metal. Average hardness is in the range of 66 to 70 Rc. A deposit of more than .001 thickness is essential for its true hardness when applied over

hardened steels. Hardened steels can be "flashed" chromed to .0002 and retain hardness. Plating can be applied from .00002 to .0005. It can be applied to thicknesses of .010 but not evenly distributed.

Applications:

- ☐ Not to be used on surface requiring lens quality finish.
- ☐ Do not chrome plate after exposure to molding resins.

Armoloy

History -- Armoloy is an Electro deposited hard chrome coating. It provides corrosion and wear resistant surface. Hardness is from 70 to 72 Rc. It produces very little contour build-up and can be applied in thicknesses from .00002 to .0002 inch. Normal recommendations are .0001 to .0002 inch, which makes it ideal for detailed cavities and sliding components. Armoloy gives an extremely even distribution on all surfaces and holes. Armoloy can be applied successfully after mold tryouts to accommodate tool resizing.

Suggested Applications:

- ☐ Cavity components and ejector pins, blades.
- ☐ Medical molds (white or colored materials)
- ☐ Production tools running abrasive, mineral, or glass-filled materials.
- ☐ Reduce wear, steel to steel contact (ejectors and sleeves for medical molds)
- ☐ Armoloy on lens quality requirements will dull surface appearances. Use with SPE-SPI # 2 finish or greater.

MOLD DESIGN FOR PROCESSIBILITY

- A. Gate location in the thickest wall section.
- B. Mold layout to allow for uniform cooling in cavity blocks.

Draft on deep walls. 1 deg. per side under 1.0 inch depth.
2 deg per side over 1.0 inch depth. Non-functional areas
to have maximum draft allowed.
- C. Vent ejector pins as needed, all CAMM parting lines,
mold parting lines, runners and faces of insert
components.
- D. Runner and branch intersections to be 1/8 inch radius
minimum or 1/2 of the runner "O" dim, sprue to runner
intersection 1/8 inch radius minimum.
- E. Runner volume not to exceed 1/3 of the shot where
possible.
- F. The diameter X length of the runner cold slug to be twice
the square of the runner diameter.
- G. Provide guidance within the cavity block to engage before
telescoping shutoffs.
- H. Moving components to have safety protection.
- I. Parting lines and ejector pins not to be located on areas of
surface requiring printing or hot stamping.
- J. Tool or fixture is safe to control and operate.
- K. Tool or fixture can be operated without damage to the tool
or machinery.
- L. Parts must fit fixtures. Inserts must fit molds. Fixtures
must function as designed, and accomplish the desired
tasks.

MOLD DESIGN FOR PROCESSIBILITY

- A. Gate location in the thickest wall section.
- B. Mold layout to allow for uniform cooling in cavity blocks.

Draft on deep walls. 1 deg. per side under 1.0 inch depth.
2 deg per side over 1.0 inch depth. Non-functional areas to have maximum draft allowed.
- C. Vent ejector pins as needed, all CAMM parting lines, mold parting lines, runners and faces of insert components.
- D. Runner and branch intersections to be 1/8 inch radius minimum or 1/2 of the runner "O" dim, sprue to runner intersection 1/8 inch radius minimum.
- E. Runner volume not to exceed 1/3 of the shot where possible.
- F. The diameter X length of the runner cold slug to be twice the square of the runner diameter.
- G. Provide guidance within the cavity block to engage before telescoping shutoffs.
- H. Moving components to have safety protection.
- I. Parting lines and ejector pins not to be located on areas of surface requiring printing or hot stamping.
- J. Tool or fixture is safe to control and operate.
- K. Tool or fixture can be operated without damage to the tool or machinery.
- L. Parts must fit fixtures. Inserts must fit molds. Fixtures must function as designed, and accomplish the desired tasks.
- M. Tool must open, close, fill and eject without assistance of mold release.
- N. Tool must not leak water or oil.
- O. Part is molded with acceptable finish.
 - 1. Mold will run and produce parts without visible burn marks during final sample run.
 - 2. Weld and flow lines will not appear on areas of part, which function under forces of load.
 - 3. Will produce aesthetically acceptable parts consistently.
- P. Parts and runner consistently clear the mold components during the final sample run.
- Q. Maximum allowable fill variation between cavities by use of the short shot method will be 5% of part weight (MoldFlow)

MOLD DESIGN FOR PROCESSIBILITY

- R. Mold steel must be adjusted so that $\bar{x}$ will be within the range of print nominal $\pm 15\%$ of the tolerance range (center 30% of specs). An option to steel adjustment is to persuade the customers to change the print.

PART DESIGN FOR PROCESSIBILITY

11. Is coring required?

1. Optimum gate location may require change of wall section. Locate gate in thickest wall section and consider material flow, glass orientation, etc.
2. Adjoining walls and ribs to be 60% thickness of main wall.
3. Radius at wall and rib intersections to be a minimum of .015".
4. Secondary operations engineering to be consulted for part design input when applicable, i.e., hot stamping, pad printing, ultrasonic inserting, gate removal, etc.
5. $1\frac{1}{2}^\circ$ draft required for each .001" depth of texture.
6. Can rib or internal corner radius help control warp?
7. Does design of part require alteration to allow appropriate cooling?
8. Is there a better material choice to be recommended to the customer?
9. Is the part detail formed by a slide action appropriately supported to eliminate distortion when slide is pulled?
10. Is the wall thickness specified appropriate for the size and configuration of the part?

MOLD AND CAVITY ALIGNMENT MATRIX

The following matrix should be used to determine the necessary guidance system in designing and building tools. This matrix was developed based on piece part complexity, maintenance and processing. This may not cover all circumstances but should act as a guideline to produce initial design.

MOLD AND CAVITY ALIGNMENT MATRIX

Tool complexity or Maintenance consideration → Increasing part complexity and narrowing process window ↓	• Standard mold base w/ leader pins & bushings • No special provisions for alignment A & B sides	• In addition to std. Leader pins & bushings: side and top locks required on mold base only for final alignment • Use for large cavities and/or heavy tools	• Taper locks or strawberry pins required in cavity blocks • Increased maintenance needed discrepancies will alert conditions	• "0" zero clearance leader pins or taper cavity • A & B side temperature must be consistent side to side
• Part requirements allow for cavity A & B misalignment >.005" • No delicate cores or slide by shut-offs are required • Platen "drop" or press wear and maintenance is not an issue	NORMAL			
• Part requirements demand that cavity misalignment A & B be .0015 to .005" • No delicate cores or slide by shut-offs are required • Platen "drop" or press wear and maintenance is not an issue		NORMAL		
• Part requirement demand that cavity misalignment A & B be <.0015" • Delicate cores are present • No slide by's or telescoping cores • Compensation for platen "drop" required			NORMAL	
• Part requirement demand that cavity misalignment A & B be .000" • Delicate cores with slide by's and telescoping cores are present				NORMAL

UFE INCORPORATED GUIDELINES FOR MOLD LUBICATION AND CLEANING

For medical molds or tools requiring no grease or lubricant residue on parts, a class I lubrication has been specified as follows:

Class I Lubrication

- Use a light film of high temperature food grade grease on ejector blades and sleeves.
- Apply ample amount of food grade grease to unscrewing cores, slides and gibs.
- Apply small film of grease to inside of cam pin holes and leader pin bushings.
- Apply light film of food grade lubricant to ejector pins unless they have been tin plated and cavities are Armolloy plated, in this case, ejector pins can run dry.

NOTE:

It is important the ejector blades, pins and sleeves have .0004/.0006 total clearance in any direction after plating is applied. Every attempt should be made to have pins Titanium Nitride plated before the first sample. Also, all tools should be lubricated properly during final assembly in the tool room.

Class II Lubrication

The same criteria as for Class I Lubrication should be followed except more ample amounts of lubricant can be applied to ejector pins, blades, sleeves and cam pins. In addition to this, the following items should be considered on hot oil tools or in extreme cases:

- Automatic greasers with zirk fittings on bushings.
- Apply to leader pins (650 deg F high temperature grease does not hold up).
- On the Process and Routing insure that tool is checked and the above items covered every 48 hours.

UFE INCORPORATED GUIDELINES FOR MOLD LUBRICATION AND CLEANING

Pre-Cleaning of Tools

It was determined that two levels of pre-cleaning should be used for molds, and the proper method should be specified on the Process and Routing Sheet. They are as follows:

Parting Line Pre-Cleaning

Clean tool with mold cleaning solvent from parting line only, spray on rag and wipe parting line, DO NOT spray directly on parting line components, wipe clean. This WILL NOT extract oil residue from between inserts, slides, etc. (If over abundance of grease or oil is present on the slides and ejectors; these areas should be disassembled and cleaned as necessary).

Complete Pre-Clean

Complete disassembly of tool required. Finally, wipe all components with alcohol and lubricate as necessary.

TABLE OF CONTENTS

<u>Contents</u>	<u>Section</u>
UFE MOLD DESCRIPTION	A
MOLD DESIGN & DRAWING	B
CAVITY & FORCE DATA	C
SLIDES & CAMS	D
RUNNER, GATES, SPRUE BUSHINGS & LOCATING RINGS	E
VENTING	F
EJECTOR SYSTEMS	G
WATER COOLING	H
AIR & HYDRAULIC CYLINDERS & STANDARD SIDE CORE CYCLES	I
MOLD BASE DATA	J
UFE TOOL ACCEPTANCE CHECKLIST & TOOL CERTIFICATION	K
MOLD IDENTIFICAION	L
PRESS DATA	M
UFE STANDARD MOLDSET COMPONENTS	N
MISC. ITEMS & TECHNICAL DATA	O

TABLE OF CONTENTS

SECTION A – UFE INCORPORATED MOLD DESIGN

<u>Contents</u>	<u>Page</u>
Mold Description	1
UFE Mold Classifications	2-4
UFE INCORPORATED FORM 521122	5

UFE Mold Classifications

These items will be required for the mold class' UFE1 through UFE3.

1. Thermocouples (Minimum of 1 per A and B side of mold).
2. Cycle counter.
3. Built with in the guidelines of the UFE Mold Specification Book.
4. All Ejector pins and ejector sleeves with an outside diameter of 1/16" and larger will be provided with vents, in either the form of a ring or small flats, to a escape groove. Vent dimension to be determined at final design review. There maybe cases in which this would be undesirable or impractical, in which case the Project Manger or their representative can approve a deviation to the standard. This is to be documented in writing by the supplier.

Class UFE1: Cycles of one million or more. This class is suggested for molds requiring life of production guarantees.

1. Detailed electronic mold design per UFE Mold Design Documentation for UFE1 class molds.
2. Mold base will be made of stainless steel and have a hardness minimum of 300 Bhn, for the A & B plates and any other plate or component in which cooling lines are present. All other components will be of steel with a minimum hardness of 300 Bhn.
3. Cavities and cores must be hardened to a minimum of 48 R/C.
4. Cavities and cores will be inserted into mold base.
5. Mold build contractor will be responsible to provide venting of all gas trap areas identified during the final design review meeting.
6. All other details (slides, heel blocks, gibs, wedge blocks, runner plates, etc.) also to be hardened tool steel.
7. Inserted runner plates required.
8. Parting line locks are required.
9. Ejection will be guided.
10. Slides must have wear plates.
11. Temperature control provisions to be in cavities, cores, slides, and inserts wherever possible per guidelines of the UFE Specification Manual.
12. Water channels in the cavity and core blocks will be electroless nickel-plated following heat treating prior to final detail machining. (Unless cavity or core steel is made of stainless)
13. Molds to be used for automotive customers will contain the provisions for at least one cavity pressure transducer. Required slot and/or installation requirements will be provide, however the transducer is not required.
14. Critical dimension steel inspection report required per UFE PRO-2354.

UFE Mold Classifications

These items will be required for the mold class' UFE1 through UFE3.

1. Thermocouples (Minimum of 1 per A and B side of mold).
2. Cycle counter.
3. Built with in the guidelines of the UFE Mold Specification Book.
4. All Ejector pins and ejector sleeves with an outside diameter of 1/16" and larger will be provided with vents, in either the form of a ring or small flats, to a escape groove. Vent dimension to be determined at final design review. There maybe cases in which this would be undesirable or impractical, in which case the Project Manger or their representative can approve a deviation to the standard. This is to be documented in writing by the supplier

Class UFE2: Mold life guarantees not to exceeding one million cycles.

1. Detailed electronic mold design per UFE Mold Design Documentation for UFE2 class molds.
2. Mold base will have a minimum hardness of 300 Bhn
3. Cavities and cores must be harden to a minimum of 48 R/C
4. Mold build contractor will be responsible to provide venting of all gas trap areas identified during the final design review meeting.
5. Temperature control provisions to be in cavities, cores, slides, and inserts wherever possible per guidelines of the UFE Specification Manual.
6. The following items may or may not be required. The requirements need to be specified at time of quoting:
 - Are the cavities and cores to be inserted?
 - Specify material types and hardness for the cavities and cores.
 - Specify material types and hardness for associated components like slides, heel blocks, wedge blocks, etc.
 - Inserted runner plates are recommended for abrasive resins.
 - Parting lock locks should be used if part design requires this type alignment.
 - Slide wear plates are required if the mold temperature is to exceed 200 deg. F.
 - Corrosive resistant plating of cavity and core water channels maybe required.
7. Critical dimension steel inspection report required per UFE PRO-2354

UFE Mold Classifications

These items will be required for the mold class' UFE1 through UFE3.

1. Thermocouples (Minimum of 1 per A and B side of mold). If mold is stand alone with it's own mold base.
2. Cycle counter. Not required on MUD type tools.
3. Built with in the guidelines of the UFE Mold Specification Book.
4. All Ejector pins and ejector sleeves with an outside diameter of 1/16" and larger will be provided with vents, in either the form of a ring or small flats, to a escape groove. Vent dimension to be determined at final design review. There maybe cases in which this would be undesirable or impractical, in which case the Project Manger or their representative can approve a deviation to the standard. This is to be documented in writing by the supplier.

Class UFE3: Expect life of 500,000 cycles or less.

1. Mold design will be per UFE Mold Design Documentation for UFE3 class molds.
2. Mold base will be of medium carbon (SAE 1030) steel minimum.
3. Cavity and cores minimum P-20 pre-harden to 280 BHN or higher
4. Cavities and cores may be cut directly in mold base plates. However this is not recommended for abrasive of filled materials.
5. Mold build contractor will be responsible to provide venting of all gas trap areas identified during the final design review meeting.
6. Critical dimension steel inspection report required per UFE PRO-2354
7. The following items may or may not be required. The requirements need to be specified at time of quoting:
 - Inserted runner plates
 - Slide wear plates
 - Harden tool steel in cavity, core, and/or inserts.
 - Parting line locks

Class UFE4: This is a prototype mold that is to be run in a UFE molding press. Cycle life of 100,000 cycles or less. Abrasive and filled materials will cut cycle life expectance by up to 50%. Used only for prototype molding. Quality of part should not be guaranteed past the stated cycle life.

1. Mold design will be per UFE Mold Design Documentation for UFE4 class molds.
2. Mold base can be of mild steel or aluminum
3. Cavity may be of any steel or aluminum and may be cut directly into mold base.
4. Mold build contractor will be responsible to provide venting of all gas trap areas identified during the final design review meeting.
5. All other extras are optional and need to be specified at time of quoting.

Class UFE5: This is a prototype mold that we will purchase from an outside prototype part vendor. Its life is that which the vendor states it to be or as we request. There are no stated guidelines and it should never be expected that this class of mold could be run in a UFE molding press. The tool will be of sufficient strength and durability to meet the part requirements and molding life.

UFE INCORPORATED MOLD DESCRIPTION

I. DESCRIPTION OF MOLD

- A. Just a word about UFE Incorporated built molds.
We are attempting to produce a mold that matches our customer's requirements and quality at a competitive cost. In other words, don't overbuilt and over price ourselves.
- B. UFE Incorporated tooling is to be quoted and built per Mold Specification Form 122 (see Section A, PG 5) with reference to UFE Incorporated Mold Specification Manual.

MOLD SPECIFICATION FORM

SEE UFE FORM 521122

TO: _____

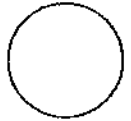
FR: _____

Date: _____



Mold - RFQ - Specification

RFQ # _____



Customer Name: _____ File Name: _____
 Part Name: _____ Part Number: _____ Rev. Number: _____
 Resin: _____ Shrinkage: ☐ uniform ☐ To be specified on a shrink print.

Mold Base Size: _____ Cavity: _____ Machine Tonnage: _____ Mach. Make: _____

Mold Type: ☐ 2 Plate ☐ 3 Plate ☐ Vertical ☐ Unscrewing ☐ Insert (Pickouts) ☐ Other _____
☐ Stack ☐ M.U.D. ☐ UFE Billet ☐ Quick Change

Gate Type:

- ☐ Pin
☐ Tunnel
☐ Edge
☐ Sprue
☐ Valve

Runner Type:

- ☐ Cold
☐ Hot Runner System
☐ Hot Sprue
☐ Hot Drops
☐ Other: _____

Cavity Finish:

- ☐ SPI/SPE # _____
☐ EDM
☐ Texture/Plating
 Describe: _____

Core Finish:

- ☐ SPI/SPE # _____
☐ EDM
☐ Texture/Plating
 Describe: _____

Ejection:

	"A" Side	"B" Side
Pin	☐	☐
Blade	☐	☐
Sleeve	☐	☐
Stripper Ring or plate	☐	☐
Lifts	☐	☐
2 Stage	☐	☐
Air	☐	☐
Delayed	☐	☐
Manually Removed	☐	☐

Cams:

- ☐ Angle Pins
☐ Hydraulic
☐ Pneumatic
☐ Electric

Misc:

- ☐ Date Insert
☐ Pressure Transducer
☐ Customer Logo in mold
☐ Customer Mold ID
☐ UFE Logo in mold
☐ Early Return ejection system

UFE Mold Classifications: (Refer to UFE Mold Specification Book for details)☐ UFE1

Cavity & Core Steel: ☐ Stainless Steel ☐ Hardened Tool Steel

☐ UFE2

Cavity & Core Steel: ☐ Stainless Steel ☐ Hardened Tool Steel

Associated Components: ☐ Stainless Steel ☐ Hardened Tool Steel

- ☐ Inserted Cavity & Cores ☐ Inserted Runner Plate ☐ Parting Line Locks
☐ Guided Ejection ☐ Slide Wear Plates ☐ Plate water lines
☐ Mold Temperature will exceed 200 deg. F
☐ Other: Describe _____

☐ UFE3

Cavity & Core Steel: ☐ Stainless Steel ☐ Hardened Tool Steel

Associated Components: ☐ Stainless Steel ☐ Hardened Tool Steel

- ☐ Inserted Cavity & Cores ☐ Inserted Runner Plate ☐ Pre-Hard Steel
☐ Guided Ejection ☐ Slide Wear Plates ☐ Pre-Hard Steel
☐ Mold Temperature will exceed 200 deg. F ☐ Parting Line Locks
☐ Other: Describe _____ ☐ Plate water lines

☐ UFE4 ☐ Parting Line Locks

Describe: _____

☐ UFE5 Describe: _____

TO: _____ FR: _____ Date: _____



Mold - RFQ - Specification

RFQ #



Customer Name: _____ File Name: _____
 Part Name: _____ Part Number: _____ Rev. Number: _____
 Resin: _____ Shrinkage: ☐ uniform ☐ To be specified on a shrink print.

Mold Base Size: _____ **Cavitation:** _____ **Machine Tonnage:** _____ **Mach. Make:** _____

Mold Type: ☐ 2 Plate ☐ 3 Plate ☐ Vertical ☐ Unscrewing ☐ Insert (Pickouts) ☐ Other _____
☐ Stack ☐ M.U.D. ☐ UFE Billet ☐ Quick Change

Gate Type:

- ☐ Pin
- ☐ Tunnel
- ☐ Edge
- ☐ Sprue
- ☐ Valve

Runner Type:

- ☐ Cold
- ☐ Hot Runner System
- ☐ Hot Sprue
- ☐ Hot Drops
- ☐ Other: _____

Cavity Finish:

- ☐ SPI/SPE # _____
- ☐ EDM
- ☐ Texture/Plating
- Describe: _____

Core Finish:

- ☐ SPI/SPE # _____
- ☐ EDM
- ☐ Texture/Plating
- Describe: _____

Ejection:

	"A" Side	"B" Side
Pin	☐	☐
Blade	☐	☐
Sleeve	☐	☐
Stripper Ring or plate	☐	☐
Lifts	☐	☐
2 Stage	☐	☐
Air	☐	☐
Delayed	☐	☐
Manually Removed	☐	☐

Cams:

- ☐ Angle Pins
- ☐ Hydraulic
- ☐ Pneumatic
- ☐ Electric

Misc:

- ☐ Date Insert
- ☐ Pressure Transducer
- ☐ Customer Logo in mold
- ☐ Customer Mold ID
- ☐ UFE Logo in mold
- ☐ Early Return ejection system

UFE Mold Classifications: (Refer to UFE Mold Specification Book for details)

☐ **UFE1**

Cavity & Core Steel: ☐ Stainless Steel ☐ Hardened Tool Steel

☐ **UFE2**

Cavity & Core Steel: ☐ Stainless Steel ☐ Hardened Tool Steel

Associated Components: ☐ Stainless Steel ☐ Hardened Tool Steel

- ☐ Inserted Cavity & Cores ☐ Inserted Runner Plate ☐ Parting Line Locks
- ☐ Guided Ejection ☐ Slide Wear Plates ☐ Plate water lines
- ☐ Mold Temperature will exceed 200 deg. F
- ☐ Other: Describe _____

☐ **UFE3**

Cavity & Core Steel: ☐ Stainless Steel ☐ Hardened Tool Steel

Associated Components: ☐ Stainless Steel ☐ Hardened Tool Steel

- ☐ Inserted Cavity & Cores ☐ Inserted Runner Plate ☐ Pre-Hard Steel
- ☐ Guided Ejection ☐ Slide Wear Plates ☐ Pre-Hard Steel
- ☐ Mold Temperature will exceed 200 deg. F ☐ Parting Line Locks
- ☐ Other: Describe _____ ☐ Plate water lines

☐ **UFE4**

☐ Parting Line Locks

Describe: _____

☐ **UFE5**

Describe: _____

TABLE OF CONTENTS

SECTION B – MOLD DESIGN & DRAWINGS

<u>Contents</u>	<u>Page</u>
GENERAL DESIGN PRACTICES	1 & 2
PRELIMINARY REQUIREMENTS	3
FINAL LAYOUT REQUIREMENTS	4
INITIAL DESIGN REVIEW CHECKLIST	5

MOLD DESIGN AND DRAWINGS

(WHICH VENDORS ARE TO SUPPLY)

I. GENERAL DESIGN PRACTICES

A. Layout printings and lines must be dark and legible.

B. Layouts should be on UFE Inc. or customer borders. See Form 122. Obtain borders from UFE Inc., Engineering Department.

Standard UFE Inc. border sizes are: A - 8.5 x 11, B - 11 x 17
C - 17 x 22, D - 22 x 34, E - 34 x 44

C. Layout should have customer name, part number and UFE Inc. job number on it.

D. UFE Inc. should get original mold layout drawing for preliminary and final approval.

E. Layouts should be positioned and labeled per drawings on page 2 section B.

F. Prior to ordering material, preliminary mold design should be submitted for approval in writing. Completed design should be approved in writing. (prior to cutting steel) The original drawing is necessary for our approval.

G. At time of delivery of the mold to the receiving business unit within UFE: Mold class: - UFE1 & UFE2 & UFE3 the supplier will provide a detailed electronic database of the mold as it was at the time of mold build completion. This database will reflect all revisions formally and informally made. Informal is defined to mean any actual steel dimension that is greater than .001" difference from the original design. Further after Jan. 1, 2002 the electronic database will be a "solids" file either in Unigraphics format or convertible to Unigraphics. In addition the supplier will maintain at his facility all electronic programming files of the mold construction for a period of 3 years. UFE will also be given free access to these files, so long as any actual tool work that they may be used for is done at the original suppliers tool shop.

Mold class - UFE4 the supplier will provide a 2D electronic file or paper prints of the design updated to show the mold as it was at the time of mold build completion with all formal and informal changes show.

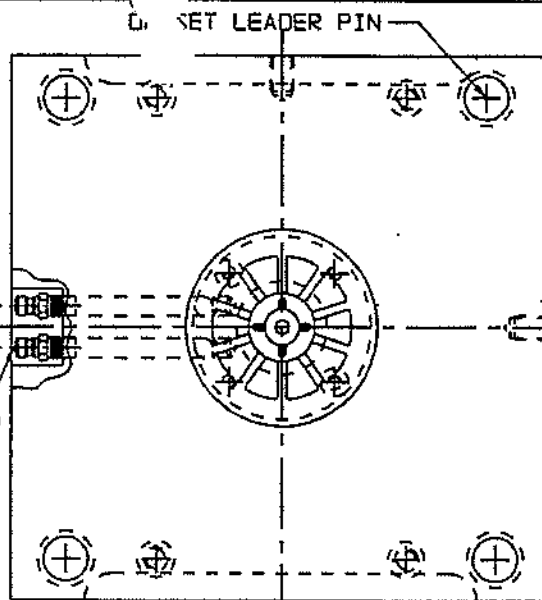
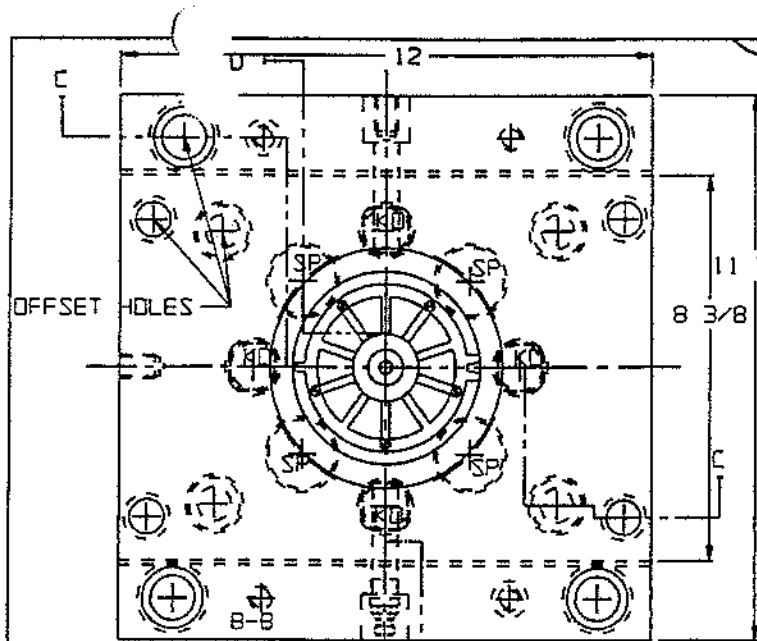
H. When cavity details are required, details should be derived from the mold layout. Provide enough details and dimensions (finished cavity dim) for the toolmaker's requirements. Tolerances are unnecessary for dimensions unless mentioned in quote.

I. Layout molds for wipers and part pickers when required. (Van Dorn and Stokes: Wipers - Top to bottom / Pickers - Back to front.)

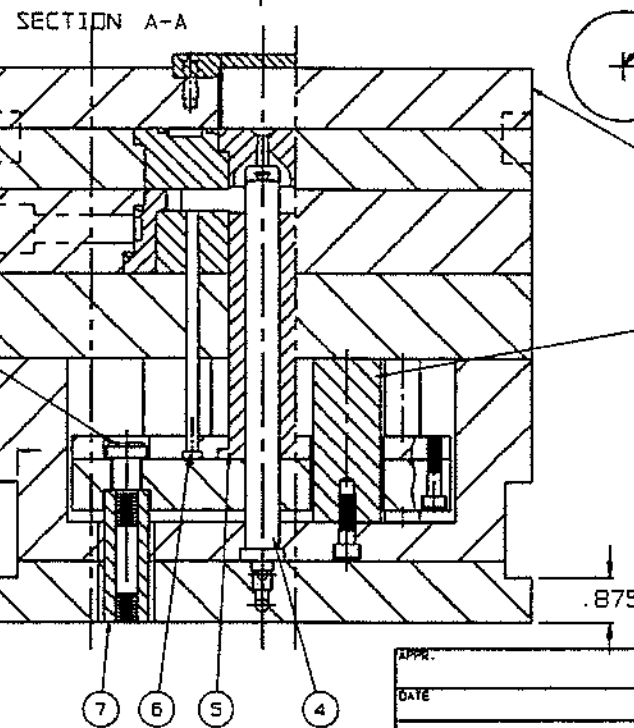
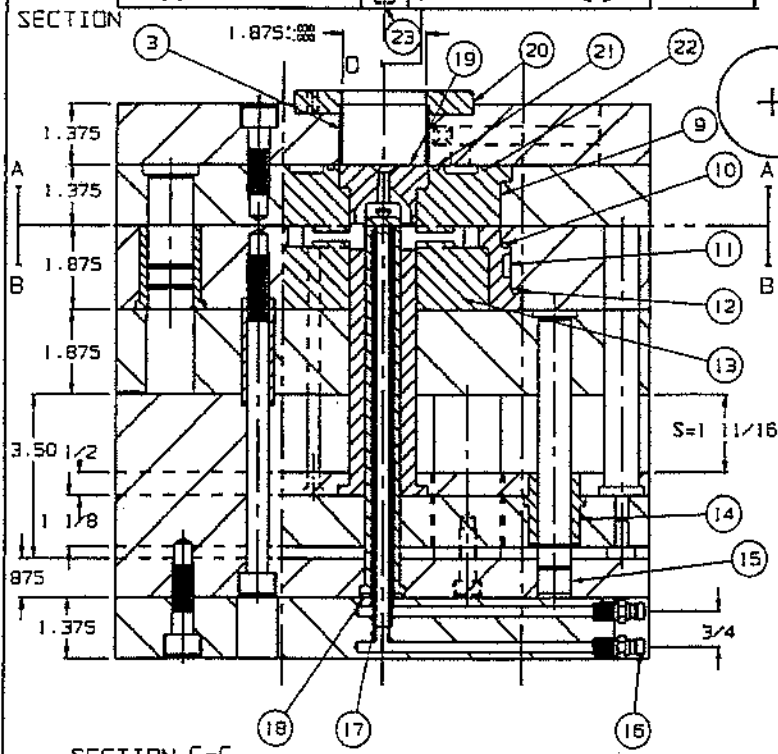
J. If the mold layout is for a customer on customer border The vendor should request a copy of "Tool Design Guidelines"

K. The purpose of this manual is to provide as much insight on general and specific rules and practices of design considerations and/or components as possible. However, it is feasible that a design or an integral part of a design may fall outside the rules and practices of this manual. When this occurs, all customer concerns and financial risks must be addressed in writing, preferably in the form of an FMEA. After evaluation of all concerns and risks, approval shall be obtained from all of the following individuals; Project Manager, Engineering Project Manager, Business Development Manager and Plant Manager of the designated molding plant.

L. Layouts must meet requirements stated for molds on the UFE Inc., Mold Specification Sheet. (Form 122).



QTY	DESCRIPTION	UNIT	QTY	UNIT
24	JIFFY PLUG	3/8-18 NPT		ONE
24	JIFFY PLUG	3/8-18 NPT		ONE
21	O-RING	SIZE 157	BUN	ONE
21	O-RING	SIZE 140	BUN	ONE
20	LOCAT. RING	DME 8504		ONE
19	SPRUE BUSH	Ø 2 X 1 3/8 LG	P-20	
18	O-RING	SIZE Ø17	BUN	ONE
17	TUBING	1.500X.40 10X9LG	SS	
16	JIFFY PLUG	1/8-27 NPT		ONE
15	GUIDE PIN	DME 5008		ONE
14	GUIDE BUSH	DME GE-06		ONE
13	LAV. INSERT	Ø 4.75 X 1.50 LG	SS	54-56
12	O-RING	SIZE 162	BUN	ONE
11	LAV. INSERT	Ø 5.25 X 2 LG	SS	54-56
10	O-RING	SIZE 146	BUN	ONE
9	LAV. INSERT	Ø 5.7/8 X 1 9/16 LG	SS	54-56
8	SHLD. BOLT	UFE C-11019-06		ONE
7	HYD. COUPLE	UFE C-11925-02		ONE
6	EJECT. PIN	Ø 1/4 X 6 LG		
5	SLEEVE	Ø 1.5 X 5.5 LG	H-13	46-48
4	CORE PIN	Ø 3/4 X 9 LG	S-7	54-56
3	TUBING	2.00 OD .065W	STL	
2	SUPP. PILLAR	Ø 1 1/2 X 3.500	CRS	
1	DME MOLD BASE	1212A-13-17 NO.2 STL		
		Ø 3.990, E=12.0, F=7.32, R=12.2, TOP PCT=1 3/8		



TIE BARS, NO.2
PRESS (FOR
ILLUSTRATION
ONLY)

SECTION C-C

SECTION D-D

APPRO.	 UFE Incorporated UNITED FOR EXCELLENCE STILLWATER, MN	
DATE		
CUSTOMER	TITLE MOLD LAYOUT	
PART NO.	SCALE	DRWG. NO.
PART NAME	SHEET OF	SECTION B PG 2

PRELIMINARY MOLD LAYOUT REQUIREMENTS

SEE UFE FORM 510199

PRELIMINARY MOLD LAYOUT GUIDELINES

- _____23. Are there any featheredges of steel?
- _____24. Is there a runner block-off on family molds?
- _____25. Has gate location been verified by Moldflow?
- _____26. Is a date code pin required?
- _____27. Have hydraulic cylinders been designed in the "FORWARD" or "EXTENDED" position while molding?
- _____28. Balance pad required?
- _____29. Have all customer requirements from the launch meeting been met?

PRELIMINARY MOLD LAYOUT GUIDELINE CHECK LIST

- _____1. Does mold fit in designated press size?
 - _____ Base size
 - _____ Shut height
 - _____ Knock Out location
 - _____ E.J. travel
 - _____ Full open height (including early return travel)
 - _____ Shot size
 - _____ Projected area
- _____2. Has DVR form been filled out?
- _____3. Are runner and sprue volumes per quote?
- _____4. Does part fall freely past all components? (tie bars, shoulder bolts, leader pins, slides, pockets, cam pins, etc.)
- _____5. Are sliding cores always contained?
- _____6. Are W/L clear of clamps and tie rods?
- _____7. Does mold concept agree with Mold Specification Form?
- _____8. Is gating per quote? (auto, manual)
- _____9. If hot oil tool, is insulator pad shown? (Must maintain 7/8" clamp slot)
- _____10. Are runners symmetrical between cavities?

PRELIMINARY MOLD LAYOUT GUIDELINES

- ____11. Are any fixtures required? (gate trim, etc.)
- ____12. Is part towards operator side of tool?
- ____13. Has shrink been determined? (Cavity ID must also be on shrink print)
- ____14. Are there protector pins where required? (including early returns)
- ____15. Are there wear plates where required? (including gear racks)
- ____16. Are parting lines necessary draft acceptable to customer?
- ____17. Are all through holes telescoped where necessary? (double telescope if possible) (blind telescoped not allowed).
- ____18. Are pickouts on A-side of tool?
- ____19. Is mold base laid out to superior mold base specifications? (note other patterns on mold layout).

NOTES:

PRELIMINARY MOLD LAYOUT GUIDELINES

Customer _____ Tool ID # _____ Date _____
Part Number _____ Designer _____
Part Name _____

These Guidelines are not intended to establish basic mold engineering, or to dictate design practice, but they should supplement these activities. The following items should be addressed prior to considering the tool is ready for a design review.

- _____ 1. Layout should include four views. (On one sheet whenever possible)
- _____ 2. Clearly label base size, plate thickness, shut height, open height and ejector stroke.
- _____ 3. Show placement and size of cavities.
- _____ 4. Indicate all water/oil lines, bubblers, and baffles (avoid water out top of tools when possible).
- _____ 5. Show position of runner and gates.
- _____ 6. Show position of support pillars.
- _____ 7. Do standard locations of rest buttons and e.j. plate bolts interfere with support pillars?
- _____ 8. Show ejector pins and sleeve locations.
- _____ 9. Label and indicate amount of travel of all P/L.
- _____ 10. Show position of press tie bars.
- _____ 11. Show any special mounting holes.
- _____ 12. Show thermocouple locations. (2 on hot oil molds, preferably out top or operator side of mold key, must clear clamp slot.
- _____ 13. Note press size on layout.
- _____ 14. Note nickel plating or special moldbase plate steel types on layout.
- _____ 15. Avoid locating part directly below sprue whenever possible.
- _____ 16. Note any special concerns on layout.
- _____ 17. Note cavity float on print.
- _____ 18. Note up side of mold.
- _____ 19. Show cavity alignment system if required.
- _____ 20. Show all shutoffs and high wear areas (sketches are appropriate).
- _____ 21. Show position of guided ejector system.
- _____ 22. Show side/end view in the open position or parting line's dimensioned.

FINAL MOLD LAYOUT REQUIREMENTS

SEE UFE FORM 510201

FINAL MOLD LAYOUT REQUIREMENTS

Customer _____ Tool ID # _____ Date _____
Part Number _____ Designer _____
Part Name _____

These requirements are not intended to establish basic mold engineering, or to dictate design practice, but they should supplement these activities. The following items must be addressed and shown on the mold layout if they apply. In addition to the following list, it is expected that all items on the Preliminary Mold Design Requirements list are complete.

REQUIREMENTS

- _____ 1. All preliminary design requirements must be met.
- _____ 2. Note cavity plating on final details only if required by the customer.
- _____ 3. Note nonstandard return pins, bolt patterns, and leader pins on layout.
- _____ 4. Complete bill of material including quantity, sizes, part numbers, sources, etc.
- _____ 5. Cross hatching and section lines must be shown on cut-aways. (Show appropriate cutting planes on corresponding views).
- _____ 6. Show eyebolt locations and size. (All plates over 75 lbs. Must have eye bolts).
- _____ 7. Moldbase called out in bill of material including "O" dimension and catalog number.
- _____ 8. Note cavity press on mold layout.
- _____ 9. Note jack screw holes whenever they are necessary.
- _____ 10. Title block must be filled out completely and signed.
- _____ 11. Mold Specification form 122 filled out completely and up to date.
- _____ 12. If hot oil, Callout proper fittings and O-rings.
- _____ 13. If hydraulic cylinders, use NPT connections and internal limit switches. (Safety shields should be included in design).
- _____ 14. Cavity ID must be noted on details.
- _____ 15. All electrical connector locations should be shown and connectors called out on B.O.M.
- _____ 16. For 2 stage ejector systems, 2 sets of return pins are required. (also tie ejector plates together with shoulder bolts).
- _____ 17. Slide detents must be shown.
- _____ 18. All hot sprues and manifold systems should have thermocouples included and on B.O.M.
- _____ 19. Sprue puller pin angle should be specified if a nonstandard angle is required (see Spec. Book).
- _____ 20. Note on mold layout to stamp max. mold open, cycle number, part number, customer, and UFE Inc. tool I.D.
- _____ 21. Document the mold sequence in written format on all multi-action molds on Mold Layout.

FINAL MOLD LAYOUT REQUIREMENTS (continued)

- _____ 22. Call out steel type and hardness required on each individual detail.
- _____ 23. Plastic baffles and plugs are prohibited.
- _____ 24. Where applicable, CAD/CAM database transferring can be substituted for detailed dimensioning.
(Every opportunity to maximize and enhance these capabilities should be pursued, but always include overall dimensions and appropriate REF dimensions).
- _____ 25. The use of "E" size drawings for details should be avoided whenever possible.
- _____ 26. Note ejector pin height requirements on M.L.O.
- _____ 27. Gear spec. sheet should be included on final design.
- _____ 28. Ejector pins must be .010" minimum from cavity walls.
- _____ 29. Note general radii from shrink print on detailed drawings as well as draft.

CHECKLIST

- _____ 1. Are all symmetrical slides and/or pickouts fool-proofed? Cavity numbers on cavities, slides, holders, etc. should be engraved at parting line and behind blocks.
- _____ 2. Are gate and runner fully detailed and are they designed to moldflow specifications? (Specify tunnel gate angles and intersection points).
- _____ 3. If moldbase is larger than 10" x 12", are bolt patterns of plates sufficient? (Add ejector stops under areas of large ejector pins).
- _____ 4. If mud set, has shoulder bolt been shown on ejector plate? (assure orientation is correct).
- _____ 5. If mud is set, do water lines exit appropriately?
- _____ 6. Have all sharp corners been radiused where possible?
- _____ 7. Have hydraulic cylinders been doweled in place?
- _____ 8. Have ejector stroke limiters been used whenever possible?
- _____ 9. Do rotating cores rotate the right direction?
- _____ 10. Show P/L pry bar slots.
- _____ 11. Have all customer requirements from the launch meeting been met?

FINAL MOLD LAYOUT REQUIREMENTS

Customer _____ Tool ID # _____ Date _____
Part Number _____ Designer _____
Part Name _____

These requirements are not intended to establish basic mold engineering, or to dictate design practice, but they should supplement these activities. The following items must be addressed and shown on the mold layout if they apply. In addition to the following list, it is expected that all items on the Preliminary Mold Design Requirements list are complete.

REQUIREMENTS

- ____ 1. All preliminary design requirements must be met.
- ____ 2. Note cavity plating on final details only if required by the customer.
- ____ 3. Note nonstandard return pins, bolt patterns, and leader pins on layout.
- ____ 4. Complete bill of material including quantity, sizes, part numbers, sources, etc.
- ____ 5. Cross hatching and section lines must be shown on cut-aways. (Show appropriate cutting planes on corresponding views).
- ____ 6. Show eyebolt locations and size. (All plates over 75 lbs. Must have eye bolts).
- ____ 7. Moldbase called out in bill of material including "O" dimension and catalog number.
- ____ 8. Note cavity press on mold layout.
- ____ 9. Note jack screw holes whenever they are necessary.
- ____ 10. Title block must be filled out completely and signed.
- ____ 11. Mold Specification form 122 filled out completely and up to date.
- ____ 12. If hot oil, Callout proper fittings and O-rings.
- ____ 13. If hydraulic cylinders, use NPT connections and internal limit switches. (Safety shields should be included in design).
- ____ 14. Cavity ID must be noted on details.
- ____ 15. All electrical connector locations should be shown and connectors called out on B.O.M.
- ____ 16. For 2 stage ejector systems, 2 sets of return pins are required. (also tie ejector plates together with shoulder bolts).
- ____ 17. Slide detents must be shown.
- ____ 18. All hot sprues and manifold systems should have thermocouples included and on B.O.M.
- ____ 19. Sprue puller pin angle should be specified if a nonstandard angle is required (see Spec. Book).
- ____ 20. Note on mold layout to stamp max. mold open, cycle number, part number, customer, and UFE Inc. tool I.D.
- ____ 21. Document the mold sequence in written format on all multi-action molds on Mold Layout.

FINAL MOLD LAYOUT REQUIREMENTS (continued)

- ____ 22. Call out steel type and hardness required on each individual detail.
- ____ 23. Plastic baffles and plugs are prohibited.
- ____ 24. Where applicable, CAD/CAM database transferring can be substituted for detailed dimensioning.
(Every opportunity to maximize and enhance these capabilities should be pursued, but always include overall dimensions and appropriate REF dimensions).
- ____ 25. The use of "E" size drawings for details should be avoided whenever possible.
- ____ 26. Note ejector pin height requirements on M.L.O.
- ____ 27. Gear spec. sheet should be included on final design.
- ____ 28. Ejector pins must be .010" minimum from cavity walls.
- ____ 29. Note general radii from shrink print on detailed drawings as well as draft.

CHECKLIST

- ____ 1. Are all symmetrical slides and/or pickouts fool-proofed? Cavity numbers on cavities, slides, holders, etc. should be engraved at parting line and behind blocks.
- ____ 2. Are gate and runner fully detailed and are they designed to moldflow specifications? (Specify tunnel gate angles and intersection points).
- ____ 3. If moldbase is larger than 10" x 12", are bolt patterns of plates sufficient? (Add ejector stops under areas of large ejector pins).
- ____ 4. If mud set, has shoulder bolt been shown on ejector plate? (assure orientation is correct).
- ____ 5. If mud is set, do water lines exit appropriately?
- ____ 6. Have all sharp corners been radiused where possible?
- ____ 7. Have hydraulic cylinders been doweled in place?
- ____ 8. Have ejector stroke limiters been used whenever possible?
- ____ 9. Do rotating cores rotate the right direction?
- ____ 10. Show P/L pry bar slots.
- ____ 11. Have all customer requirements from the launch meeting been met?

INITIAL DESIGN REVIEW CHECKLIST

SEE UFE FORM 510174

INITIAL DESIGN REVIEW CHECKLIST

Customer _____ Designer _____ Date _____
 Part Number _____ Members Present _____
 Part Name _____
 Tool No. _____

These requirements are not intended to establish basic mold engineering, or to dictate design practice, but they should supplement these activities. The following items must be addressed and shown on the mold layout if they apply. In addition to the following list, it is expected that all items on the Preliminary Mold Design Guidelines list are complete.

Mold Design General:

1. Have the UFE Inc. Design Launch Meeting Requirements been met? ☐ YES ☐ NO
2. Have the UFE Inc. Preliminary Mold Layout Guidelines been reviewed? ☐ YES ☐ NO
3. Are the drawings complete and legible enough for a thorough review? ☐ YES ☐ NO
4. Is the cavity orientation/layout optimized? ☐ YES ☐ NO
5. Are dimensions representing the mold size shown in the plan views? ☐ YES ☐ NO
6. Have consideration for a "Melt flipper" design been reviewed? ☐ YES ☐ NO
7. Is the running daylight identified and acceptable? ☐ YES ☐ NO
8. Is the TOP-OF-MOLD notation shown and acceptable? ☐ YES ☐ NO
9. Are parting lines and flash callout acceptable? ☐ YES ☐ NO
10. Additional comments? ☐ YES ☐ NO

Mold Base Design:

11. Is the mold base designed to mimic a standard UFE supplier? ☐ Superior ☐ Hasco ☐ Other
12. Does mold concept and gating appear appropriate? ☐ YES ☐ NO
13. Are the leader pins of adequate diameter, length and location? ☐ YES ☐ NO
14. Are precision parting line alignment devices shown and acceptable? ☐ N/A ☐ YES ☐ NO
15. Is the press capable of sequences and actions required? ☐ YES ☐ NO
16. Is the sprue a limiting factor? ☐ YES ☐ NO
17. Is a harden runner plate required (abrasive resin)? ☐ YES ☐ NO
18. Does part fall freely past all mold components and water hookups? ☐ YES ☐ NO
19. Are the ejector couplers the correct type and located properly? ☐ YES ☐ NO
20. Is support pillar arrangement acceptable? ☐ YES ☐ NO

INITIAL DESIGN REVIEW CHECKLIST

- | | |
|--|---|
| 21. Are protector pins required? | ☐ YES ☐ NO |
| 22. Is a thermocouple required? | ☐ YES ☐ NO |
| 23. Is a cycle counter required? | ☐ YES ☐ NO |
| 24. Is a cavity pressure transducer sensor required? | ☐ YES ☐ NO |
| 25. Is special grease required to run production? | ☐ YES ☐ NO |
| 26. Does the sprue bushing use 5/16-18 S.H.C.S.? | ☐ YES ☐ NO |
| 27. Is the mold's clamping features acceptable (7/8 clamp slots)? | ☐ YES ☐ NO |
| 28. Is the mold base designed for easy assembly and disassembly? | ☐ YES ☐ NO |
| 29. Are eye-bolt holes and pry-slots present as needed? | ☐ YES ☐ NO |
| 30. Are tags, warnings and other mold base markings properly shown? | ☐ N/A ☐ YES ☐ NO |
| 31. Is mold function safe (finger pinchers)? | ☐ YES ☐ NO |
| 32. Do conditions exist that will inhibit the use of a sprue picker? | ☐ N/A ☐ YES ☐ NO |
| 33. Does the mold base have corrosion protection (nickel-plate/Stainless)? | ☐ N/A ☐ YES ☐ NO |
| 34. Is the mold stack height appropriate for the designated press? | ☐ YES ☐ NO |
| 35. Does the base fit between the tie bars of the designated press? | ☐ YES ☐ NO |
| 36. Additional comments? | ☐ YES ☐ NO |
-

Cavities and Cores:

- | | |
|---|---|
| 37. Is each cavity location inserted? | ☐ N/A ☐ YES ☐ NO |
| 38. Are fragile and suspect areas inserted? | ☐ N/A ☐ YES ☐ NO |
| 39. Do cavity and core blocks contain water circuits? | ☐ N/A ☐ YES ☐ NO |
| 40. Are cavity components to be plated? | ☐ N/A ☐ YES ☐ NO |
| 41. Is a date code pin required? | ☐ YES ☐ NO |
| 42. Are steel types and hardness specified and acceptable? | ☐ YES ☐ NO |
| 43. Is venting sufficient? | ☐ YES ☐ NO |
| 44. Does the mold design have adequate draft and/or radii for part release? | ☐ YES ☐ NO |
| 45. Has cavity I.D. been optimized regarding location, visibility, and manufacturability? | ☐ N/A ☐ YES ☐ NO |

INITIAL DESIGN REVIEW CHECKLIST

46. Are additional part markings shown on the drawings? ☐ N/A ☐ YES ☐ NO
47. Is the cavity finish specified on the Mold Layout? ☐ YES ☐ NO
48. Are cores, sleeves, slides and other moving parts stepped or drafted properly for optimum wear and shut off conditions? ☐ N/A ☐ YES ☐ NO
49. Additional comments? ☐ YES ☐ NO
-

Undercut Relief System:

50. Does this design require cams, or slides? (if NO, skip this section) ☐ YES ☐ NO
51. Is slide(s) travel distance dimensioned on Mold Layout? ☐ YES ☐ NO
52. Are spring detent devices employed on slides? ☐ YES ☐ NO
53. Are heel blocks being used to back-up slides? ☐ YES ☐ NO
54. Is the cam pin angle different than the heel angle? ☐ YES ☐ NO
55. Is the cam pin angle dimensioned on the Mold Layout? ☐ YES ☐ NO
56. Do the slides have positive stops to prevent over-stroking? ☐ YES ☐ NO
57. Are slide protector pins required? ☐ YES ☐ NO
58. Are the slides captured by replaceable gibs? ☐ YES ☐ NO
59. Are wear plates being used under the slides? ☐ YES ☐ NO
60. Are the slides removable from the parting line of the mold? ☐ YES ☐ NO
61. Is cooling required/present in the slides? ☐ YES ☐ NO
62. Are all symmetrical slides/pick-outs fool-proofed? ☐ YES ☐ NO
63. Are cavity numbers to be engraved at parting line on all components? ☐ YES ☐ NO
-

64. Are hydraulic core pulls required? (if NO, skip this section) ☐ YES ☐ NO
65. Is the core sequence listed on the Mold Layout? ☐ YES ☐ NO
66. Are the hydraulic fittings shown and acceptable? ☐ YES ☐ NO
67. Has the molding force acting on the cylinder been calculated? ☐ YES ☐ NO
68. Are core position switches/sensors shown and acceptable? ☐ YES ☐ NO
69. Are heels/locks being used to back-up cores? ☐ YES ☐ NO

INITIAL DESIGN REVIEW CHECKLIST

70. Can the mold be installed without the removal of the cylinder(s)? ☐ YES ☐ NO
71. Are the cylinders design to be easily serviceable? ☐ YES ☐ NO
72. Is cooling required/present in the cores? ☐ YES ☐ NO
73. Is the cylinder type and vendor identified and acceptable? ☐ YES ☐ NO
-

74. **Are Lifters being used in this design?** (if NO, skip this section) ☐ YES ☐ NO
75. Are the lifters modified catalog standard components? ☐ YES ☐ NO
76. Are the lifters free of shut-off surfaces? ☐ YES ☐ NO
77. Are the lifters shown in both open and closed positions on the Mold Layout? ☐ YES ☐ NO
78. Will the lifters interfere with anything when stroked forward? ☐ YES ☐ NO
79. **Additional comments?** ☐ YES ☐ NO
-

Ejector System:

80. Does the system have enough "stroke" to remove the molded part? ☐ YES ☐ NO
81. Are there enough ejector locations on each part? ☐ YES ☐ NO
82. Are contoured ejector pins keyed? ☐ N/A ☐ YES ☐ NO
83. Is an ejector-positioning switch installed? ☐ N/A ☐ YES ☐ NO
84. Are return pins indicated on the Mold Layout? ☐ YES ☐ NO
85. Is guided ejector system shown and acceptable? ☐ YES ☐ NO
-

86. **Are ejector blades being used?** (if NO, skip to next section) ☐ YES ☐ NO
87. Are sub-inserts being used for ejector blades in the cores? ☐ YES ☐ NO
88. Are the ejector blades a single-piece type construction? ☐ YES ☐ NO
89. Are the ejector blades standard catalog items? ☐ YES ☐ NO
-

90. **Are ejector sleeves being used?** (if NO, skip to next section) ☐ YES ☐ NO
91. Are the ejector sleeves standard catalog items? ☐ YES ☐ NO
92. Are steel types and hardness specified and acceptable? ☐ YES ☐ NO
93. Does the center pin require cooling? ☐ YES ☐ NO

INITIAL DESIGN REVIEW CHECKLIST

94. Additional comments?

☐ YES ☐ NO

Cooling System:

95. Is temperature control adequate?

☐ YES ☐ NO

96. Are water circuits present in cavity/core blocks?

☐ N/A ☐ YES ☐ NO

97. Are the water circuits an acceptable size?

☐ YES ☐ NO

98. Are the water fittings the proper size?

☐ YES ☐ NO

99. Are baffled circuits proportional to the supply circuits?

☐ N/A ☐ YES ☐ NO

100. Are cascade water circuits properly designed?

☐ N/A ☐ YES ☐ NO

101. Are water diversion plugs present and acceptable?

☐ N/A ☐ YES ☐ NO

102. Are the water circuits design to promote turbulent flow?

☐ YES ☐ NO

103. Additional comments?

☐ YES ☐ NO

Runner System:

104. Is a cold runner system being used? (if NO, skip to next section)

☐ YES ☐ NO

105. Is the runner system designed for balanced filling?

☐ YES ☐ NO

106. Are the runner feeder sizes acceptable?

☐ YES ☐ NO

107. Are the runner branch sizes indicated on the Mold Layout?

☐ YES ☐ NO

108. Is the gate type identified and acceptable?

☐ YES ☐ NO

109. Are cold slugs present and at proper locations?

☐ YES ☐ NO

110. Is a sprue-puller present?

☐ YES ☐ NO

111. Will the runner stick to the correct side of the mold?

☐ YES ☐ NO

112. Additional comments?

☐ YES ☐ NO

113. Is a Hot runner system being used? (if NO, skip to next section)☐ YES ☐ NO

114. Is the Hot-runner system manufacturer indicated and acceptable?

☐ YES ☐ NO

115. Is the Hot-runner system a standard stock item (i.e. Husky Pronto)?

☐ YES ☐ NO

116. Is the system gating directly into the molded part?

☐ YES ☐ NO

INITIAL DESIGN REVIEW CHECKLIST

- | | |
|---|--|
| 117. Are the gate locations acceptable? | ☐ YES ☐ NO |
| 118. Are the gate sizes and types indicated and acceptable? | ☐ YES ☐ NO |
| 119. Are hot-half alignment pins and bolts shown and acceptable? | ☐ YES ☐ NO |
| 120. Are the nozzle heaters and thermocouples serviceable from the press? | ☐ YES ☐ NO |
| 121. Is an insulator plate being used? | ☐ YES ☐ NO |
| 122. Is there a cooling circuit in the vicinity of the nozzle? | ☐ YES ☐ NO |
| 123. Does the nozzle design/type fit the molding resin? | ☐ YES ☐ NO |
| 124. Are the nozzle tips replaceable or inserted for replacement? | ☐ YES ☐ NO |
| 125. Additional comments? | ☐ YES ☐ NO |
-

Design Summary:

- | | |
|--|--|
| 126. Has the mold design been optimized for manufacturability and maintenance? | ☐ YES ☐ NO |
| 127. Has the mold design been optimized for CNC programming and machining? | ☐ YES ☐ NO |
| 128. Does the production plant want to order any spare components? | ☐ YES ☐ NO |
| 129. Is a customer part redesign required? | ☐ YES ☐ NO |
| 130. Can the mold base be ordered at this time? | ☐ YES ☐ NO |
| 131. Can other long lead-time components be ordered at this time? | ☐ YES ☐ NO |

Comment / Action Items (Final Design Review to address action items):

SECTION C-CAVITY & FORCE DATA

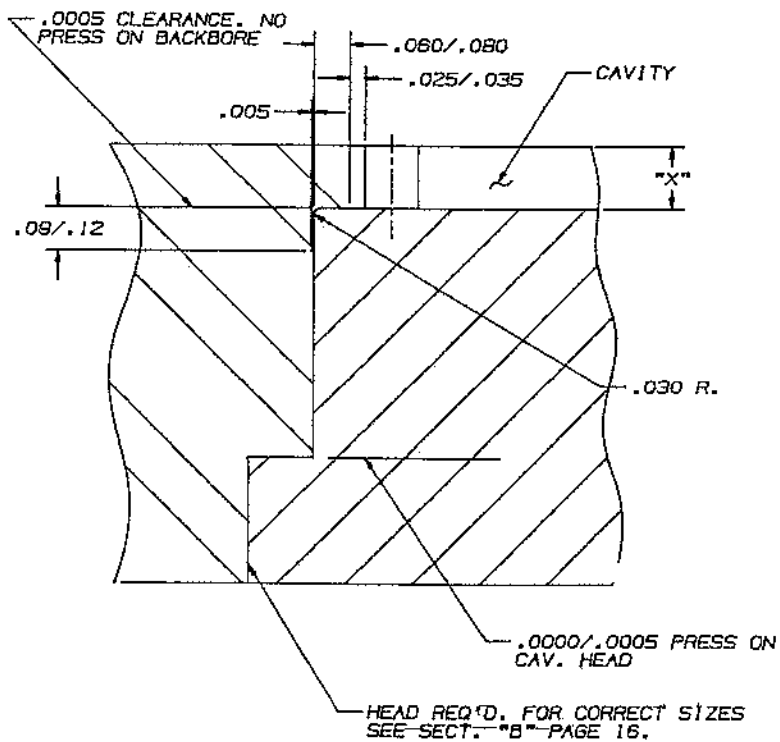
<u>Contents</u>	<u>Page</u>
CAVITY AND FORCE DATA	1
GEAR CAVITY CONSTRUCTION	2
CAV'S FOR WIRE EDM	3
WORM GEAR HOB AND HOLDER	4
HELICAL GEAR HOB AND HOLDER	5
TRANSDUCER SLOTS	6
RJG SENSOR	7

CAVITY AND FORCE DATA

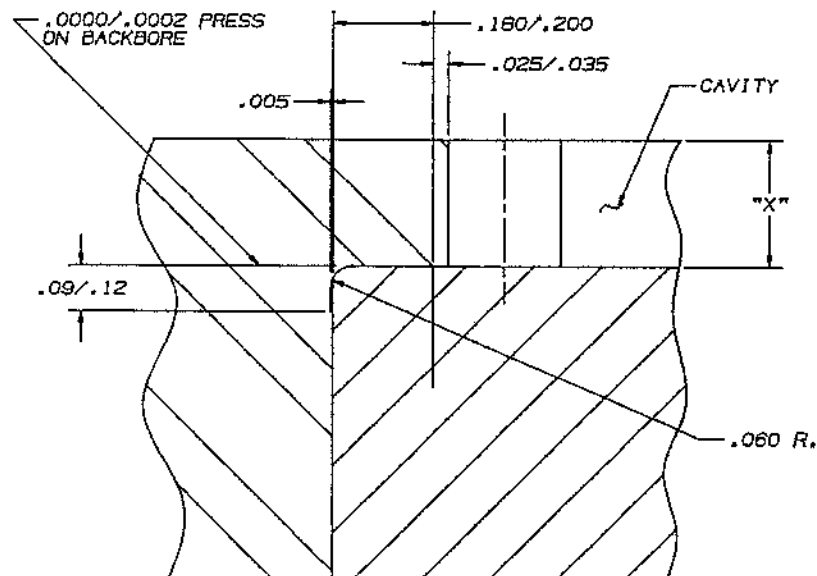
I. CAVITY AND FORCE REQUIREMENTS

- A. All shrink dimensions must be held to within 25% of all piece part tolerances of $\pm.003$ or larger and within 10% of all below $\pm.003$. On multi-cavity molds, details to be repetitive to within 10%
- B. Jig grind all round cavity holes and insert unless otherwise specified by UFE.
- C. To insure proper clamping, cavities to project .002/ side above parting line on small bases. On 10 x 12 and larger mold bases, the cavities are to .003/ side above parting line. Any shutoff inside cavity to have an additional .0005 press
- D. Break all unnecessary sharp non-molding edges and corners on the mold.
- E. All design telescoping shutoff surfaces to have $0^{\circ} 30'$ minimum draft. (Use maximum draft print will allow.)
- F. Draw polish core pins, forces, and cavities in direction of ejection.
- G. Molds made with interchangeable cavities must be provided with a sliding fit for ease of changing.
- H. Mold components requiring shims must have UFE approval and must be marked with the amount of the shim on the surface requiring shimming (i.e., shim .010). We may ask for plating to replace the shims after the mold is approved. If UFE does allow shims, the minimum thickness allowed will be .005.
- I. Provide grease grooves on parts that are subject to galling.
- J. Lubricate all moving mold parts with high temperature grease.
- K. On all non-functional telescoping surfaces, provide clearance (.015/.25).
- L. Welding of cavities, cores, etc., will not be permitted unless approved by UFE Engineering in writing.
- M. Stamp mold components with proper type of steel and Rockwell hardness.

USE WHEN "X" EQUALS .060 TO .200



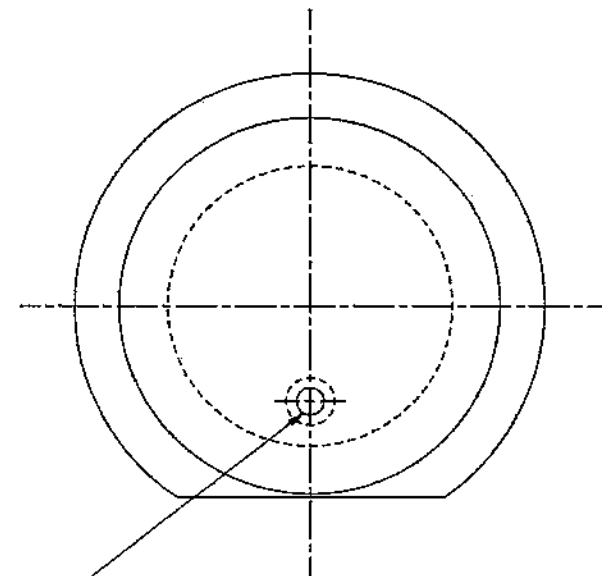
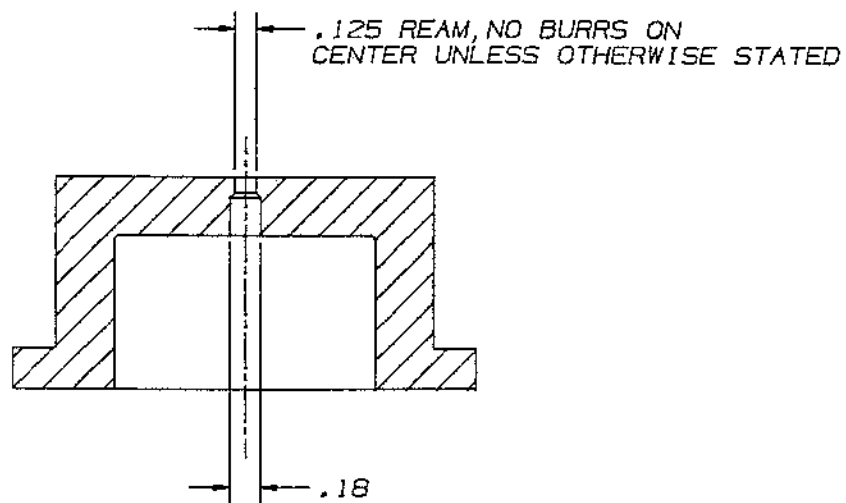
USE WHEN "X" EQUALS .201 & OVER



NOTE:
1- FOR GEAR VENTING DETAILS
SEE SECT. F PAGES 5 AND 6.

3	PM	6/15/98	HRB INC C PG 20
ISSUE	BY	DATE	REVISION

DRAWN DATE TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL 1/32 DECIMAL .001 ANGULAR 1/2°	APPR. DATE UFE #14 CUSTOMER PART NO. PART NAME	ufe UFE Incorporated STILLWATER, MN TITLE GEAR CAVITY CONSTRUCTION SCALE NONE SHEET SECT. C	DRWG. NO. PAGE NO. 2
--	---	--	-------------------------

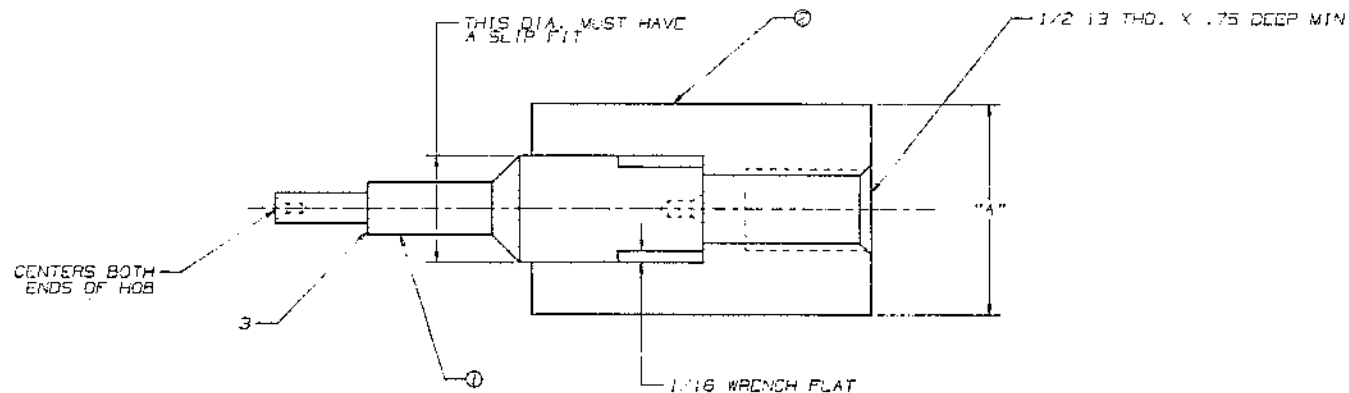


NOTES

- 1- MOLD I.D. AND TYPE OF STEEL WILL BE STAMPED
ON THE CAVITIES BEFORE THEY ARE BROUGHT
IN TO BE WIRE FED.

A	REV	DATE	BY	CHKD	APP'D
1		4/15/88			

DRAWN		APPR.		ufe UFE Incorporated. PROPRIETARY TOOLING STILLWATER, MN	
DATE		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE #		TITLE	
FRACTIONAL 2/128		CUSTOMER		CAV'S FOR WIRE EDM	
1 P.L.O.D.G. 2.011		PART NO.		SCALE NONE	
2 P.L.O.D.G. 2.000		PART NAME		DRWG. NO.	
3 P.L.O.D.G. 2.000				PAGE NO. 3	
ANGULAR 2 1/2° MIN				SHEET C	

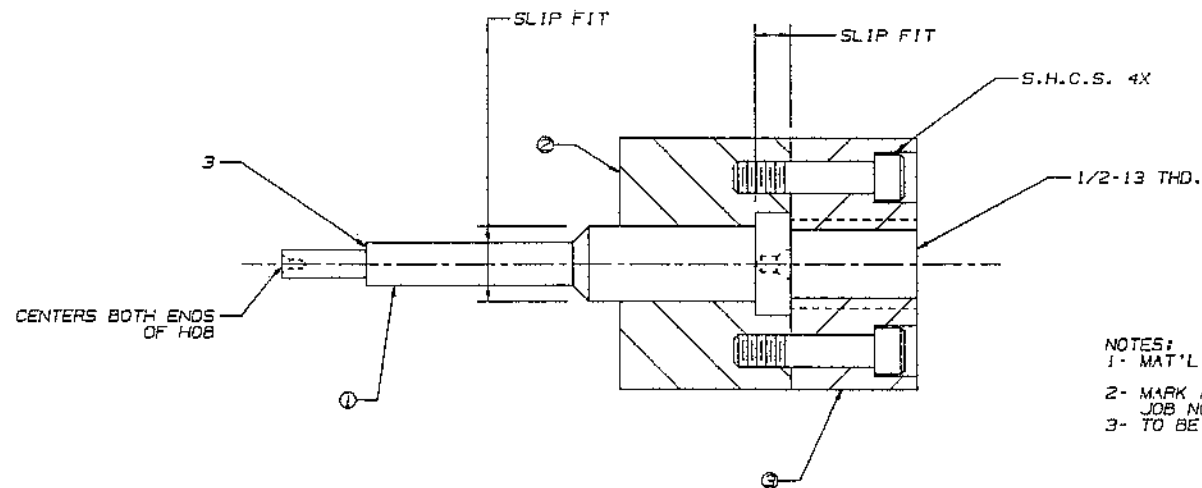


NOTES:

- 1- MAT'L: ITEM NO. 1, H-13 R/C 52-54, ITEM NO. 2 C.R.S.
- 2- MARK BOTH ITEMS WITH PART NO., JOB NO., CO. NAME, AND MIN. CAST LENGTH.
- 3- TO BE CUT OFF HERE AFTER THREAD GRINDING.
- 4- HOB FINISH SHOULD BE POLISHED.
- 5- DIA. "A" SHOULD BE .50 LARGER THAN DIA. OF CAV. THE DIA. IS FROM 1 TO 4 INCHES IN INCREMENTS OF .25. MUST BE .005/.010 UNDER NOMINAL SIZE. EXAMPLE: 1.250 WOULD BE 1.245 $\pm$.000 $\pm$.005.

DRAWN		APP.		 UFE Incorporated. Manufacturing Technology	STILLWATER, MN
DATE		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED.		UFE UN		TITLE	
FRACTIONAL 2/123		CUSTOMER		WORM GEAR HOB AND HOLDER	
3 PL. DEC. 3.113		PART NO.		SCALE NONE	
4 PL. DEC. 3.366		PART NAME		DRWG. NO.	
ANGULAR 11° 00'				SHEET 1 OF 1	

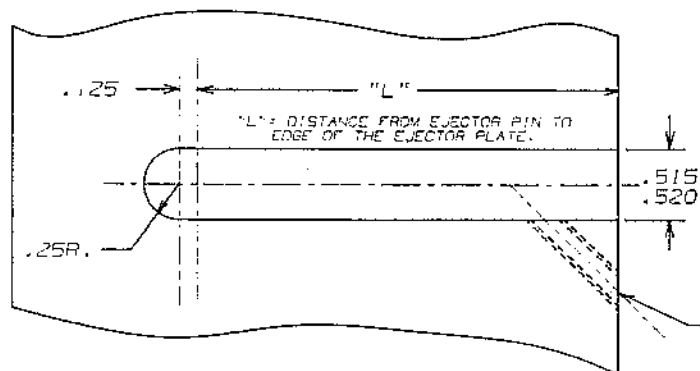
R	MS	REV. DATE	MS. DEC. 2 PG. 0
ISSUE	BY	DATE	REVISION



- NOTES:
- 1- MAT'L: ITEM NO. 1, H-13 R/C 52-54, ITEM NO. 2 AND 3 C.R.S.
 - 2- MARK ALL THREE ITEMS WITH PART NO., JOB NO., CO. NAME, AND MIN. CAST LENGTH.
 - 3- TO BE CUT OFF HERE AFTER THREAD GRINDING.

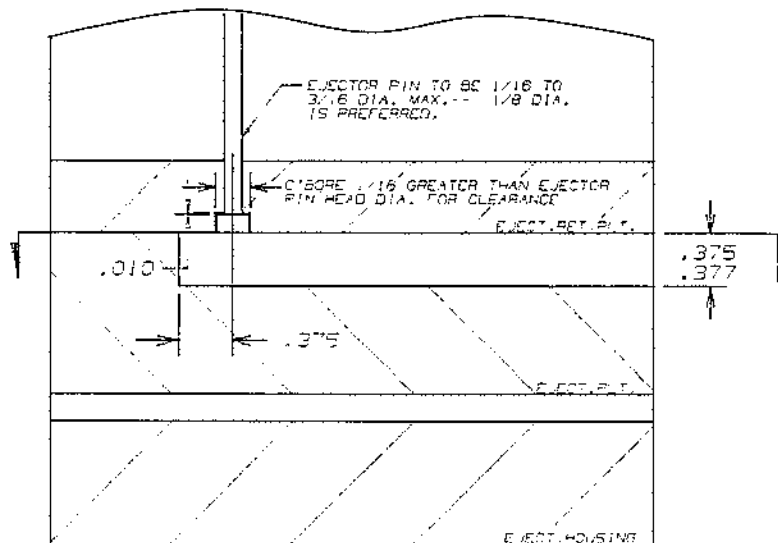
ID	REV	DATE	VAR	REV	Q	NO	7
ISSUE	BY	DATE					REVISION

DATE	DATE	ufe UFE Incorporated. STILLWATER, MN
DATE	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:	UFE JIN	TITLE HELICAL GEAR HOB AND HOLDER
FRACTIONAL 3/16	CUSTOMER	
1 PL. DEC. 3.015	PART NO.	SCALE NONE
2 PL. DEC. 3.001	PART NAME	DRWG. NO.
4 PL. DEC. 3.001		SHEET 5 of 5
ANGULAR 1/2" 90°		PAGE #5

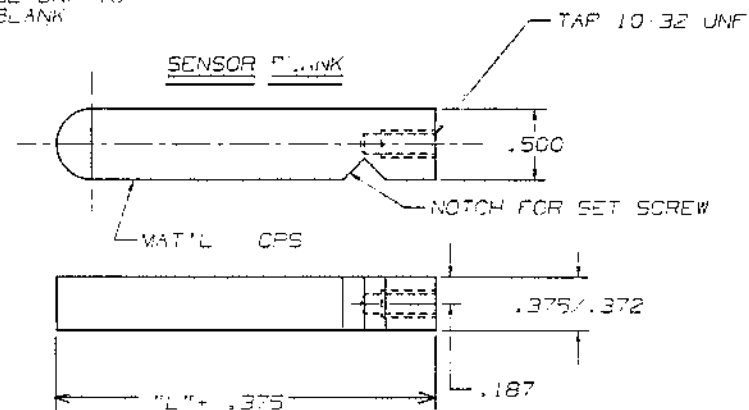


NOTE:

1. LOCATE TRANSDUCER SLOT PER SHRINK PRINT.
2. VENDOR TO FURNISH 1 SENSOR BLANK FOR EACH TRANSDUCER SLOT.
3. STAMP EJECTOR PIN SIZE ON END OF EJECTOR PLT.

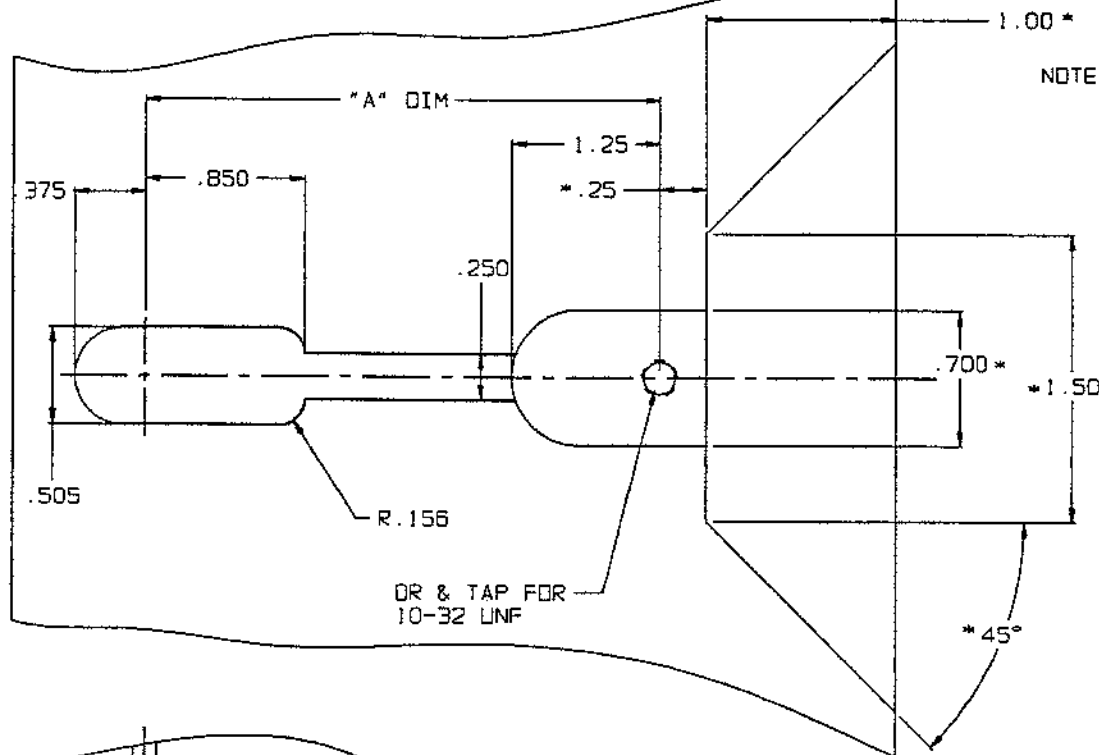


TAP 10-32 UNF TO
RETAIN BLANK



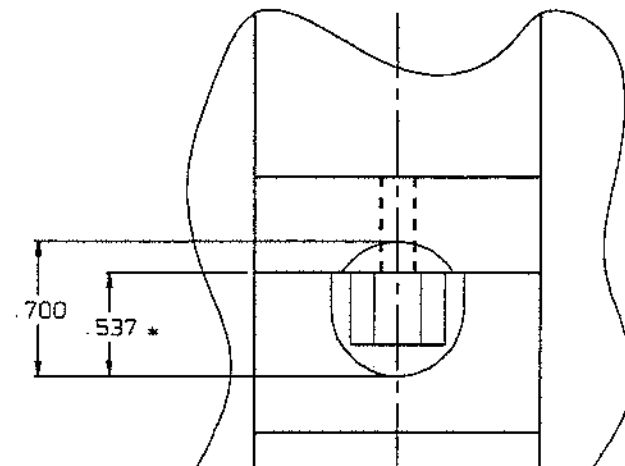
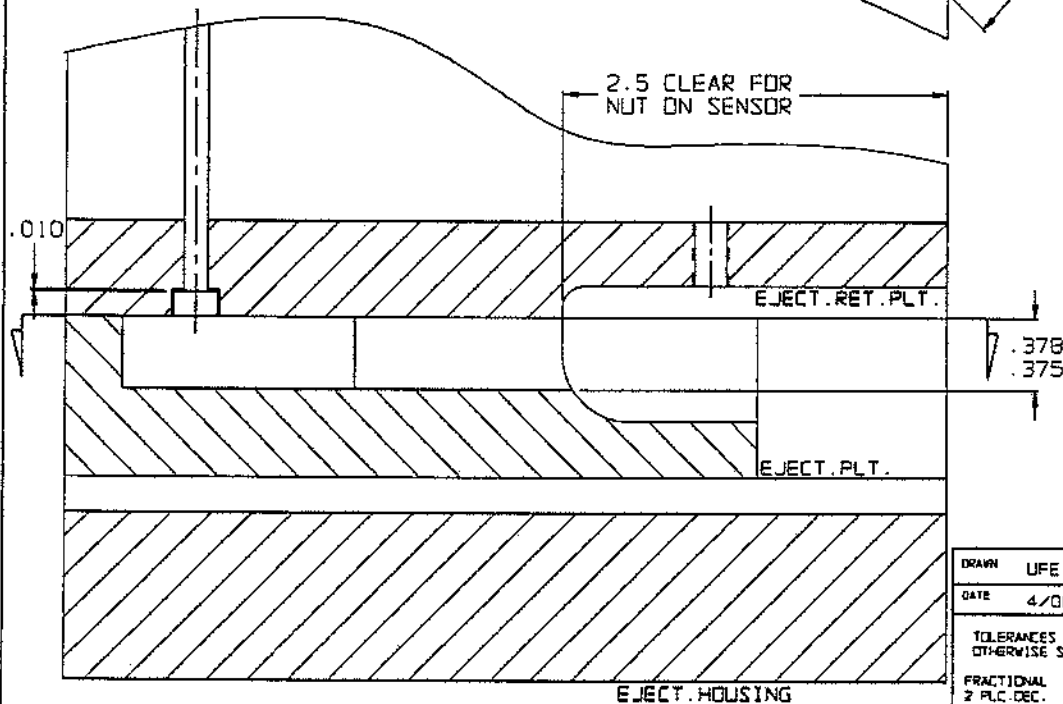
DRAWN		APPR.		ufe ® UFE Incorporated, Industrial Processors STILLWATER, MN	
DATE		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE PIN		TITLE	
FRACTIONAL 2/100		CUSTOMER		TRANSducer SLOTS	
1 PL. DEC. 2.015		PART NO.		SCALE NONE	
2 PL. DEC. .100		PART NAME		DRWG. NO.	
3 PL. DEC. 2.000				SHEET 1 OF 1	
ANGULAR 21° MAX				PAGE # 6	

BY	DATE	REVISION



NOTES:

1. TRANSDUCER NUMBER IS DETERMINED BY THE SIZE OF THE EJECTOR PIN.
2. THE "A" DIM CANNOT EXCEED 24 INCHES.
3. WHEN THE "A" DIM IS LESS THAN 3 INCHES A BLOCK IS MADE THAT MOUNTS ON THE OUTSIDE OF THE MOLD AND THE "*" DIM ARE USED FOR THE BLOCK WITH ADDITIONAL MOUNTING BOLTS.
4. SEE ENGINEERING FOR DETAILS



DRAWN	UFE	APPR.	
DATE	4/00	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JPH	
FRACTIONAL		CUSTOMER	
2 PLC. DEC.		PART NO.	
3 PLC. DEC.		PART NAME	
4 PLC. DEC.			
ANGULAR			

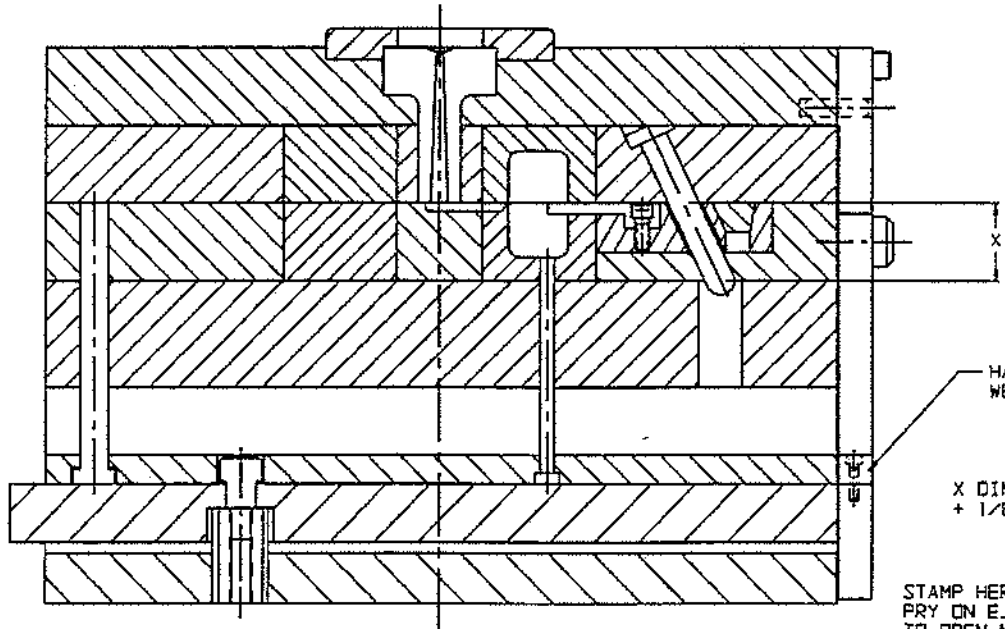
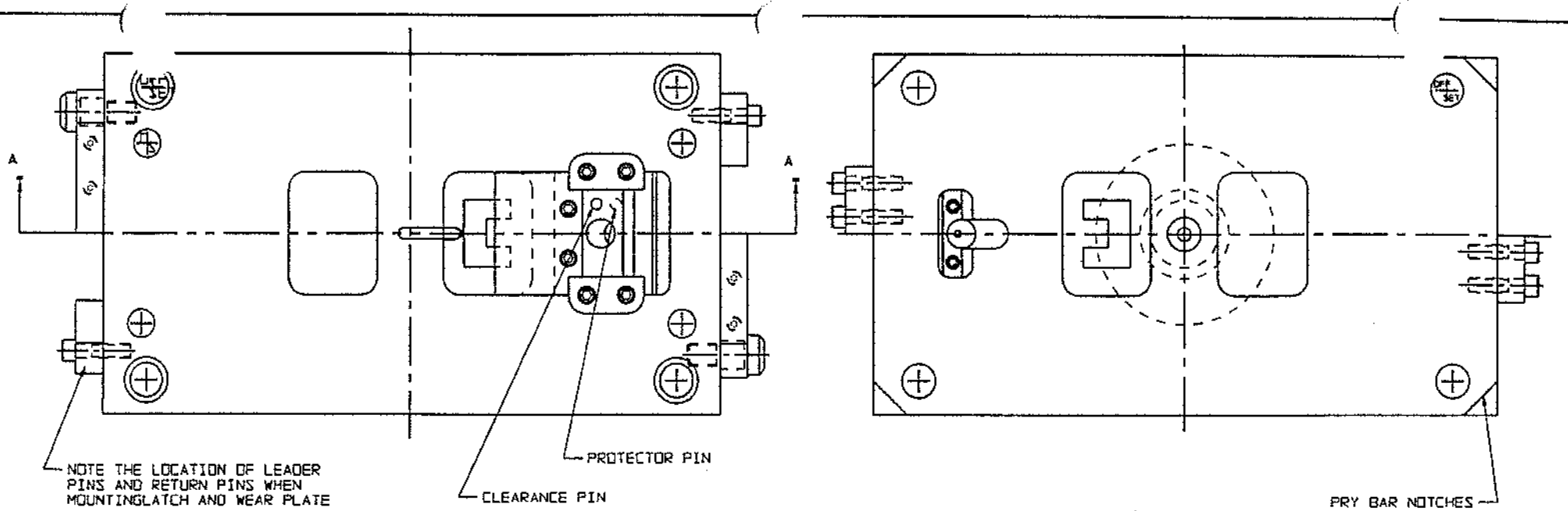
ufe UFE Incorporated	
STILLWATER, MN	
TITLE	
RJG SENSOR	
SCALE	DRWG. NO.
SHEET OF	SECTION C PG 7

SECTION D – SLIDES/CAMS

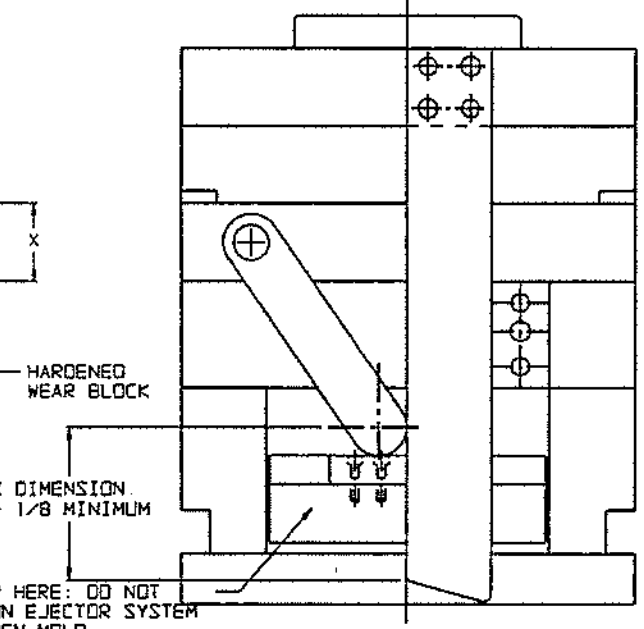
<u>Contents</u>	<u>Page</u>
RULES	2
SLIDES WITH PROTECTOR PINS A	3
SLIDES WITH PROTECTOR PINS B	4
SLIDES WITH HYD. CYLINDERS	5
SLIDE	6
SUPPORT FOR HEAVY SLIDES	7
SPRING LOADING SLIDES	8
SLIDE PLUNGER A	9
SLIDE PLUNGER B	10

SLIDES

- A. Slides with more than 2" of travel should be actuated with a hydraulic cylinder and use a standard lock block to hold molding pressure.
- B. Slides are to have adequate over travel so as not to interfere with part ejection (1/8" to 3/8" over-travel) Note: 3/8" min. over travel required on deeper slides for runner extraction.
- C. If possible make all slides easily removable from the parting line.
- D. On molds where ejector sleeves, pins, etc. are located under the slide and their late return would result in damage, see special requirements in Section G, Ejector Systems, pg. 3 Para. K-4
- E. Gibs are to be thick enough to use standard socket head cap screws to retain them. No flat head screws or low head screws are to be used.
- F. Provide jack screw holes in gibs for gib removal (Tap existing counter-bored hole to next tap size).
- G. Break all non-molding edges and corners to prevent galling and shaving of other steel parts.
- H. Provide grease grooves and wear plates under slide and behind lock blocks where slides are subject to galling.
- I. Water fittings in the cam must be 1/64" - 1/16" below mold base or protector block when closed. See section H, pg. 4
- J. For other slide requirements, see the example drawings in this section.
- K. On identical slides, one must be doweled or made dissimilar by some means. One slide must not fit in a pocket of another during assembly / repair.

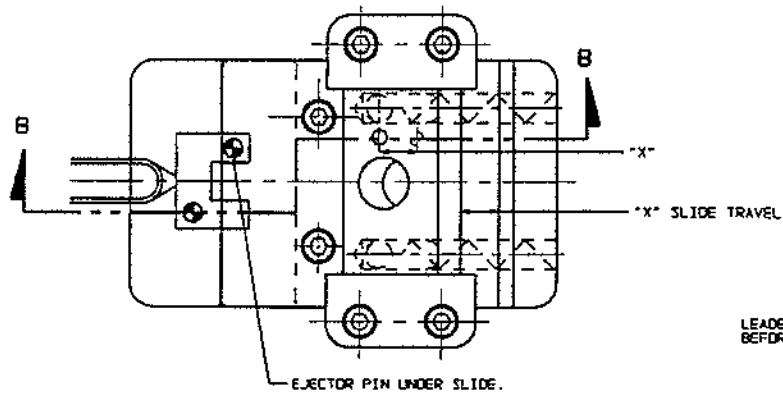


SECTION A-A



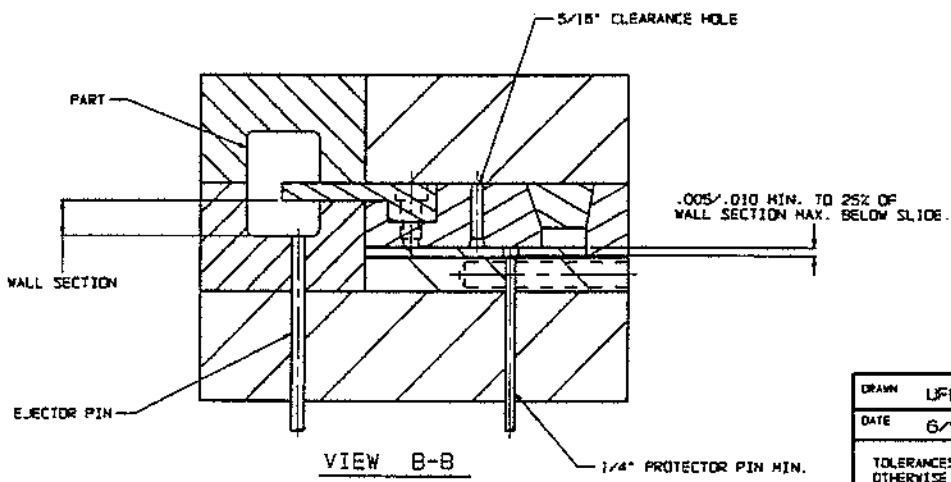
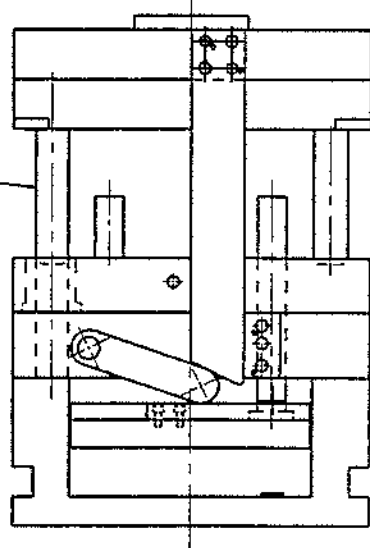
STAMP HERE: DO NOT
PRY ON EJECTOR SYSTEM
TO OPEN MOLD

DRAWN UFE		APPR.		 UFE Incorporated UFE INC. FOR EXCELLENCE	
DATE 6/99		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JCN		STILLWATER, MN	
FRACTIONAL 1/32		CUSTOMER		TITLE	
2 PLC. DEC. ±.010		PART NO.		SLIDES WITH PROTECTOR PINS	
3 PLC. DEC. ±.005		PART NAME		SCALE	
4 PLC. DEC. ±.0002				SHEET OF	
ANGULAR 1° 0' 00"				DRWG. NO.	
				SECTION D PG 3	



SLIDE SHOWN CLOSED

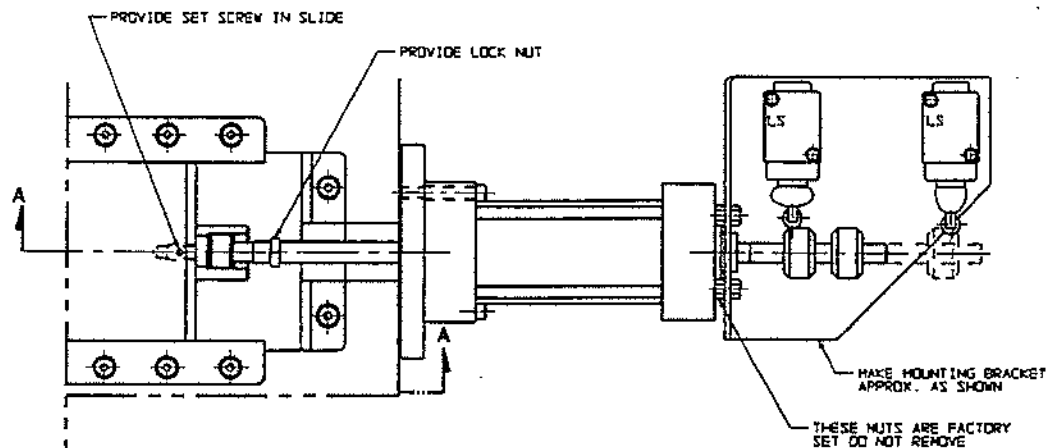
LEADER PINS MUST ENGAGE BEFORE EARLY RETURN



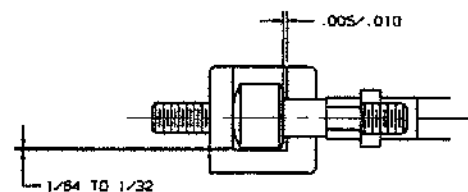
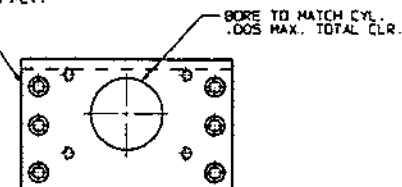
NOTE:

1. UFE PREFERRED USING THE TOP MOUNT STYLE. ANY USE OF THE SIDE MOUNT MUST BE APPROVED BY UFE ENGINEERING DEPT.

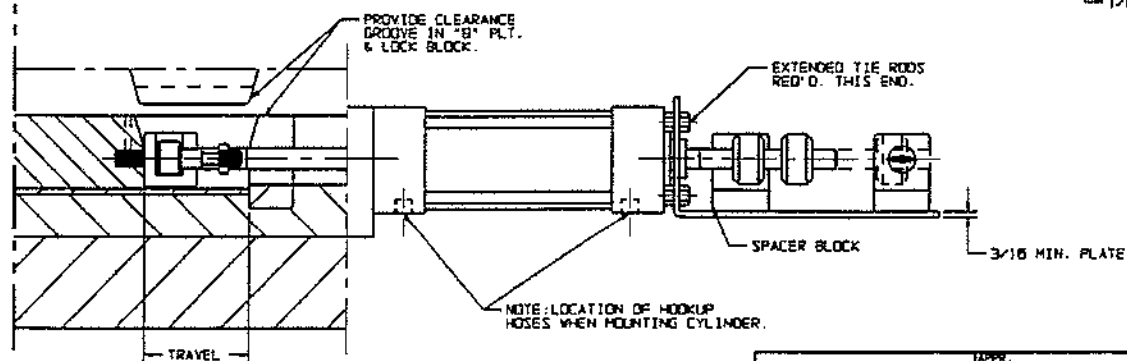
DRAWN	UFE	APPR.		ufe UFE Incorporated 4000 10th Avenue STILLWATER, MN	
DATE	6/99	DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JPN		TITLE SLIDES WITH PROTECTOR PINS	
		CUSTOMER			
FRACTIONAL	11/32	PART NO.		SCALE	DRWG. NO.
2 PLC. DEC.	±.010	PART NAME		SHEET	OF
3 PLC. DEC.	±.005			SECTION 0 PG 4	
4 PLC. DEC.	±.0002				
ANGULAR	±1° 00'				



TYPICAL CYL. MOUNTING PLT.

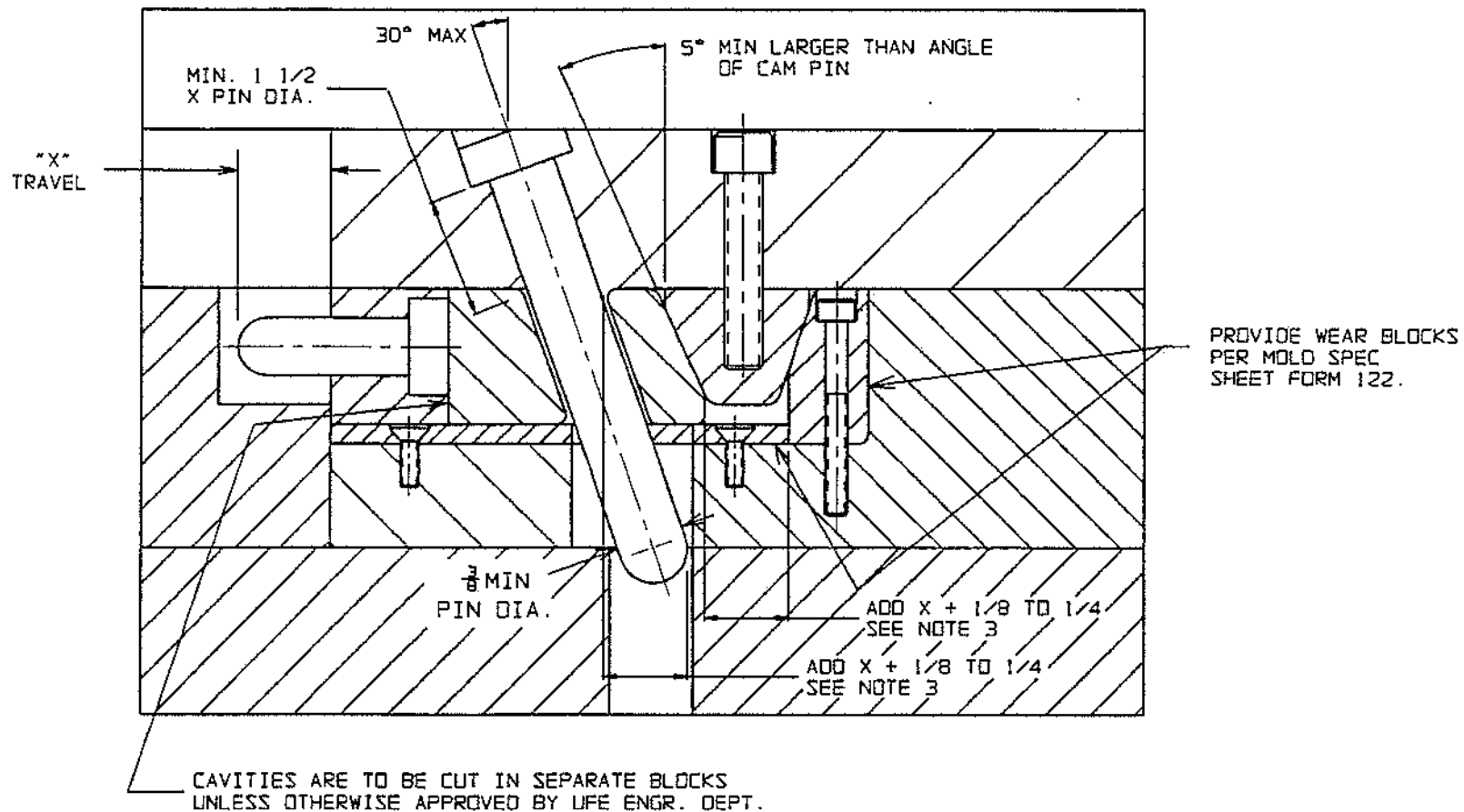


COUPLER DETAIL



VIEW A-A

DRAWN	UFE	APPR.		ufe [®] UFE Incorporated WE'RE FOR EXCELLENCE STILLWATER, MN
DATE	6/99	DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JPN		TITLE SLIDES WITH HYD. CYLINDERS
FRACTIONAL		CUSTOMER		
2 PLC. DEC.		PART NO.		SCALE SHEET OF
3 PLC. DEC.		PART NAME		
4 PLC. DEC.				DRWG. NO. SECTION D PG 5
ANGULAR				



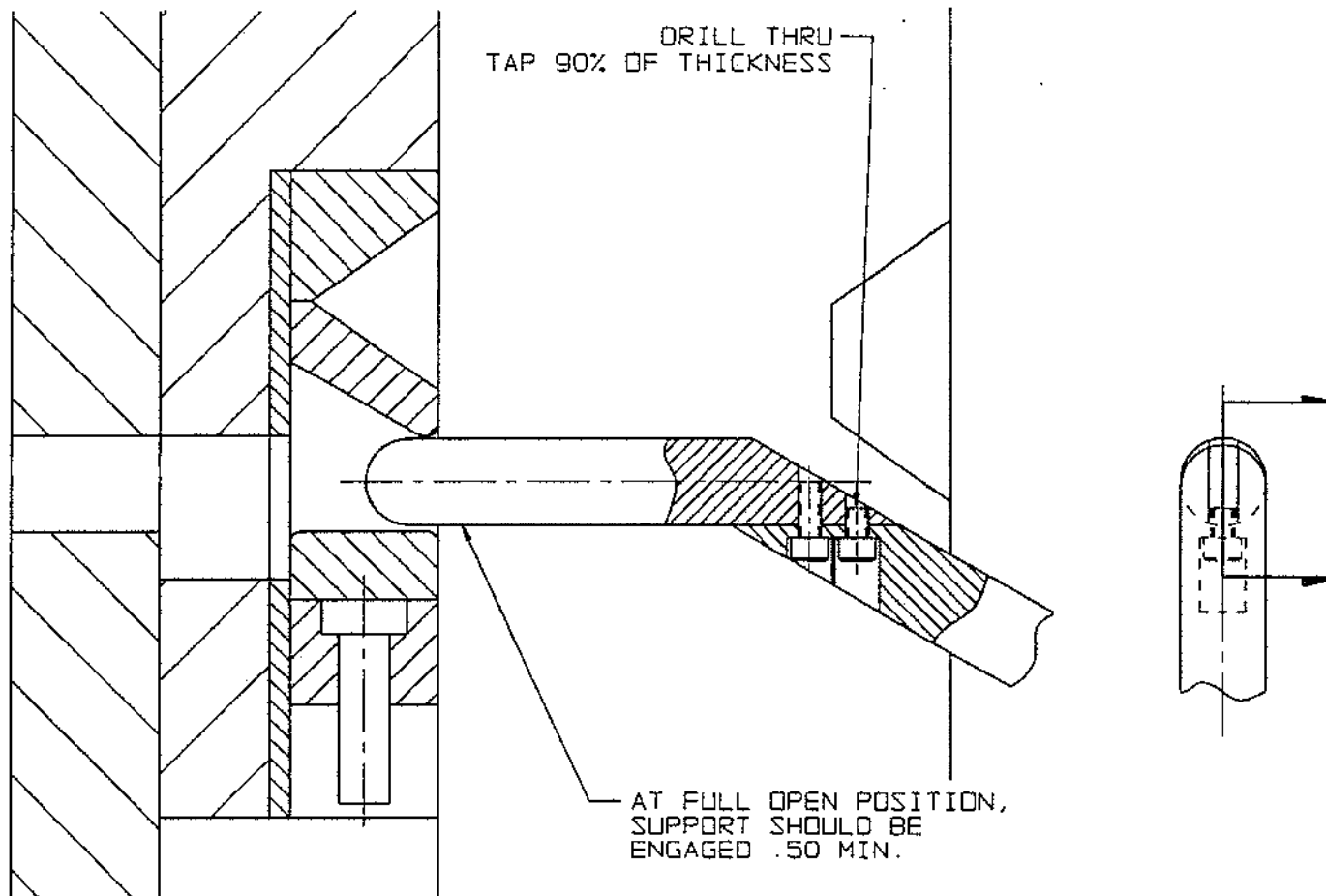
NOTE:

1. SLIDES WITH MORE THAN 2" OF TRAVEL TO BE ACTIVATED WITH AIR OR HYDRAULIC CYLINDERS.
2. WHEN CAM IS DELAYED, ADD LENGTH OF DELAY TO CAM TRAVEL AND CAM PIN LENGTH.
3. SEE SECTION D, PAGE 1, B

DRAWN: LIFE		DATE: 6/99		DATE: 6/99		DATE: 6/99	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		FRACTIONAL ±1/32		2 PLC. DEC. ±.010		3 PLC. DEC. ±.005	
		4 PLC. DEC. ±.0002		ANGULAR ±1°0'00"			
		PART NO.		PART NAME		SCALE	
						SHEET OF	
						DRWG. NO.	
						SECTION D PG 6	

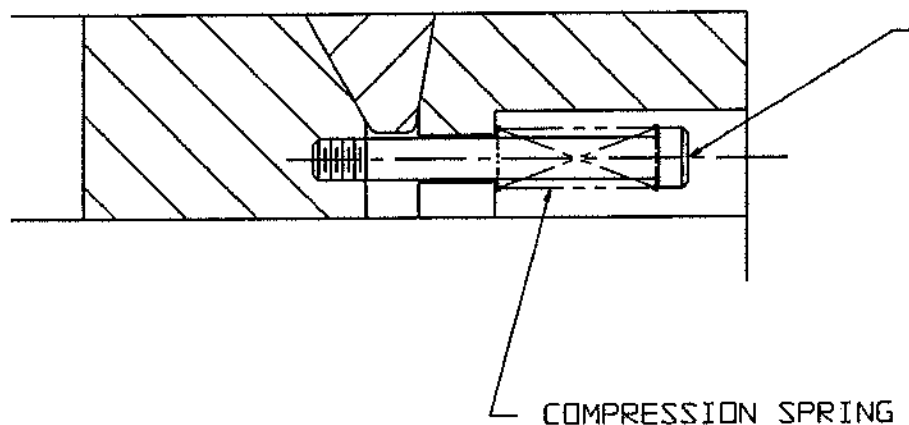
ufe LIFE Incorporated
STILLWATER, MN

TITLE: SLIDE



NOTES:
SUPPORTS ARE ONLY REQUIRED ON
TOP VERTICAL SLIDES

DRAWN	UFE	APPR.		ufe UFE Incorporated STILLWATER, MN
DATE	6/99	DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		LIFE SW		TITLE SUPPORT FOR HEAVY SLIDES
FRACTIONAL $\pm 1/32$		CUSTOMER		
2 PLC. DEC. $\pm .010$		PART NO.		SCALE
3 PLC. DEC. $\pm .005$		PART NAME		ORIG. NO.
4 PLC. DEC. $\pm .0002$				SHEET
ANGULAR $\pm 1^{\circ} 0' 00''$				OF
				SECTION 0 PG 7



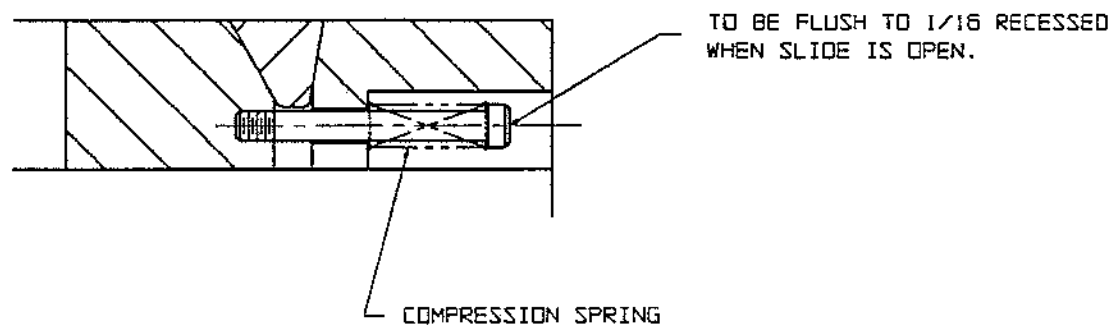
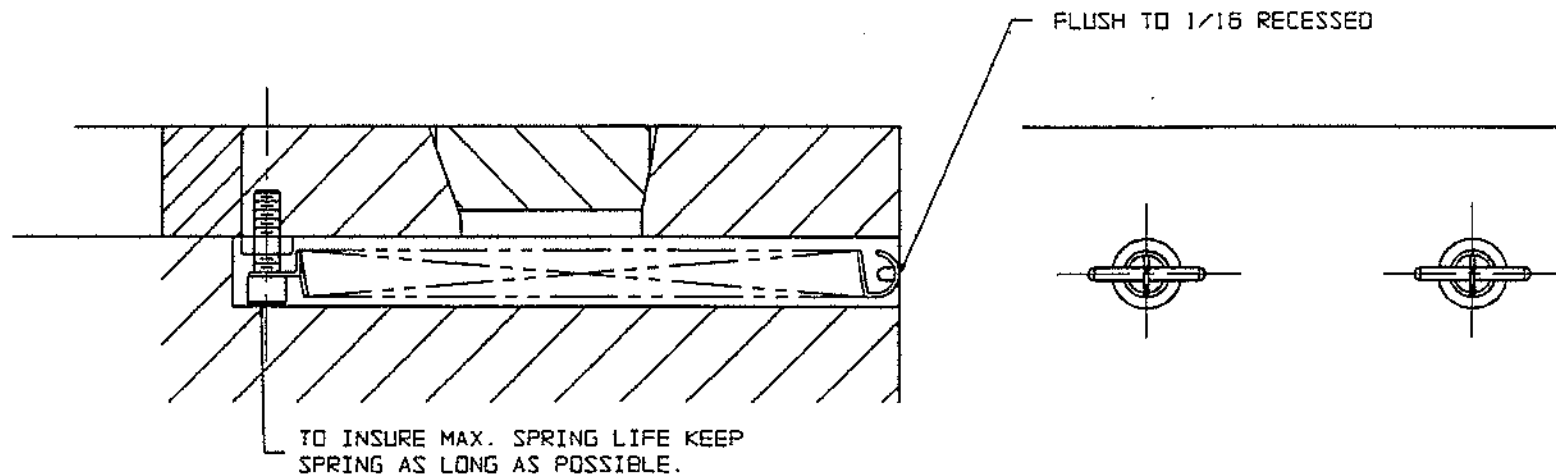
TO BE FLUSH TO 1/16 RECESSED
WHEN SLIDE IS OPEN.

COMPRESSION SPRING

NOTE:

1. TWO SPRINGS REQUIRED PER SLIDE

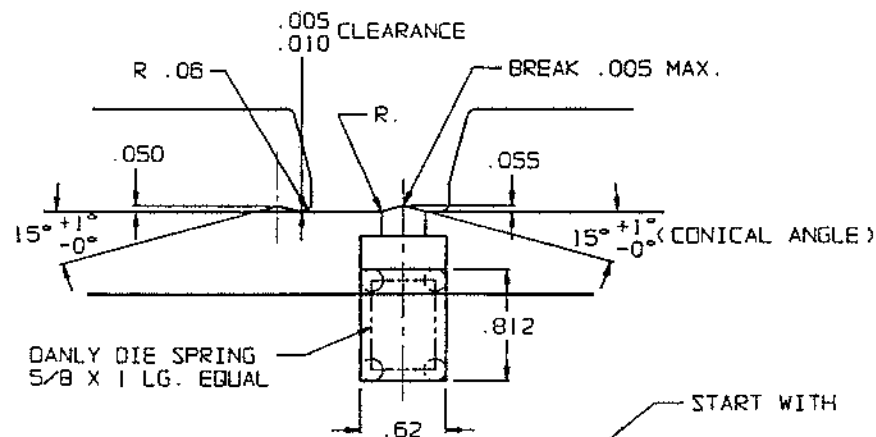
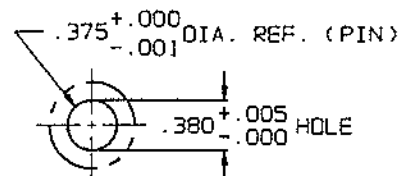
DRAWN: UFE		APPR:		 ufe [®] LIFE Incorporated UNITED FOR EXCELLENCE STILLWATER, MN
DATE: 3/01		DATE:		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		CUTTER		TITLE: SPRING LOADING SLIDE
FRACTIONAL ±1/32 2 PLC. DEC. ±.010 3 PLC. DEC. ±.005 4 PLC. DEC. ±.0002 ANGULAR ±1°0'00"		PART NO.		
		PART NAME		SCALE: _____ SHEET _____ OF _____
				ORG. NO.: _____ SECTION 0 PG 8



2 SPRINGS REQUIRED PER SLIDE.

DRAWN	UFE	DATE	8/99	DATE		ufe UFE Incorporated WEIRDO AND ENGINEERS STILLWATER, MN
DATE	8/99	DATE		DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:				CUSTOMER		TITLE
FRACTIONAL	1/32			PART NO.		SPRING LOADING SLIDES
2 PLC. DEC.	0.010			PART NAME		SCALE
3 PLC. DEC.	0.005					DRWG. NO.
4 PLC. DEC.	0.0002					SHEET
ANGULAR	1° 0' 00"					OF
						SECTION D PG 8

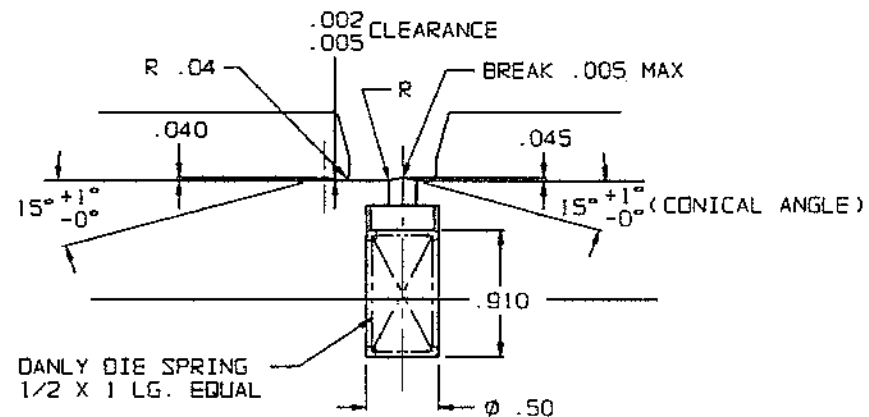
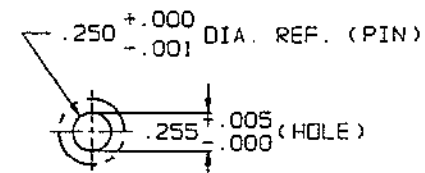
FOR SLIDES THAT WEIGH 5 TO 20 LBS.



DANLY NO.	PRELOAD	DEF. 1/10 IN.
9-1004-11	19.3 LB	10 LB
9-1004-21	35.7 LB	18.5 LB
9-1004-26	96.5 LB	50 LB

NOTE:
PINS ARE TO BE 2 PTS. ROCKWELL UNDER
SLIDE HARDNESS.

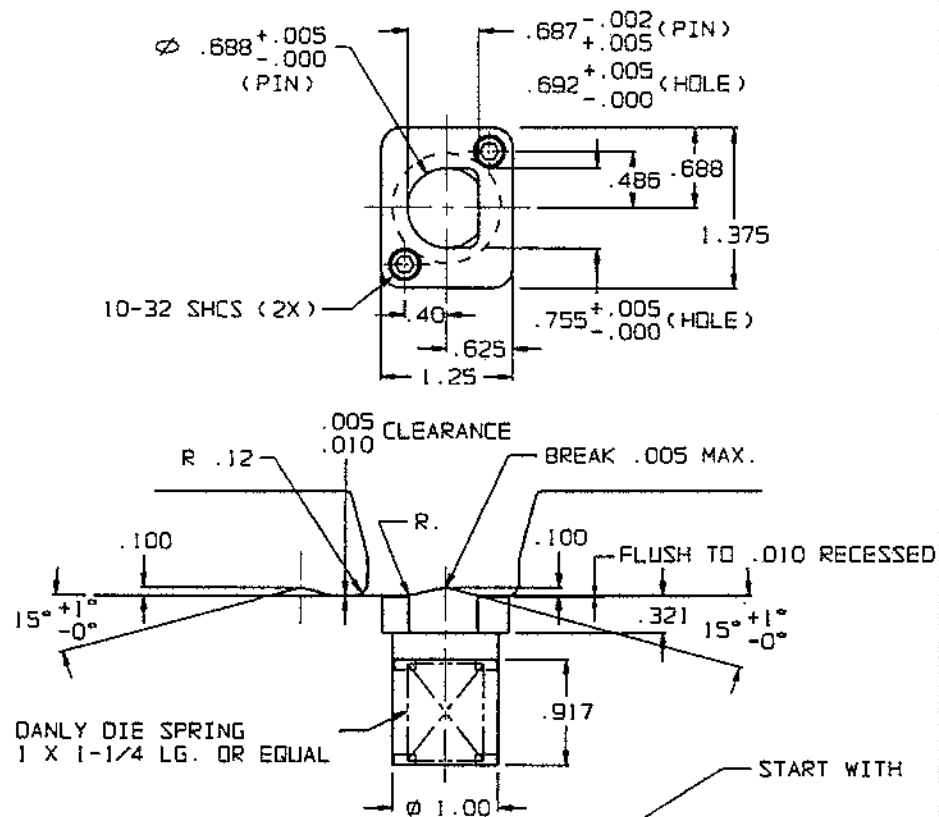
FOR SLIDES THAT WEIGH 5 LBS. OR LESS



DANLY NO.	PRELOAD	DEF. 1/10 IN.
9-0804-11	4.94 LB	5.2 LB
9-0804-21	12.35 LB	13 LB
9-0804-26	21.38 LB	22.5 LB

DRAWN: LIFE DATE: 6/99 TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL: ±1/32 2 PLC. DEC.: ±.010 3 PLC. DEC.: ±.005 4 PLC. DEC.: ±.0002 ANGULAR: ±1°0'00"	APPR.: DATE: LIFE: JPN CUSTOMER: PART NO.: PART NAME:	ufe LIFE Incorporated STILLWATER, MN TITLE: SLIDE PLUNGER SCALE: OF SHEET: OF ORG. NO.: SECTION D PG 9
--	--	--

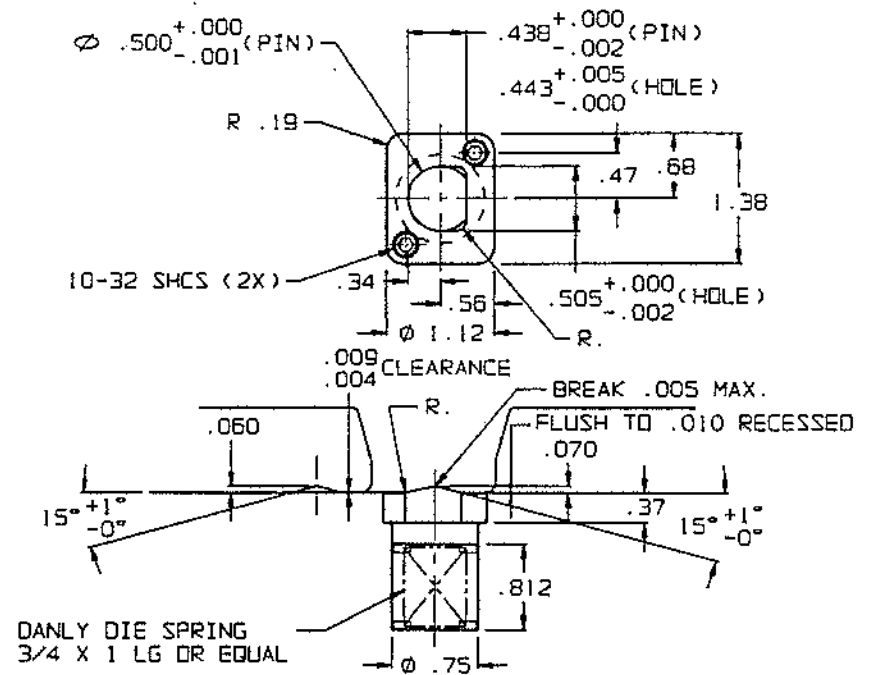
FOR SLIDES THAT WEIGH 40 TO 60 LBS.
2 PER SLIDE



DANLY NO.	PRELOAD	DEF./1/10 IN.
9-1605-11	109.2 LB	42 LB
9-1605-21	182 LB	70 LB
9-1605-26	335 LB	129 LB

NOTE:
PINS ARE TO BE 2 PTS. ROCKWELL
SLIDE HARDNESS.

FOR SLIDES THAT WEIGH 20 TO 40 LBS.
2 PER SLIDE



DANLY NO.	PRELOAD	DEF./1/10 IN.
9-1204-11	57.42 LB	29 LB
9-1204-21	99 LB	50 LB
9-1204-26	255.4 LB	129 LB

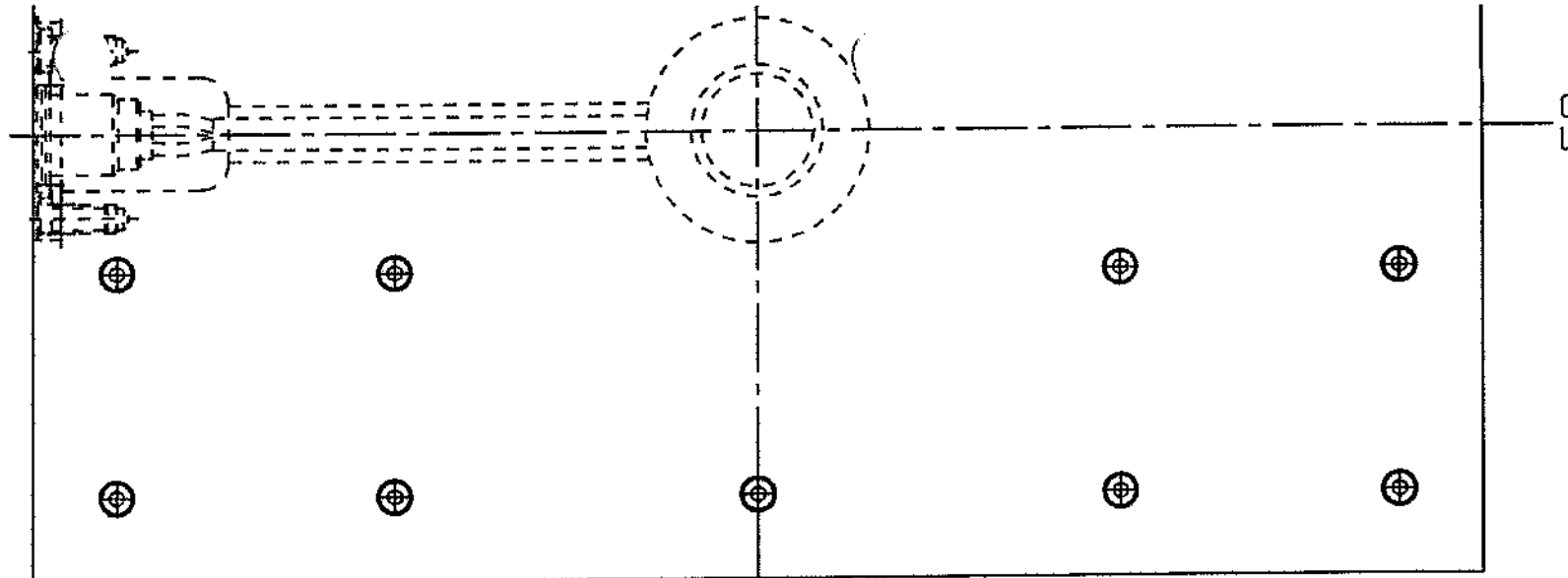
DRAWN DATE 5/99 TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ±1/32 2 PLC. DEC. ±.010 3 PLC. DEC. ±.005 4 PLC. DEC. ±.0002 ANGULAR ±1° 0' 00"	APPR. DATE UFE JPN CUSTOMER PART NO. PART NAME	ufe UFE Incorporated STILLWATER, MN TITLE SLIDE PLUNGER SCALE DWT OF DRWG. NO. SECTION D PG 10
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SECTION E – RUNNERS, GATES, SPRUE BUSHINGS AND LOCATING RINGS, HOT MANIFOLD SYSTEMS AND HOT SPRUES

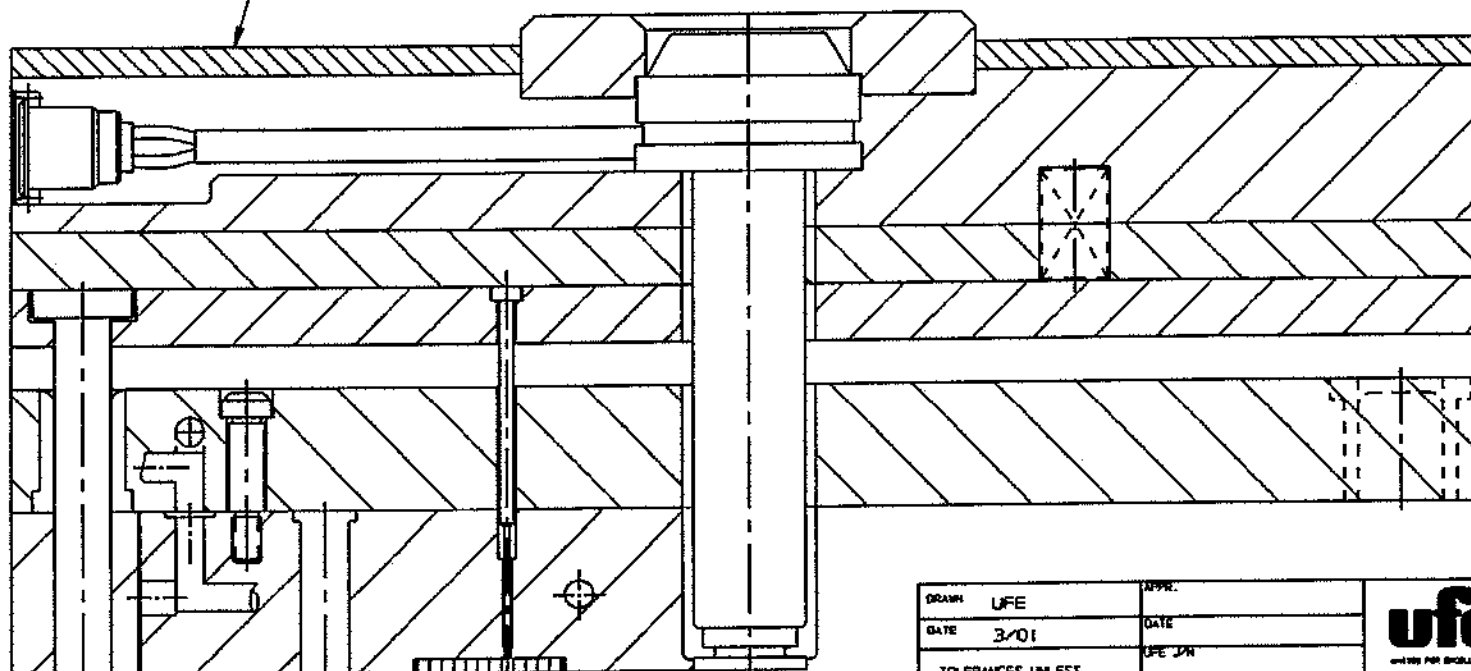
<u>CONTENTS</u>	<u>PAGE</u>
RULES	2
HOT RUNNER SPRUE	3
MOLDFLOW RUNNER DETAIL	4
SEMI-ROUND RUNNER DETAIL	5
PIN GATES AND PULLER PINS	6, 7
TUNNEL OR SUBGATES	8
POST GATES	9
RAMP GATE	10
TAB GATE	11
SPRUE GATE – WITHOUT EJECTOR SLEEVE	12
SPRUE GATE – WITH EJECTOR SLEEVE	13
SPRUE GATE – CUT INTO CAVITY	14
SPRUE BUSHING AND LOCATING RING – INSTALLATION OF	15
STANDARD AIR BLOW OFF	16
SUBGATES IN SLIDES	17
RUNNER SHUT-OFF CORE (SHOWN IN APPLICATION)	18
RUNNER SHUT-OFF CORE (DETAIL)	19
REFERENCE GUIDE FOR GATE SIZES	20

RUNNERS, GATES, SPRUE BUSHINGS & LOCATING RINGS

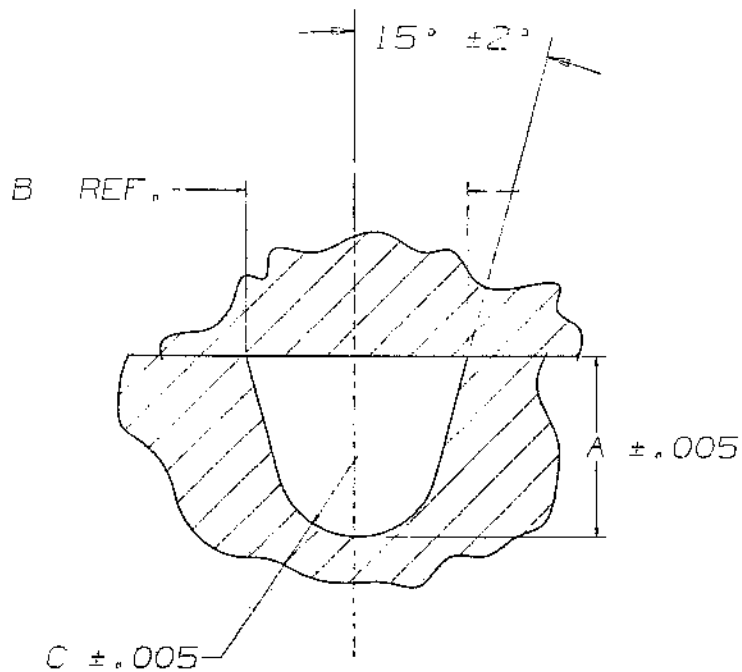
- A. If possible, balance runners and gates especially on large parts.
- B. Extended nozzle clearance hole is 1 7/8" - 0, 1/16" x 3" max. deep from the top face of top clamp plate to the tip of spherical radius.
- C. On conventional gates, provide 1/8" min. diameter ejector pins at the intersection of the runners.
- D. Use extension nozzle sprue bushing on 3-plate tools
- E. Provide radius corners at intersections of sprue and runners.
- F. Design of 3-plate runner systems requires one puller pin per downspout. If downspouts are in a cluster, then one pin can pull.
- G. Runners to have vented cold slug wells and to be 2 times runner diameter or width in length.
- H. On 3-plate molds, to prevent spring pad damage due to drool from sprue bushings, never places spring pad directly under the sprue bushing.
- I. Finishes:
Runner - shall have a SPI NO C-3 or better finish.
Gates - shall have a SPI NO C-1 or better finish.
- J. Never place a cavity directly under the sprue bushing on 2-plate molds due to drool from the sprue bushing.
- K. Runner to be on ejector side of mold, if possible.
- L. On multiple cavity molds, runners and conventional gates should be geometrically and dimensionally alike.
- M. On standard bases, sprue bushings must be held down, see Section E pg. 15
- N. For molds requiring standard sprue air ejection, see Section E, pg.16
- O. Sprue bushings to have 1/2" spherical radius and 1/2" taper per foot. See Form 122 for "O" dimension.
- P. All mold bases for horizontal Van Dorn presses must be equipped with a locating ring to support the weight of the mold base during its installation into and out of the press. The locating ring must be installed in a counter-bored hole in the top clamping plate.
- Q. Sprue bushing may be offset from the center of the mold base, should not exceed a 2" radius from the mold base center. Balance cavity pads of at least 60% of the mold cavity block areas are included.
- R. To stop part and gate hang-up, stripper plates and stripper ring are not to have any runners or gates cut in on their parting line surfaces.
- S. Project Engineering will be responsible for the type of hot manifold system, which will be used to meet the critical aspects of the project.
- T. To stop part and gate hang-up, runners should be designed to fall between tie bars, spring pad, or any other mold obstruction.



VENDOR TO PROVIDE INSULATED BOARD
AND SLOT FOR WIRES AND CONNECTOR



DRAWN LIFE		APPR.		ufe LIFE Incorporated STILLWATER, MN
DATE 3/01		DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		LIFE JPN		TITLE
FRACTIONAL ±1/32		CUSTOMER		HOT RUNNER SPRUE
2 PLC DEC. ±.010		PART NO.		SCALE
3 PLC DEC. ±.005		PART NAME		DRWG. NO.
4 PLC DEC. ±.0002				SHEET 1 OF 1
ANGULAR ±1° 0' 00"				SECTION E PG 3



RADIUS VEE
CROSS SECTION

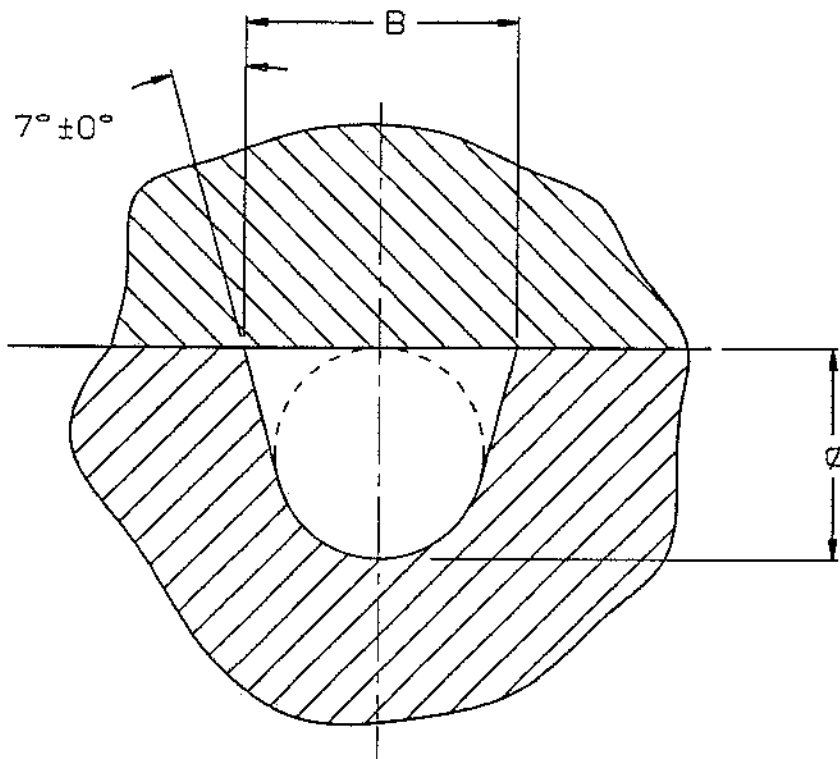
RADIUS VEE RUNNER			
BASIC RUNNER SIZE	A DEPTH	B WIDTH REF.	C RADIUS
1/8	.125	.14	.047
5/32	.156	.18	.062
3/16	.187	.21	.069
1/4	.250	.28	.093
5/16	.312	.35	.119

NOTE:

RUNNER TO HAVE A 32 RMS OR BETTER FINISH

DRAWN J. BOGGS		APPR.		 LIFE Incorporated, STILLWATER, MN
DATE		DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		LIFE JIN		TITLE RADIUS VEE RUNNER DETAIL
FRACTIONAL ± .015		CUSTOMER		
2 DEC. ± .005		PART NO.		SCALE
4 DEC. ± .002		PART NAME		
ANGULAR ± .1° MAX				DRYING NO.
				SEC E PG 3

A	POS	GROUP	REVISION AND REVISION
ISSUE	BY	DATE	REVISION



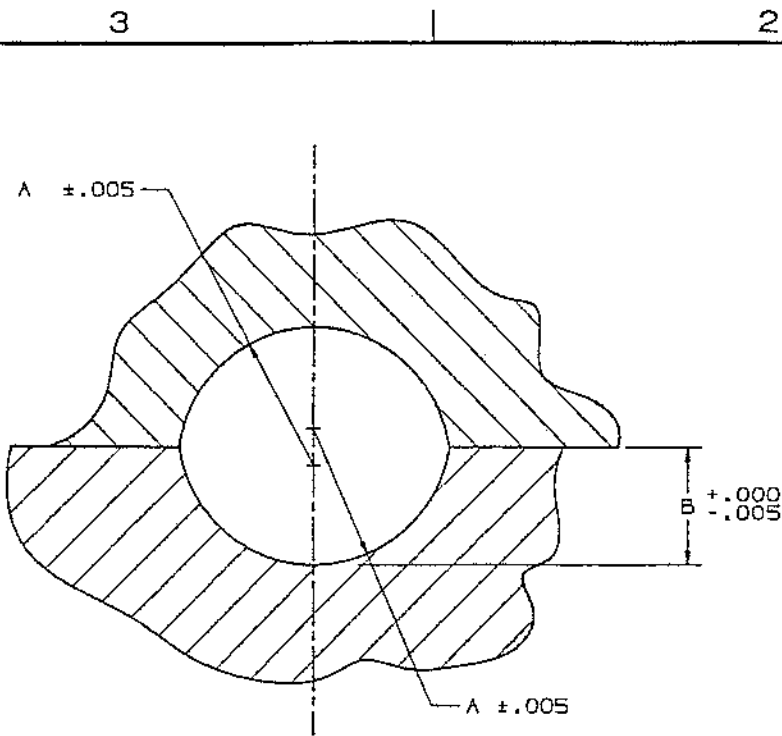
TO FIND "B" MULTIPLY MOLD
FLOW Ø TIMES 1.1303

NOTES:

B WIDTH OF RUNNER

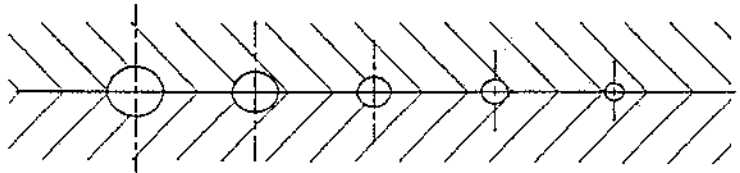
A Ø GIVEN BY MOLDFLOW

DRAWN LIFE		DATE		 ufe LIFE Incorporated STILLWATER, MN
DATE 5/99		DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		LIFE 3/99		TITLE MOLDFLOW RUNNER
FRACTIONAL 1/32 2 PLE. DEC. .010 3 PLE. DEC. .005 4 PLE. DEC. .0002 ANGULAR .11" BY .00"		CUSTOMER		
		PART NO.		SCALE SHEET OF
		PART NAME		
				ORG. NO. SECTION E PG 4



BASIC RUNNER SIZE	A RADIUS	B DEPTH	CROSS SECTION AREA	PROJECTED AREA PER 1" LGTH
1/8	.062	.055	.0104	.1241
5/32	.078	.068	.0160	.1547
3/16	.093	.080	.0223	.1841
1/4	.125	.110	.0416	.2481
5/16	.156	.135	.0634	.3092

SEMI-ROUND RUNNER
CROSS SECTION



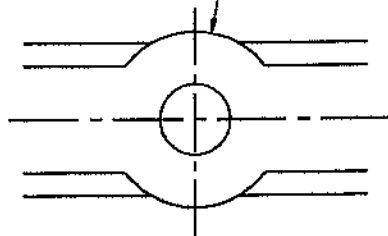
5/16 1/4 3/16 5/32 1/8
ACTUAL RUNNER SIZE

NOTE:
RUNNER TO HAVE A C-1 SPI OR BETTER FINISH

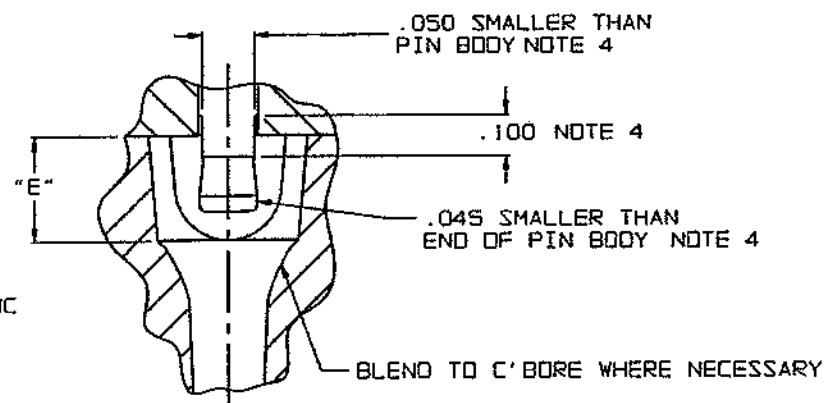
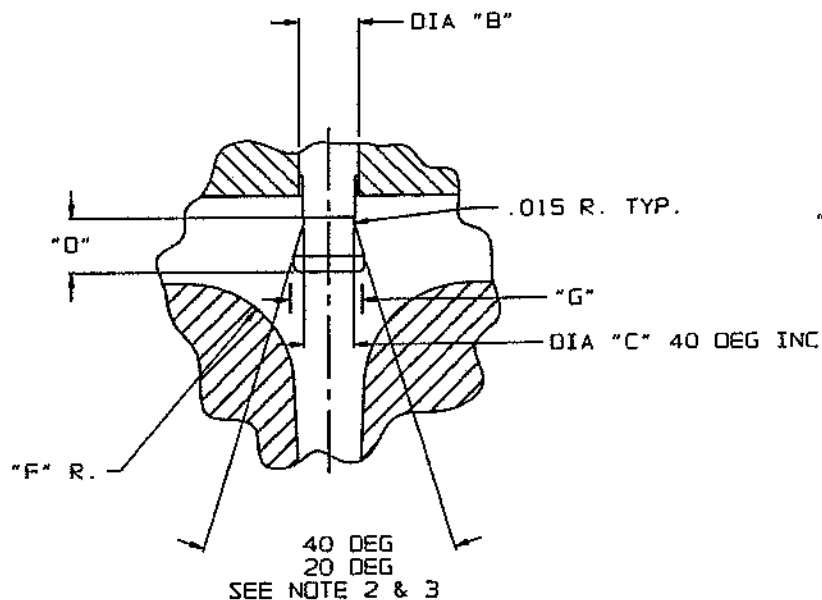
DRAWN UFE		APPR. <i>KCS</i>		 ufe [®] UFE Incorporated STILLWATER, MN
DATE 8/94		DATE 3-2-95		
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ± 1/32 2 PLC.DEC. ± .010 3 PLC.DEC. ± .005 4 PLC.DEC. ± .0002 ANGULAR ± 1° 0'00"		UFE M/N		TITLE
		CUSTOMER		SEMI-ROUND RUNNER DETAIL
		PART NO.		SCALE
		PART NAME		DRWG. NO.
		SHEET OF		SEC E PG 5

LEVEL	DCN	BY	DATE	CHKD	REVISION
-------	-----	----	------	------	----------

DIA "A" C'BORE MINUS 5 DEG DIA



RUNNER SIZE	"A"	"B"	"C"	"D"	"E"	"F"	"G"
1/8	.28	3/16	.080	.090	.185	.23	.125
5/32	.31	3/16	.080	.103	.216	.23	.125
3/16	.34	3/16	.094	.124	.248	.22	.125
7/32	.44	3/16	.110	.144	.278	.25	.150
1/4	.47	3/16	.126	.165	.310	.28	.160
9/32	.56	1/4	.142	.185	.341	.31	.218
5/16	.62	1/4	.158	.206	.372	.34	.230

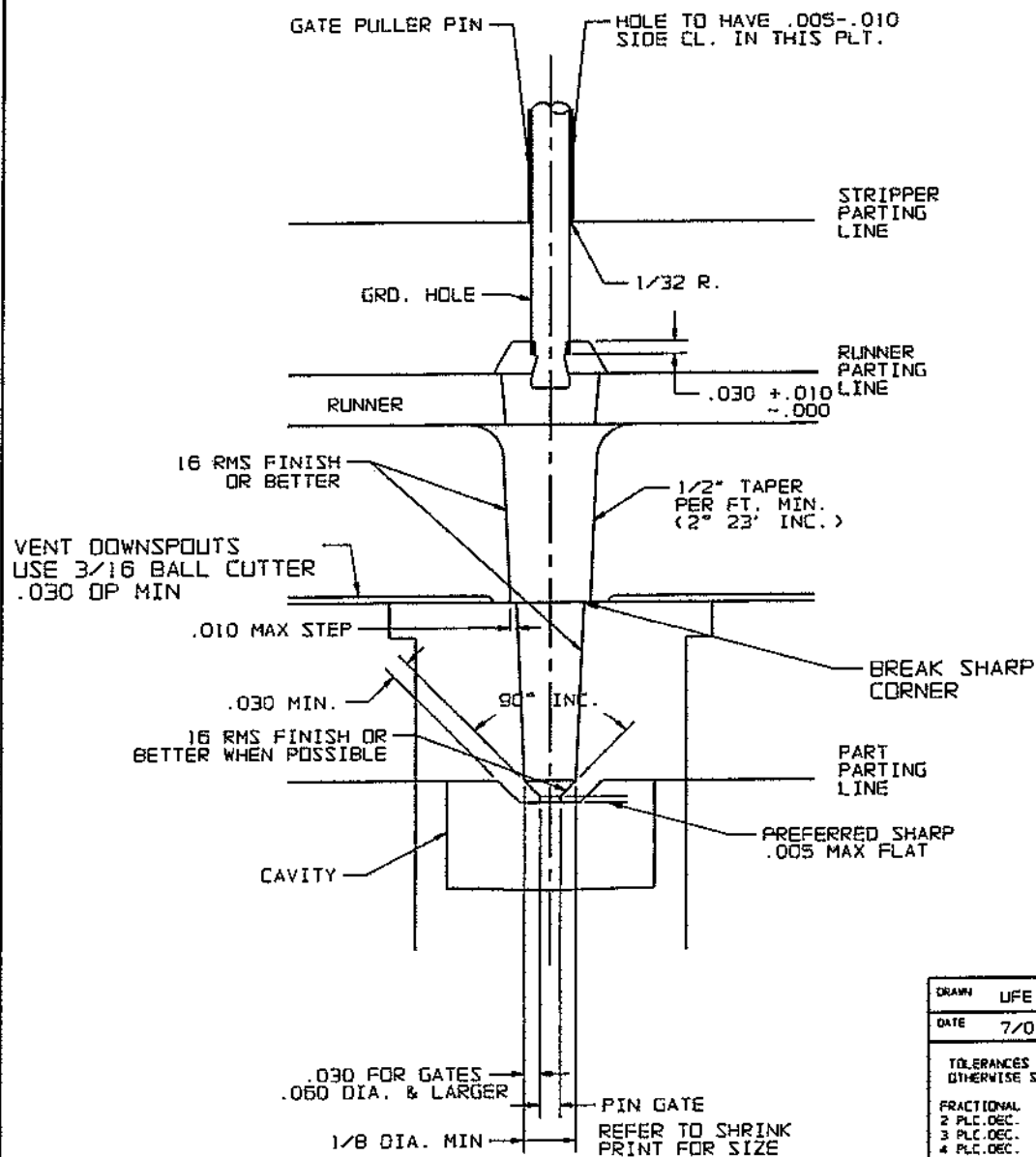


NOTE:

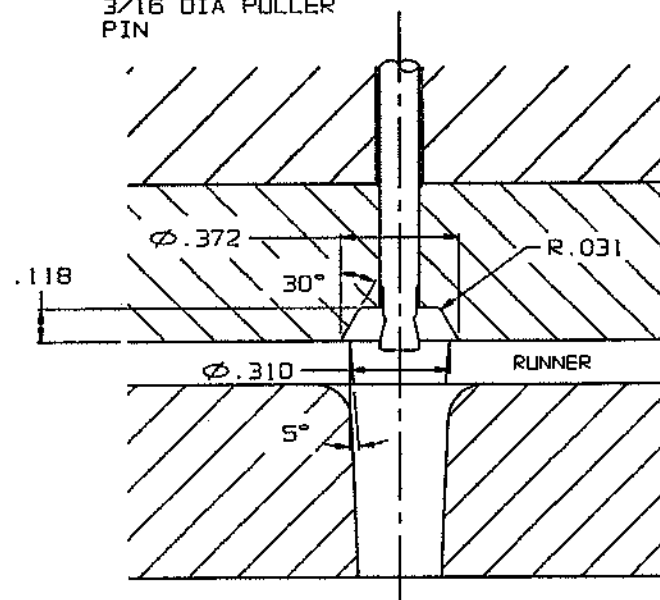
1. SEE PAGE 7 FOR CROSS SECTION THROUGH TYPICAL PIN GATE PART.
2. 20 DEG INC. ON GATE PULLER IS REQUIRED ON TOOLS THAT ARE HOT OIL.
3. 40 DEG INC. ON GATE PULLER IS REQUIRED ON TOOLS THAT RUN WITH WATER.
4. DIM USED FOR THE PICKER PIN ONE PER MOLD REQUIRED

DRAWN LIFE	DATE 3/01	APPROV. 	DATE
TOLERANCES UNLESS OTHERWISE SPECIFIED:		LIFE JAN	CUSTOMER
FRACTIONAL 2 PLC. DEC. 3 PLC. DEC. 4 PLC. DEC. ANGULAR	±1/32 ±.010 ±.005 ±.0002 ±1°0'00"	PART NO.	PART NAME
ufe LIFE Incorporated STILLWATER, MN		TITLE GATE, PICKER PULLER PIN	
SCALE 		DRWG. NO.	SECTION E PG 6

SECTION THROUGH TYPICAL PIN GATED PART

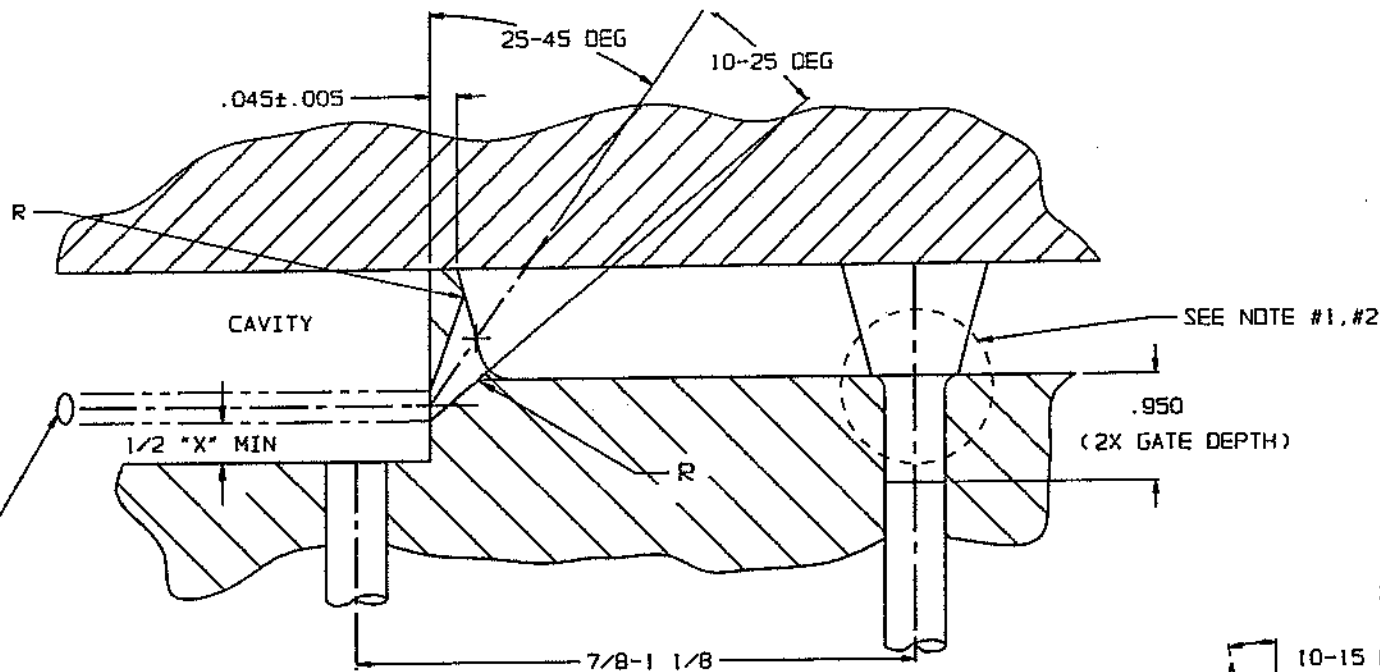


DIM APPLY FOR
3/16 DIA PULLER
PIN



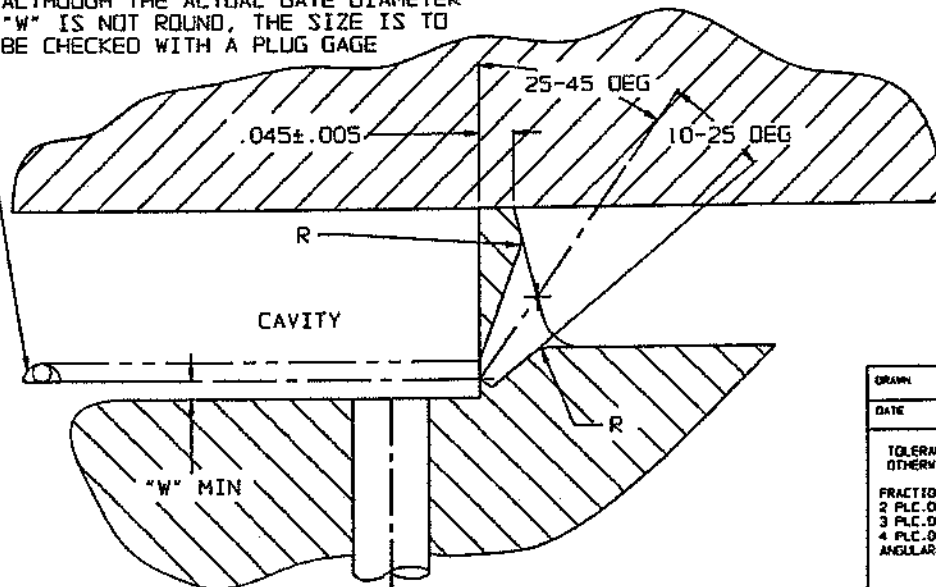
NOTE:
SEE ENGINEERING FOR DIMENSIONS
FOR NON-RESTRICTING PULLER PIN

DRAWN	UFE	APPR.	 UFE Incorporated UNITED FOR EXCELLENCE	
DATE	7/03	DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE PIN	CUSTOMER	TITLE
FRACTIONAL	1/32	PART NO.		GATE PULLER PINS
2 PLC. DEC.	± .010	PART NAME		
3 PLC. DEC.	± .005			SCALE
4 PLC. DEC.	± .0002			DRWG. NO.
ANGULAR	± 1° 0' 00"			SHEET
				OF
				SEC E PG 7



ALTHOUGH THE ACTUAL GATE DIAMETER "X" IS NOT ROUND, THE SIZE IS TO BE CHECKED WITH A PLUG GAGE

ALTHOUGH THE ACTUAL GATE DIAMETER "W" IS NOT ROUND, THE SIZE IS TO BE CHECKED WITH A PLUG GAGE



LIP RELIEF
8-12 DEG

20-50 DEG

10-15 DEG

MAKE GATES
CUTTER USED TO
(SPADE DRILL)

NOTES:

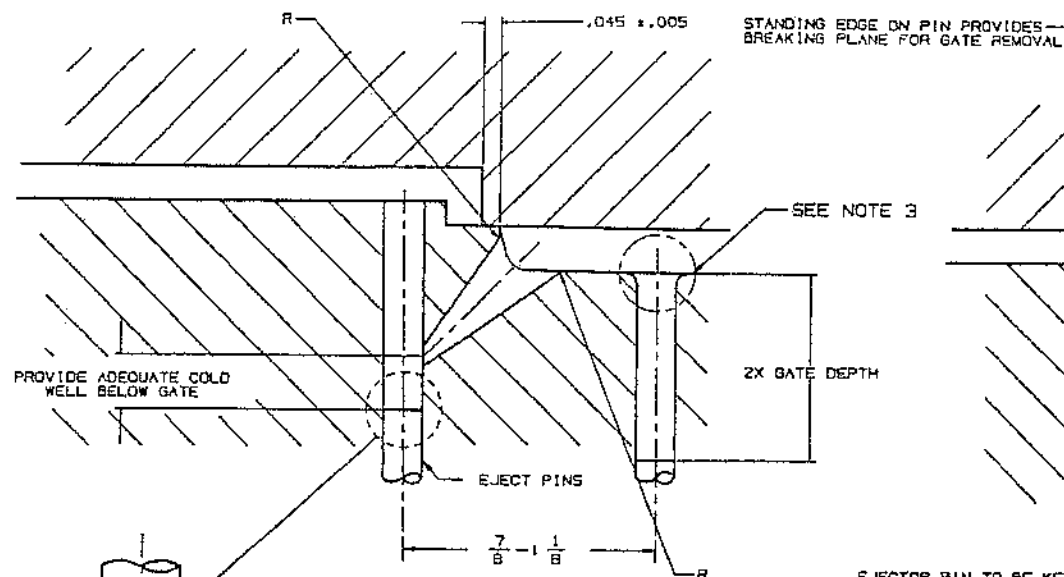
1. R 1/32 ON RUNNER UNDER 1/4
R 1/16 ON RUNNER UNDER 1/4 OR MORE
2. IF SPURE PULLER IS USED SEE
PG 14 FOR DIMS

DRAWN: LIFE		DATE: 3/01		 ufe Incorporated STILLWATER, MN	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		CUSTOMER:		TITLE: TUNNEL OR "O" GATE	
FRACTIONAL: ±1/32		PART NO.:		SCALE: OF	
2 DEC. DEC: ±.010		PART NAME:		DRWG. NO.:	
3 DEC. DEC: ±.005				SECTION E PG 8	
4 DEC. DEC: ±.0002					
ANGULAR: ±1°0'00"					

3

2

1

DETAIL OF TYPICAL
POST GATED PARTDETAIL OF TYPICAL
1/2 POST GATED PART

NOTES

1. R 1/32 ON RUNNER UNDER 1/4
R 1/16 ON RUNNER 1/4 AND ABOVE
2. TO PREVENT POST FROM PULLING BACK
INTO MOLD AS EJECTOR RETRACTS,
A DECELERATED EJECTOR PIN MAYBE
NECESSARY. SEE UFE ENG
FOR REQ. SEE SEC G, PG 19
3. IF SPRUE PULLER IS USED SEE
PG 14 FOR DIMS

SEE NOTE 1

D		JJR	7/92		ADDED NOTE #3
C		JJR	9/91		ADDED NOTE #2
B		PRS	7/98		ADDED NOTE #1
A		PRS	8/95		WAS SEC F PG 7
		PRS	3/98		RELEASE
LEVEL	DCN	BY	DATE	CHKD	REVISION

DRAWN	JJR	APPR.	RGS
DATE	7-84	DATE	2-28-95
TOLERANCES UNLESS OTHERWISE SPECIFIED:			
FRACTIONAL	± 1/32		
2 PLG.DEC.	± .019		
3 PLG.DEC.	± .005		
4 PLG.DEC.	± .0002		
ANGULAR	± 1° 00'		
PART NO.		CUSTOMER	
PART NAME		SCALE NONE	
		SHEET OF	

ufe® UFE Incorporated
STILLWATER, MN
TITLE
POST GATED PART

SCALE NONE

DRWG. NO.

SHEET OF

SEC E PG 9

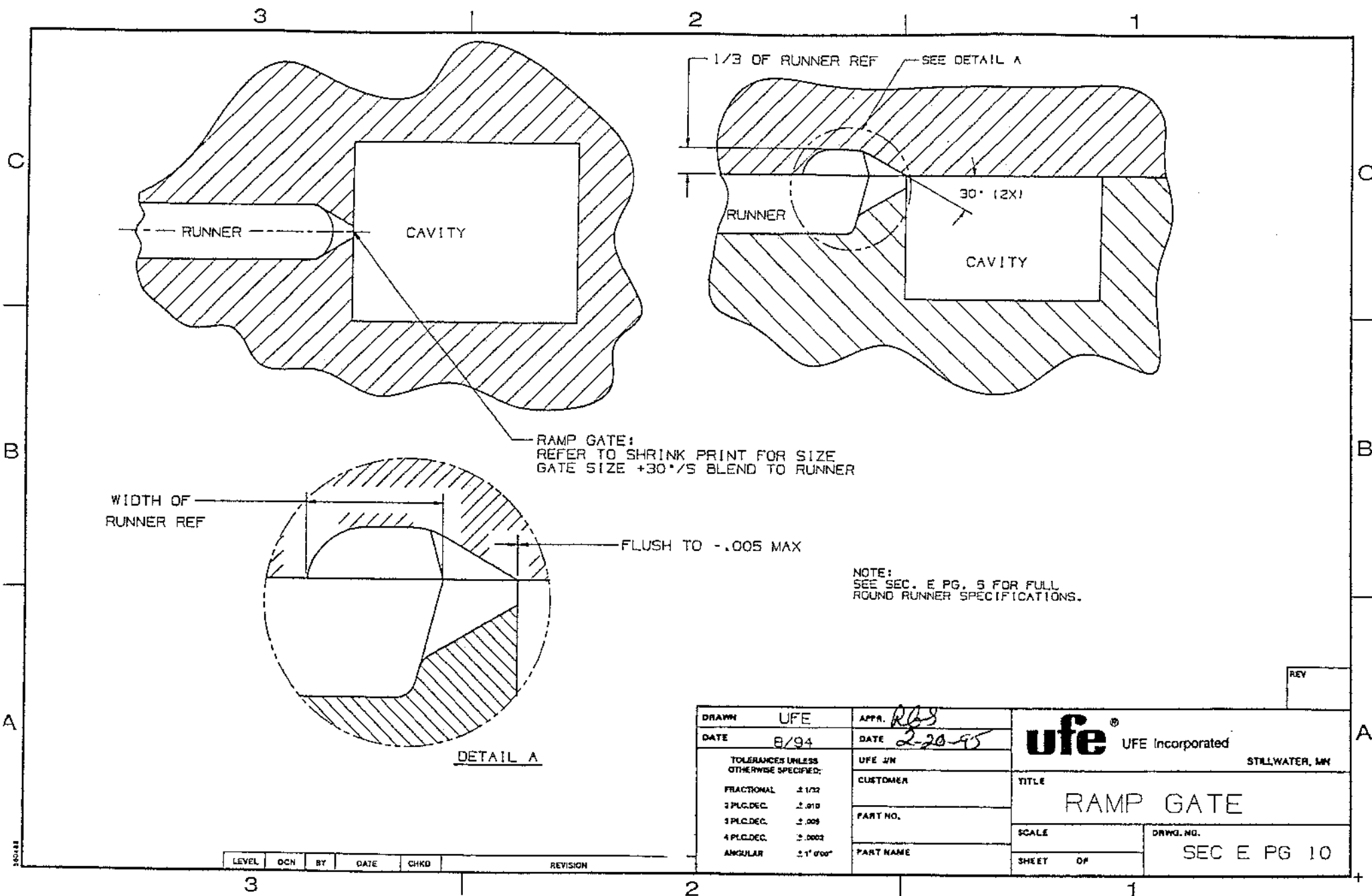
3

2

1

SECTION

A



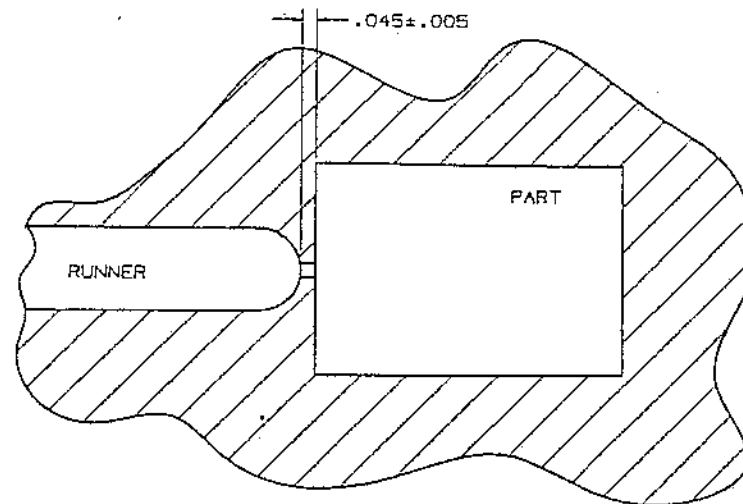
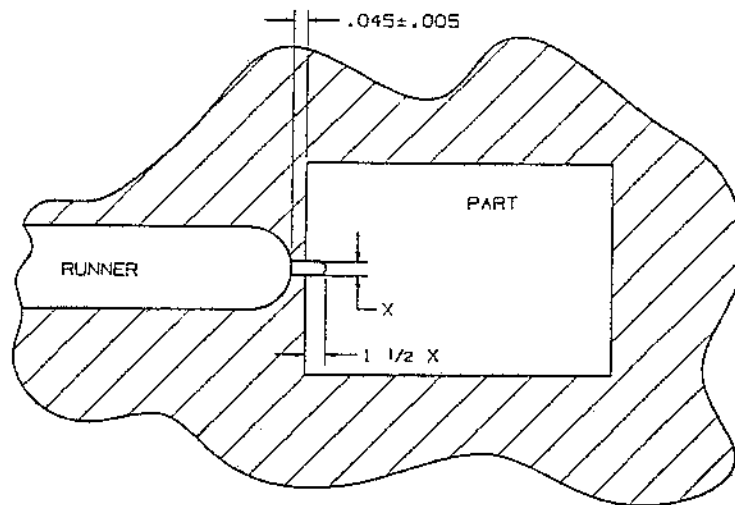
3

2

1

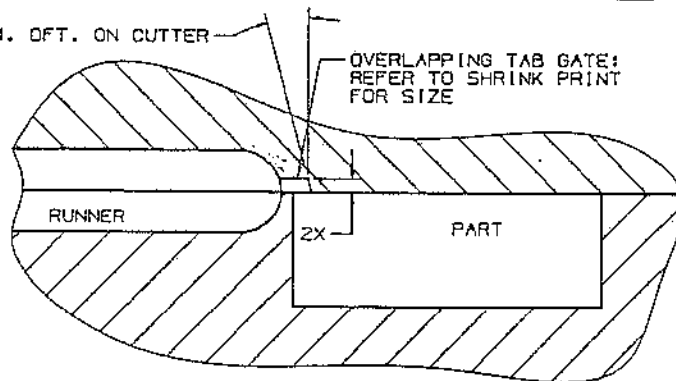
TYPICAL OVERLAPPING TAB GATED PART

TYPICAL TAB GATED PART

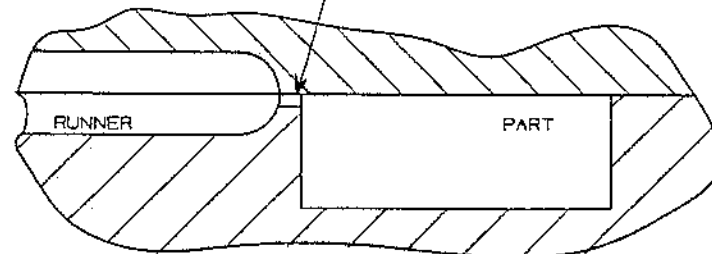


5°/SIDE MIN. OFT. ON CUTTER

OVERLAPPING TAB GATE: REFER TO SHRINK PRINT FOR SIZE



TAB GATE: REFER TO SHRINK PRINT FOR SIZE



REV

NOTE:
SEE SEC. E PG. 5 FOR FULL ROUND
RUNNER SPECIFICATIONS.

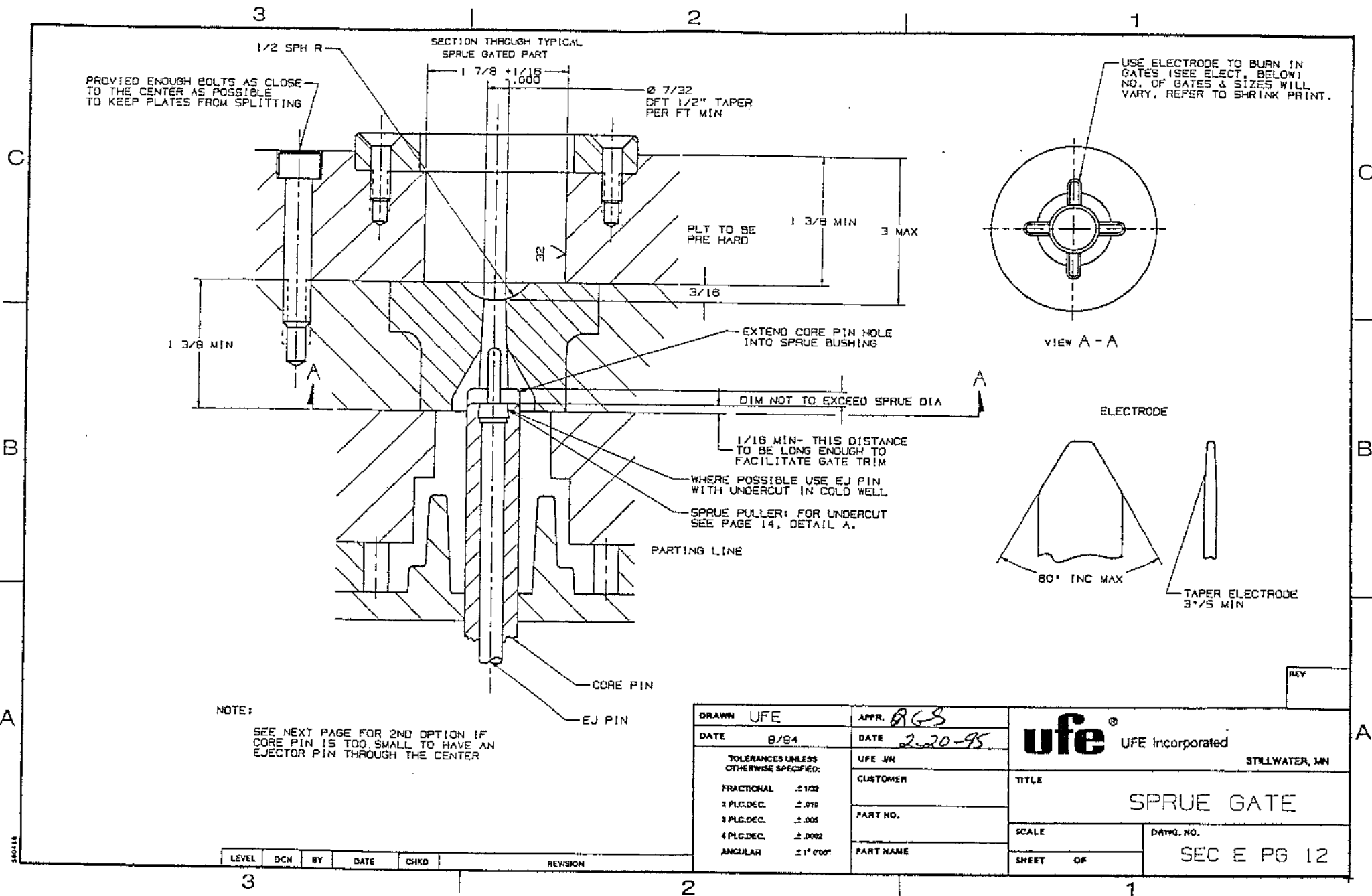
DRAWN UFE		APPR. <i>RGB</i>		ufe ® UFE Incorporated STILLWATER, MN	
DATE 8/94		DATE 2-20-95			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JWH		TITLE	
FRACTIONAL $\pm 1/32$		CUSTOMER		TAB GATE	
2 PLC.DEC. $\pm .010$		PART NO.		SCALE	
3 PLC.DEC. $\pm .005$		PART NAME		DRAWG. NO.	
4 PLC.DEC. $\pm .0002$				SEC E PG 11	
ANGULAR $\pm 1' 00''$				SHEET OF	

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3

2

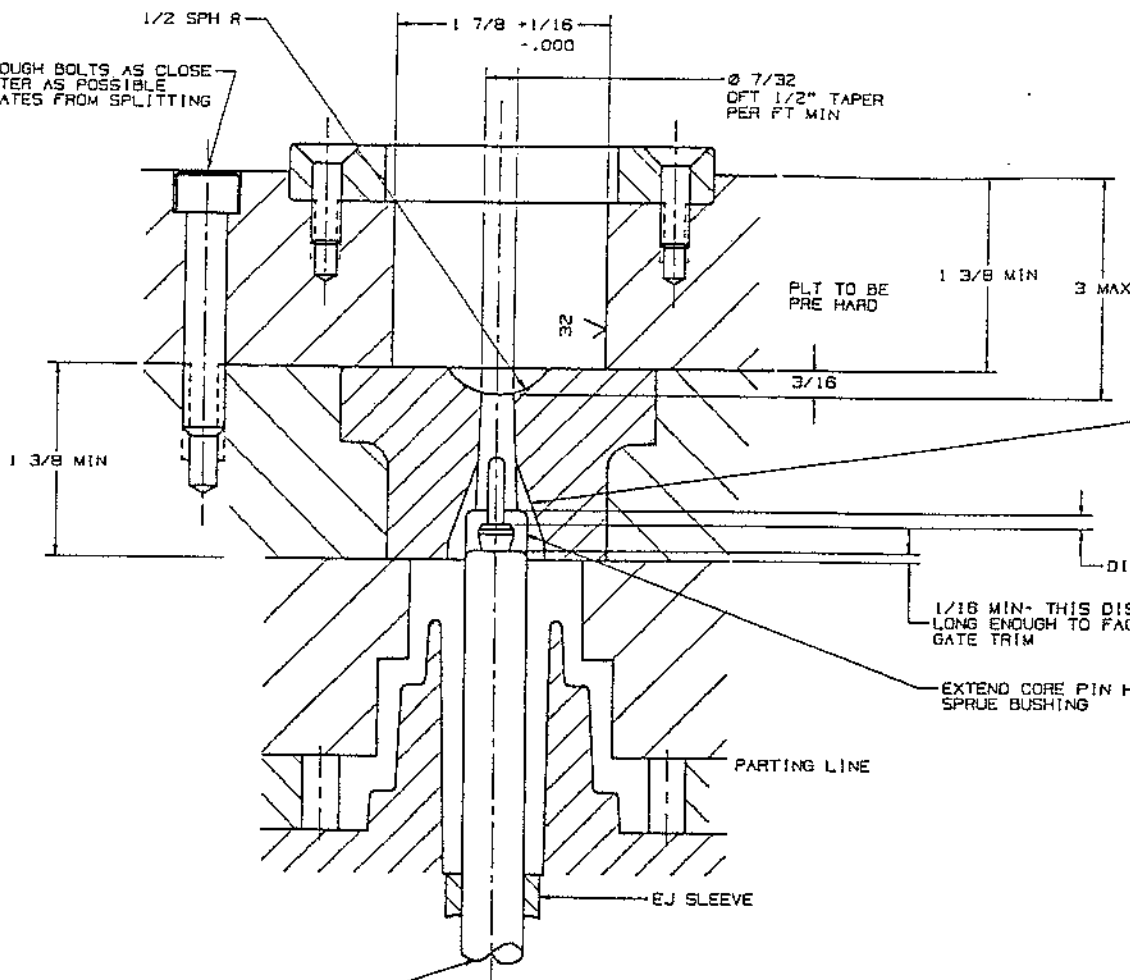
1



LEVEL	DCN	BY	DATE	CHKD	REVISION
3					

DRAWN UFE	APPR. <i>AGS</i>	ufe UFE Incorporated STILLWATER, MN
DATE 8/94	DATE 2-20-95	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		TITLE SPRUE GATE
FRACTIONAL ± 1/32	UFE JN	SCALE
1 PLG.DEC. ± .010	CUSTOMER	DWG. NO.
2 PLG.DEC. ± .005	PART NO.	SHEET OF
4 PLG.DEC. ± .0002	PART NAME	SEC E PG 12
ANGULAR ± 1° 0'00"		

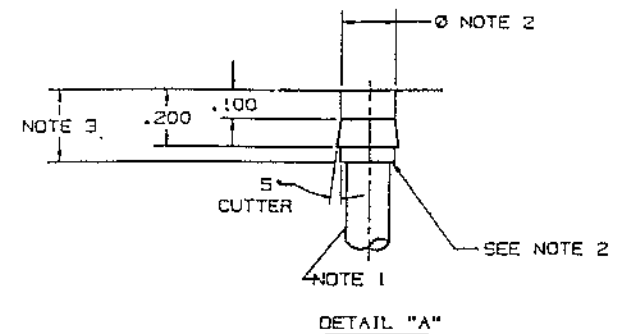
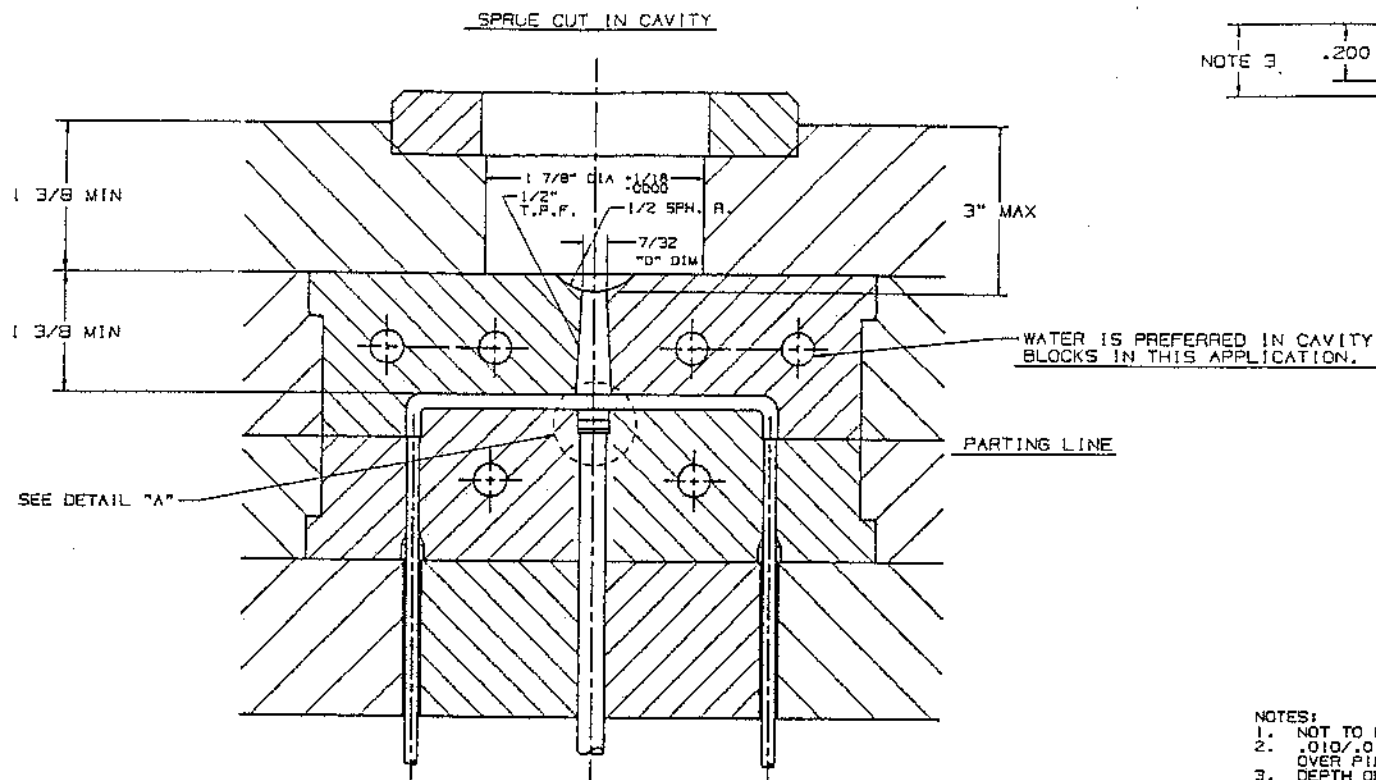
PROVIDE ENOUGH BOLTS AS CLOSE TO THE CENTER AS POSSIBLE TO KEEP PLATES FROM SPLITTING



CORE AND GATE PULLER PIN
GATE PULLER PORTION OF PIN TO
BE MADE APPROX TO THE SHAPE
SHOWN

DRAWN UFE DATE 8/94	APPR. <i>Rib</i> DATE 2-20-95	ufe UFE Incorporated STILLWATER, MN
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL $\pm \frac{1}{32}$ 2 PLC.DEC. $\pm .016$ 3 PLC.DEC. $\pm .005$ 4 PLC.DEC. $\pm .0002$ ANGULAR $\pm 1' 00''$	UFE JVN CUSTOMER PART NO. PART NAME	TITLE SPRUE GATE 2ND OPTION SCALE DRWG. NO. SEC E PG 13

LEVEL	DCN	BY	DATE	CHKD	REVISION
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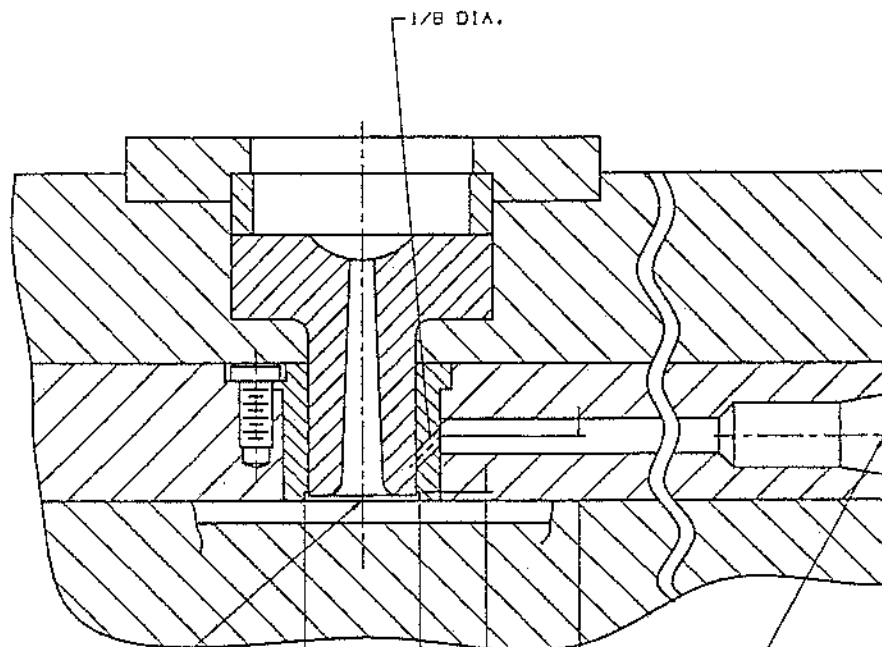


- NOTES:
1. NOT TO EXCEED "Ø" DIM.
 2. .010/.015 PER SIDE OVER PIN DIA.
 3. DEPTH OF .250 WHEN USED FOR SPRUE PULLER WHEN USED WITH POST OR TUNNEL GATE DEPTH IS DETERMINED BY 2X GATE DEPTH

REV 8

B		JR	8/92		REVISED DETAIL "A"
A		PHS	8/95		WAS SEC F PG 12
LEVEL	DCN	BY	DATE	CHKD	REVISION

DRAWN UFE DATE 8/94	APPR. <i>Rab</i> DATE 2-20-95	ufe UFE Incorporated STRLWATER, MN	
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ±.1/32 2 PLC.DEC. ±.010 3 PLC.DEC. ±.001 4 PLC.DEC. ±.0002 ANGULAR ±1° 0'00"		UFE J/N CUSTOMER PART NO. PART NAME	TITLE SPRUE CUT IN CAVITY SCALE SHEET OF
		DRWG. NO. SEC E PG 14	



1/8 DIA.

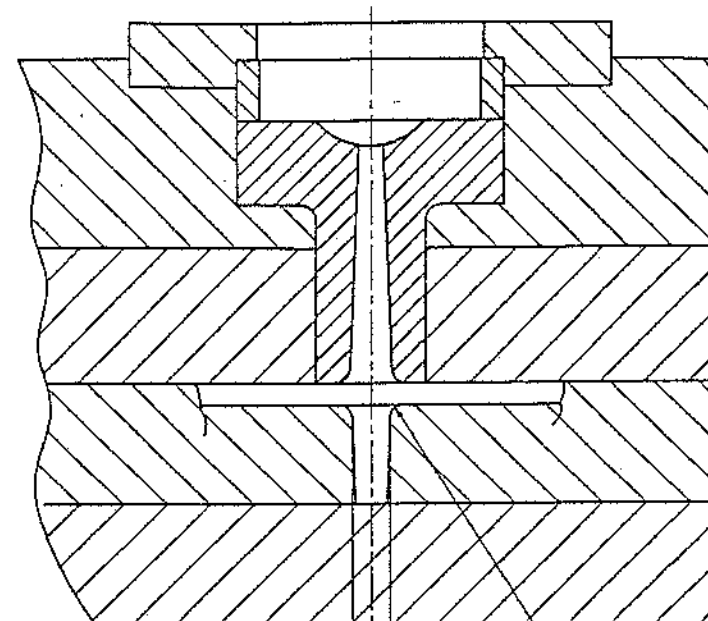
1.050
Ø

.060

SEE NOTE 1

OR 5/32 Ø CBORE Ø 11/32 1.5 DP
TAP 1/8-18 NPT PREFERABLY OUT
BACK FRONT ACCEPTABLE-EXCEPT IN
CLAMP SLOTS (TOP OR BOTTOM)

PROVIDE 1/32 - 3/64 THICK



R .09 MIN

WIDTH OF RUNNER
-1.19" PER SIDE MIN

R 1/8
.002 P/S CLEAR
.001

STRIPPER PLATE TRAVEL

CL .0005

- NOTES:
1. DETERMINED BY STRIPPER PLATE TRAVEL. (SEE ENLARGED VIEW.)
2. BUSHING OPTIONAL PER FORM 122.

REV

D

DRAWN	UFE	APPR.	<i>RB</i>	ufe ® UFE Incorporated STILLWATER, MN
DATE	3/95	DATE	<i>3-8-95</i>	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE J/N		
FRACTIONAL ± 1/32		CUSTOMER		
2 PLC.DEC. ± .010		PART NO.		TITLE
3 PLC.DEC. ± .005		PART NAME		STD AIR EJECTION PICKER SPRUE PULLER
4 PLC.DEC. ± .0002				SCALE
ANGULAR ± 1° 5'00"				DWG. NO.
				SHEET OF
				SEC E PG 16

LEVEL	DCN	BY	DATE	CHKD	REVISION
1					
2					
3					

3

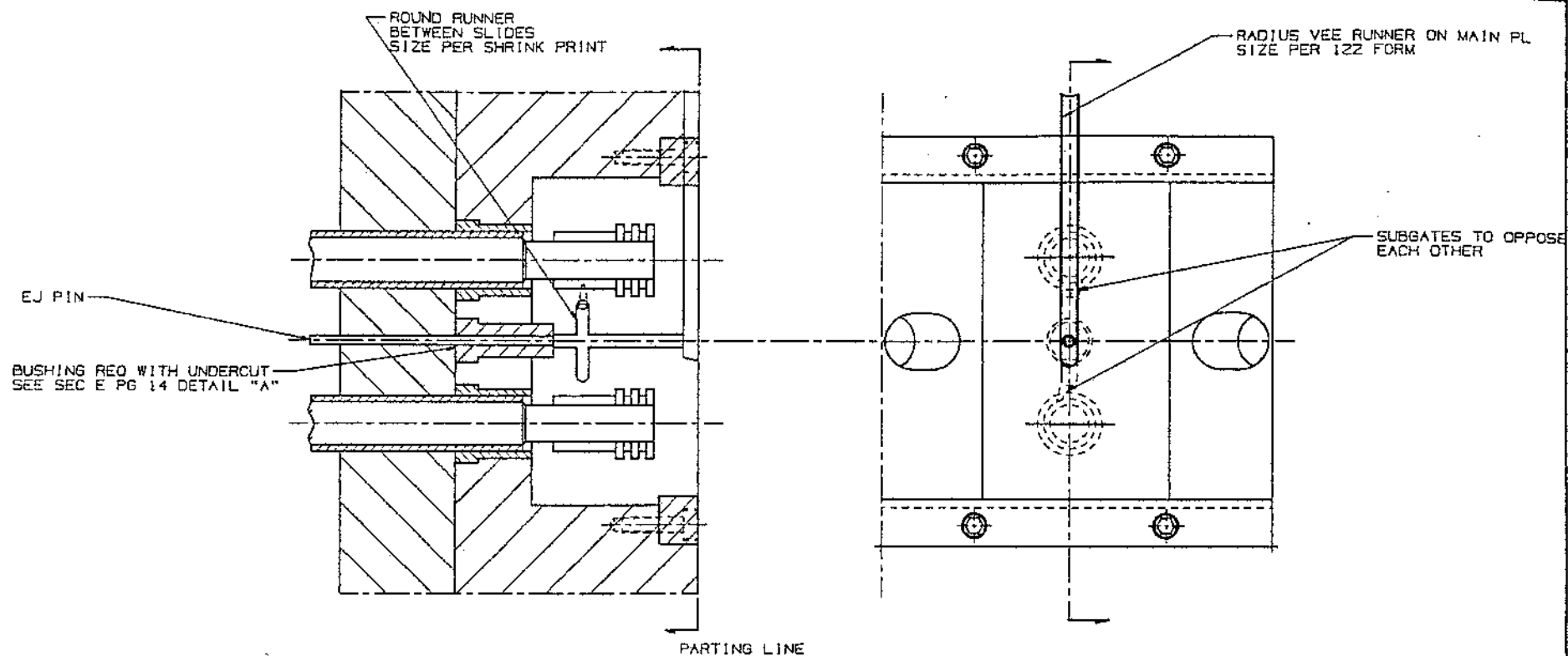
2

1

3

2

1



REV

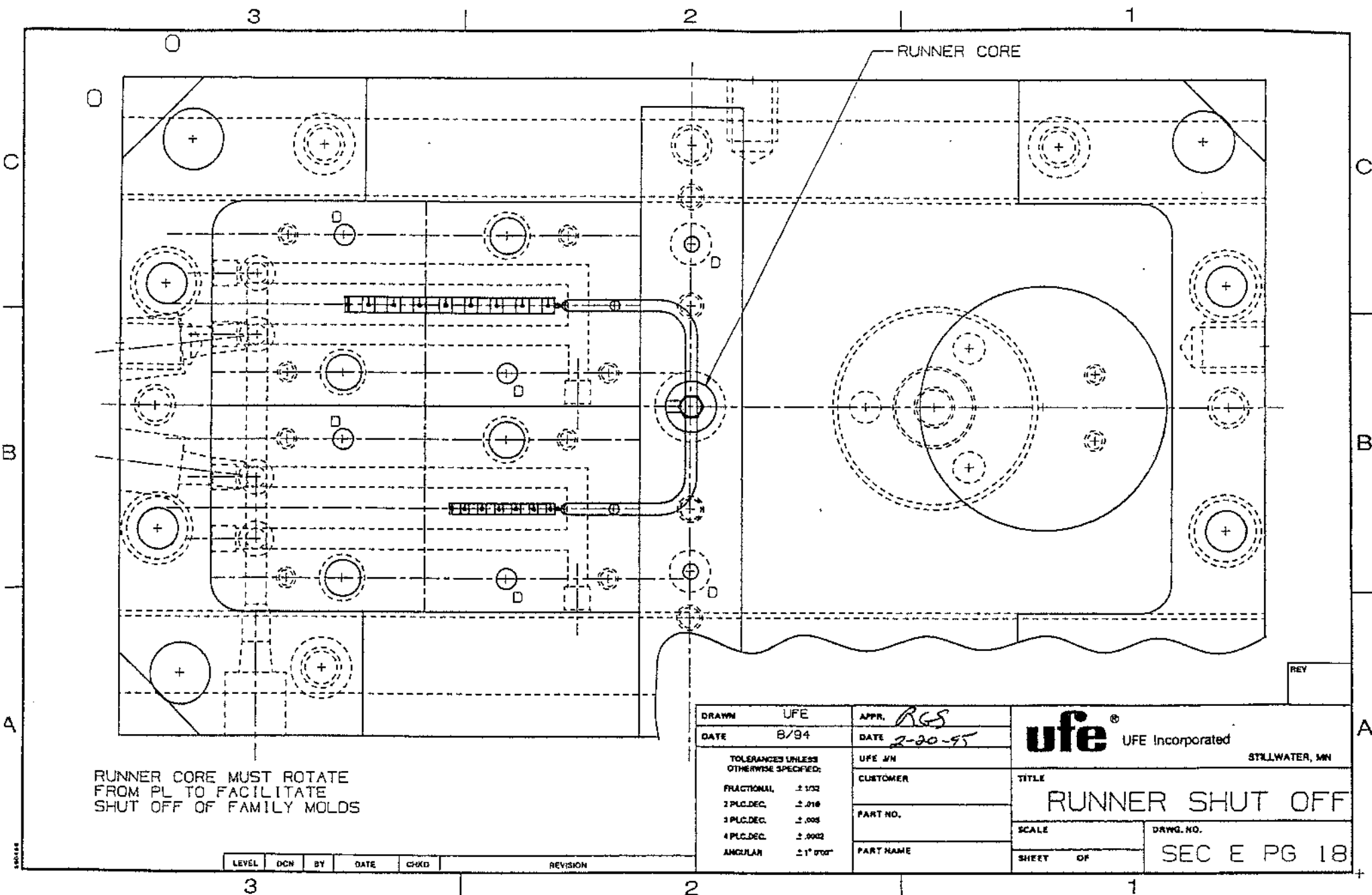
DRAWN	UFE	APPR.	RG8	ufe ® UFE Incorporated STILLWATER, MN
DATE	8/94	DATE	3-8-95	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE J/N		
FRACTIONAL	± 1/32	CUSTOMER		
2 PLC.DEC.	± .010	PART NO.		
3 PLC.DEC.	± .005	PART NAME		
4 PLC.DEC.	± .0002			
ANGULAR	± 1° 00'			
TITLE			SUBGATES IN SLIDES	
SCALE			DRWG. NO.	
SHEET OF			SEC E PG 17	

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3

2

1



RUNNER SIZE GIVEN BY
122 FORM OR MOLDFLOW

SIZE IS DETERMINED BY RUNNER
SPRUE PULLER PIN SIZE

CBORE FOR ORING, SIZE
DETERMINED BY SPRUE
PULLER PIN OR EJ
PIN AS REQ

BEYOND DEPTH OF RUNNER .050

DRAWN UFE		APPR. <i>RLB</i>	ufe ® UFE Incorporated STRLWATER, MN
DATE 8/94		DATE 3-8-95	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE J/N	TITLE RUNNER SHUT OFF CORE
FRACTIONAL ± 1/32		CUSTOMER	
2 PLC.DEC. ± .010		PART NO.	SCALE
3 PLC.DEC. ± .005		PART NAME	DRWG. NO.
4 PLC.DEC. ± .0002			SHEET OF
ANGULAR ± 1° 0'00"			SEC E PG 19

LEVEL	DCN	BY	DATE	CHKD	REVISION
3					
2					
1					

Reference Guide For Gate Sizes

AVERAGE GATE SIZE AS A PERCENT OF WALL SECTION	TAB GATE	TAB GATE	TAB GATE	TAB GATE
	Thickness 45-50% Width 1.5-2x Gate Thickness Round Gate 45-50%	Thickness 60-80% Width 1.5-3x Gate Thickness Round Gate 60-80%	Thickness 80-100% Width 1.5-4x Gate Thickness Round Gate 80-100%	Thickness 80-125% Width 2-3x Gate Thickness Round Gate 80-125%
TYPE OF MATERIAL				
NYLON POLYETHYLENE POLYPROPYLENE POLYURETHANE RYNITE XYDAR	NORMAL			
ABS ACETAL, POLYESTER POLYCARBONATE, NORYL, POLYSTYRENE SAN, ULTEM GLASS FILLED NYLON POLYPROPYLENE		NORMAL		
ACRYLIC GLASS FILLER ABS ACETAL POLYESTER POLYCARBONATE NORYL			NORMAL	
GLASS FILLED POLYSULFONE ULTEM				NORMAL

DRAWN	UFE	APPR.	<i>RCS</i>
DATE	8/94	DATE	<i>2-20-95</i>
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE, INC.	
FRACTIONAL	± 1/32	CUSTOMER	
1 PLG. DEC.	± .010	PART NO.	
2 PLG. DEC.	± .005	PART NAME	
3 PLG. DEC.	± .0002		
ANGULAR	± 1° 0'00"		

ufe® UFE Incorporated
STILLWATER, MN

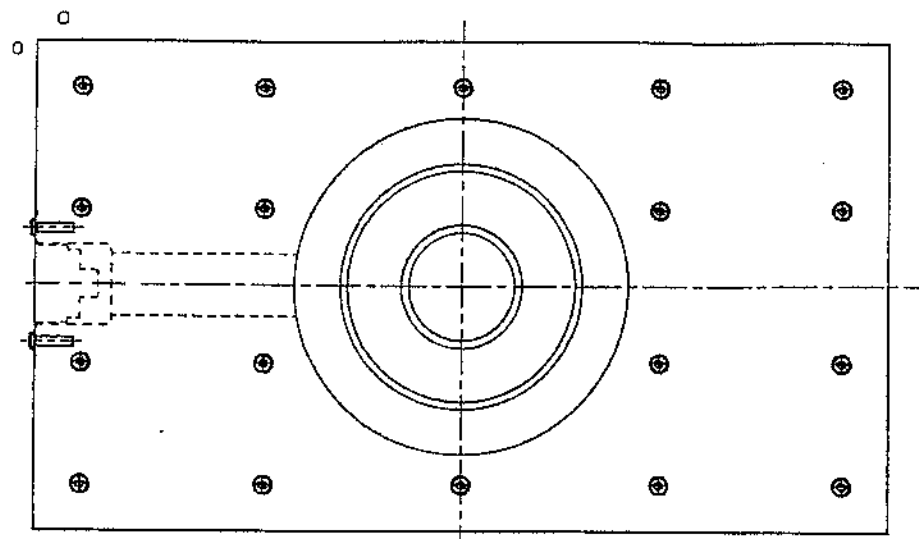
REF GUIDE FOR GATE SIZES

SCALE _____ SHEET _____ OF _____

DRWG. NO. SEC E PG 20

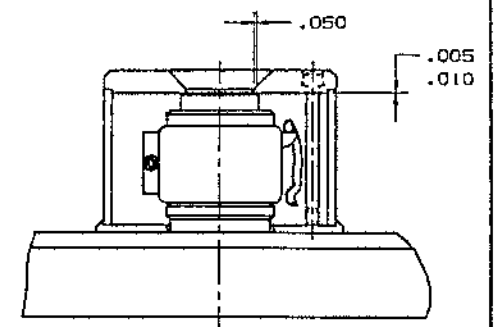
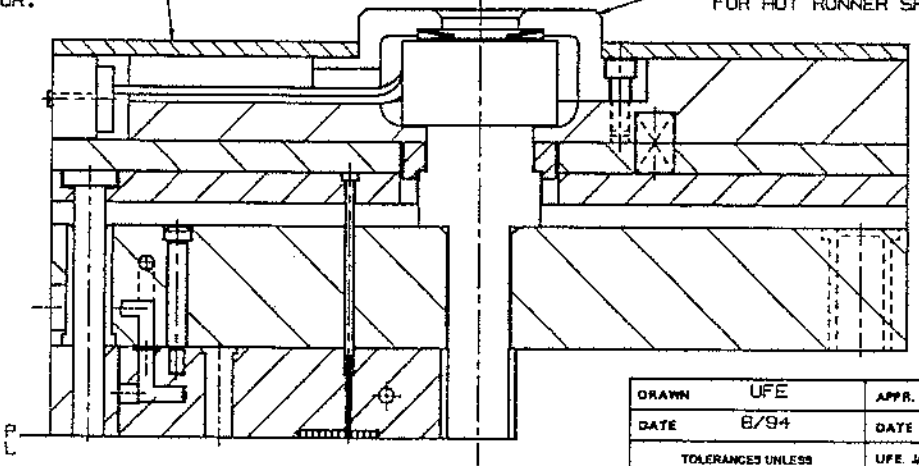
LEVEL	DCN	BY	DATE	CHKD	REVISION
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3 2 1



VENDOR TO PROVIDE INSULATED BOARD AND SLOT FOR WIRES AND CONNECTOR UFE TO PROVIDE CONNECTOR.

VENDOR TO PROVIDE COVER FOR HOT RUNNER SPRUES



REV

DRAWN	UFE	APP.	RGS
DATE	8/94	DATE	2-20-95
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE J/N	
FRACTIONAL	± 1/32	CUSTOMER	
2 PLC DEC.	± .010	PART NO.	
3 PLC DEC.	± .005	PART NAME	
4 PLC DEC.	± .002		
ANGULAR	± 1° 0'00"		

ufe ® UFE Incorporated		STILLWATER, MN	
TITLE			
HOT RUNNER SPRUE			
SCALE		DRWG. NO.	
SHEET OF		SEC E PG 21	

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3 2 1

REVISE

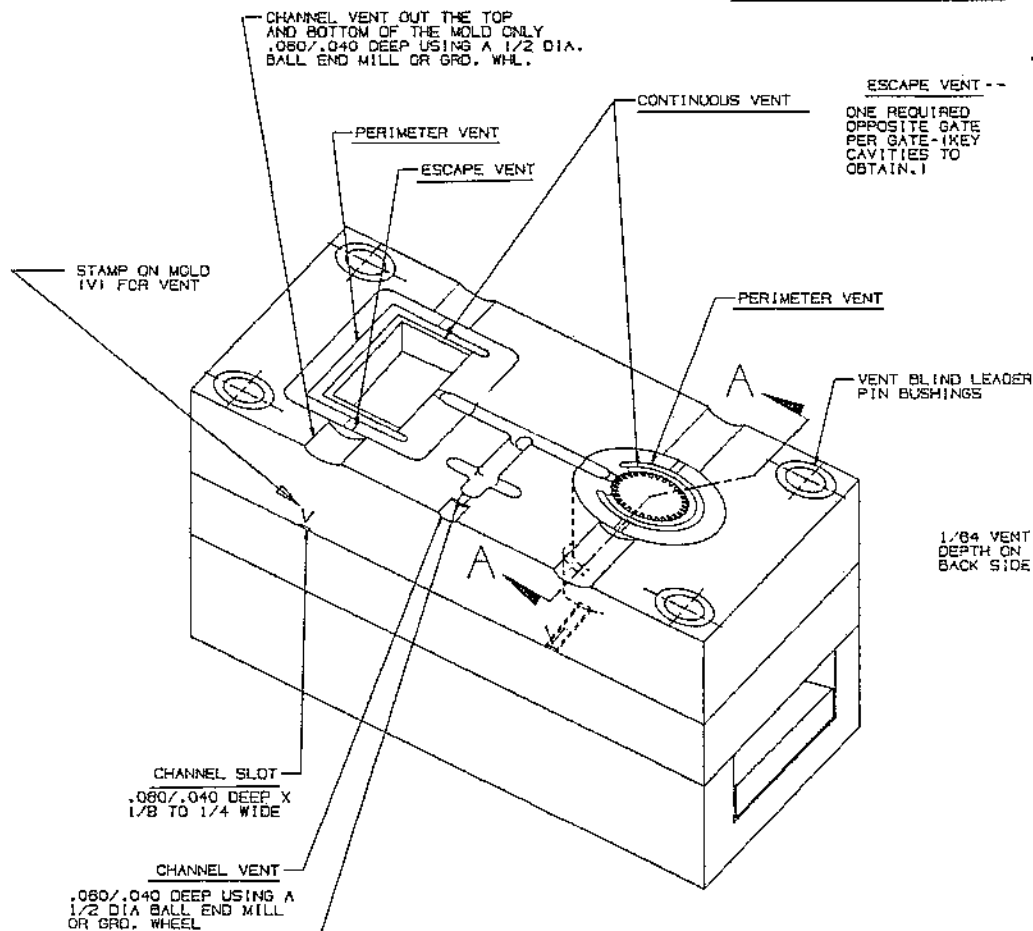
SECTION F – VENTING

<u>CONTENTS</u>	<u>PAGE</u>
RULES	2
VENT VARIATIONS	3
VENT DETAILS	4
VENT GEAR CAVITIES	5
VENT GEAR CAVITY DETAILS	6
VENTING SLEEVES	7

VENTING

- A. In order to fill the mold cavity quickly and completely, an efficient means must be provided for releasing air and other gases. If any of the below vents are omitted (see venting terminology), The vendor will be responsible for proper venting and the mold will be returned to the vendor for corrective measures.
- B. On the following pages, we will give the actual physical dimensions of the vents. As you will note, the vent will get progressively larger as you get farther from the cavity.
- C. Any vent on the parting line surface is to be a radius type vent, to make for ease of cleaning.
- D. Venting Terminology:
1. Wisker Vents - are not to be used.
 2. Periphery or Continuous Vent - is a shallow extension of the cavity area .0005/.002 deep depending on molding resin used.
 3. Perimeter Vent -- is the vent just outside the cavity periphery connecting the periphery with the escape vent or continuous vent.
 4. Escape Vent -- directs escaping air from the perimeter vent away from the cavity or core to the channel slot or vent which is in the mold base itself.
 5. Channel Vent -- used on parting line surfaces. It is a radius originating at the escape vent and continuing across parting line surface to the edge of the mold base.
 6. Channel Slot -- **not** used on parting line surface. It is a slot originating at the escape vent and continuing across any plate surface, which is not a parting line surface to the edge of the mold base.
 7. Runner Bleeder Vent -- is used to release air from the main runner passages. The preferable location is the runner cold slug area.
 8. All channel vents and channel slots to be out top, bottom and back of mold. Not out front.

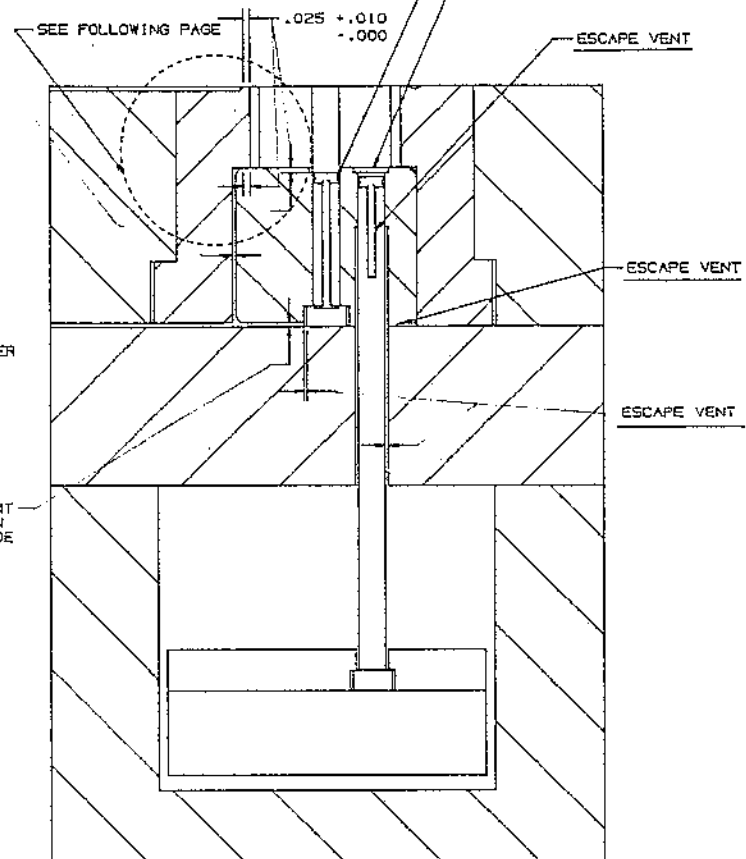
VENTING VARIATIONS



PERIMETER VENT
USE ON ALL SLEEVES, ROUND CAVITY INSERTS, CORE PINS, & EJ PINS WHICH REQUIRE VENTING. ON PINS 1/8 DIA. & UNDER USE FLAT VENT TO .025 DIM.

VENT PROCEDURE ON EJ PIN SHOWN IN AREA THAT WOULD BE HARD TO FILL WITH PLASTIC

ESCAPE VENT --
ONE REQUIRED OPPOSITE GATE PER GATE- (KEY CAVITIES TO OBTAIN.)



VIEW A-A

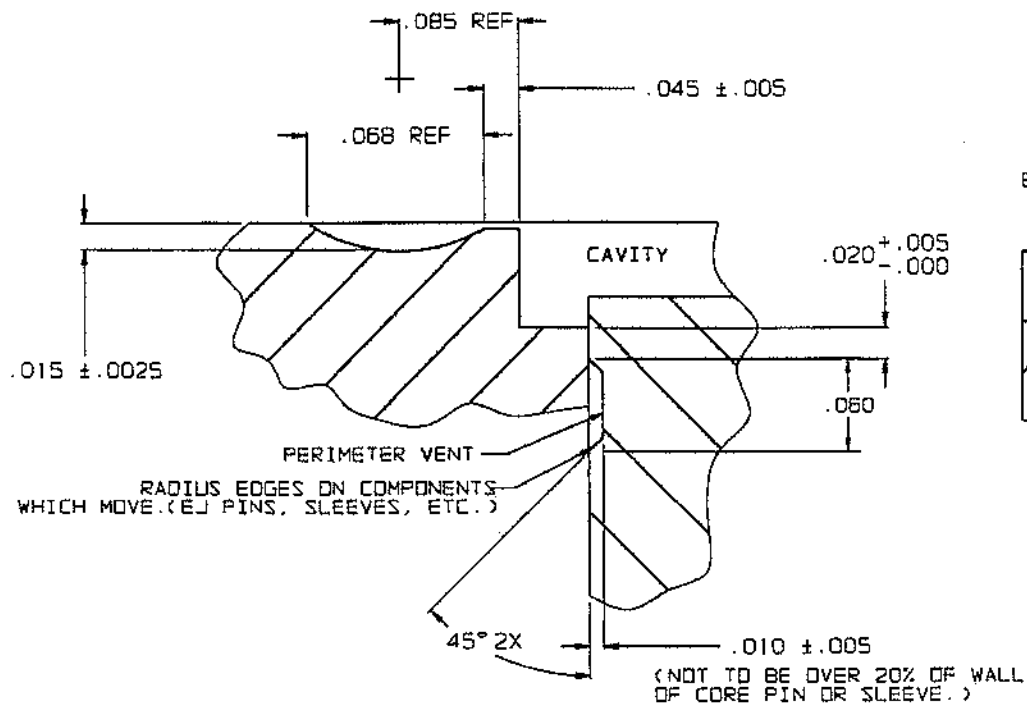
NOTE:

1. ALL NEW MOLDS WILL BE CHECKED BY UFE BY FILLING THE CAVITY WITH KEROSENE & BLOWING WITH AN AIR HOSE IN THE CHANNEL SLOTS. IF VENTED PROPERLY THE KEROSENE WILL BUBBLE IN THE CAVITY.
2. IF ROTATION OF CAVITY COMPONENTS WOULD STOP ESCAPING GASES, THEN COMPONENTS MUST BE KEVED.

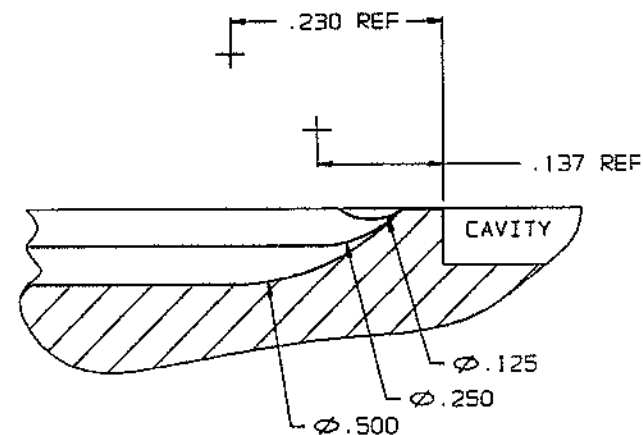
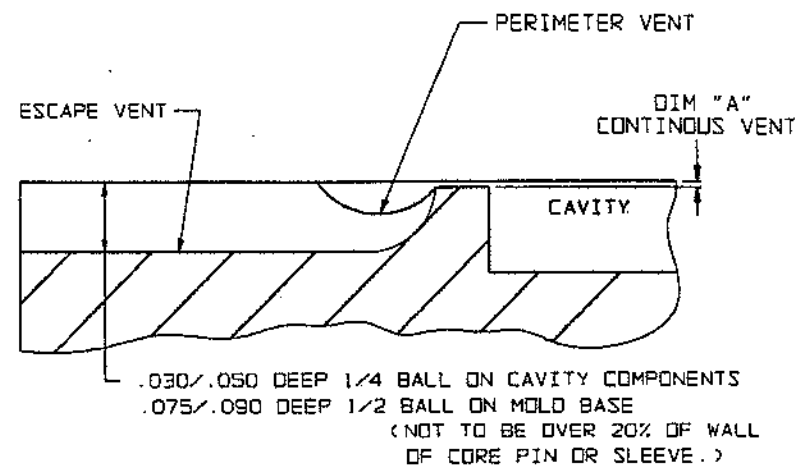
A	PHS	4-10-88	ADDED CONTIN. VENT
ISSUE	BY	DATE	REVISION

DRAWN B. NELSON		APPR.	
DATE		DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE INC. STILLWATER, MO.	
FRACTIONAL ± 1/32		CUSTOMER	
3 DEC. DEC. ± .013		PART NO.	
3 DEC. DEC. ± .001		PART NAME	
4 DEC. DEC. ± .001		SHEET OF	
ANGULAR 1:1 FRACTION		TITLE	
		SCALE	
		DRAWING NO.	
		VENTING VARIATIONS	
		SEC F PG 3	

PERIMETER VENT



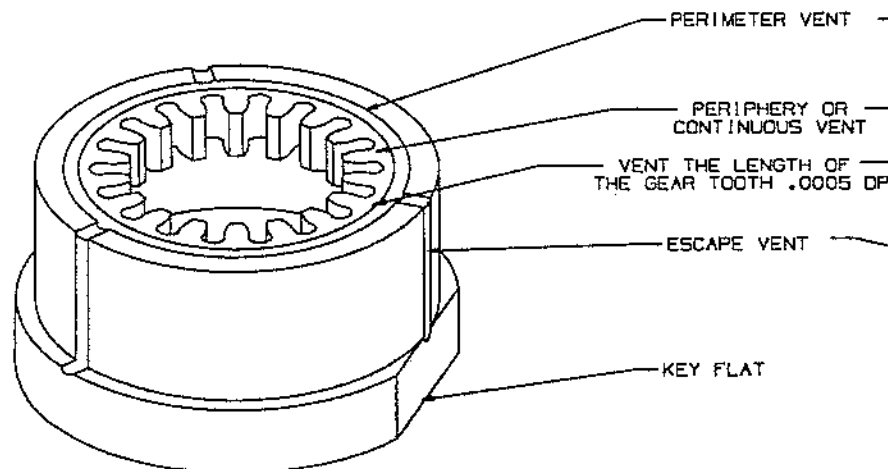
ESCAPE VENT



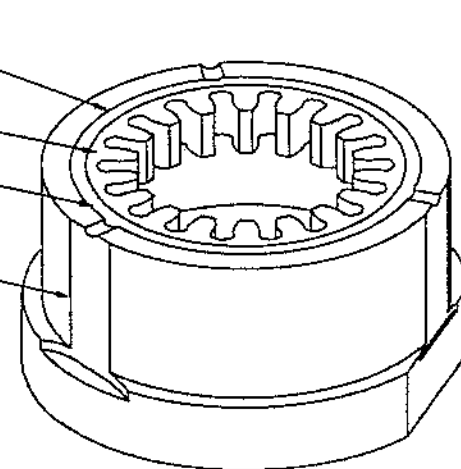
DIM. "A"	.0005/.0007	.001/.0015	.0015/.002	DRAWN LIFE	DATE	DATE	ufe LIFE Incorporated UNITED FOR EXCELLENCE STILLWATER, MN	
MATERIAL	NYLON POLYPROPYLENE POLYETHYLENE RYTON	POLYCARBONATE NORYL ACETAL POLYESTER ULTEM	(FILLED) POLYCARBONITE ABS	TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ±1/32 2 PLC. DEC. ±.010 3 PLC. DEC. ±.005 4 PLC. DEC. ±.0002 ANGULAR ±1°0'00"	DATE	LIFE SW		
						CUSTOMER	TITLE	
						PART NO.	VENT DETAILS	
						PART NAME	SCALE	DRWG. NO.
							SHEET OF	SECTION F PG 4

VENTING GEAR CAVITIES

GEAR CAVITY RING

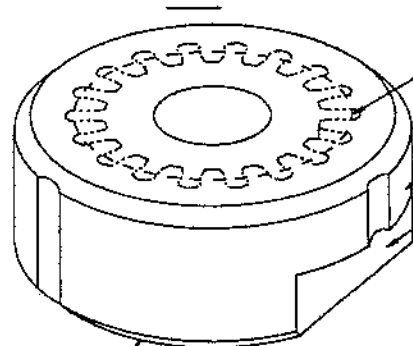


GEAR CAVITY RING

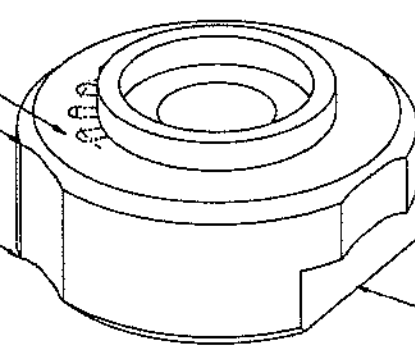


VENT 1/3 THE LENGTH OF
GEAR TOOTH .0005 DP FOR ACETAL
(SEE NOTE FOR OTHER MATL'S)

CORE



CORE



PERIMETER VENT
ESCAPE VENT
TWO REQUIRED MIN;
ONE OPPOSITE GATE
ONE PER GATE. KEY TO OBTAIN.

CAN BE PUT IN WITH ANY GRINDING
WHEEL OR 1/8 BALL END MILL.
AT TIMES BEARING SURFACE
WILL BE GREATLY REDUCED WHEN
USING A WHEEL. IF THIS IS THE
CASE IN YOUR INSTANCE USE
A BALL END MILL.

COMMON SENSE MUST BE USED
IN THIN WALL CASES.

CUT TO .020 TO .030 DEPTH
(NOT TO BE OVER 20% OF WALL
OF CORE OR SLEEVE)

CONTINUOUS VENT PER MATERIAL
SPECIFIED (SEE SEC. F PG.4)

THERE IS NO SUBSTITUTE FOR COMMON
SENSE WHEN DOING ANY VENTING.

SEE ENGINEERING FOR VENT DEPTH
ON OTHER MATL'S

ESCAPE VENT

KEY FLAT

DATE	UFE	REV		 UFE Incorporated DESIGNER FOR QUALITY	11/14/99, 10
APP	6/99	REV			
TOLERANCE UNITS		REV			
SYMBOLS SPECIFIED		REV			
1 PULSED	1.000	REV			
2 PULSED	1.000	REV			
3 PULSED	1.000	REV			
4 PULSED	1.000	REV			
5 PULSED	1.000	REV			
6 PULSED	1.000	REV			
7 PULSED	1.000	REV			
8 PULSED	1.000	REV			
9 PULSED	1.000	REV			
10 PULSED	1.000	REV			
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100 PULSED	1.000	REV			

VENTING GEAR CAVITIES

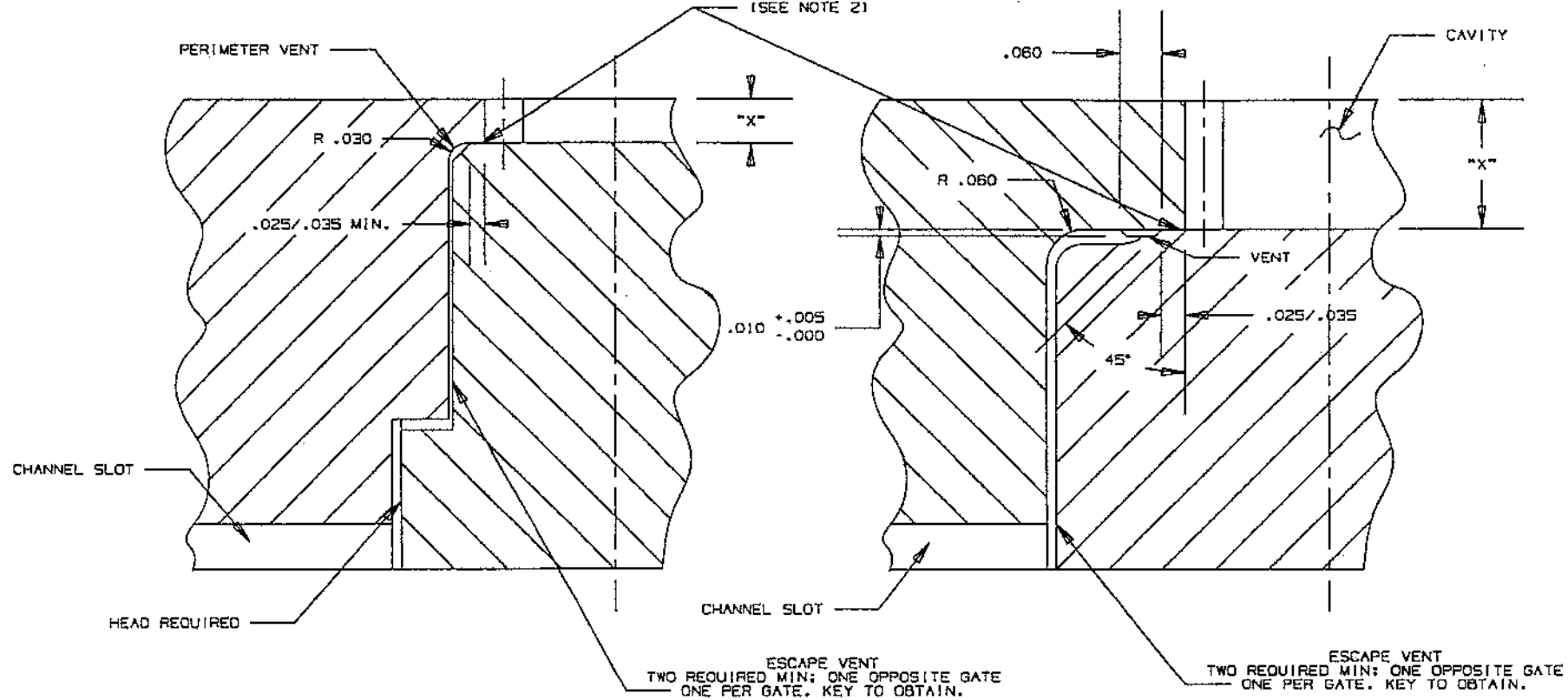
SEC F PG 5

VENTING GEAR CAVITIES

USE WHEN "X" EQUALS .060 TO .160

VENT 1/3 THE LENGTH
OF THE GEAR TOOTH
.0005 DP FOR ACETAL
(SEE NOTE 2)

USE WHEN "X" EQUALS .180 AND OVER



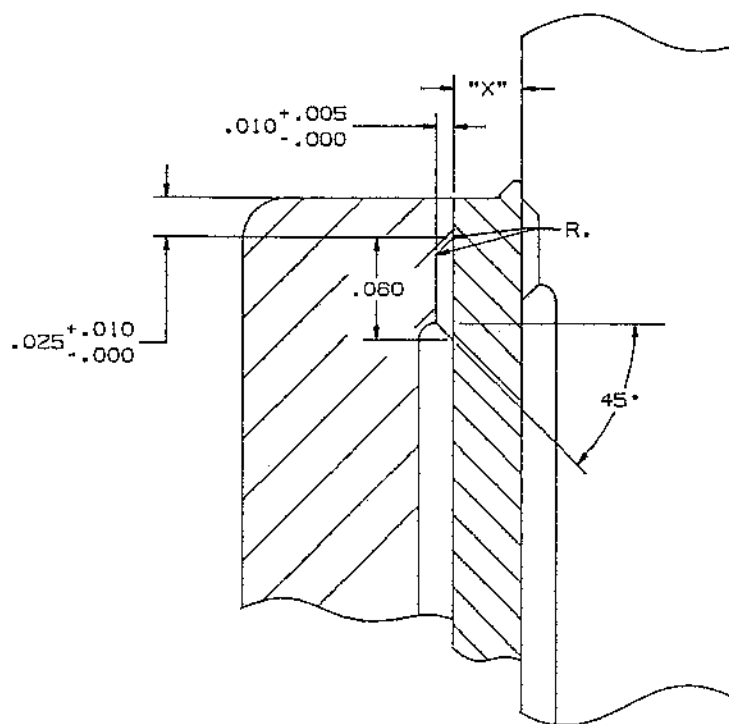
NOTE:

1. FOR GEAR CAVITY CONSTRUCTION SEE SECTION "C" PAGE 2
2. SEE ENGINEERING FOR VENT DEPTH ON OTHER MAIL'S

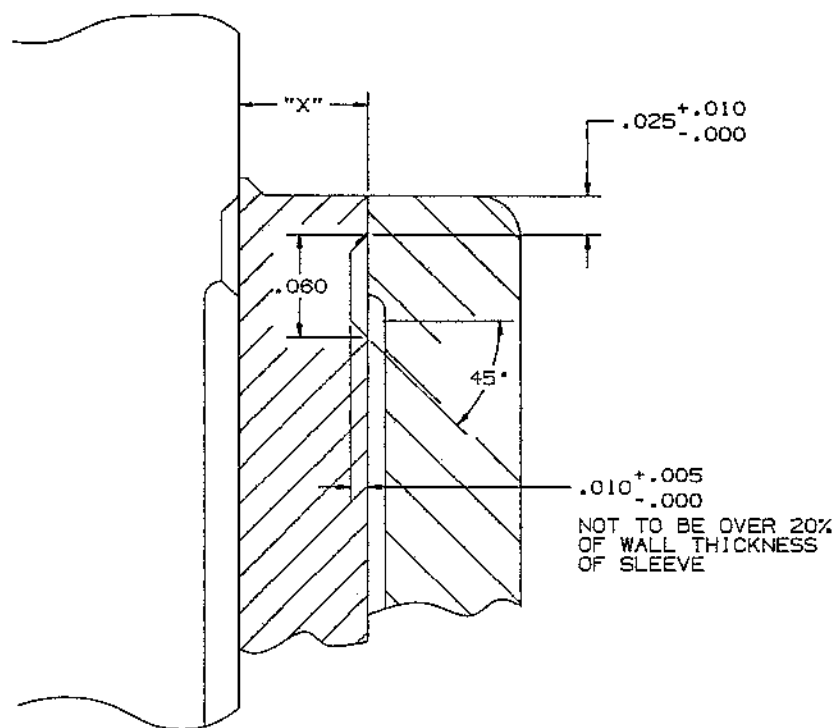
ISSUED	LIFE	DATE	 ufe Incorporated
DATE	6/99	DATE	
YOUR FIVE VALUES		DATE	SEC F PG 6
STAFFING, 1999		DATE	
1. PRODUCTIVITY, 1999		DATE	VENTING GEAR CAVITIES
2. PRODUCTIVITY, 1999		DATE	
3. PRODUCTIVITY, 1999		DATE	SEC F PG 6
4. PRODUCTIVITY, 1999		DATE	
5. PRODUCTIVITY, 1999		DATE	SEC F PG 6
6. PRODUCTIVITY, 1999		DATE	

VENTING SLEEVES

USE WHEN "X" = .040 OR LESS



USE WHEN "X" IS OVER .040



NOTE:

1. FOR INFORMATION ON ESCAPE VENTS
SEE SECTION F, PAGES 3 & 4.

A	PPS	4/18/80	1/8 SEC 8 P 7
ISSUE	BY	DATE	REVISION

DRAWN	APPR.	ufe [®] UFE Incorporated, STILLWATER, MN
DATE	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		
FRACTIONAL	1/32	TITLE
2 PL. DEC.	2.513	VENTING SLEEVES
3 PL. DEC.	2.509	SCALE NONE
4 PL. DEC.	2.5092	DRAWN NO.
ANGULAR	1/4" 800"	SHEET OF
	LIFE 3M	SEC F PG 7
	CUSTOMER	
	PART NO.	
	PART NAME	

SECTION G – EJECTOR SYSTEM

<u>Contents</u>	<u>Page</u>
RULES - GENERAL	2 & 3
RULES – EJECTOR PINS	4
RULES – EJECTOR PINS	5
BLADE EJECTORS	6
SLEEVE EJECTORS – CONSTRUCTION BY CLASSIFICATION	7
SLEEVE EJECTOR – RETAINING CORE PIN	8
SLEEVE EJECTOR – WITH SLIDES	9
CUSHIONED RETURN SYSTEM	10 & 11
GUIDED EJECTOR SYSTEM	12
COUPLED EJECTOR RETURN – PRESS SIZE 3 & 3 (OPTIONAL DESIGN)	13
COUPLED EJ RETURN – PRESS SIZE 2 & 3	14
COUPLED EJECTOR RETURN – PRESS SIZE 4	15
GUIDED RETURN PIN INSTALLATION	16
FLOATING COUPLERS	17
PROTECTOR PINS (SLIDES WITH)	18 & 19
DELAYED EJECTORS	20
EJ PIN TRAVEL LIMITER	21

EJECTOR SYSTEMS

GENERAL:

- A. Heads to be annealed on all ejector pins, sleeves and components in the ejector system.
- B. Ejector system to be set up so any pick-out component (pin, core, block, etc.) cannot be ejected off their locating pins to prevent damage to them and part.
- C. On molds that have guided ejector systems, refer to example of guided system in this section. See Form 122
- D. On mold bases larger than 10" x 12", provide additional bolts in ejector plates to keep them from spreading.
- E. UFE's molding presses have two different cycles or Sequences of their K.O. systems. These are as follows:
 - I. Standard molding cycles: Used when there are no cylinders, etc. Ejectors are pulsed to flick part off ejector pins

A. Press Closing

- 1. Close part
- 2. Die closes

B. Continue Standard Cycle

- 3. Mold part

C. Press Opening

- 4. Die opens full
- 5. Eject ahead
- 6. Eject return (usually pulsed requires coupling)
- 7. Open gate

- II. Standard Molding Cycle: Used when there are no cylinders, etc. Mold is run with an operator or a part picker to catch or pick the part off the ejector pins.

A. Press Closing

- 1. Close gate
- 2. Ejector return (usually coupled)
- 3. Die closes.

B. Continue Standard Cycle

- 4. Mold part

C. Press opens full

- 5. Die opens full
- 6. Eject ahead and stay ahead
- 7. Open gate

EJECTOR SYSTEM

GENERAL

- K. On molds which require the ejector system to have early returns(mold in which pins,sleeves,etc. could damage cavity if they were not out of the way when slides closed), UFE Incorporated requires the following.
1. Mold to be coupled to press's air or hydraulic return system. (There are some exceptions where molds cannot be coupled. They will be noted on quote.) Refer to press data for location which can be coupled.
 2. Mold must have a system of its own to return its ejector system before angle pins enter slide.
 - a. Early returns can be used for this, but they must be the top mounting type. UFE Engineering must approve any use of the side mounts. UFE Incorporated must be able to adjust these systems later when they wear. Minimum mold base size is 9 7/8" x 12". See Form 122.
 - b. Early returns can be used only when the mold can be coupled per Note 1 or if ejector stroke prohibits use of early return. See Form 122.
 3. Stamp on both ends of the ejector plate. **DO NOT** pry on Ejector system to open mold.
 4. Provide protector pins; pins that go through a hole in the Slide when they are open. They are to be 1/4" diameter minimum. On molds with large, heavy slides 3/8" diameter or larger, if possible, they are to be .005/.010" minimum to 25% of wall section maximum below slides and are to have 1/32 per side clearance on hole diameter in slide; for protection of mold on bench. On slide carriers longer than 3 inches, use two protector pins.
 5. See example in this section. (Pages 18 and 19)
 6. For example of delayed ejectors, so references on page 20 of this section.

EJECTOR SYSTEMS

EJECTOR PINS:

- A. Ejector pins to be standard fractional size hot form ejector pins. (Do not use nitralloy steel pin because of chipping problem.)
- B. 7/64" diameter and smaller by 4" and over pins are to be standard fractional size with a 2" shank (stepped type) minimum.

Exceptions:

- 1. On molds where large shanks and heads of stepped type create a problem, use taper-headed pins.
- 2. Do not use taper-headed pins when they form a part dimension.
- C. All ejector pins requiring keying must be square headed type ground to a D shape.
- D. On molds that have ejector pins on the periphery of the cavity (half of the ejector pin of the cavity molding surface and half on the clamping surface of the cavity), use UFE's cushioned return pin system. For cushioned return system, see example on page 10 and 11, this section.

- E. Whenever a part's dimension is formed by an ejector pin's length, it must be equipped with a bottom clamping plate complete with stop pins.
- F. Whenever an ejector pin's length forms a part dimension, then limit the counter bored depth to .001 maximum over the head height.
- G. Whenever an ejector pin's length doesn't form a part dimension, then limit the counter bored depth to .003 maximum over the head height.
- H. Ejector pinholes to be jig ground or wire cut to obtain a "flash free" fit. (See Mold Specification Form 122)
- I. Ejector pin marks on the part to be cored .003/.005 into part unless otherwise stated.
- J. Provide ejector pin lead-ins in cavity blocks.
- K. Molds with large ejector pins should have additional rest buttons or pads added to the ejector plate to support the injection pressure.

EJECTOR SYSTEMS

SLEEVE EJECTORS:

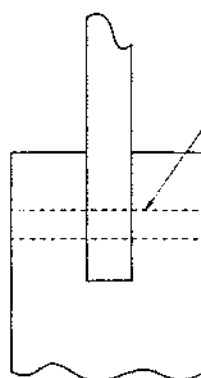
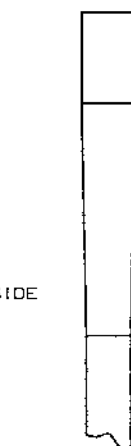
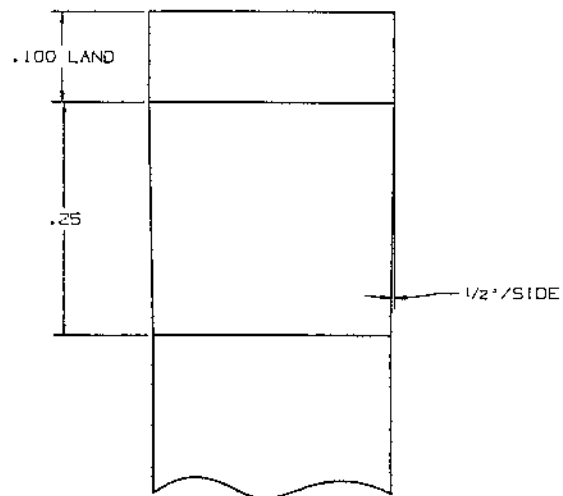
Construction per Mold Specification and Quotation Form 122:

- A. Review specification of mold to be built and review Page No. 7 of this section. NOTE: Shrink print and its sketches take precedence.
- B. Sleeve ejectors and their respective core pins are to be free floating on their head diameters by clearance and on their head height, by .002 maximum extra in counter bore depth.
- C. Never use set screws to retain core pins. They tend to cock pin, put unnecessary wear on pin and sleeve wear out the hole in which the pin telescopes into.
- D. Molds with ejector sleeves must have a guided ejector system. See example on Page 11 this section.
- E. To prevent bending the ejector plates on molds with large sleeves, due to applied injection pressure, provide additional support by adding support steps on the support pillars. This is a must on double ejector plate (systems) and on single ejector (systems), additional rest buttons can be added as close to core pin as possible to maintain support behind sleeve.
- F. Radius sleeve ejector holes in cavities except at part and radius any venting edges on sleeves to prevent galling.

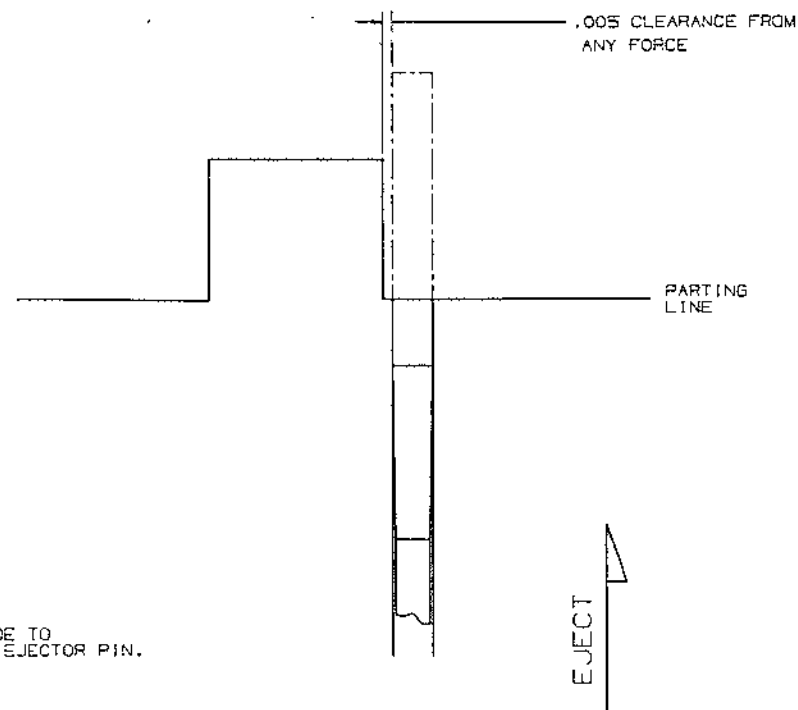
G. Sleeve ejectors are to be made of M-2 tool steels with a 3/16" minimum head height. (Do not use nitrided or DME sleeves.)

H. When venting thin walled sleeves, grind vent in bushing not sleeves.

NOTE: For venting instructions on sleeves, see Section F, Page No. 7.



PIN BLADE TO
SLOTTED EJECTOR PIN.

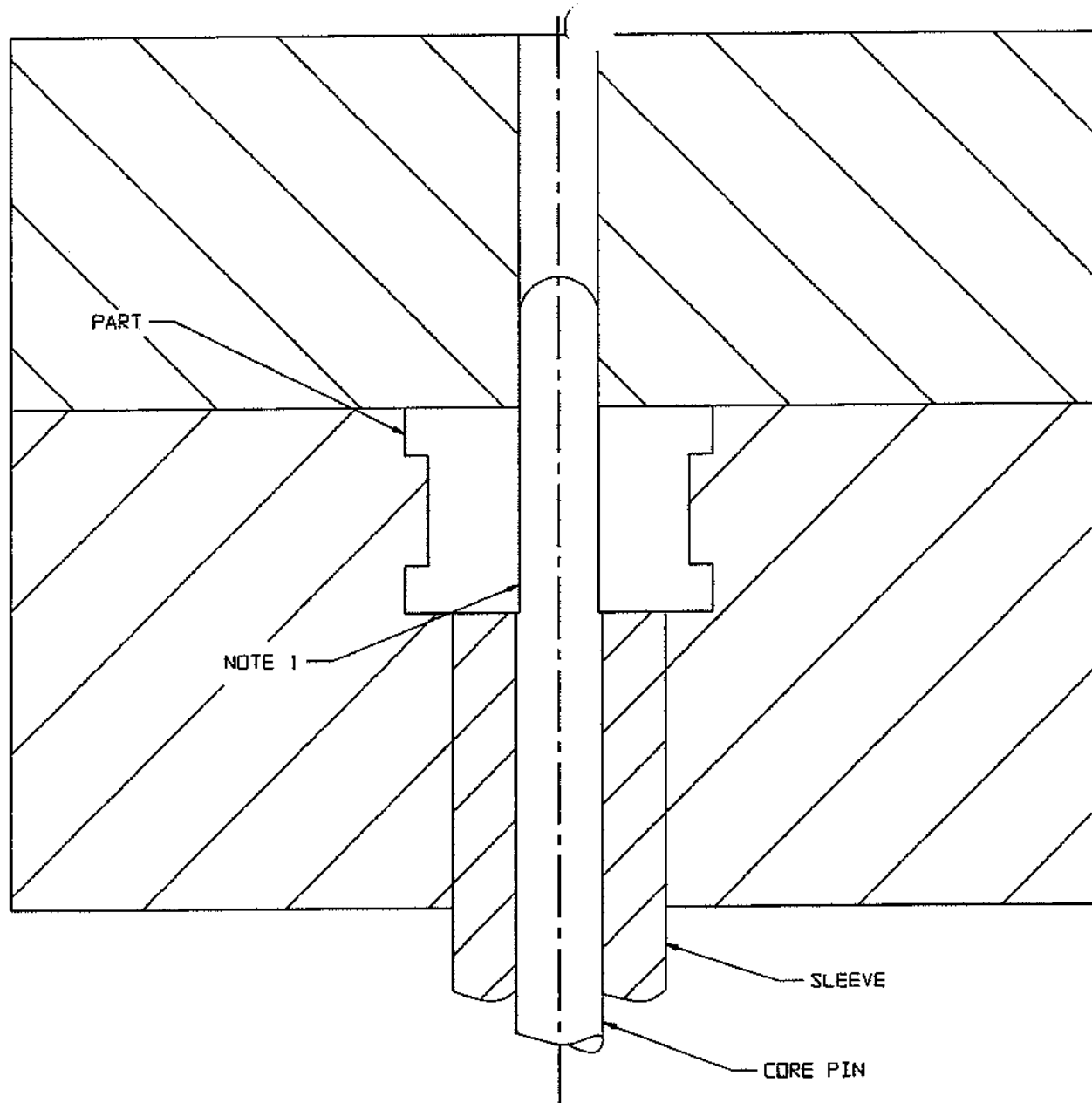


NOTES:

1. BLADE EJECTORS TO BE MADE OF COLD-ROLLED SPRING STEEL, BLUE TEMPERED CLOCK STEEL, SAE 1095, R/C 48-51, OR H-13, R/C 48-50.
2. BLADE EJECTORS CAN ALSO BE MADE FROM M-2 EJECTOR PINS.

DRAWN J. BOGGS		APPR.		 UFE Incorporated, STILLWATER, MN	
DATE 8/9/85		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE UN		TITLE	
FRACTIONAL 1/32		CUSTOMER		BLADE EJECTORS	
3 DEC.DEC. 2.011		PART NO.		SCALE NONE	
3 DEC.DEC. 2.011		PART NAME		DRAWING NO. PAGE 6	
4 DEC.DEC. 2.011				SHEET 1 OF 1	
ANGULAR 1/4\"/>					

ISSUE BY DATE REVISION

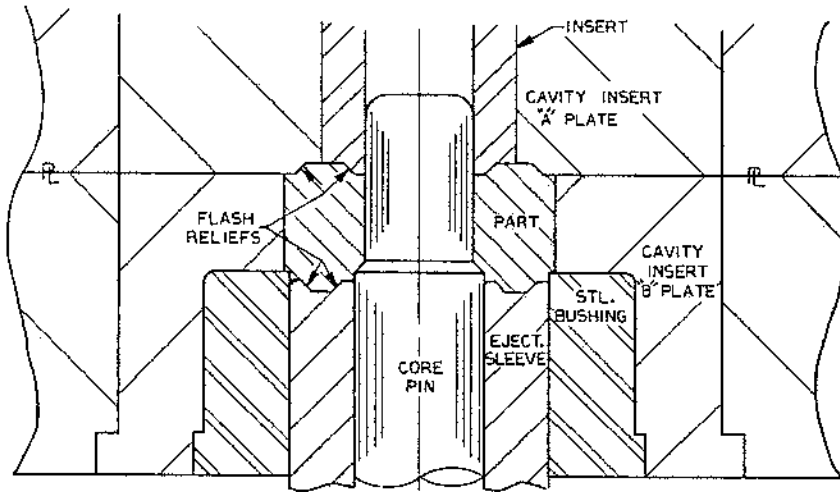


NOTE:

1. PROVIDE A .001-.002 PER SIDE STEP ON THE CORE PIN TO REDUCE THE GAILING EFFECT AS THE SLEEVE MOVES ON THE CORE PIN

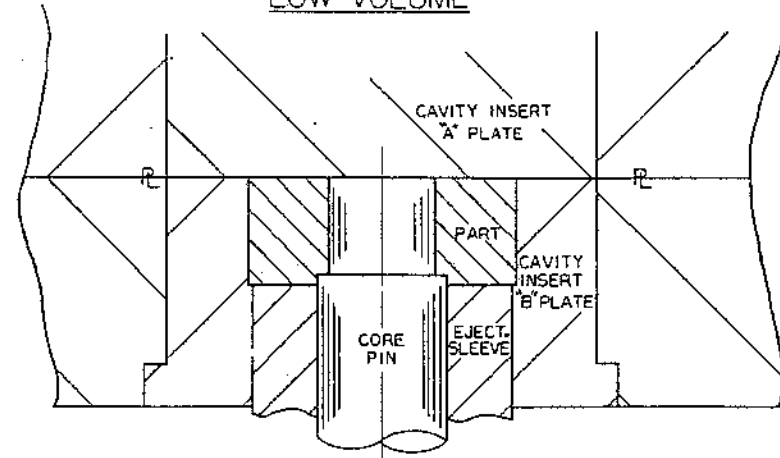
DRAWN LIFE		APPR.		 UFE Incorporated STILLWATER, MN	
DATE 3/01		DATE			
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		CUSTOMER		SLEEVE EJECTOR	
		PART NO.		SCALE	
		PART NAME		SHEET 12	
				DRWG. NO.	
				SECTION G PG 7	

PRODUCTION MOLD



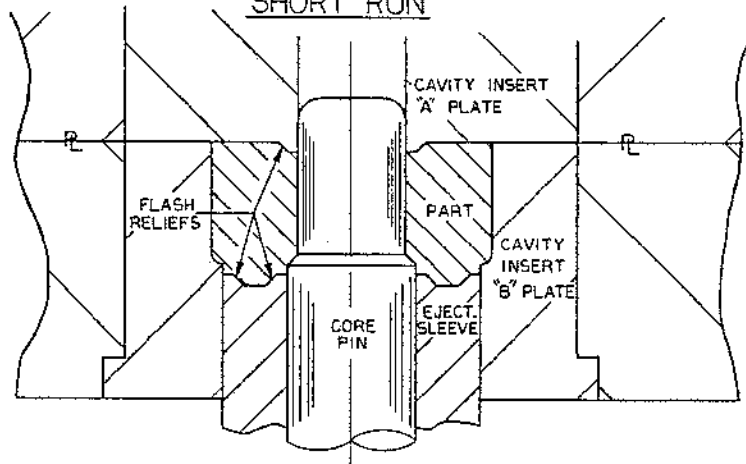
FIXED VOLUME (200M & OVER PARTS PER CAVITY)

LOW VOLUME



LOW VOLUME OR DEVELOPMENT TYPE.

SHORT RUN



A SET VOLUME UP TO 200M PARTS PER CAVITY.

FOR PREFERRED CONSTRUCTION, CONSULT UFE PROJECT ENGINEER. SHOWN ARE ILLUSTRATIONS OF DIFFERENT METHODS OF CONSTRUCTION—ALSO DEPENDS ON DESIGN AND TOLERANCE ON DIAMETERS.

APPROVED BY: *[Signature]* DATE: 12-13-77

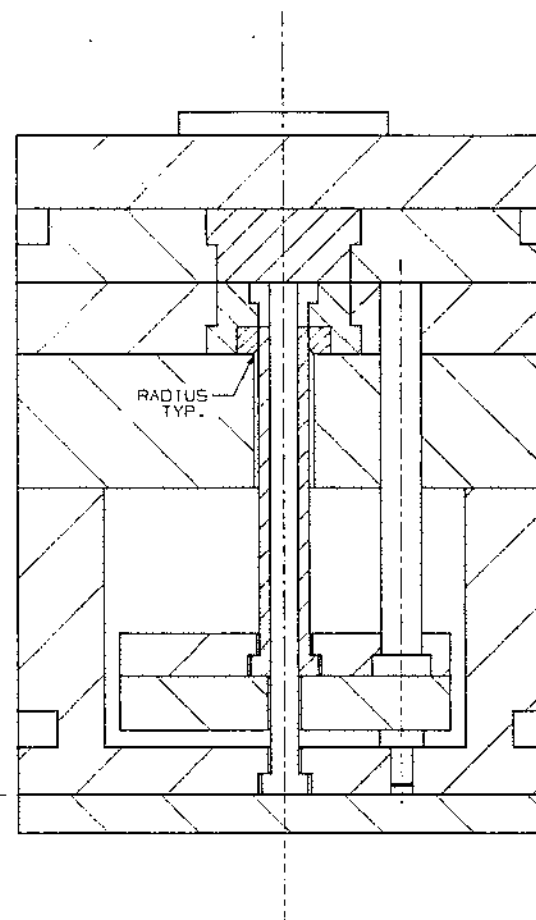
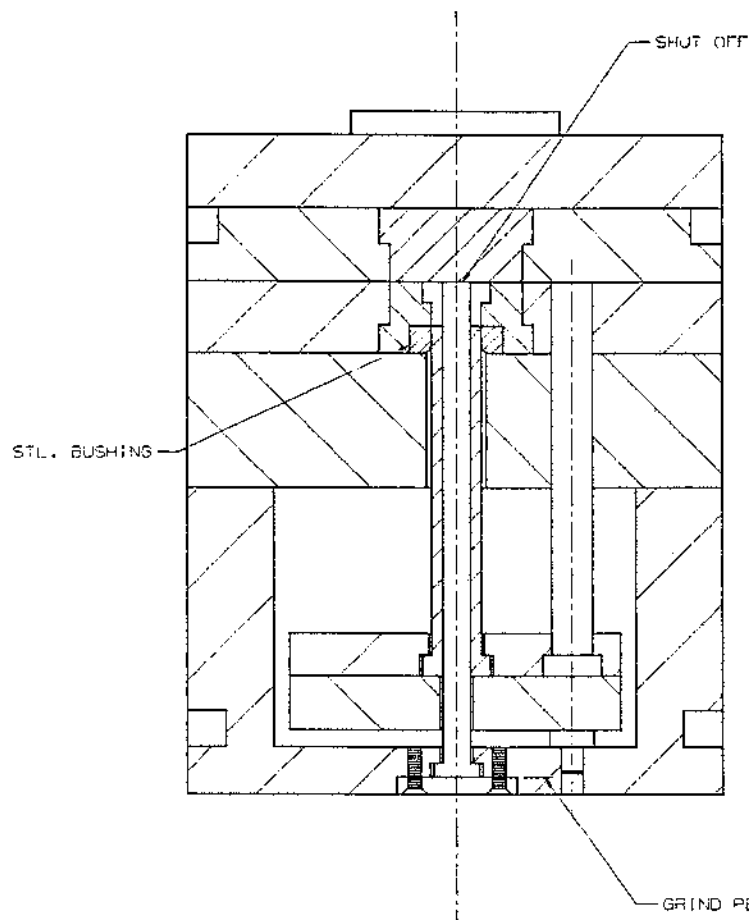
REVISION

DRAWN T. R. JAROSCH	APP. _____
DATE 6-2-76	DATE _____
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FRACTIONAL 1/16	CUSTOMER
3 DEC. 0.010	PART NO.
5 DEC. 0.005	PART NAME
4 DEC. 0.002	
ANGULAR 1/2° 0.005"	

ufe UFE Incorporated, STILLWATER, MN	
TITLE SLEEVE EJECTOR CLASSIFICATION	
SCALE NONE	DRWG. NO.
SHEET SECT. G	PAGE NO. 7

OPTIONAL

PREFERRED

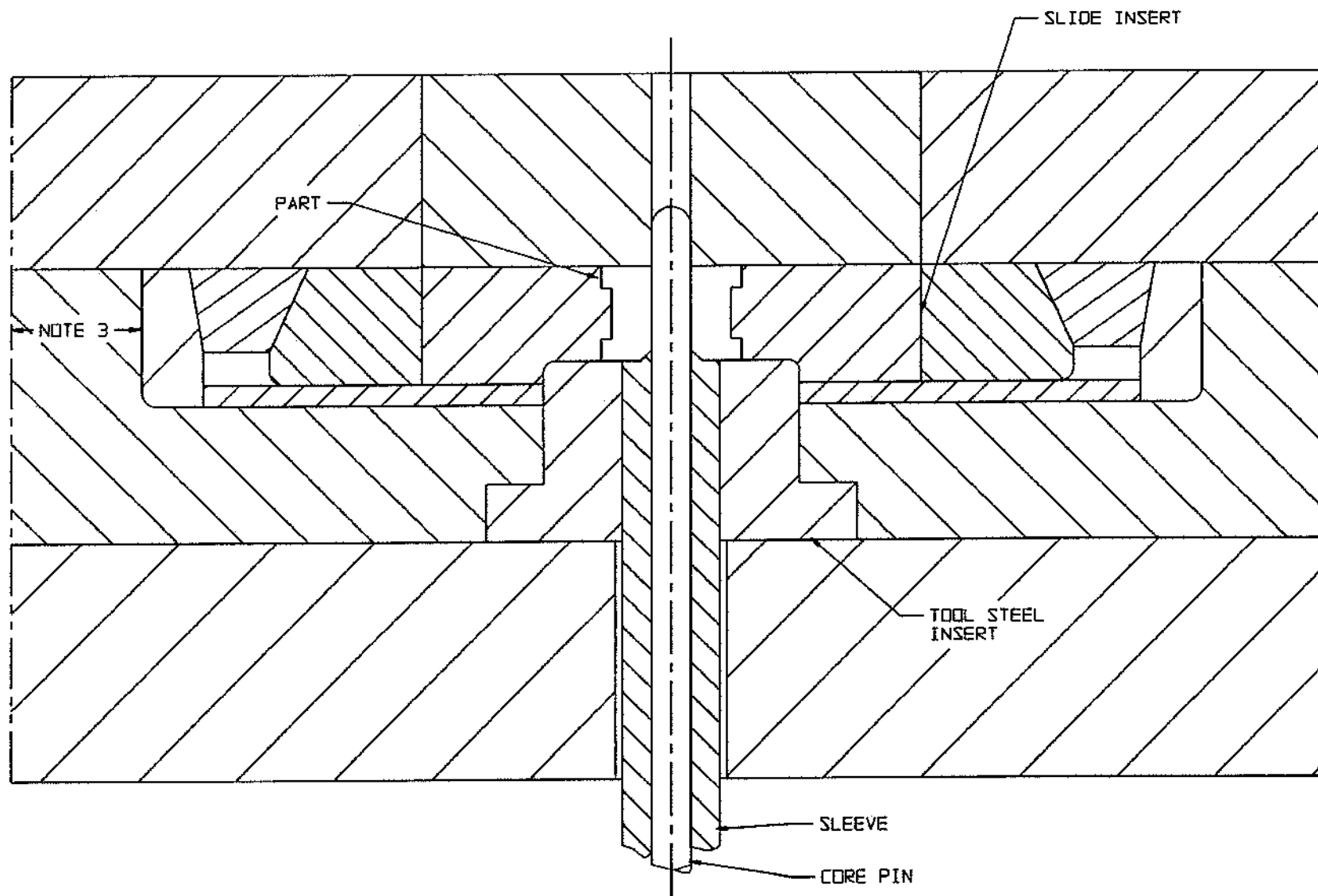


NOTE:

1. ON MOLDS WHERE THE CORE PIN SHUTS OFF FLAT, THE CORE PIN MUST BE FL. STL. BACKED TO PREVENT HOBBING. GRIND INDICATED SURFACE TO CONTROL SHUT OFF.
2. NEVER USE SET SCREWS TO RETAIN CORES.

DRAWN J. BOGGS		APP. _____		ufe [®] UFE Incorporated, Northbrook, Minnesota ST. LOUIS, MO.	
DATE 8/9/85		DATE _____			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE #1		CUSTOMER _____	
FRACTIONAL 1/16		PART NO. _____		TITLE SLEEVE EJECTORS	
2 PL. DEC. 0.015		PART NAME _____		SCALE NONE	
3 PL. DEC. 0.005				DRWG. NO. _____	
4 PL. DEC. 0.002				SHEET 1 OF 1	
ANGULAR 2.1° 30"				PAGE 8	

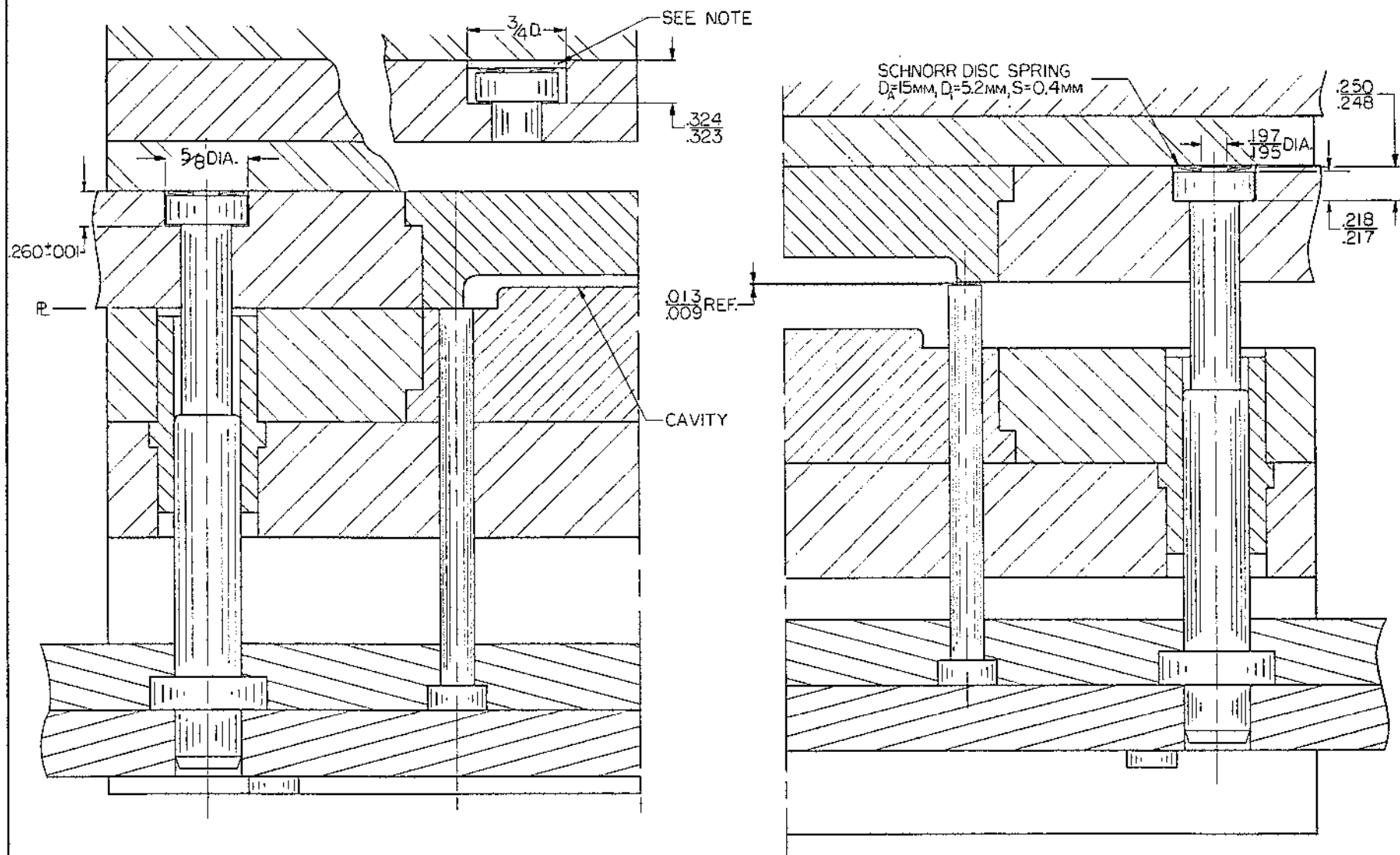
ISSUE BY DATE REVISION



NOTE:

1. DO NOT WRAP SLIDES AROUND A SLEEVE
PROVIDE A TOOL STEEL INSERT AS SHOWN
2. FOR SLEEVE EJECTORS OR EJECTOR PINS WHICH
ARE IN COLLISION WITH SLIDES, SEE PAGES 18
AND 19, THIS SECTION
3. SUPPORT BEHIND LOCK BLOCKS AND/OR WEAR PLATES
MUST BE SUFFICIENT TO RETAIN MOLDING PRESSURES

DRAWN LIFE		APPV.		ufe LIFE Incorporated MILWAUKEE, WI 53219 STILLWATER, MN	TITLE SLEEVE EJECTOR WITH SLIDES
DATE 3/01		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		LIFE JUN		DRAWN FOR COLLING	
FRACTIONAL $\pm 1/32$		CATCHER		SCALE	
2 P.L.C. DEC. $\pm .010$		PART NO.		SHEET	
3 P.L.C. DEC. $\pm .005$		PART NAME		ORIG. NO.	
4 P.L.C. DEC. $\pm .0002$				SECTION G PG 9	
ANGULAR $\pm 1^{\circ} 0' 00''$				SHEET OF	

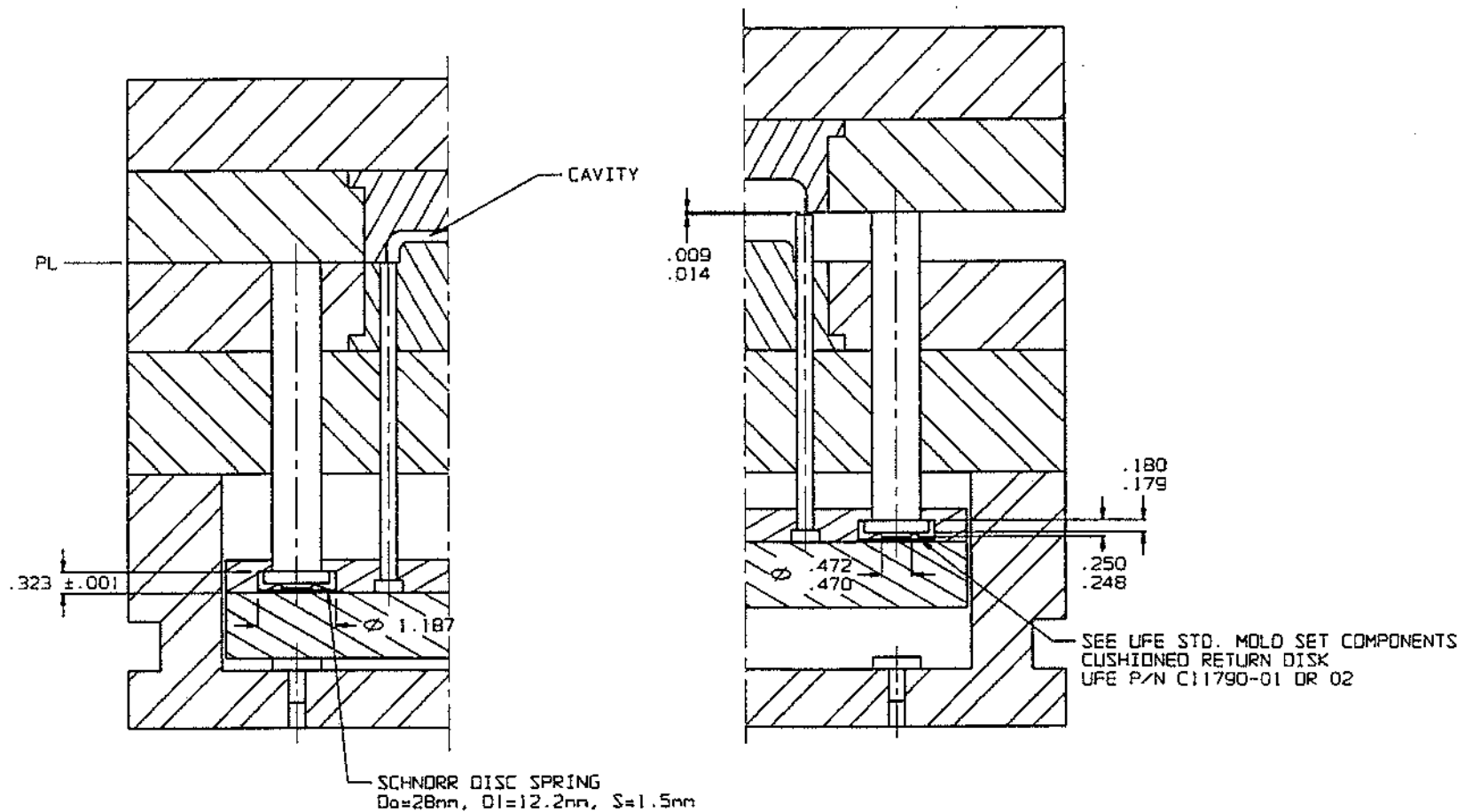


NOTE:

SCHNORR DISC SPRING MUST BE BACKED WITH TOOL STL.
PROVIDE TOOL STL. INSERT, (UFE #C-11790-01), IF IN PREHARD
BASE.

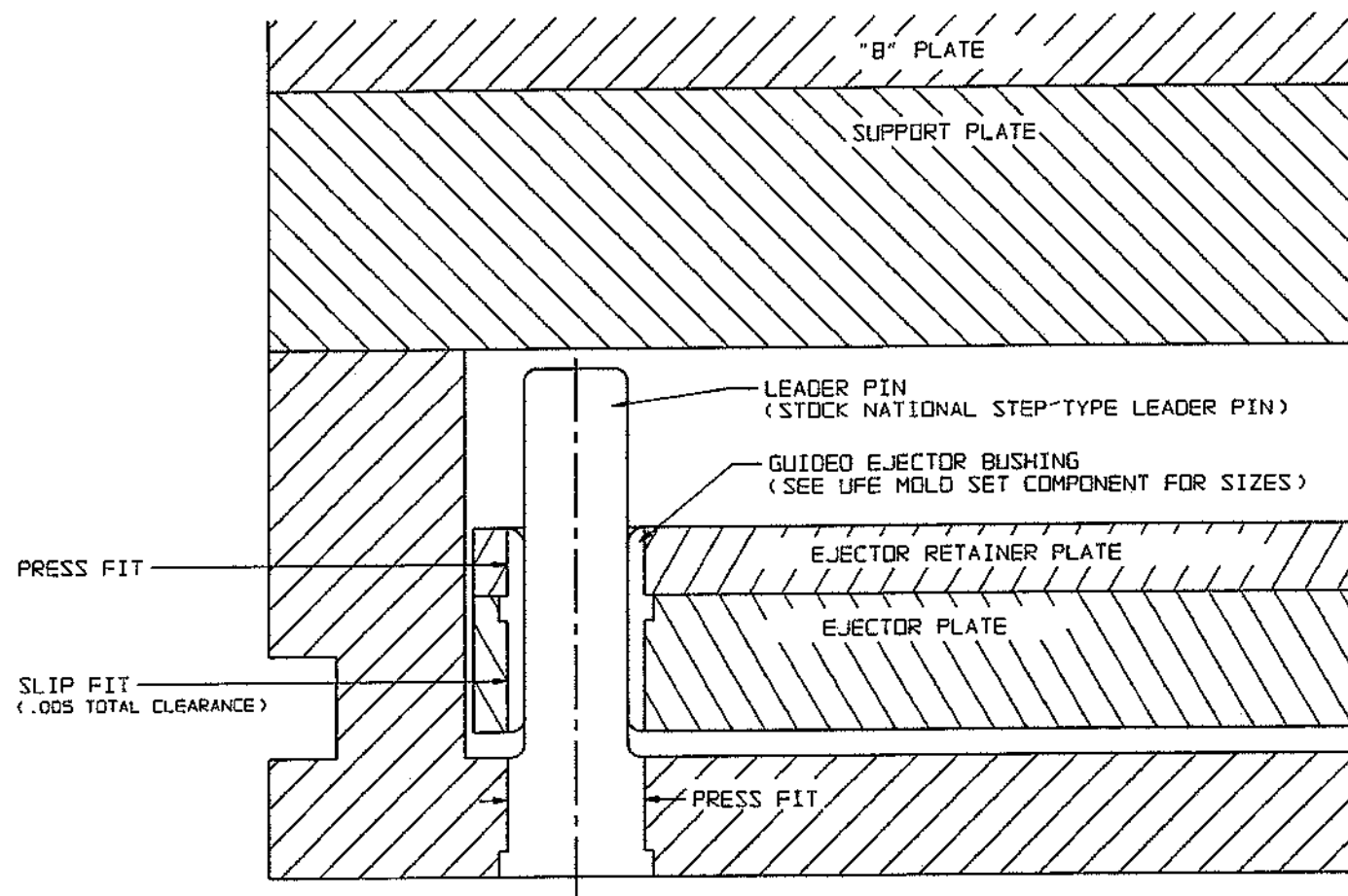
ISSUE BY DATE REVISION

DRAWN 3-2-76	APP.	ufe [®] UFE Incorporated, STILLWATER, MN	
DATE T. JAROSCH	DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:	UFE JAN	CUSTOMER	
FRACTIONAL 2/100			
1 PL. DEC. 2.515		PART NO.	
2 PL. DEC. 2.500			
3 PL. DEC. 2.500		PART NAME	
4 PL. DEC. 2.500			
ANGULAR 2 1/2°		SCALE NONE	DWG. NO.
		SHEET SECT. G	PAGE NO. 10



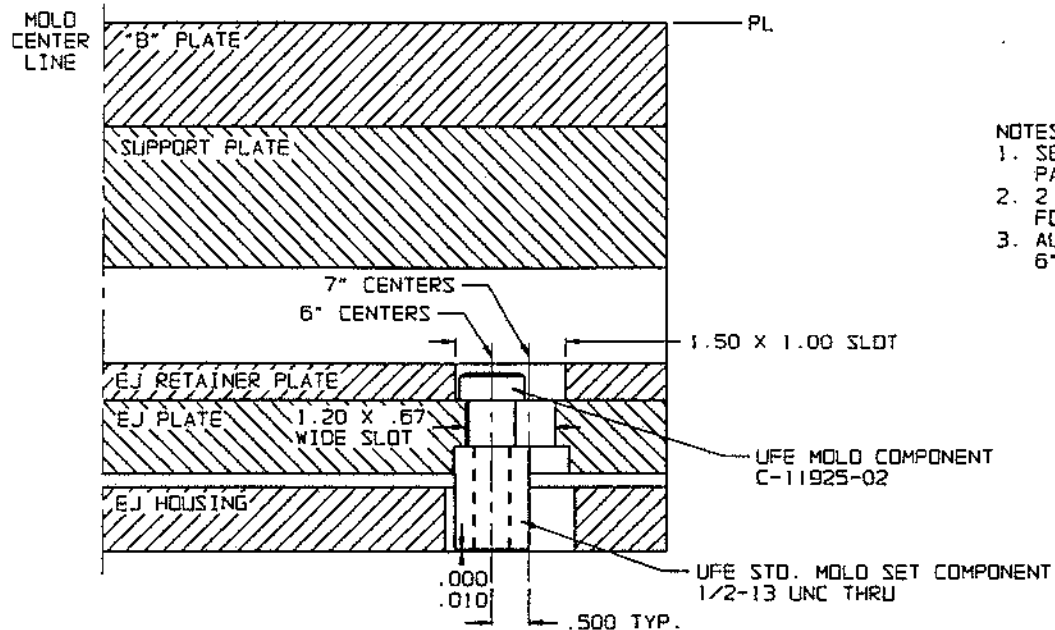
NOTE:
TO BE USED ON Ø 1/2, Ø 5/8,
& Ø 3/4 RETURN PINS.

DRAWN UFE		DATE		ufe [®] UFE Incorporated UNITED FRONT ENDOLLERS STILLWATER, MN	
DATE 6/99		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:				TITLE	
FRACTIONAL 1/32 2 PLC. DEC. ±.010 3 PLC. DEC. ±.005 4 PLC. DEC. ±.002 ANGULAR 11°D'00"				CUSHIONED RETURN SYSTEM	
UFE P/N CUSTOMER PART NO. PART NAME				SCALE SHEET OF	
				DRWG. NO. SECTION G PG 11	



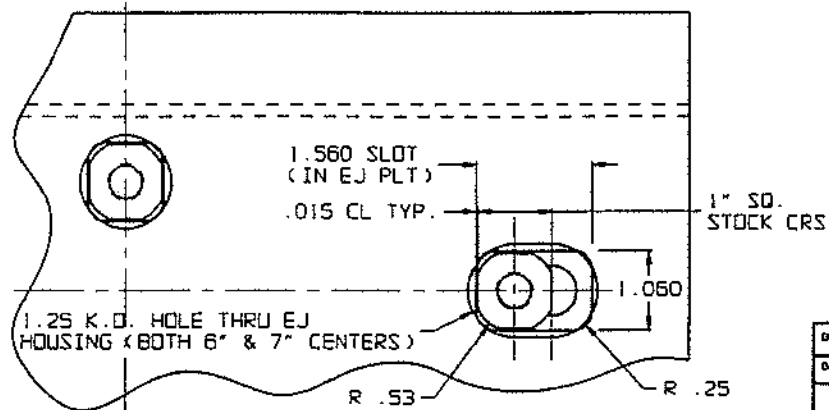
1. SIZE OF BUSHING DETERMINED BY SIZE OF TOOL.

DRAWN	UFE	APPR.	ufe LIFE Incorporated STILLWATER, MN
DATE	2/01	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JCN	TITLE GUIDED EJECTOR SYSTEM
		CUSTOMER	
FRACTIONAL	1/32	PART NO.	SCALE
2 PLC. DEC.	±.010	PART NAME	DRWG. NO.
3 PLC. DEC.	±.005		SECTION G PG 12
4 PLC. DEC.	±.0002		
ANGULAR	1° 0' 00"		SHEET OF



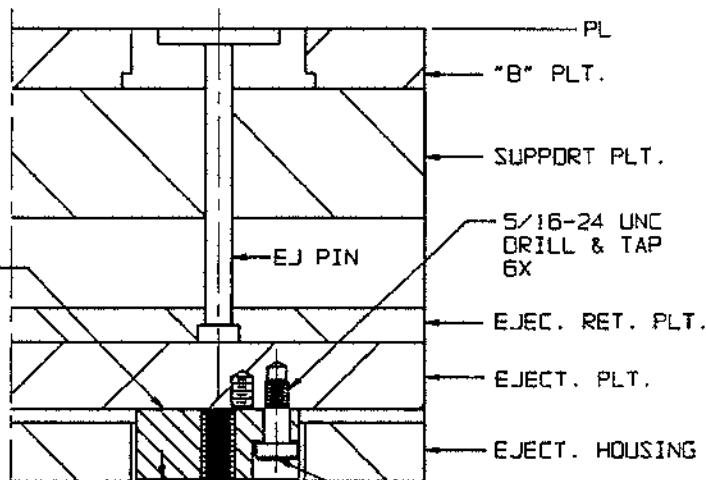
NOTES:

1. SEE PRESS DATA FOR LOCATION OF PATTERNS TO BE USED FOR HYD RETURN
2. 2 COUPLERS REQ'D PER MOLO EXCEPT FOR BASES ON WHICH EJ PLATES ARE TO NARROW
3. ALL #2 AND #7 MOLOS TO HAVE OPTIONAL 6" AND 7" CENTERS FOR HYDRAULIC COUPLERS



DRAWN	UFE	DATE	6/99	UFE INC.	DATE
DATE	6/99	UFE INC.	DATE	CUSTOMER	DATE
TOLERANCES UNLESS OTHERWISE SPECIFIED:		FRACTIONAL	±1/32	PART NO.	DATE
		2 PLC. DEC.	±.010	PART NAME	DATE
		3 PLC. DEC.	±.005		
		4 PLC. DEC.	±.0002		
		ANGULAR	±1° 0' 00"		
ufe [®] UFE Incorporated				STILLWATER, MN	
TITLE				OPTIONAL COUPLERS FOR	
				HYD EJ PLT RETURNS	
SCALE				DRWG. NO.	
SHEET				SECTION G PG 13	

UFE STO MOLD SET COMP
UFE C-12559-02

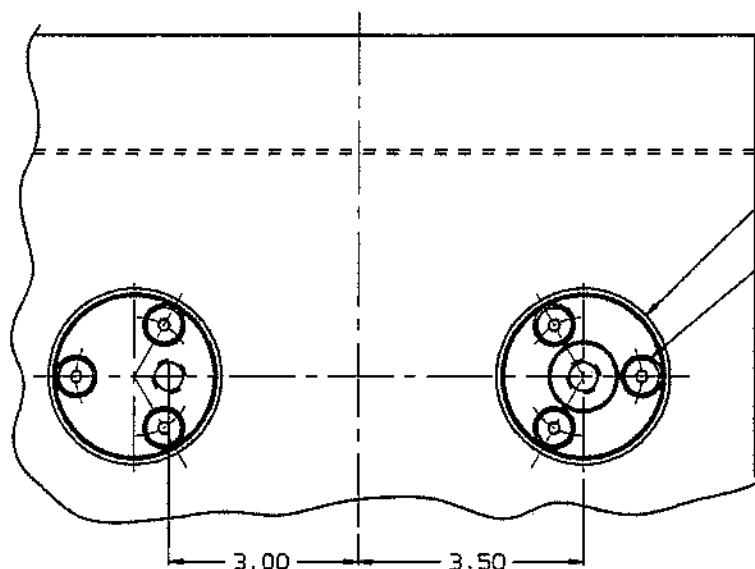


FLUSH TO .010 (DIM APPLIES TO SEC. N PG. 5)
MAINTAIN .000/.003 TO EACH OTHER REQ.

Ø 3/8 STO SHLD. BOLT
SHLD. LENGHT = .500
THRO. LENGHT = .500

NOTE:

1. SEE PRESS DATA FOR LOCATION OF PATTERNS TO BE USED FOR HYD RETURN.
2. 2 COUPLERS REQUIRED PER MOLD.
3. ALL MOLDS UP TO 8 X 11 MUST BE CAPABLE OF USING BOTH 6 IN. AND 7 IN. K.O.'s.

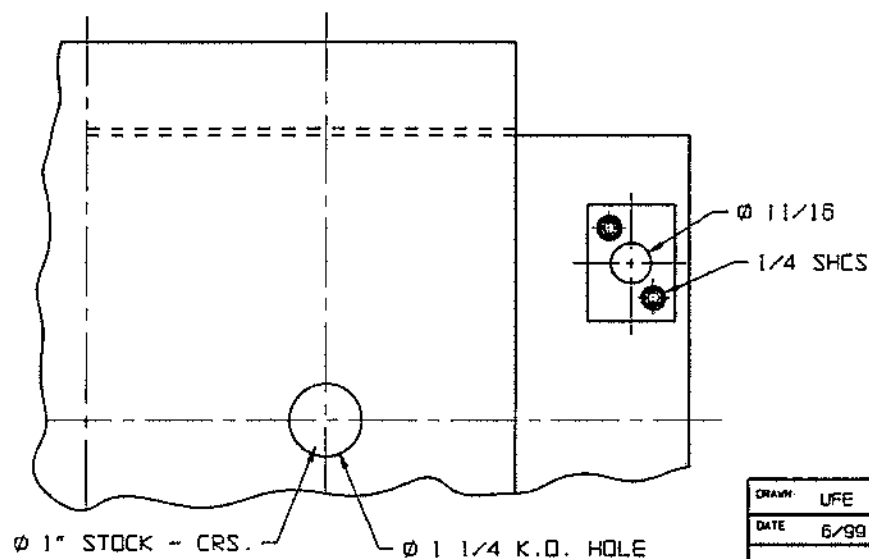
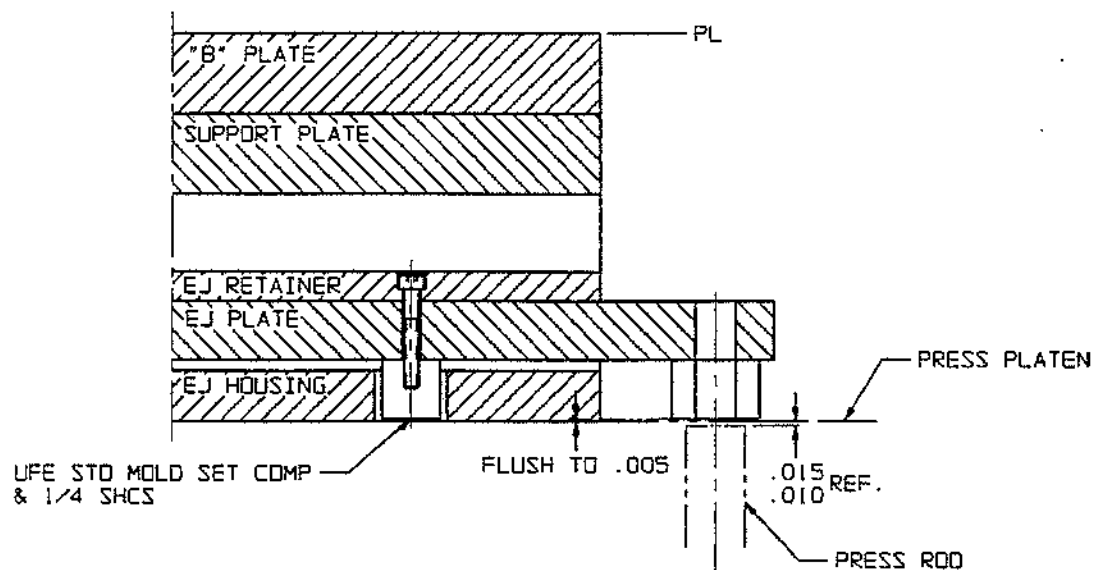


Ø 2 1/2 K.O. HOLE LOCATE ON 7" CENTER
(THRU E EJ HOUSING)

6 MOUNTING HOLES FOR COUPLER MUST BE
LOCATED AS SHOWN WITH BOLT ON
INSIDE OF COUPLER, ON MOLD CL

DRAWN UFE		APPR.	
DATE 5/99		DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		CUSTOMER	
FRACTIONAL	A1/32	PART NO.	
2 PLC. DEC.	±.010	PART NAME	
3 PLC. DEC.	±.005		
4 PLC. DEC.	±.002		
ANGULAR	11"0'00"		

 UFE Incorporated STILLWATER, MN	
TITLE HYDRAULIC COUPLER	
SCALE	DRWG. NO.
SHEET OF	SECTION G PG 14

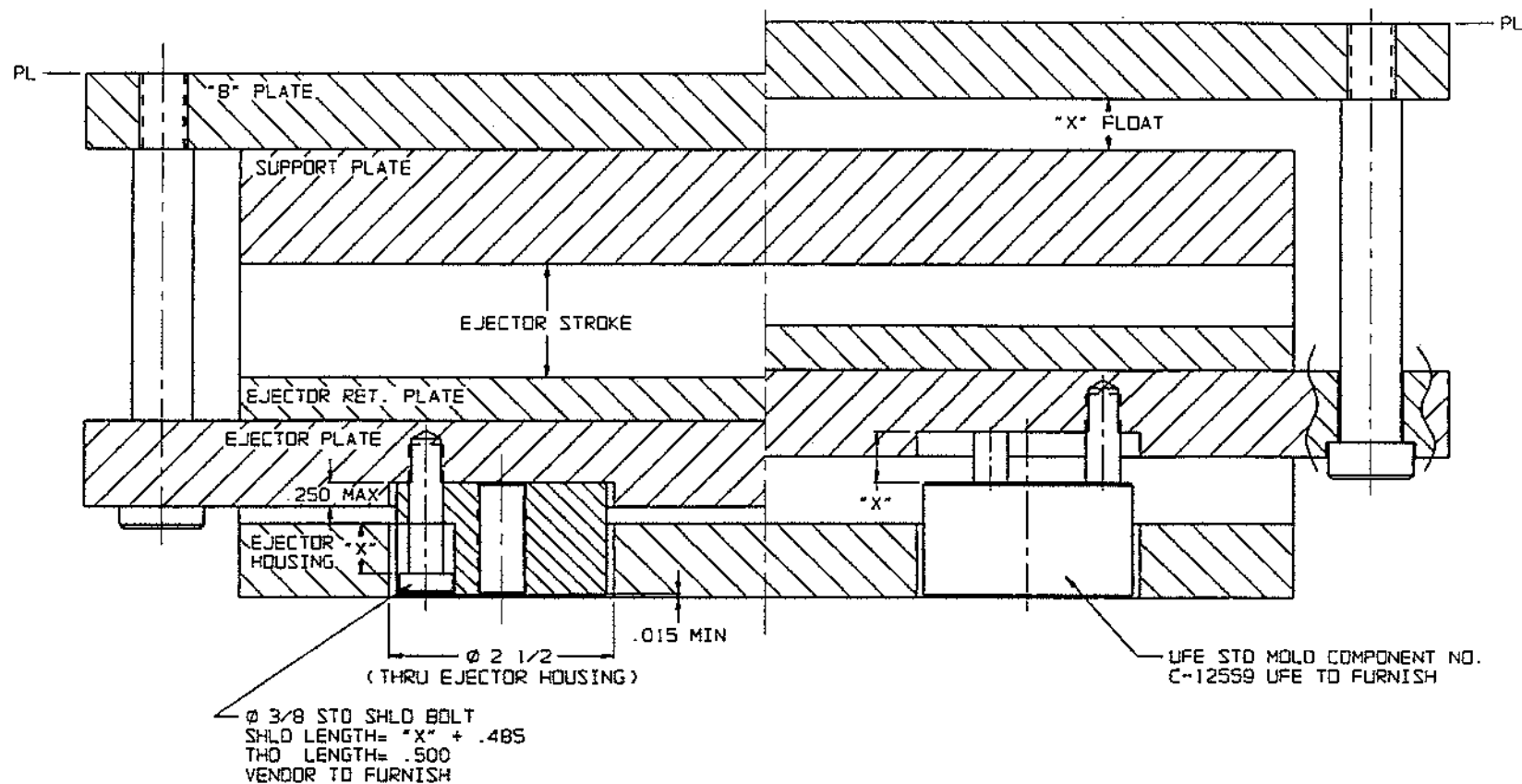


NOTE:

1. SEE PRESS DATA FOR LOCATION OF PATTERNS TO BE USED FOR HYD. RETURNS.
2. PROVIDE 2 K.O. PADS NEAR CENTER OF BASE TO KEEP EJ PLT FROM BENDING
3. WATCH CAVITY LOCATION WHEN LAYING OUT MOLD SO EJ PINS ARE CLEAR OF 1/4 SHCS
4. ALL PRESS SIZE 4 MOLDS MUST HAVE BOTH OUTBOARD COUPLERS AND 4 X 16 KNOCKOUT PATTERN.

DRAWN: UFE		DATE: 6/99		 UFE Incorporated UFE FOR EXCHANGE STILLWATER, MN	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		FRACTIONAL $\pm 1/32$ 2 PLC. DEC. $\pm .010$ 3 PLC. DEC. $\pm .005$ 4 PLC. DEC. $\pm .0002$ ANGULAR $\pm 10' 00''$		TITLE: COUPLERS FOR HYD EJ PLT RETURNS SCALE: _____ SHEET: _____ OF _____	
		PART NO. _____ PART NAME _____		DRWG. NO. _____ SECTION G PG 15	

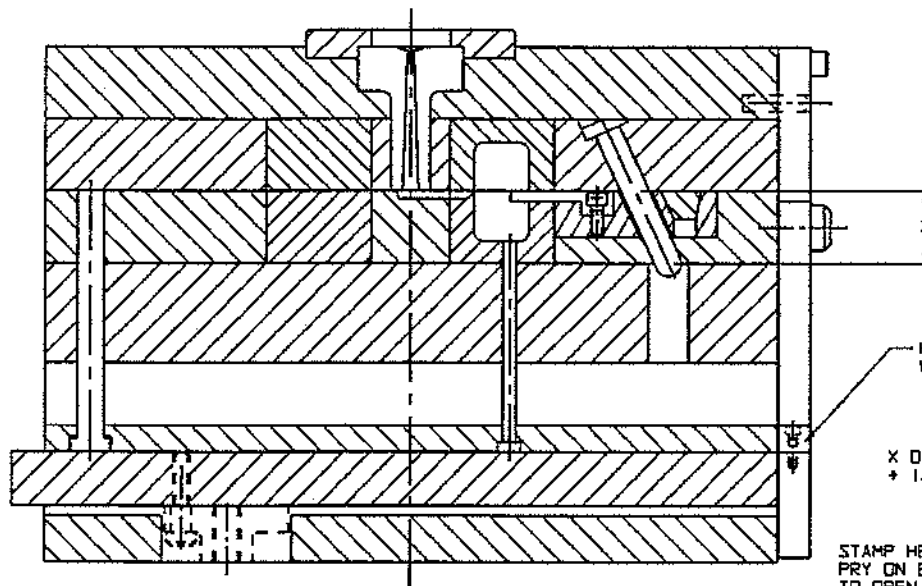
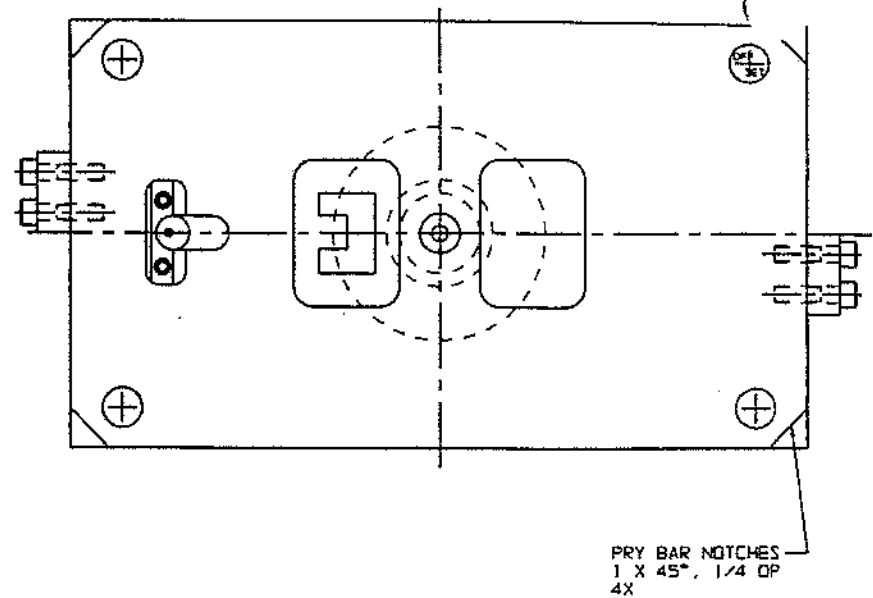
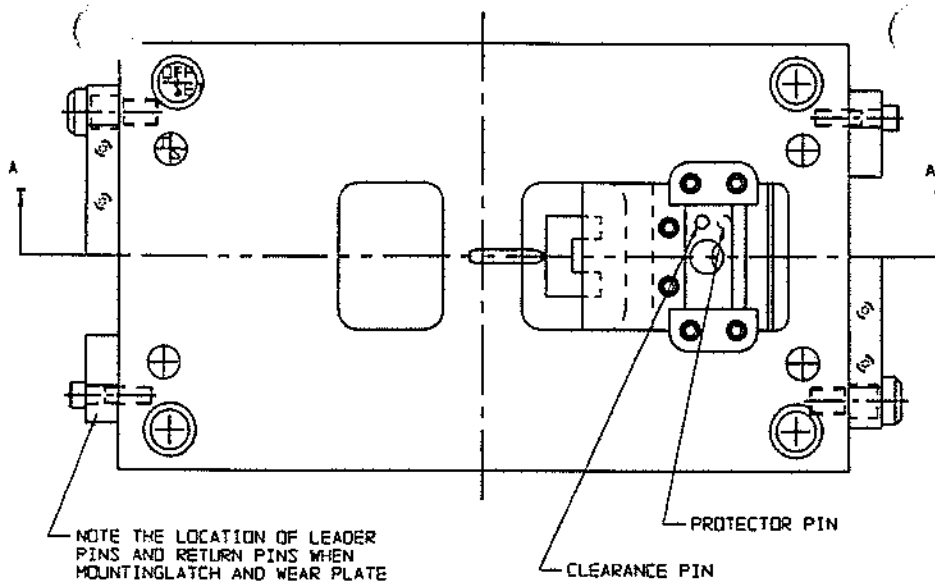
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NOTE:

1. SEE PRESS DATA FOR LOCATION OF PATTERNS TO BE USED FOR HYD RETURN
2. 2 COUPLERS REQUIRED PER MOLD (MINIMUM)
3. BOLT PATTERN TO BE LOCATED PER SPEC BOOK SECTION N, PG 13

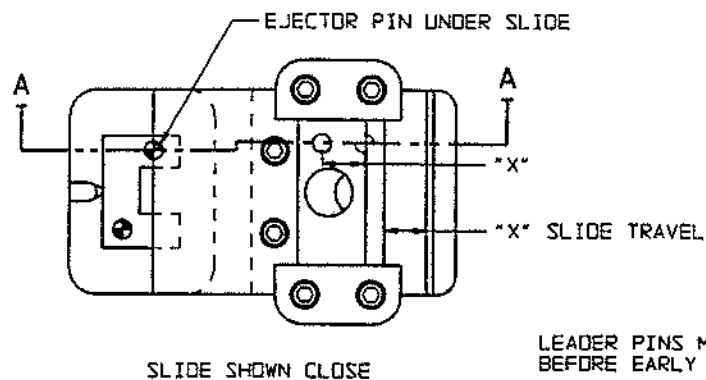
DRAWN UFE		APPR.		 UFE Incorporated STILLWATER, MN	
DATE 6/99		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JUNK		TITLE	
FRACTIONAL ±1/32		CUSTOMER		FLOATING COUPLER	
2 DEC. ±.010		PART NO.		SCALE	
3 DEC. ±.005		PART NAME		DRWG. NO.	
4 DEC. ±.0003				SHEET OF	
ANGULAR ±1° 0' 00"				SECTION G PG 17	



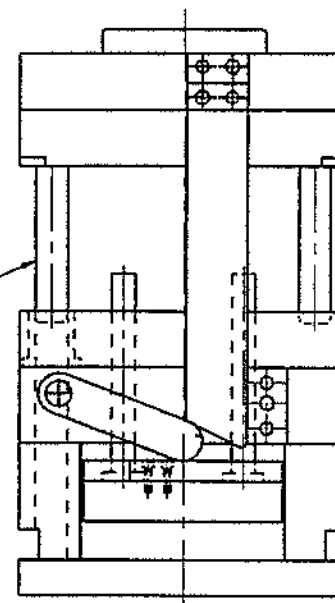
SECTION A-A

STAMP HERE: DO NOT
PRY ON EJECTOR SYSTEM
TO OPEN MOLD

DRAWN	UFE	DATE	6/99	APPR.		ufe UFE Incorporated WE ARE FOR EXCELLENCE STILLWATER, MN
TOLERANCES UNLESS OTHERWISE SPECIFIED:				UFE JPH		
FRACTIONAL	±1/32			CUSTOMER		TITLE
2 PLC. DEC.	±.010			PART NO.		SLIDES WITH PROTECTOR PINS
3 PLC. DEC.	±.005			PART NAME		SCALE
4 PLC. DEC.	±.0002					DRWG. NO.
ANGULAR	±1°0'00"					SHEET
						OF
						SECTION G PG 18

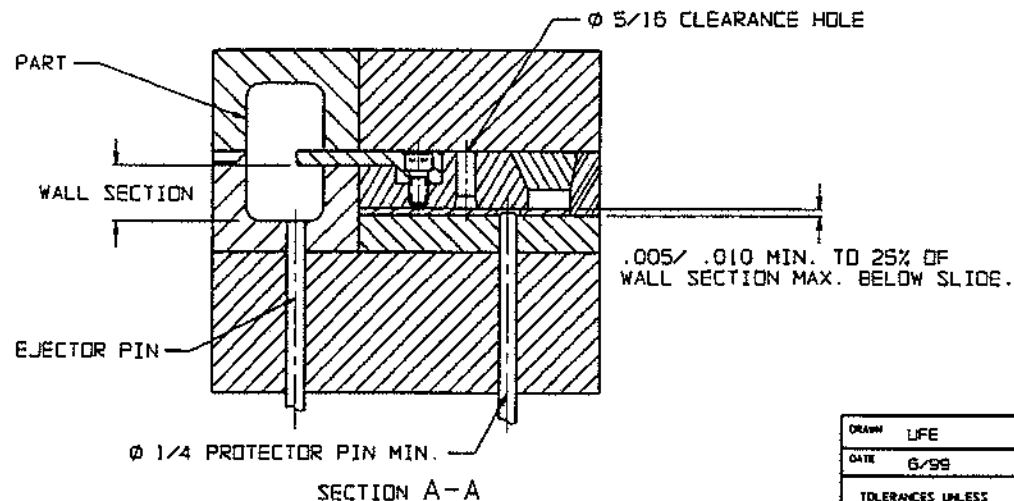


LEADER PINS MUST ENGAGE
BEFORE EARLY RETURN

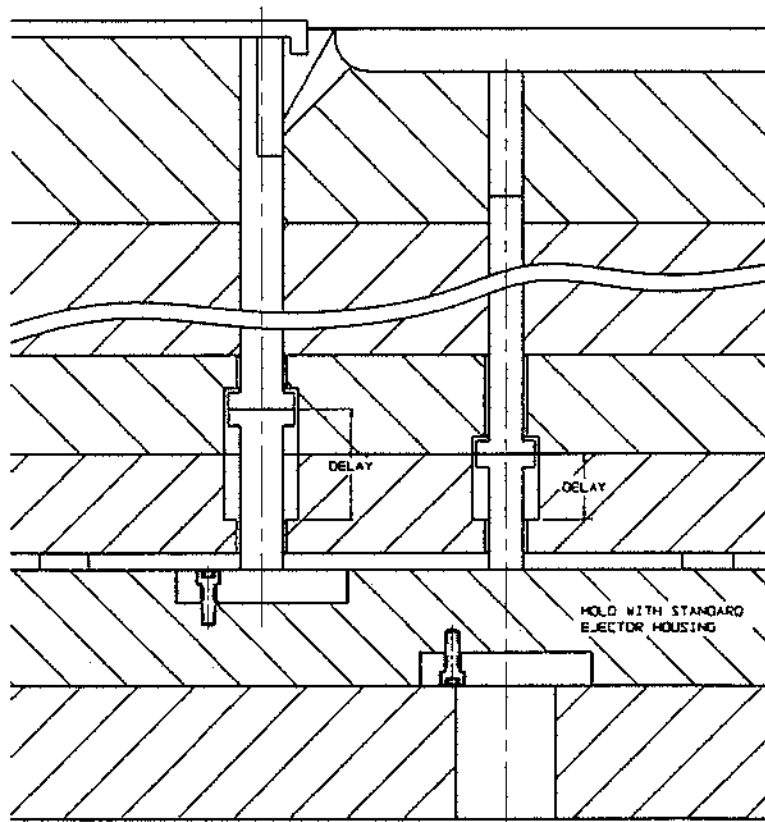


NOTE:

1. UFE PREFERS USING THE TOP MOUNT STYLE
ANY USE OF THE SIDE MOUNT MUST BE
APPROVED BY UFE ENGINEERING DEPT.



DRAWN UFE		DATE		 UFE Incorporated STILLWATER, MN	
DATE 6/99		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JOB		CUSTOMER	
FRACTIONAL 1/32		PART NO.		TITLE	
2 PLC. DEC. ±.010		PART NAME		SLIDES WITH PROTECTOR PINS	
3 PLC. DEC. ±.005		PART NUMBER		SCALE	
4 PLC. DEC. ±.0002				DRAWING NO.	
ANGULAR ±1° 0' 00"				SECTION G PG 19	



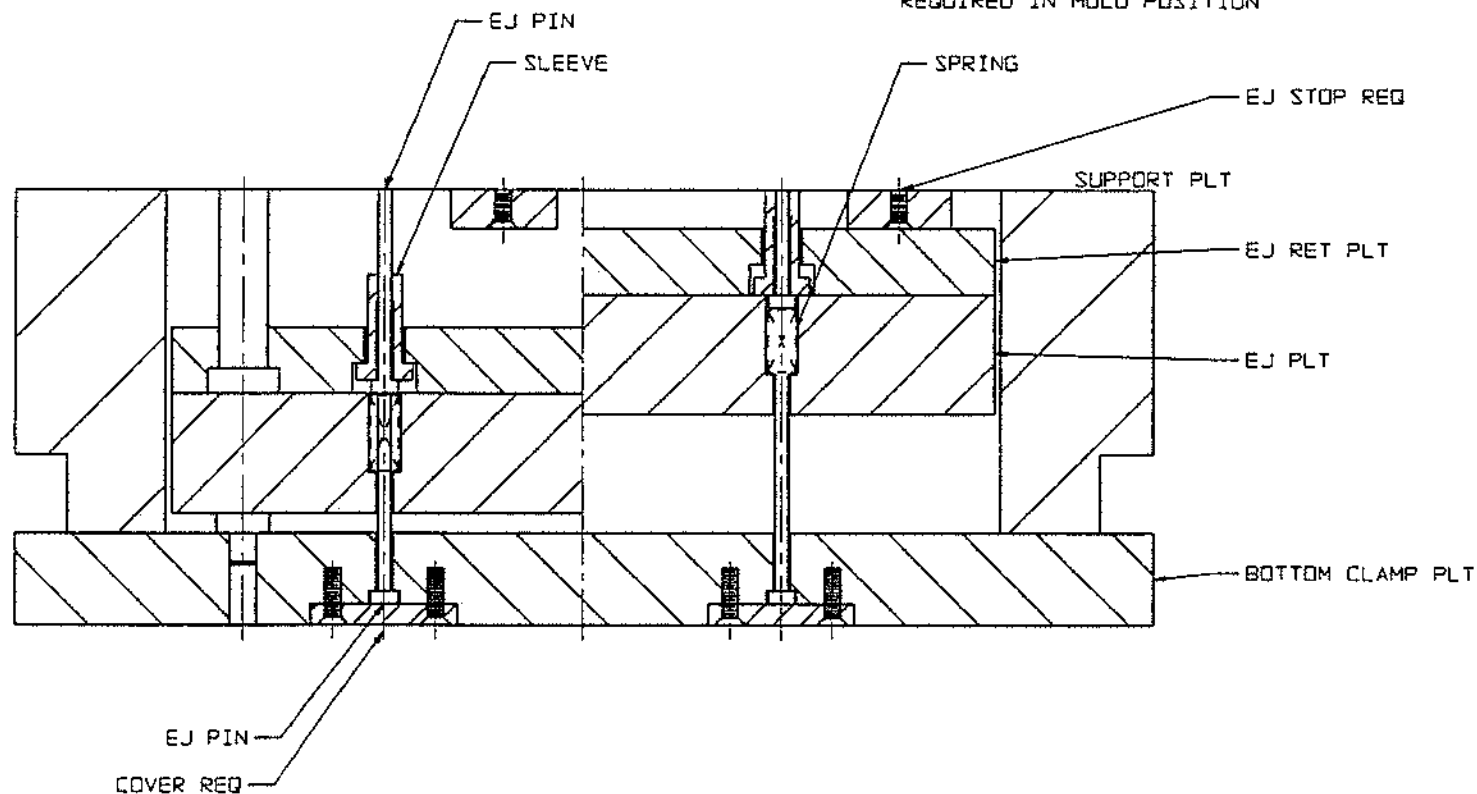
NOTE:

1. ON OCCASION UFE WILL REQUEST DELAYED EJECTORS. IN SOME CASES THEY WILL BE USED TO REMOVE THE RUNNER AND SUBGATE BEFORE EJECTING THE PART. THIS WILL PREVENT DAMAGE TO THE PART AS THE SUBGATE RELEASES FROM THE UNDERCUT. WE MAY ALSO USE THIS TO FIRST MOVE THE RUNNER AND THEN SHEAR THE GATE BEFORE EJECTING THE PART. IT IS ALSO USED WHERE WE WANT TO DUMP THE RUNNER IN ORDER TO PICK THE PARTS AND/OR AUTOMATICALLY LOAD INSERTS INTO THE TOOL. IF MORE DELAY IS NEEDED THE SUPPORT PIN CAN BE EXTENDED AND THE EJECTOR RETAINER PLATE COUNTER BORED TO GET DESIRED TRAVEL.
2. DO NOT LET PIN GO THRU THE BOTTOM CLAMP PLATE, WILL DENT PLATTEN.

DRAWN UFE		DATE		 UFE Incorporated 4670 HWY 100 STILLWATER, MN	
DATE 8/99		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:				TITLE	
FRACTIONAL $\pm 1/32$ 2 PLC. DEC. $\pm .010$ 3 PLC. DEC. $\pm .005$ 4 PLC. DEC. $\pm .002$ ANGULAR $\pm 1^{\circ} 0' 00''$				DELAYED EJECTORS	
CUSTOMER				SCALE	
PART NO.				DRWG. NO.	
PART NAME				SHEET OF	
				SECTION G PG 20	

NOTE:

1. A DEVICE THAT PREVENTS POST GATED PARTS FROM PULLING BACK INTO THE MOLD AS EJ RETRACTS.
2. A DEVICE THAT CAN INSURE PARTS WILL NOT STICK ON EJ SIDE OF MOLD
3. MINIMUM 50 LBS SPRING PRESSURE REQUIRED IN MOLD POSITION



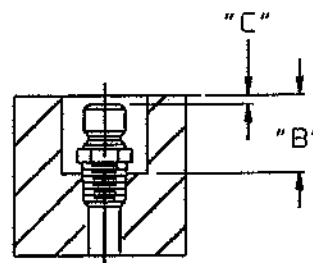
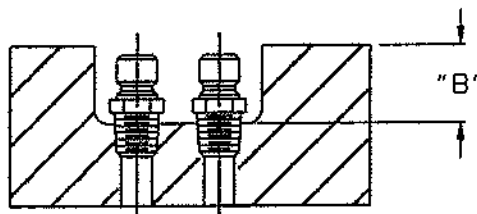
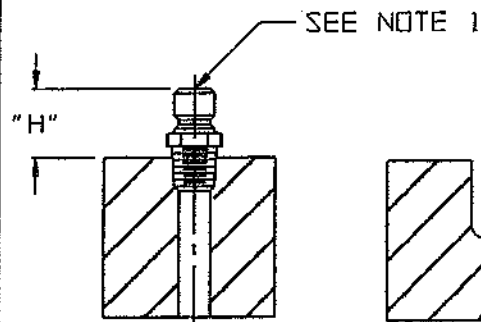
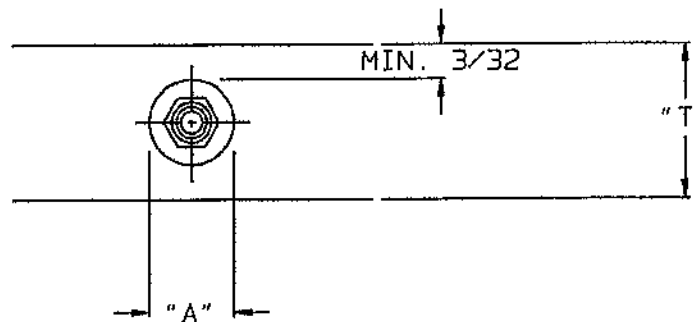
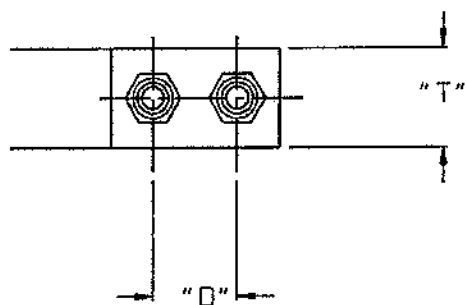
DRAWN LFE		DATE		ufe UFE Incorporated STILLWATER, MN	
DATE 5/99		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		EJ PIN		TITLE	
FRACTIONAL ±1/32		CUSTOMER		EJ PIN TRAVEL	
2 PLC. DEC. ±.010		PART NO.		LIMITER	
3 PLC. DEC. ±.005		PART NAME		SCALE	
4 PLC. DEC. ±.0002				DRWG. NO.	
ANGULAR ±1°0'00"				SHEET OF	
				SECTION G PG 21	

SECTION H – MOLD COOLING/HEATING

<u>Contents</u>	<u>Page</u>
RULES	2
JEFFY-TITE CONNECTOR PLUGS – INSTALLATION OF	3 & 4
1/16 O-RINGS – STOCK LIST & INSTALLATION DIMENSIONS	5
3/32 O-RINGS – STOCK LIST & INSTALLATION DIMENSIONS	6
SUGGESTED CAVITY AND CORE COOLING	7
BUBBLER – STOCK SIZES & INSTALLATION OF	8 & 9 & 10
THERMAL PINS – DIMENSIONS & INSTALLATION	11
OIL HEAT	12 & 13
CARTRIDGE HEATERS	14
THERMOCOUPLE GUIDELINES	15
THERMOCOUPLE INSTALLATION	16

WATER COOLING

- A. UFE Inc. uses jumper hoses on outside of mold:
 - 1. Vendor to supply mold with connector plugs installed in their C' bored holes
 - 2. UFE Inc. supplies all jumper hoses.
- B. Water line inlets or outlets to be:
 - 1. C' bored for Jiffy - Tite connector plugs. (See Section H, pg 3)
 - 2. Each stamped with its own number starting at "0" corner clockwise around each plate. (1 through total number of inlets or outlets in the mold)
 - 3. On molds with water in cores; stamp in and out next to inlet and outlet connection; Core 1,2,etc. Number to correspond to cavity identity.
- C. Blade baffles are to be purchased with threaded end and located in correct position by bottoming or snugging pipe thread in marked position to prevent rotation. Brass only; no plastic baffles permitted.
- D. Braze Jiffy-Tite connector plugs to the pipe nipples when nipples are to be threaded into cavities, forces, or slide blocks. Provide flat or C' bore on cavities, etc., for tapping a full pipe thread or use purchased one piece design Jiffy-Tite connector plugs. Can be purchased from mold component suppliers.(Do not use 1/16" NPT threads)
- E. Remove all drilling and tapping chips from waterline.
- F. New molds should have plugs and connectors installed prior to delivery to UFE Inc.
- G. Use a pipe joint compound on all pipe plugs and fittings.
- H. Vendor must supply any use of non-standard O rings and supply a second set of spare parts.
- I. Avoid installing O-rings in mold plates. If possible, install in a round or smaller cavity.
- J. When using O-rings on core pins or small cavity components, be sure to provide adequate support area equal to, or more than, its actual molding area. This will prevent hobbing into backing plate.
- K. All O-rings should be installed with axial squeeze only. (Sealing occurs along axis or parallel to centerline of I.D. & O.D.)
- L. Test mold at 75 PSI for water leaks.
- M. No water connectors out the topside of the mold unless approved by UFE Inc. Engineer.
- N. No oil fittings in the stripper plate; there is too much motion for the fittings.
- O. All molds must have temperature controls on both sides of parting line.
- P. On molds with closely toleranced bores, each water-cooled core should be on its own separate circuit. This gives better control of the bore size.
- Q. For bubbler sizes and approved methods of installation, see following pages.



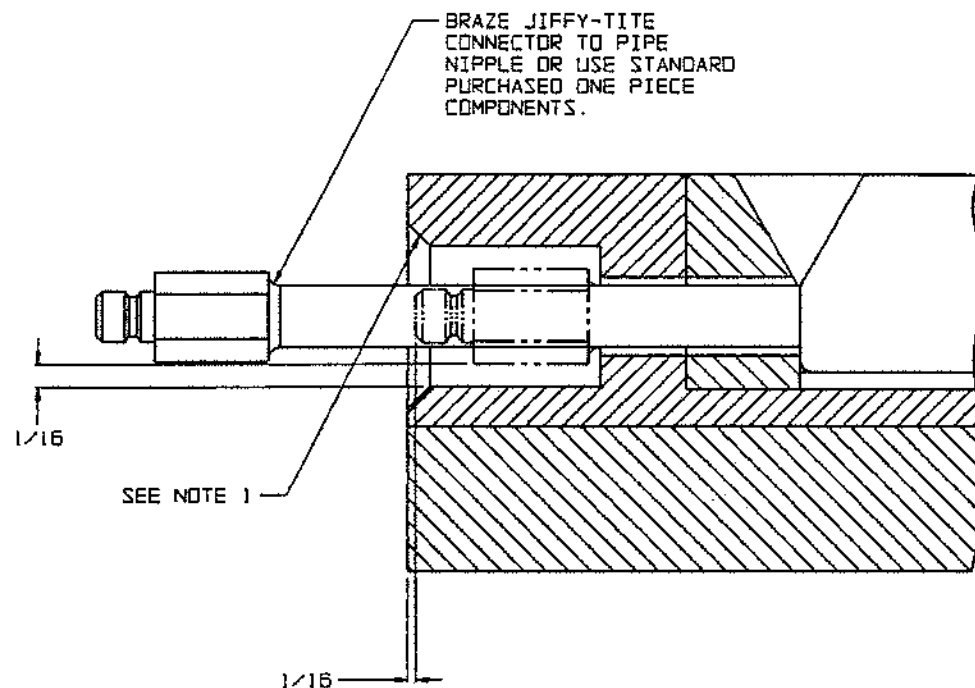
5. PLATE THICKNESS OF 1 3/8, 7/8 PLATE THICKNESS IF O.K. BY UFE ENGINEERING. (NOT IN STRIPPER PLATE)
4. FOR OIL ONLY: DRILL 1.06 APART LEAVING A 1/16 WEB OF STEEL. MILL .87 APART LEAVING NO WEB. AS SHOWN BY DIM "D", "T".
3. REMOVE WEBS OF STEEL THAT ARE 3/32 OR UNDER FROM BREAKING OUT OF PLATE'S SURFACE OR WHEN BREAKING INTO EACH OTHER.
2. REFER TO SEC. N FOR MOLD SET COMPONENTS FOR STOCK SIZES.
1. UFE WILL ACCEPT PLUGS THIS WAY ONLY WHEN THEY ARE PROTECTED BY AN OVERHANGING PLATE. (EX. 3 PLY. MOLDS) OR ON NEWBURY MOLDS, PLANT APPROVED.

REFER TO MANUFACTURES MACHINING SPECIFICATIONS FOR SPECIFIC C'BORE DIAMETER AND DEPTH.

NOTES:

COOLANT	PIPE THREAD	C'BORE DIA. "A"	C'BORE DEPTH "B"	PLUG DEPTH "C"	MIN. CENTER DIST. "D"	PLUG HEIGHT "H"	MIN. PLATE THK. "T"
WATER	1/8 NPT	3/4	5/8	1/16	3/4	5/8	7/8
WATER	1/4 NPT	7/8	3/4	1/16	7/8	7/8	1
WATER	3/8 NPT	1.060	15/16	1/16	1.060	29/32	1 3/8
OIL	1/4 NPT	1.0	1.0	1/16	1.060	1 1/8	NOTE 5

DRAWN UFE		APPR.	
DATE 7/03		DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE 3/18	
FRACTIONAL ±1/32		CUSTOMER	
2 DEC. ±.010		PART NO.	
3 DEC. ±.005		PART NAME	
4 DEC. ±.0002		SCALE	
ANGULAR ±1°0'00"		DRWG. NO.	
		SHEET OF	
		TITLE	
		UFE Incorporated	
		STILLWATER, MN	
		PLUG INSTALLATION	
		SECTION H PG 3	



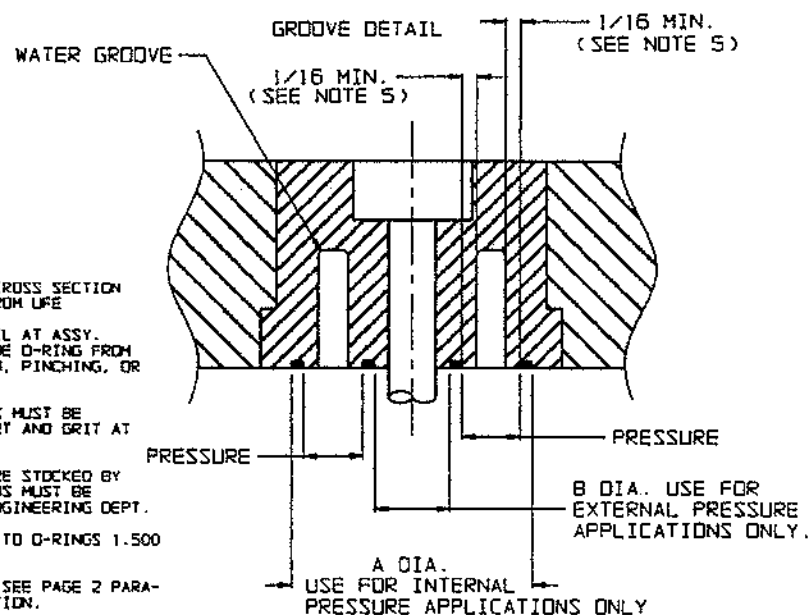
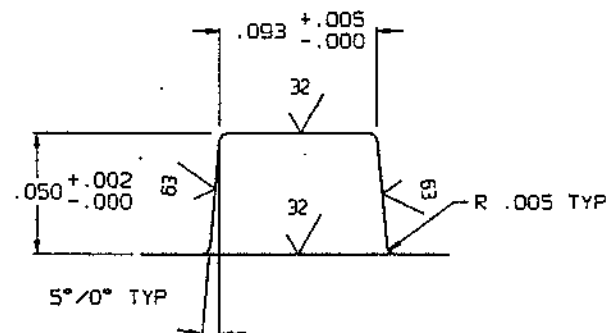
NOTES:

1. 3/16 X 45° CHAMFER TO PREVENT CONNECTOR FROM BREAKING OFF WHEN PIPE BECOMES BENT.
2. WATER FITTING TO BE 1/16 BELOW MOLD BASE OR PROTECTOR BLOCK WHEN CLOSED.

DRAWN UFE		DATE 6/99		DATE 6/99		UFE JPN		CUSTOMER		PART NO.		PART NAME		SCALE		SHEET OF		DRAWING NO.		SECTION H PG 4	
TOLERANCES UNLESS OTHERWISE SPECIFIED:										ufe UFE Incorporated STILLWATER, MN TITLE PLUG INSTALLATION (IN SLIDES)											
FRACTIONAL 1/32																					
2 PLC. DEC. ±.010																					
3 PLC. DEC. ±.005																					
4 PLC. DEC. ±.0002																					
ANGULAR 1/16" 00"																					

COMMON O-RING SIZES

O-RING SIZE	GROOVE DIA'S FOR INTERNAL PRESSURE		GROOVE DIA'S FOR EXTERNAL PRESSURE	
	A DIA +.000	-	B DIA -.000	+
006	.243	.002	.119	.002
007	.274	.002	.150	.002
008	.305	.002	.181	.002
009	.337	.002	.213	.002
010	.369	.002	.244	.002
011	.430	.002	.306	.002
012	.493	.002	.369	.002
013	.555	.002	.431	.002
014	.618	.002	.494	.002
015	.680	.002	.556	.002
016	.743	.002	.619	.002
017	.805	.002	.681	.002
018	.868	.002	.744	.002
019	.929	.002	.807	.002
020	.992	.002	.870	.002
021	1.054	.003	.932	.003
022	1.117	.003	.995	.004
023	1.179	.003	1.057	.005
024	1.242	.003	1.120	.005
025	1.304	.003	1.182	.006
026	1.367	.003	1.245	.006
027	1.429	.003	1.307	.007
028	1.492	.003	1.370	.008
029	1.613	.003	1.499	.005
030	1.738	.003	1.624	.006
031	1.863	.003	1.749	.007
032	1.988	.004	1.874	.009
033	2.113	.005	1.999	.010
034	2.238	.007	2.124	.011
035	2.363	.008	2.249	.012
036	2.488	.009	2.374	.014
037	2.613	.010	2.499	.015
038	2.738	.012	2.624	.016
039	2.858	.008	2.754	.012
040	2.983	.009	2.879	.014



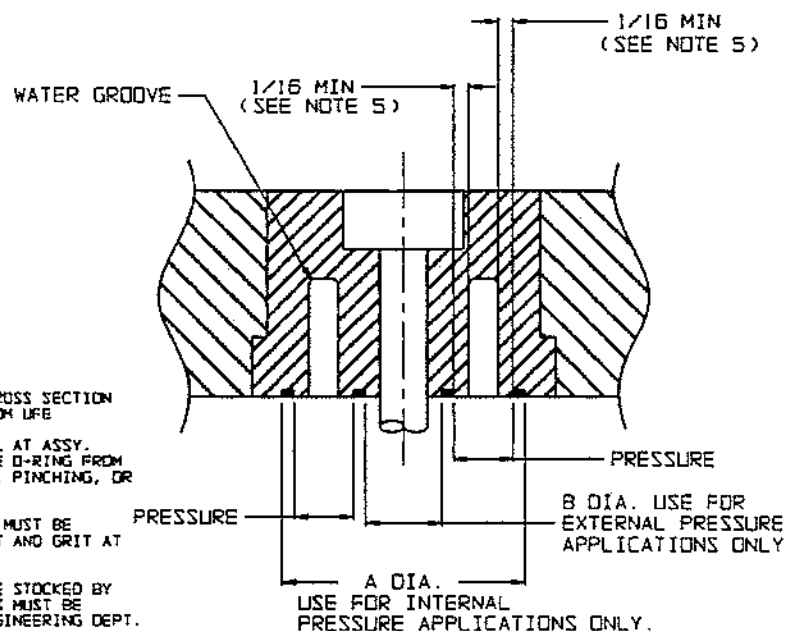
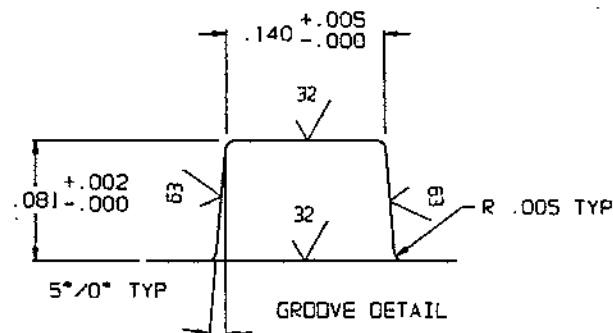
NOTES:

1. USE 1/16 NOMINAL CROSS SECTION O-RINGS. OBTAIN FROM LIFE.
2. USE A GREASE OR OIL AT ASSY. TO HELP PROTECT THE O-RING FROM DAMAGE BY ABRASION, PINCHING, OR CUTTING.
3. ALL O-RING GROOVES MUST BE FREE OF CHIPS, DIRT AND GRIT AT ASSY.
4. ALL SHOWN SIZES ARE STOCKED BY LIFE. ANY DEVIATIONS MUST BE APPROVED BY LIFE ENGINEERING DEPT.
5. 1/16 MIN. APPLIES TO O-RINGS 1.500 DIA. AND LARGER.
6. PLATING REQUIRED. SEE PAGE 2 PARAGRAPH K, THIS SECTION.
7. 3/4 O.D. SIZE O-RINGS AND LARGER.

DATE	DATE	ufe UFE Incorporated 6470 FM 1970 RD STILLWATER, MN
DATE	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:	UFE JPN	TITLE
FRACTIONAL ±1/32	CUSTOMER	1/16 O-RING GROOVE
2 PLC. DEC. ±.010	PART NO.	SCALE
3 PLC. DEC. ±.005	PART NAME	DRWG. NO.
4 PLC. DEC. ±.002		SHEET OF
ANGULAR ±1°/00'		SECTION H PG 5

COMMON O-RING SIZES

O-RING SIZE	GROOVE DIA.'S FOR INTERNAL PRESSURE		GROOVE DIA.'S FOR EXTERNAL PRESSURE	
	A DIA +.000	-	B DIA -.000	+
133	1.989	.004	1.809	.008
134	2.052	.005	1.872	.009
135	2.115	.005	1.935	.009
136	2.177	.006	1.997	.010
137	2.240	.007	2.060	.010
138	2.302	.007	2.122	.011
139	2.365	.008	2.185	.012
140	2.427	.008	2.247	.012
141	2.490	.009	2.310	.013
142	2.552	.010	2.372	.014
143	2.615	.010	2.435	.014
144	2.677	.011	2.497	.015
145	2.740	.012	2.560	.016
146	2.802	.012	2.622	.016
147	2.860	.008	2.690	.012
148	2.922	.008	2.752	.012
149	2.985	.009	2.815	.013
150	3.047	.010	2.877	.014
151	3.172	.011	3.002	.015
152	3.422	.013	3.252	.017
153	3.672	.016	3.502	.020
154	3.922	.018	3.752	.022
155	4.172	.021	4.002	.025
156	4.422	.023	4.252	.027
157	4.672	.026	4.502	.030
158	4.922	.028	4.752	.032
159	5.172	.031	5.002	.035
160	5.414	.025	5.260	.029
161	5.664	.028	5.510	.032
162	5.914	.030	5.760	.034
163	6.164	.033	6.010	.037
164	6.414	.035	6.260	.039
165	6.664	.038	6.510	.042

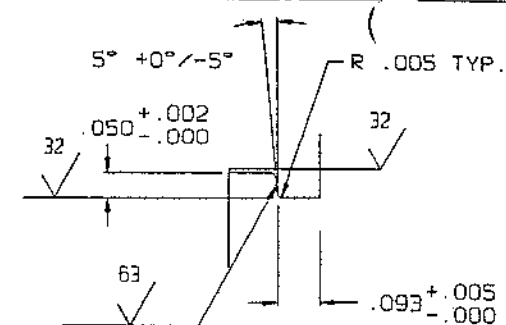


NOTES:

1. USE 3/32 NOMINAL CROSS SECTION O-RINGS. OBTAIN FROM UFE
2. USE A GREASE OR OIL AT ASSY. TO HELP PROTECT THE O-RING FROM DAMAGE BY ABRASION, PINCHING, OR CUTTING.
3. ALL O-RING GROOVES MUST BE FREE OF CHIPS, DIRT AND GRIT AT ASSY.
4. ALL SHOWN SIZES ARE STOCKED BY UFE. ANY DEVIATIONS MUST BE APPROVED BY UFE ENGINEERING DEPT.
5. PLATING REQUIRED. SEE PAGE 2 PARAGRAPH K, THIS SECTION.
6. 3/4 O.D. SIZE O-RINGS AND LARGER.

DRAWN: UFE DATE: 6/99 TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL: ±1/32 2 P.L.C. DEC.: ±.010 3 P.L.C. DEC.: ±.005 4 P.L.C. DEC.: ±.002 ANGULAR: ±1°/00'	APPR.: DATE: UFE JPN CUSTOMER: PART NO.: PART NAME:	ufe UFE Incorporated 10000 100 000000 STILLWATER, MN TITLE: 3/32 O-RING GROOVE SCALE: SHEET: OF:
		ORG. NO.: SECTION H PG 6

WATER LINE



DETAIL A
GROOVE FOR 1/16 NOMINAL O-RING
SCALE 10 : 1

P/L

SEE DETAIL A

SEE NOTE 1

BRASS BAFFLE
NO PLASTIC BAFFLES

NOTES:

1. NICKLE PLATE ALL MOLD PLATE HOLES & SURFACES WHICH CONTACT WATER.
2. 3/4 O.D. SIZE O-RINGS & LARGER.

DRAWN LIFE		APPROVED		ufe [®] UFE Incorporated UNITED FOR EXCELLENCE STILLWATER, MN
DATE 6/99		DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		LIFE DYN		TITLE
FRACTIONAL ±1/32		CUSTOMER		SUGGESTED CAVITY COOLING
2 PLC. DEC. ±.010		PART NO.		SCALE
3 PLC. DEC. ±.005		PART NAME		DRWG. NO.
4 PLC. DEC. ±.0002				SHEET
ANGULAR ±1°0'00"				OF
				SECTION H PG 7

RUN TUBING TO DRILL POINT TO
KEEP BUBBLER FROM TIPPING
AND NOTCH AS SHOWN.

FOR PROPER BUBBLER SIZES,
SEE FOLLOWING PAGE.

WATER LINE OUT

WATER LINE IN

NOTES:

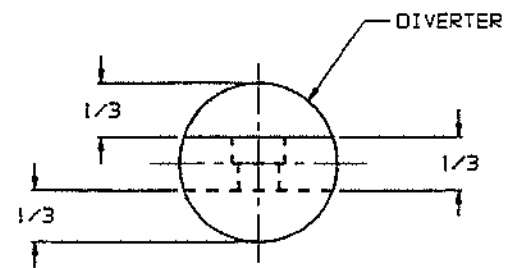
1. NICKLE PLATE ALL MOLD PLATE
HOLES & SURFACES WHICH CONTACT
WATER.
2. 3/4 D.D. SIZE D-RINGS & LARGER.

P/L

BUBBLER MAT'L TO BE STAINLESS
STEEL SEAMLESS TUBING.

SLIP FIT

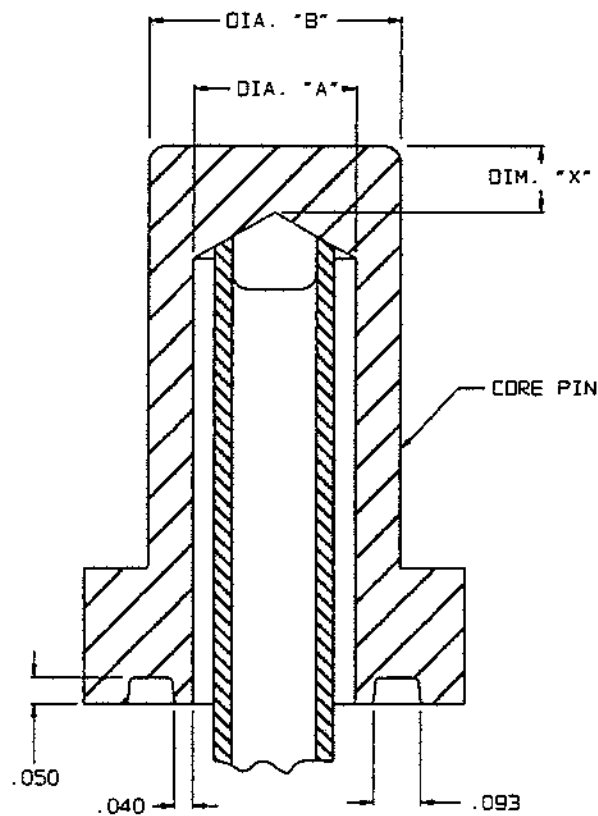
DRAWN UFE		DATE		ufe [®] UFE Incorporated UNITED FOR TOLERANCE STILLWATER, MN
DATE 6/99		DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JPN		TITLE
FRACTIONAL ±1/32		CUSTOMER		BUBBLER-INSTALL.
2 PLC. DEC. ±.010		PART NO.		SCALE
3 PLC. DEC. ±.005		PART NAME		DRWG. NO.
4 PLC. DEC. ±.0002				SHEET OF
ANGULAR ±1° 0' 00"				SECTION H PG 8



NOTES:

1. WATERLINE 11/32 USE BUBBLER NO. 050120-050200
2. WATERLINE 7/16 USE BUBBLER NO. 050200-050230
3. USE BRASS FOR THE DIVERTER
4. DIVERTER TO BE MILLED AS SHOWN IN DETAIL A

DRAWN UFE		DATE		 UFE Incorporated STILLWATER, MN	
DATE 6/99		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JOB		TITLE	
		CUSTOMER		ONE LINE BUBBLER	
FRACTIONAL 1/16		PART NO.		SCALE	
2 DEC. 0.010				DWG. NO.	
3 DEC. 0.005				SHEET OF	
4 DEC. 0.0002				SECTION 4 PG 9	
ANGULAR 1/1000		PART NAME			



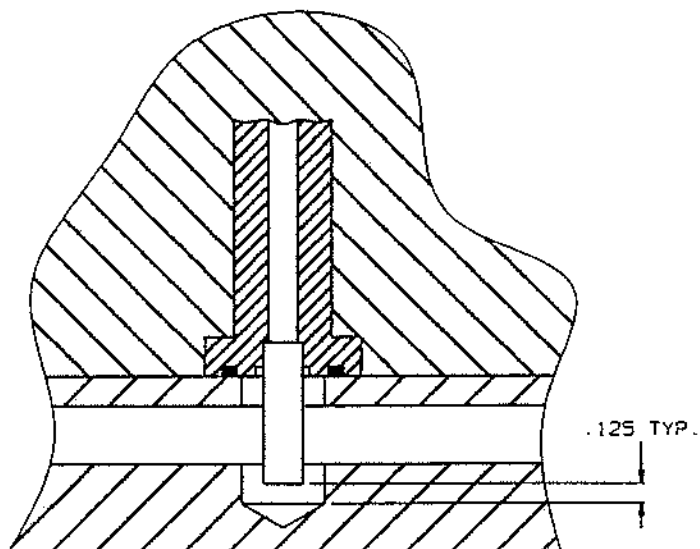
BUBBLER DETAIL

TUBING NO.	TUBING OD - ID	DRILL SIZE	DIA "A" MAX	DIA "B" MIN	DIM "X" MIN	AREA ₂ ID (IN ²)	D-RING NUMBER
050120	.032 .020	63	.037	.100	.045	.0003	008
050170	.065 .047	47	.079	.139	.045	.0017	010
050190	.083 .063	38	.102	.162	.062	.0031	010
050200	.095 .071	32	.116	.176	.052	.0040	011
050210	.109 .085	29	.136	.196	.062	.0057	011
050230	.134 .106	18	.169	.229	.062	.0088	011
050260	.180 .150	1	.228	.288	.062	.0177	012
050670	.250 .194	5/16	.312	.412	.093	.0296	014
051130	.375 .245	7/16	.438	.538	.093	.0471	015
051360	.500 .370	39/64	.609	.709	.093	.1075	018
051570	.625 .495	25/32	.781	1.000	.125	.1924	021

NOTES:

1. MAT'L TO BE STAINLESS STEEL TUBING.
2. ALL SHOWN SIZES ARE STOCKED BY U.F.E. ANY DEVIATIONS MUST BE APPROVED BY U.F.E. ENGINEERING DEPT.
3. NICKLE PLATE ALL HOLD PLATE HOLES AND SURFACES WHICH CONTACT WATER.
4. THE D-RING GIVEN IS ALLOWING A RIB OF MAT'L BETWEEN THE I.D. OF THE D-RING, O.D. OF DIA. "A".

Drawn LFE		DATE 6/99		 UFE Incorporated UNITED FINE ENGINEERING	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		CUSTOMER		TITLE	
FRACTIONAL 1/32		PART NO.		SCALE	
2 PLC. DEC. 1.010		PART NAME		DRWG. NO.	
3 PLC. DEC. 1.005				SECTION H PG 10	
4 PLC. DEC. 1.0002					
ANGULAR ±1° 0' 00"					

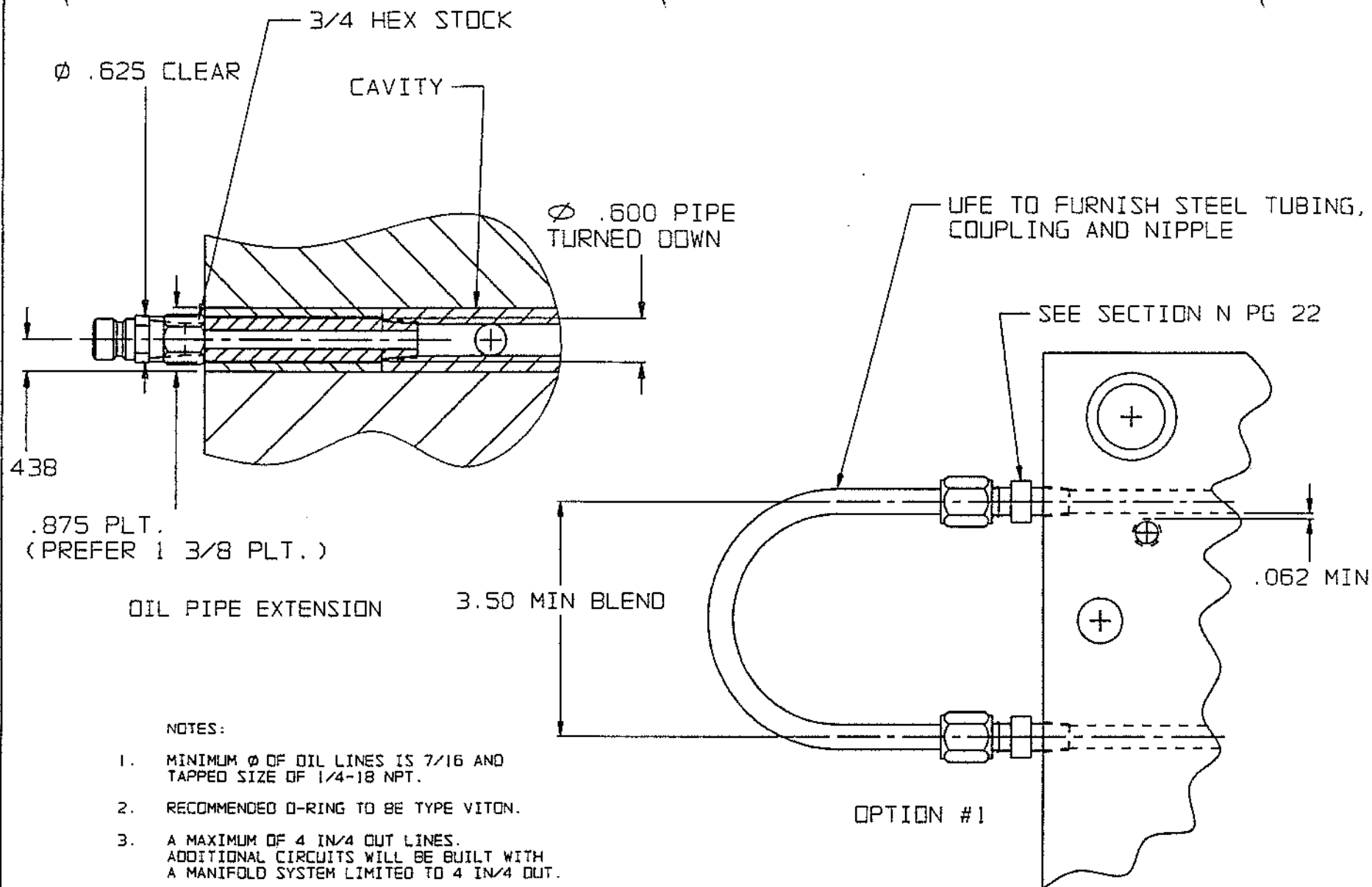


THERMAL PIN INSTALLATION

NOTES:

1. CORE PIN TO BE FREE OF DIRT, CHIPS, AND SHARP EDGES.
2. SEE RECOMMENDED APPLICATIONS BROCHURE AVAILABLE FROM OUR DISTRIBUTER.
3. THERMAL PINS ARE EXPENSIVE, CARE SHOULD BE TAKEN NOT TO JAR OR PUNCTURE END CAP WHEN INSTALLING OR REMOVING THERMAL PINS.

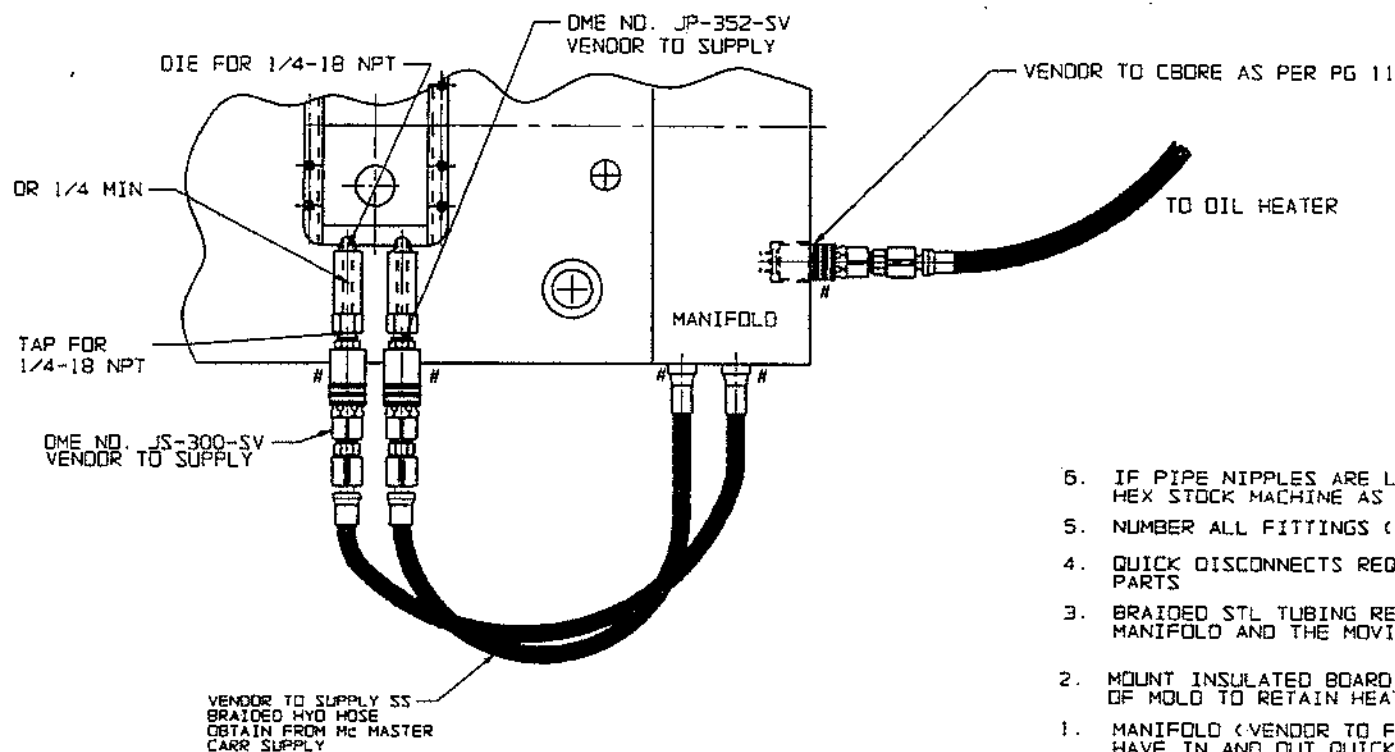
DRAWN UFE		APPROVED		 UFE Incorporated OFFICE FOR EXCHANGE STILLWATER, MN	
DATE 8/99		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE CHK		TITLE	
FRACTIONAL 1/32		CUSTOMER		THERMAL PINS	
2 PLC. DEC. ±.010		PART NO.		SCALE	
3 PLC. DEC. ±.005		PART NAME		SHEET OF	
4 PLC. DEC. ±.0002				DWG. NO.	
ANGULAR ±1° 0' 00"				SECTION H PG 11	



NOTES:

1. MINIMUM Ø OF OIL LINES IS 7/16 AND TAPPED SIZE OF 1/4-18 NPT.
2. RECOMMENDED O-RING TO BE TYPE VITON.
3. A MAXIMUM OF 4 IN/4 OUT LINES. ADDITIONAL CIRCUITS WILL BE BUILT WITH A MANIFOLD SYSTEM LIMITED TO 4 IN/4 OUT.
4. OIL CIRCUITS TO BE LOOPEO INTERNALLY IF POSSIBLE OR OPT. #1.
5. OIL CIRCUITS TO BE COUPLED OPPOSITE SIDE OF OPERATOR.

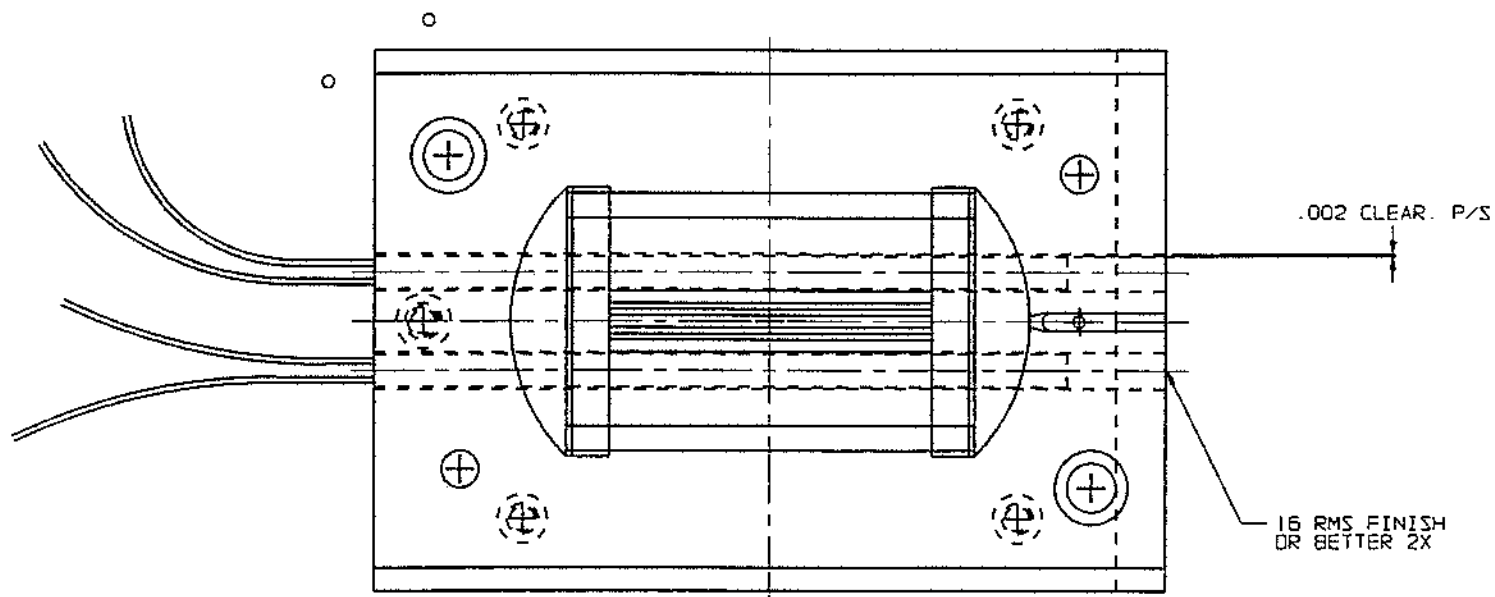
DRAWN UFE		APPV.		ufe UFE Incorporated UNITED FOR EXCELLENCE STILLWATER, MN	
DATE 6/99		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JOB		TITLE	
FRACTIONAL 1/32		CUSTOMER		OIL HEAT	
2 PLC. DEC. ±.010		PART NO.		SCALE	
3 PLC. DEC. ±.005		PART NAME		DRWG. NO.	
4 PLC. DEC. ±.0002				SECTION H PG 12	
ANGULAR ±1°0'00"				SHEET OF	



6. IF PIPE NIPPLES ARE LONG USE MIN 3/4 HEX STOCK MACHINE AS SHOWN
5. NUMBER ALL FITTINGS (#)
4. QUICK DISCONNECTS REQ ON THE MOVING PARTS
3. BRAIDED STL TUBING REQ BETWEEN THE MANIFOLD AND THE MOVING PARTS
2. MOUNT INSULATED BOARD ON TOP OF MOLO TO RETAIN HEAT
1. MANIFOLD (VENDOR TO FURNISH) IS TO HAVE IN AND OUT QUICK DISCONNECT

NOTES:

DRAWN LFE		DATE 8/99		DATE 8/99		ufe LIFE Incorporated OPEN FOR EXCHANGE STILLWATER, MN	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		DATE 8/99		DATE 8/99			
FRACTIONAL $\pm 1/32$		DATE 8/99		DATE 8/99		TITLE OIL HEAT	
2 PLC. DEC. $\pm .010$		DATE 8/99		DATE 8/99		SCALE	
3 PLC. DEC. $\pm .005$		DATE 8/99		DATE 8/99		DRAWING NO.	
4 PLC. DEC. $\pm .0002$		DATE 8/99		DATE 8/99		SHEET OF	
ANGULAR $\pm 1^{\circ} 00'$		DATE 8/99		DATE 8/99		SECTION H PG 13	



3. DR AND REAM THRU HOLE FOR CARTRIDGE HEATER
2. CARTRIDGE HEATER LENGTH TO EXTEND BEYOND THE PART
1. MUD BASES WILL HAVE CARTRIDGE HEATERS

NOTES:

DRAWN: LIFE		DATE: E/99		 UFE Incorporated STILLWATER, MN	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		DATE: E/99		TITLE: CARTRIDGE HEATERS	
FRACTIONAL: ±1/32		LIFE: JPN		SCALE: OF	
2 PLC. DEC. ±.010		CUSTOMER:		DRAWING NO. SECTION H PG 14	
3 PLC. DEC. ±.005		PART NO.:			
4 PLC. DEC. ±.0002		PART NAME:			
ANGULAR: ±1°0'00"					

GUIDELINES FOR THE INSTALLATION OF THERMOCOUPLES IN UFE INCORPORATED TOOLING

1. Use only UFE Incorporated approved connections and hardware.

A. Connector PCS #JF-2 type "J" female

- B. Gordon # J20-1-304 or J20-1-507 with extruded F.E.P.
Insulation thermocouples wire should be used only inside the tool where wire is confined to a slot and connector attached to mold plate. White = Positive Red = negative

NOTE: Wire must not be exposed to movement (see page 16)

- C. Gordon #J20-1-S-304 thermocouple wire to be used only when wire extends beyond mold base plates.

NOTE: This wire contains stainless steel overbraid for abrasion resistance for prototype only.

- D. S.P.C. #CRS-TO-1810 HT high temperature ring to be crimped on the end of the thermocouple wire.

NOTE: Ample stock of the above items will be maintained at the Stillwater Tool Crib and provided to UFE Incorporated vendors.

2. Thermocouple wire should be attached directly behind the cavity on a support plate: i.e., cavity block, insert, etc. Reason: to develop a repeatable temperature reading that could be influenced by a change in the process. It is not to measure the actual cavity temperature.

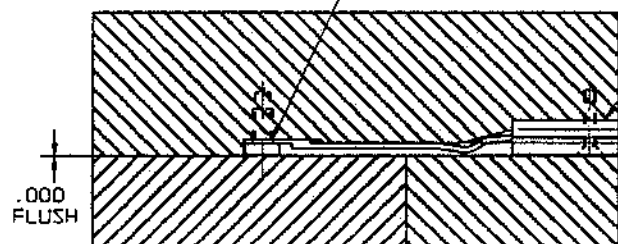
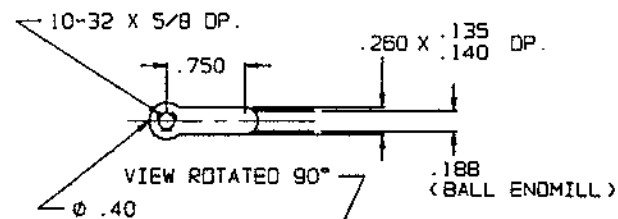
3. **ALL** UFE Incorporated production tools must contain two thermocouples. One on each half of the mold.

4. Thermocouple connectors should be installed:

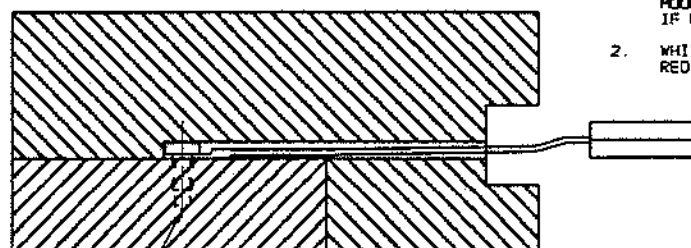
First choice - operator side of tool, sprue side preferred (check location of clamps when placing thermocouple in clamp slot area).

Second choice – Top of tool.

5. Hot oil tooling will contain two thermocouples one on each side of parting line.
6. Installations will consist of attaching the female connector in a recess so that nothing protrudes beyond the edge of the mold base plates (see page 16 Example A).

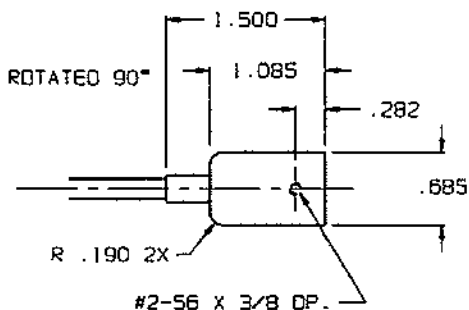


EXAMPLE A
PRODUCTION MOLD



#10-32 LOW HEAD
EXAMPLE B
(THIS STYLE TO BE USED
ON PROTOTYPE MOLDS ONLY)

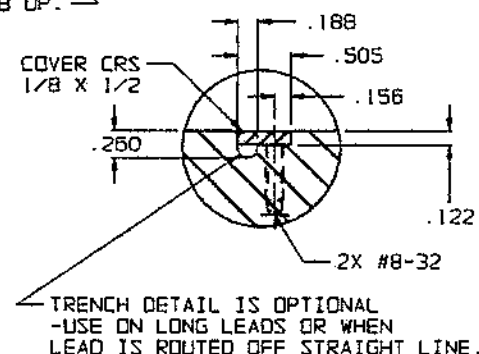
VIEW ROTATED 90°



.340
.250 -15°
.125
(USE 3/16 BALL END MILL)

NOTES:

1. THERMOCOUPLE CONNECTOR SHOULD BE MOUNTED IN SAME COMPONENT AS LEAD IF POSSIBLE.
2. WHITE WIRE IS (+) POSITIVE LEAD
RED WIRE IS (-) NEGATIVE LEAD.



DRAWN	UFE	DATE	6/99	DATE		ufe UFE Incorporated STILLWATER, MN
TOLERANCES UNLESS OTHERWISE SPECIFIED:		CUSTOMER		DATE		
FRACTIONAL	±1/32	PART NO.		TITLE	THERMOCOUPLE INSTALLATIONS	
2 PLC. DEC.	±.010	PART NAME		SCALE	OF	
3 PLC. DEC.	±.005			DRWG. NO.	SECTION H PG 16	
4 PLC. DEC.	±.0002					
ANGULAR	±1° 0' 00"					

SECTION I-AIR & HYDRAULIC CYLINDERS

<u>Contents</u>	<u>Page</u>
AIR AND HYDRAULIC CYLINDERS	1
CYCLES I, II	2
CYCLES III, IV	3
SIDE CORE SEQUENCE	4-4B
SIDE CORE WITH HYD CYL	5, 5A

AIR & HYDRAULIC CYLINDERS

- A. To prevent unscrewing of male and female rod end couplers on cylinder, lock them positively with either a set screw or a jam nut. With set screw, flat must be ground on threaded rod to prevent damaging threads. (Pages 5 and 5a this section)
- B. Provide for limit switch mounting on molds. Use two limit switches per cylinder; one for "In" position and one for "Out" position. See the following cycles (pg. 2 through 4b this section) and Section N, pg. 12, Standard Mold Set Components, for detailed drawing of limit switches.(UFE Inc. to supply switches)
- C. All molds with gear racks are to unscrew by pushing into the mold and to reset (rescrew) by pulling out of the mold. To prevent hitting the gear rack on the gate or the bottom of the press, check these dimensions for centerline of press to gate and bottom dimension. See Section M, Press Data.
- D. On molds with two cylinders on opposite sides of mold, a slot must be provided on the top side of the mold 1/2" x 1/2" to run wires from limit switches.
- E. When air or hydraulic cylinders are added to a mold, they must be tied into the molding press. Over the years, UFE Inc. has installed programmable controllers over sequence-type timers. Because these units are not unlimited, some basic programs or "Sequences of Operations" had to be written. These specific sequences are typical on all UFE Inc. presses and must be adhered to. If you can not match the requirements of your mold, then you must advise UFE Inc. Engineering and receive approval before proceeding.

We designate these sequences by cycle "number" and note "letter" which are described in the following pages.

Unless specified** all hydraulic and air cylinders to be purchased by vendor, being approved by UFE Inc. Engineering.

a. Data Required:

Quantity, model, bore, stroke, air, hyd., mtg., style and rod end style.

b. Cushion:

1 - Less than 2" stroke, not required

2 - 2" and longer stroke, both ends required.

- F. All molds with movable components (racks, etc.) mounted outside of the mold must be completely enclosed for operator safety.
- G. Limit switches to be of mechanical nature as shown on internal mechanical switch. No proximity switches!
- H. To aid in the actual calculation of the holding capacity or working force of the cylinder, here are the specification of UFE's presses:
 - a. All presses have air supplied to them that can be varied from 0-90 p.s.i.
 - b. Size 2 & 3 - Van Dorn presses have hydraulic pressure of 300 - 1850 p.s.i.
 - c. For data on Sumitomo, Demag, and True Blood molding presses; contact UFE Inc. Project Engineering Manager.
- I. Molds with cylinders on the bottom must have pillars or rails so that the mold can be set down on that end without damaging tool or cylinder.
- J. Molds with cylinders on top must have eyebolts so that the mold can be lowered into the press.

AIR & HYDRAULIC CYLINDERS

Standard UFE Cycles

CYCLE I

Use on a slide-type mold. Can have lock blocks but can't have ejector pins under the slide.

1. Close gate (If ejector, sorter, and wiper checked).
2. Ejectors returned.
3. Set-A-Core.
4. Clamp die and continue cycle.
5. Die opens.
6. Pull core.
7. Eject forward.
8. Recycle.

CYCLE II

Use on a slide-type mold that usually attached to the ejector system (ride with it). Can have a lock block but can't have ejector pins under the slide.

1. Close gate.
2. Set core.
3. Ejectors return.
4. Close die and continue standard cycle.
5. Open full.
6. Eject forward.
7. Pull core.
8. Recycle.

AIR & HYDRAULIC CYLINDERS

Standard UFE Cycles

CYCLE III

Use on a slide-type mold. Can have ejector pins under the slide but must be coupled to the return and can't have a lock block

1. Close gate.
2. Ejector returned.
3. If core is out and ejectors are returned (Die closes).
4. Clamp die.
5. Set core.
6. Inject and continue cycle.
7. Pull core.
8. Die open full.
9. Eject forward.
10. Recycle.

CYCLE IV

Unscrewing type mold where the threaded core, etc. is located on the sprue or ejector side and is fixed axial, with the parting line or stripper plate being cammed open, or forwarded, to allow for the lead advancement.

A. Press Closing

1. Close gate
2. Eject return (optional couple)
3. Set core or rescrew (retract cylinder)
4. Die closes

B. Continue Standard Cycle

5. Mold part

C. Press Opening

6. Die opens off of die closed L.S. and stops (adjustable from O-full)
7. Pull core or unscrew (advance cylinder)
8. Die opens full
9. Eject ahead
10. Open gate

NOTE: Additional cycles are available in machines with 5 T.I. control. See side core cycle flowchart (Page 4 – 4B this section).

SIDE CORE SEQUENCE
FOR 3 OZ. MACHINE & UP

[illegible]

SIDE CORE SEQUENCES

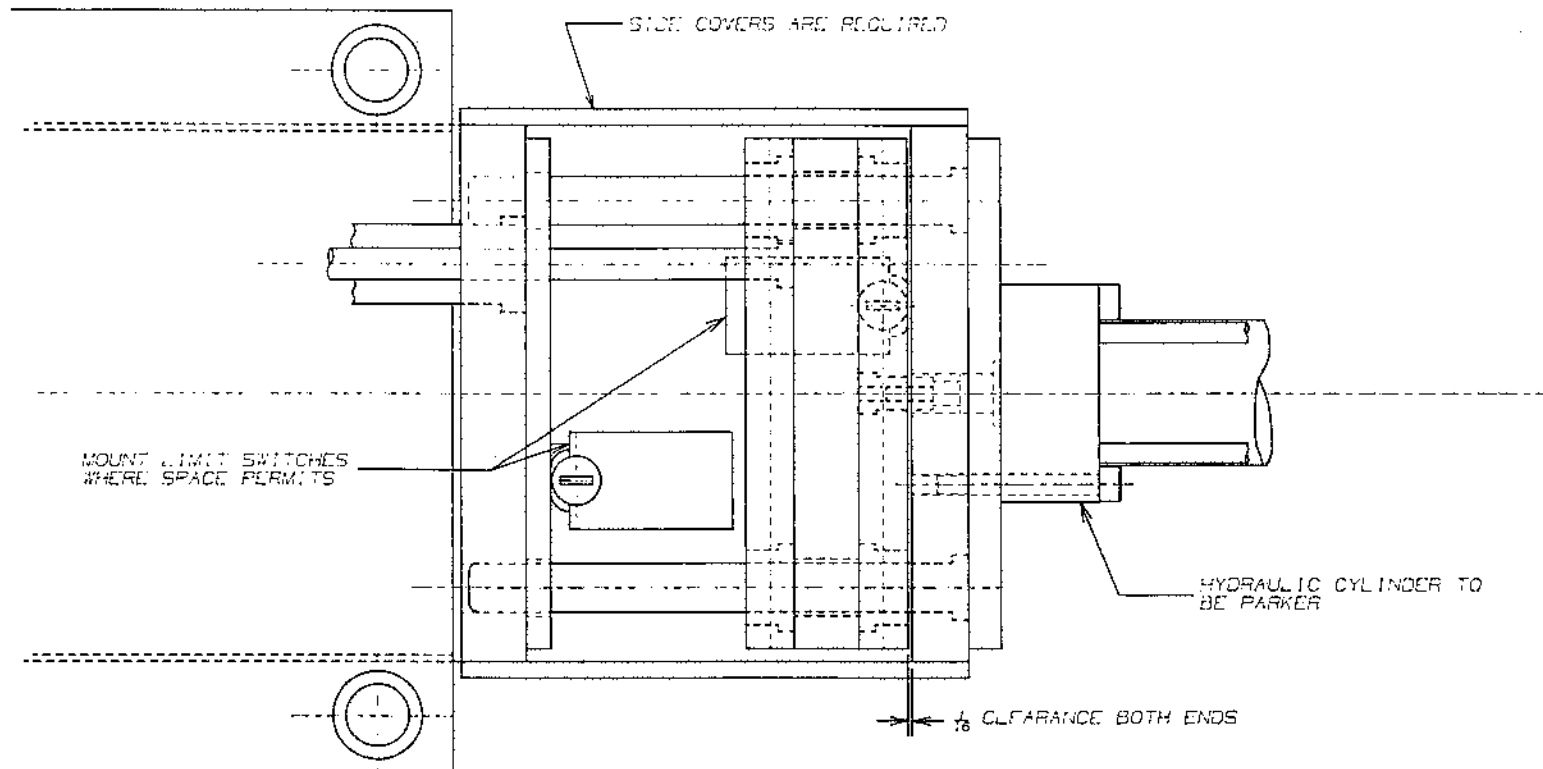
Side Core Cycle Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
Inj. Timer Times Out										X					X		X	X	X	X	X	X	X	X									X		
Clamp Timer Times Out				X							X		X				X	X	X		X	X	X	X									X		
Open Off Die Close LS							X	X								X			X															X	
Open Off L.P.C.						X																													
Open Full		X										X		X			X				X	X		X											
Pull A Core		X		X			X			X		X			X	X	X	X			X	X	X	X										X	
Rotate A Core Out											X			X																					
Check A Core Out		X		X			X			X	X	X		X		X	X	X			X	X		X										X	
De-Energize A Core Out											X																								
Pull B Core								X								X								X											
Rotate B Core Out														X						X															
Check B Core Out							X							X		X				X					X										
De-Energize B Core Out														X						X															
Manual Loader Out										X					X																				
Manual Loader In										X					X																				
Open Full			X	X		X	X		X		X				X	X		X	X	X			X											X	
Eject Forward		X	X	X			X				X			X		X				X	X		X	X										X	
B Core Out (Air Eject Fwd)																	X		X																
Check B Core Out																	X							X											
Eject Return		X		X			X				X		X	X		X				X	X		X	X										X	
B Core In (Air Eject Rtn)																	X																		
Check B Core In																	X																		
Check Eject Return		X											X																						X
Open Off Die Close LS													X																						
Set A Core		X					X					X											X											X	

SIDE CORE SEQUENCES

Side Core Cycle Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
Check A Core In		X										X											X											X	
Eject Forward												X																						X	
Wiper Down - Then Up												X					X																		
Pull A Core			X					X				X		X			X				X														
Check A Core Out			X					X	X				X							X															
Pull B Core															X					X															
Check B Core															X				X																
Open Full								X		X			X		X			X																	
Eject Forward								X	X																										
Wiper Down - Then Up													X																						
Set A Core			X							X			X		X		X																		
Check A Core In			X							X			X				X																		
Eject Return			X						X	X		X																							
Set B Core									X	X		X							X	X															
Check B In																			X					X											
Recycle		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

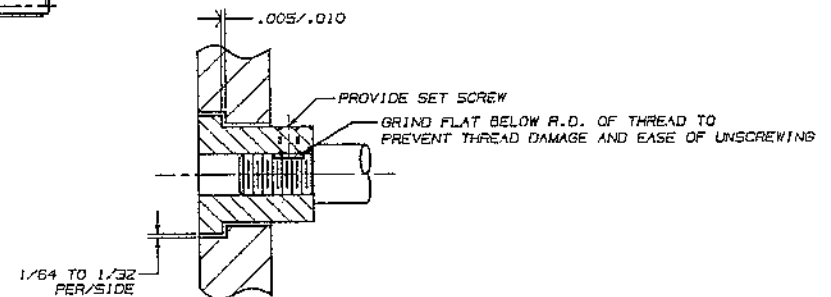
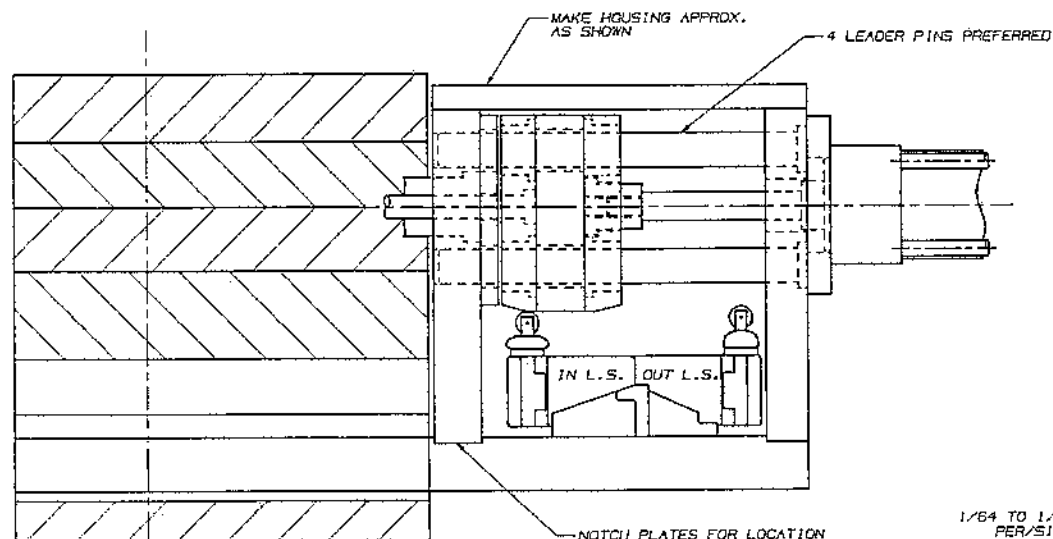
CYCLES

- | | | |
|-----|--------------------------|---------------|
| 1. | 12. | 20. |
| 2. | Coke Lab & Briggs | Digital Hinge |
| 3. | (Telecoping Cores) | 21. |
| 4. | 13. | I.B.M. Helix |
| 5. | Honeywell Case | (R.F.) |
| 6. | (Two Motors) | 22. |
| 7. | 14. | 3M Mixer |
| 8. | Delta Stem | 23. |
| 9. | (Manual Loader In & Out) | 24. |
| 10. | 15. | 25. |
| 11. | I.B.M. Pawl | 26. |
| | 16. | 27. |
| | U.S. Surgical | 28. |
| | (Air EJ Sprue Side) | 29. |
| | 17. | 30. |
| | I.B.M. Cover | 31. |
| | 18. | 32. |
| | Delta Handle | Techtronics |
| | (Ind. Plastics) | |
| | 19. | |
| | Hyd. Gate Molds | |



DRAWN		APPR.		ufe [®] UFE Incorporated, STILLWATER, MN
DATE		DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE J21		TITLE SIDE CORES WITH HYD. CYLINDER
FRACTIONAL 2/32		CUSTOMER		
1 DEC. DEC. 2.015		PART NO.		SCALE NONE
2 DEC. DEC. 2.005		PART NAME		DWG. NO.
3 DEC. DEC. 2.002				SHEET 1 OF 1
ANGULAR 0.1° 1/32"				PAGE # 5.

REV	BY	DATE	REVISION
1	WAS	5-20-10	WAS DEC 0 PC 104, PARKER WAS PARKER PLUG POWER



COUPLER DETAIL

- NOTES:
 1- THIS EXAMPLE SHOWS A SIDE CORE PULL. USE SAME COUPLING SYSTEM FOR OTHER HYD. CYL. APPLICATIONS.
 2- USE SHOULDER BOLTS TO ALLOW FREE MOVEMENT OF WEDGES AND RACKS TO ALLOW THEM TO BE SELF ALIGNING.

C	PRS	12/12/85	ADDED FLAT TO THREADED ROD
"	"	"	ADDED NOTE 2
B	PRS	5/28/85	WAS SEC C PG 198
ISSUE	BY	DATE	REVISION

DRAWN	APPR.	ufe HYDRAULIC TECHNOLOGY	UFE Incorporated,		STILLWATER, MN
DATE	DATE		TITLE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE J/M	SIDE CORES WITH		
FRACTIONAL $\pm 1/32$		CUSTOMER	HYD. CYLINDER		
2 PLC. DEC. $\pm .015$		PART NO.	SCALE	DRWG. NO.	PAGE NO. 5A
3 PLC. DEC. $\pm .005$			NONE		
4 PLC. DEC. $\pm .002$		PART NAME	SHEET NO. 1		
ANGULAR $\pm 1^{\circ} 30''$					

MOLD BASE DATA

<u>Contents</u>	<u>Page</u>
General Specifications	1
Leader Pins	1A
Typical 3 Plate Mold	2 & 3
Stripper Plate Mold Requirement	4
Drawings (Companion Inserts)	
6 1/2" x 8" Drawing Number 82750	5
5" x 8" Drawing Number 82740	6
5" x 8" Drawing Number 82565	7
5" x 6" Drawing Number 86514 Center Sprue	8
3.15" x 3.25" Drawing Number 82488 Center Sprue	9
13.874" x 14.874" Drawing Number 86580	10
Vertical Press Mold	11

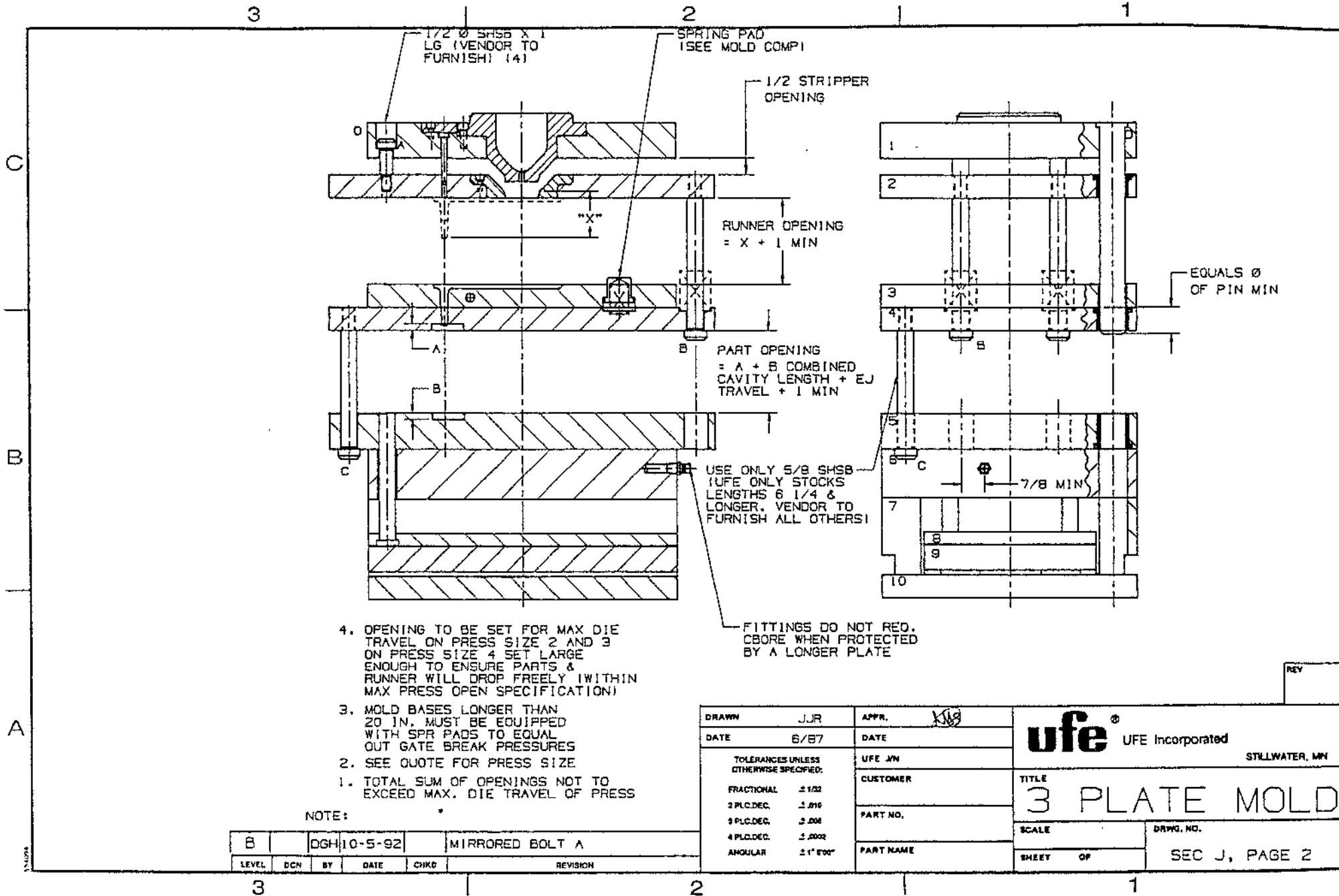
MOLD BASE DATA

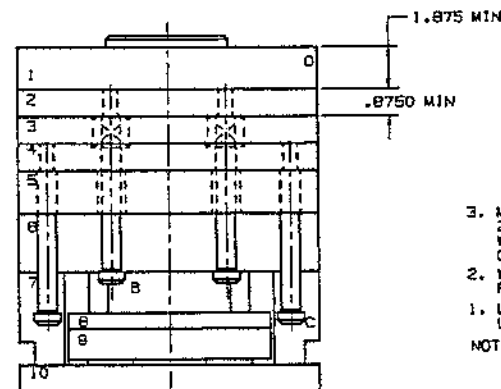
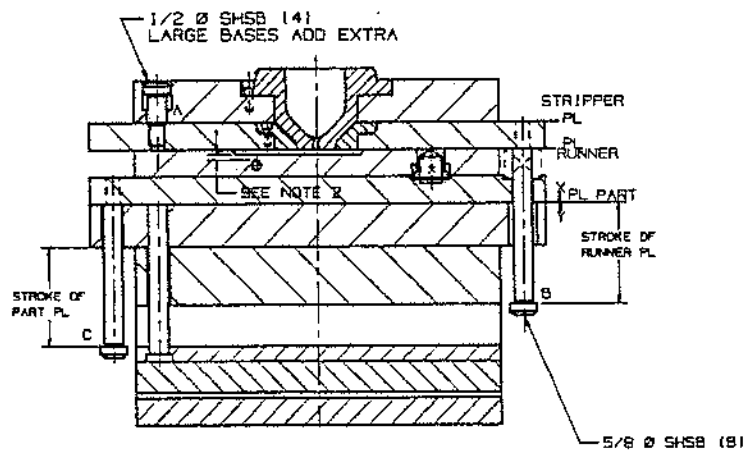
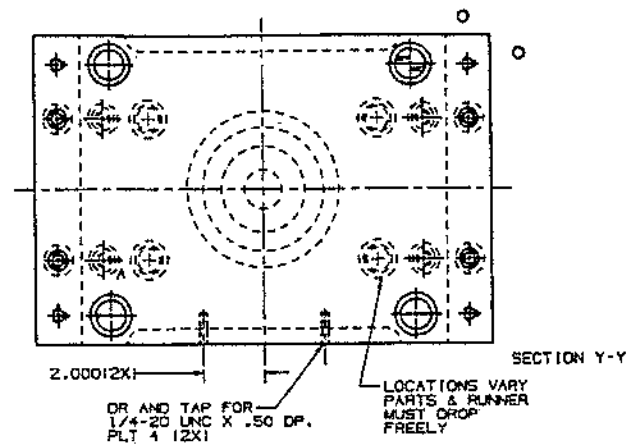
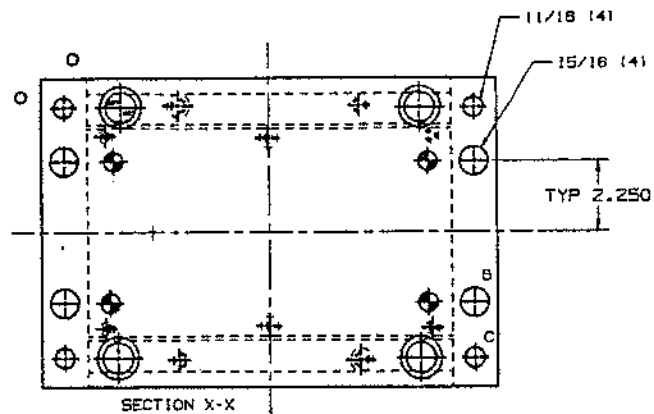
- A. Type of steel in base to be per "Mold Specification Form 122" and UFE Mold Classifications.
- B. Sprue bushings to have 1/2" spherical radius and 1/2" taper per foot with a 16 RMS or better finish. See mold flow data for "0" dim. (122 Form).
- C. On 3 - plate molds, to prevent spring pad damage due to drool from sprue bushings, never place spring pad directly under the sprue bushing.
- D. Provide two, 1/4"-20 x 1/2" deep tapped holes in bottom of runner plate on 3-plate molds (only required when plates are to be hardened).
- E. For sprue bushings on 3-plate molds refer to "Mold Specification Form 122, Sect. B, pg. 12 or Sect. E, pg. 16.
- F. All mold bases must be equipped with a bottom clamp plate and complete with stop pins.
- G. On large bases, add additional bolts to the base to keep plates from separating.
- H. All mold bases must be equipped with a locating ring to support the weight of the mold base during installation into and out of the press. The locating ring must be installed in a counter-bored hole in the top clamping plate.
- I. Provide clamping slots or surfaces. Mold to have 7/8" clamping thickness and slot widths of 3/4" x 1/2" depth.
- J. See pg. 9 for mold base requirements on vertical press tooling.
- K. Extended nozzle clearance hole is 1 7/8" - 0, + 1/16" x 3" deep from the top face to top clamping plate to the tip of spherical radius. Applies to # 2 presses and larger. For smaller presses, refer to press data for specific machine.
- L. When more than one pickout is used in a mold base, each pickout must be identifiable by a mark in/out of part. See UFE Engineering for size/shape of pickout identifier.
- M. Ejector travel must be sufficient for part ejection plus an additional 1/2" for part wiping. Provide stop blocks to limit unnecessary ejector system travel.
- N. Support pillars, whenever possible, to be the internal threaded type and fastened to the bottom clamping plate.
- O. On molds for press size #4, UFE Inc. requires two sets of K.O. couplers.(4" x 16" Van Dorn, see Section G, pg. 13-14; for other presses contact UFE Inc. Engineering)
- P. Support plate to be 1 3/8" min. thickness.
- Q. Maximum mold base size should be 17 7/8" x 30" unless approved in writing by UFE Inc. Engineering.

MOLD BASE DATA

LEADER PINS

- A. All mold bases must have one offset leader pin.
- B. Never project leader pins above the top clamping plate.
- C. Leader pins must be engaged in the leader pins bushings (1/2" min.) before the cam pins enter the slide blocks.
- D. Leader Pins must be 1/4" longer than any standing force, core pin, or molded insert; and, whenever possible, to be on the same side of the mold as the force. If not possible to put on same side as force, provide 2 pins to protect the force, core pin, etc.
- E. Provide (drop holes) holes to outside of mold where parts can go if dropped into bushing; if part or insert is such a size as there is a possibility of this happening.
- F. Blind leader pin bushing holes are:
 - 1-To be vented.
 - 2-To have 1/4" min. clearance between leader pin and bottom of hole.
- G. Leader pin grease grooves are to be deburred to prevent galling.
- H. For leader pin requirements on 3-plate molds, see UFE Standards, 3-Plate drawing. Reference this section, pg. 2





3. MOLD BASES LONGER THAN 20 IN. MUST BE EQUIPPED WITH SPR PADS TO EQUAL OUT GATE BREAK PRESSURES
 2. WATCH TH OF STL BETWEEN RUNNER AND WATER LINE
 1. LETTER SHSB ON MOLD LAYOUT AS SHOWN.
- NOTE:

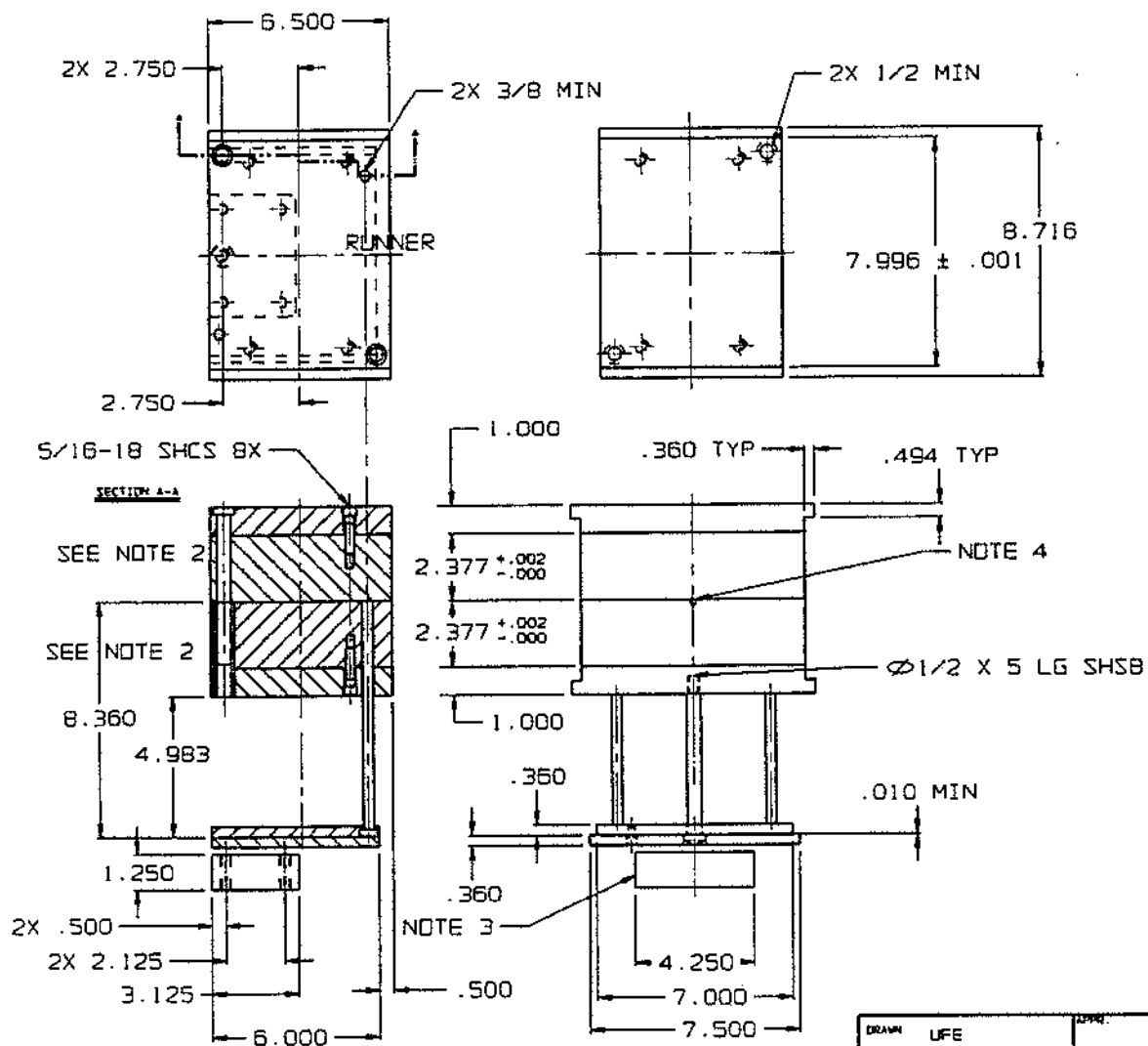
B	DGH	10-5-92	MIRRORED BOLT A, BOLT B TO 2.25
LEVEL	DCN	BY	DATE
CHKD	REVISION		

DRAWN	DGH	APPR.	<i>KJB</i>
DATE	6/92	DATE	11/20/92
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE #N	
		CUSTOMER	
		PART NO.	
		PART NAME	
FRACTIONAL	± 1/32		
2 PLC.DEC.	± .010		
3 PLC.DEC.	± .005		
4 PLC.DEC.	± .0002		
ANGULAR	± 1° 0'00"		

ufe [®] UFE Incorporated		STILLWATER, MN
TITLE		
3 PLATE MOLD		
SCALE	DRWG. NO.	
SHEET OF	SEC J, PAGE 3	

STRIPPER PLATES

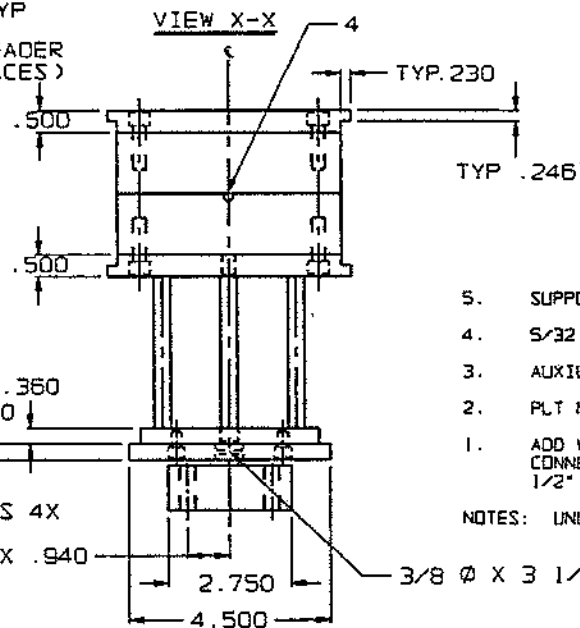
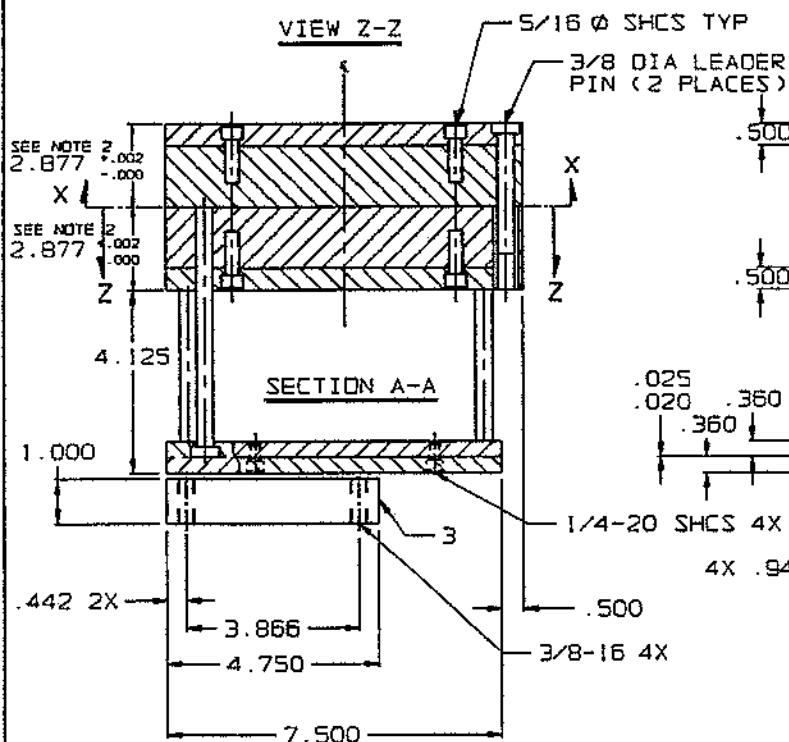
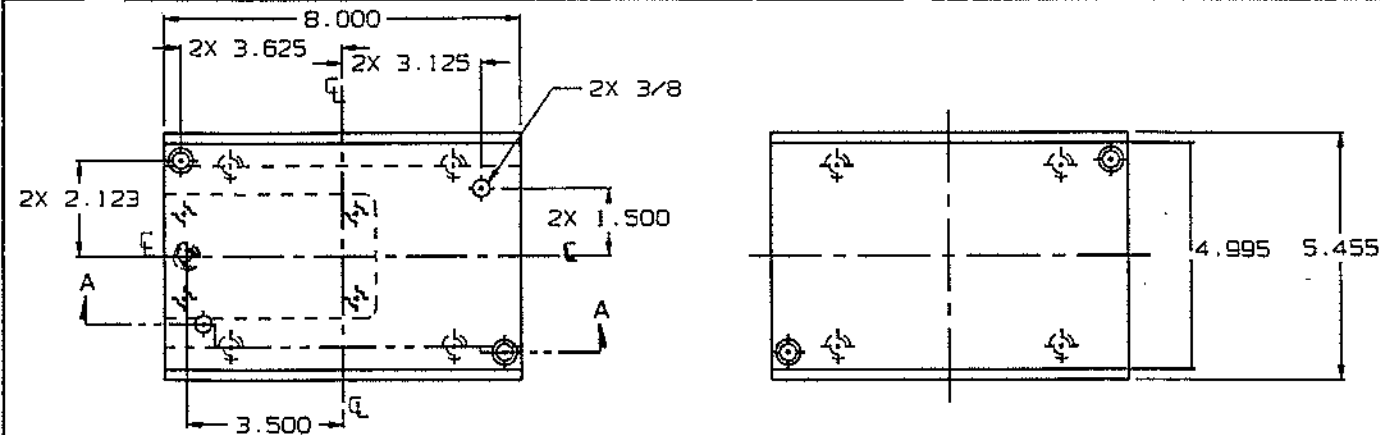
- A. On stripper plate type molds, provide guide via leader pins and bushings. Do not guide on stripper bolts or core pins.
- B. Provide for positive guidance of each core pin by floating its head and guiding on the cavity ring. If the cavity ring leaves the core pin (per stripper travel), then keep core pin float to a minimum and provide a lead in angle on the cavity ring for core pick up.
- C. To prevent gailing, plate all core pins or use dissimilar material and impreglon coat core pins.



4. UP TO A 7/32 TRAP RUNNER MUST ENTER EJECTOR SIDE.
3. AUXILLARY PLT USED ONLY WHEN SLEEVE EJ IS USED.
2. PLT MAY RED GRINDING TO OBTAIN DIM
1. ADD WATER DIRECTLY INTO EACH UNIT. ALL HOSE CONNECTIONS MUST EXIT ON SIDE OPPOSITE RUNNER 1/2" FROM EACH SIDE.

NOTES:

DRAWN	LIFE	DATE	DATE	ufe UFE Incorporated STILLWATER, MN
DATE	6/99	DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JN	CUSTOMER	TITLE
FRACTIONAL	±1/32	PART NO.		82750 6-1/2X8
2 PLE. DEC.	±.010	PART NAME		SCALE
3 PLE. DEC.	±.005			DRWG. NO.
4 PLE. DEC.	±.0002			SHEET
ANGULAR	±1°0'00"			OF
				SECTION J PG 5



5. SUPPORT PILLAR(S) MUST BE LOCATED IN THE AUX PLT AREA
4. 5/32 TRAPEZOID RUNNER MUST ENTER EJECTOR SIDE.
3. AUXILIARY PLT USED ONLY WHEN SLEEVE EJECTOR IS USED.
2. PLT MAY REQUIRE GRINDING TO OBTAIN 2.877 +.002-.000
1. ADD WATER DIRECTLY INTO EACH UNIT, ALL HOSE CONNECTIONS MUST EXIT ON SIDE OPPOSITE RUNNER 1/2" FROM EACH SIDE.

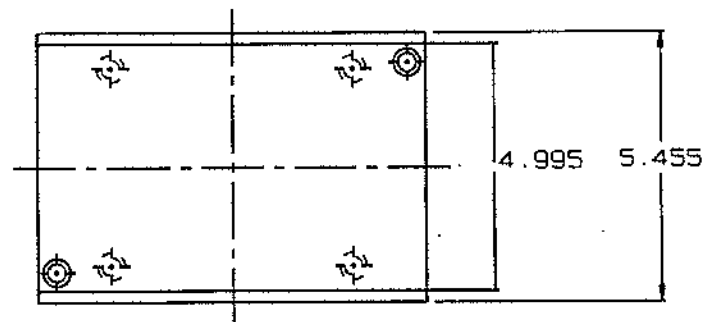
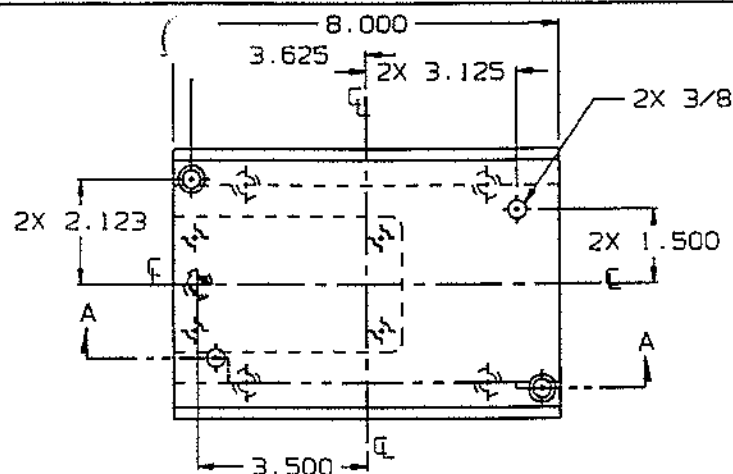
NOTES: UNLESS OTHERWISE SPECIFIED

DRAWN	LFE	APPR.	
DATE	6/99	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		LFE JPN	
FRACTIONAL		CUSTOMER	
2 PLC. DEC.		PART NO.	
3 PLC. DEC.		PART NAME	
4 PLC. DEC.			
ANGULAR			
		SCALE	DRWG. NO.
		SHEET	OF

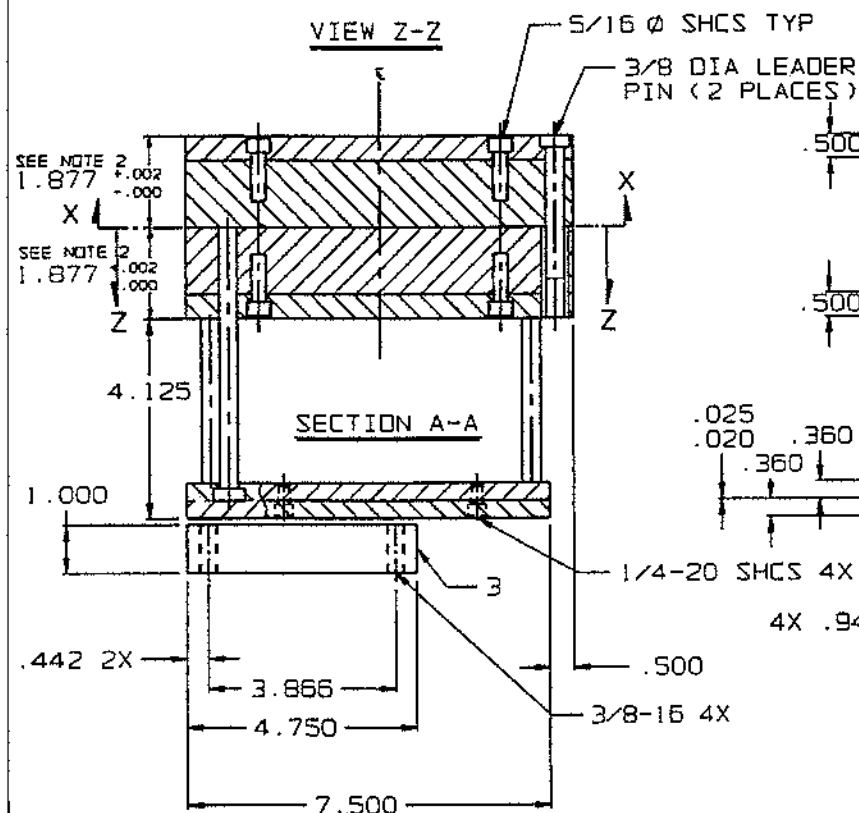
ufe UFE Incorporated
STILLWATER, MN

TITLE
82740 5 X 8

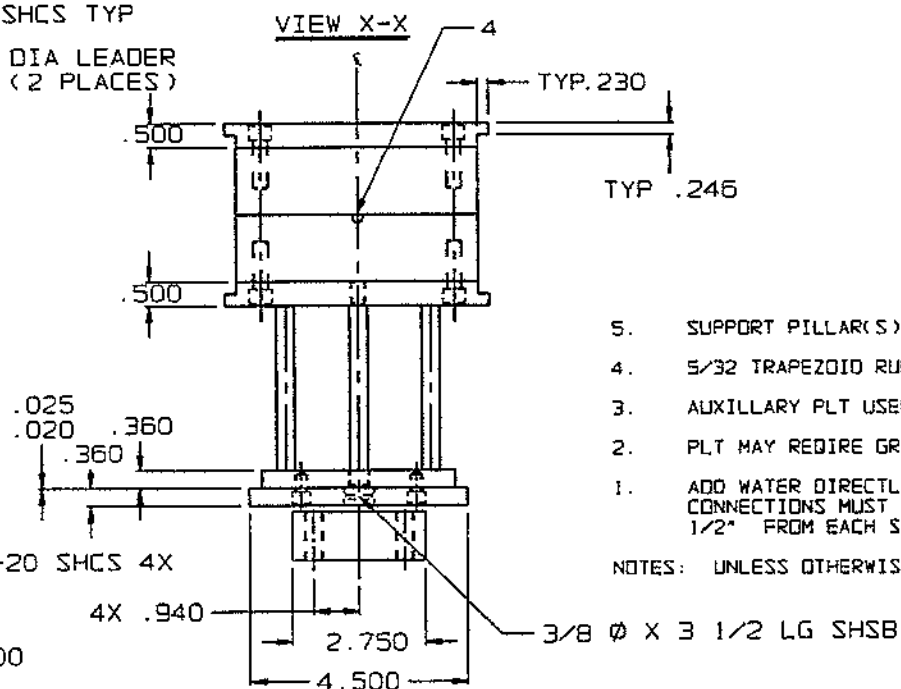
SECTION J PG 6



VIEW Z-Z



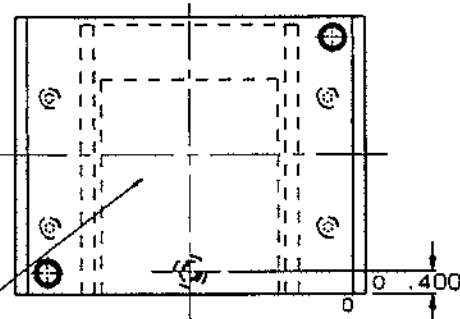
VIEW X-X



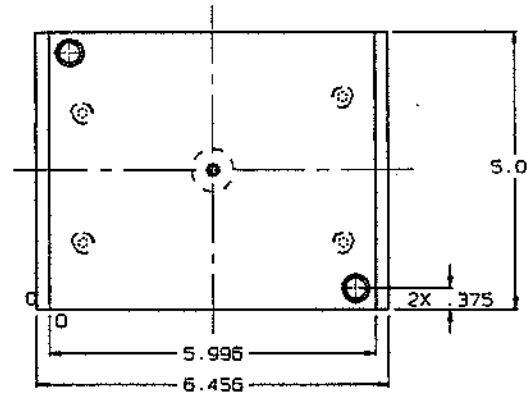
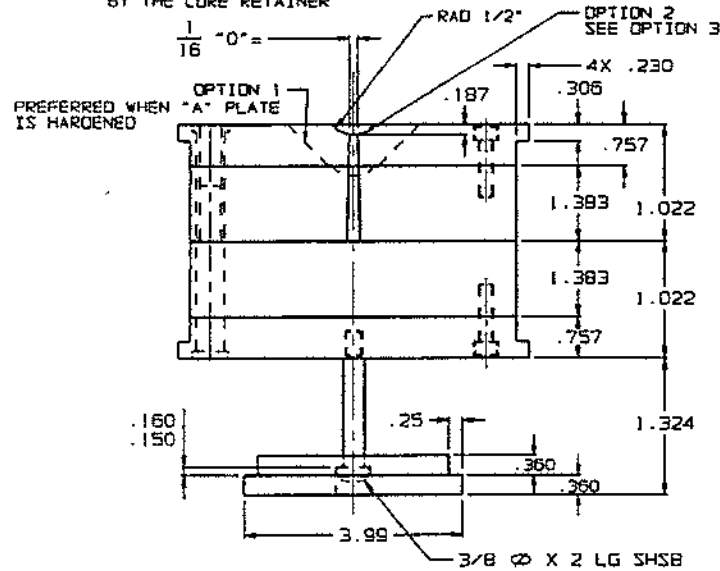
5. SUPPORT PILLAR(S) MUST BE LOCATED IN THE AUX PLT AREA
4. 5/32 TRAPEZOID RUNNER MUST ENTER EJECTOR SIDE.
3. AUXILLARY PLT USED ONLY WHEN SLEEVE EJECTOR IS USED.
2. PLT MAY REQIRE GRINDING TO OBTAIN 1.877 ±.002-.000
1. ADD WATER DIRECTLY INTO EACH UNIT, ALL HOSE CONNECTIONS MUST EXIT ON SIDE OPPOSITE RUNNER 1/2" FROM EACH SIDE.

NOTES: UNLESS OTHERWISE SPECIFIED

DRAWN: LFE DATE: 6/99 TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ±1/32 2 PLC. DEC. ±.010 3 PLC. DEC. ±.005 4 PLC. DEC. ±.0002 ANGULAR ±1°0'00"	APPR.: DATE: LFE JPN CUSTOMER: PART NO.: PART NAME:	ufe UFE Incorporated STILLWATER, MN TITLE: 82565 5 X 8 SCALE: OF DRWG. NO.: SECTION J PG 7
--	--	---

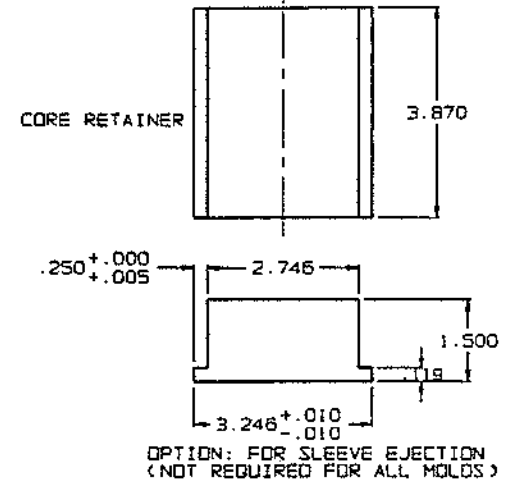
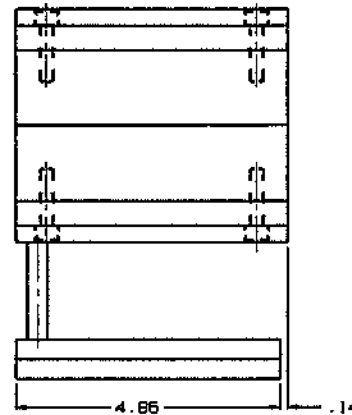


NOTE: IF SUPPORT PILLARS ARE USED THEY MUST FALL IN THE AREA COVERED BY THE CORE RETAINER



OPTION 3:

TO REPLACE SPHERICAL RADIUS IN MUD SET, A POCKET MUST BE MADE IN THE "A" SIDE SO THAT THE SPRUE PLATE WILL MOUNT FLUSH WITH THE BACK PLATE. SEE SEC. N, PAGE 23 FOR HARDENED SPRUE PLATE.



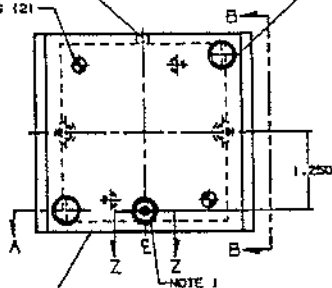
OPTION: FOR SLEEVE EJECTION (NOT REQUIRED FOR ALL MOLDS)

DRAWN LIFE	DATE 6/99	TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ±1/32 2 DEC. ±.010 3 DEC. ±.005 4 DEC. ±.0002 ANGULAR ±1°0'00"	APPR. DATE LIFE JON CUSTOMER PART NO. PART NAME	ufe LIFE Incorporated STILLWATER, MN TITLE 86514 5 X 8 SCALE SHEET OF	DRWG. NO. SECTION J PG 8
---------------	--------------	---	--	---	-----------------------------

5/32 TRAPEZOID RUNNER
MUST ENTER EJECTOR SIDE

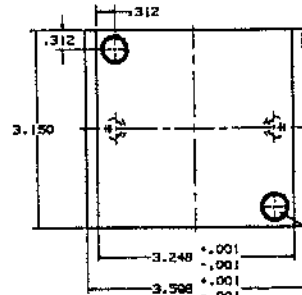
1/4 RETURN PINS (2)

8-1710 MUD LEADER BUSHINGS (2)



VIEW X-X

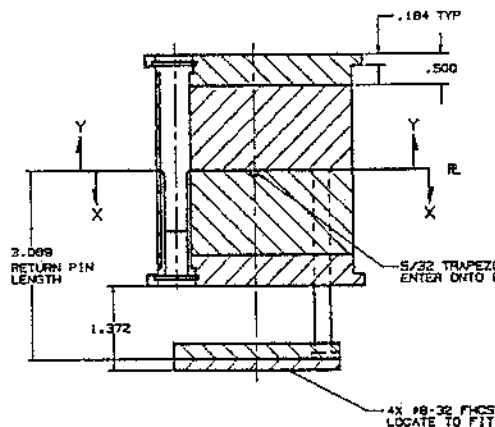
WATER LINES TO BE IN/OUT
OPPOSITE RUNNER SIDE, 1/2"
FROM EACH SIDE



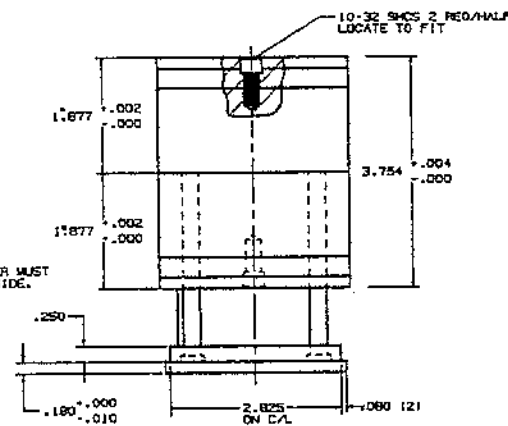
VIEW Y-Y

NOTES:

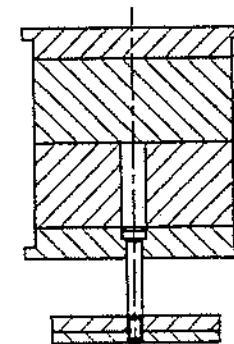
1. E-J RETAINER SHCS SHOULD NOT INTERFERE WITH THE PART OR RUNNER REMOVAL AND MUST REMAIN BELOW PARTING LINE.



SECTION A-A



VIEW B-B



SECTION Z-Z

INSTALL 8 5/16 X 1.50 LB SHCS

* MAY NEED GRINDING
FOR THESE DIMENSIONS

D	MRE	2-87		ADDED SHCS TO SECTION A-A
C	BB	5-85		ADD 3.068 RETURN PIN LENGTH 3.598 $\pm .001/-0.001$ WAS 3.598 $\pm .001/-0.000$ 3.248 $\pm .001/-0.001$ WAS 3.248 $\pm .001/-0.000$ 3.754 $\pm .004/-0.000$ WAS 3.754 $\pm .004/-0.000$ 1.677 $\pm .002/-0.000$ WAS 1.677 $\pm .004/-0.000$
B	BB	12-82		CHANGED TOLERANCES FOR A & B SIDES
LEVEL	DCN	BY	DATE	CHKD
				REVISION

DRAWN	UFE	APPR.	WJP
DATE	10-1-85	DATE	11/20/92
TOLERANCES UNLESS OTHERWISE SPECIFIED:			
FRACTIONAL	$\pm 1/32$	UFE J/N	
2 PLC.DEC.	$\pm .010$	CUSTOMER	
3 PLC.DEC.	$\pm .005$	PART NO.	
4 PLC.DEC.	$\pm .0002$	PART NAME	
ANGULAR	$\pm 1' 000"$		

uFe [®] UFE Incorporated		STILLWATER, MN	
TITLE		3" X 3 1/4"	
SCALE	HALF	DRWG. NO.	B2488
SHEET	1 OF 1	SEC J	PG 9

ALUM SHIELD REQ OPP SIDE OF SPRUE

SEE NOTE 5

SEE NOTE 7

.020

SAFETY STRAP 2 REQ

EYEBOLT REQ

SEE NOTE 8

REQ PER STD SPECS

TABLE

COUPLER

SEE NOTE 4

PREFERRED ALIGNMENT OF THE
SPRUE WITH THE SUPPORT
PARALLELS, CLAMPSLOTS,
2 KNOCKOUTS

11. SEE ALSO SEC M PG 11
10. MAX MOLD OPEN 7 5/8, DUE TO PLATTEN FLOAT
9. SPRUE HGT (PL) 7 5/8, OPTIONAL 8 5/8 SEE ENGINEERING
8. LIMIT SWITCH REQ BETWEEN "PL"
MICRO SWITCH SHOWN HONEYWELL NO. 914CE2-3
7. Ø 1.000, 2 INLINE WITH SPRUE AND COUPLER
EXCEPTIONS SEE NOTE 11
6. PROTECTIVE SHIELDS REQ AS SHOWN
5. 2 PIECE SPRUE REQ SEE SEC N, PG 4,5.
4. HYD COUPLER 1 REQ SEE SEC N, PG 2.
3. OIL HEAT MANIFOLD REQ ON SPRUE SIDE
OF MOLD. ROUTE OIL IN/OUT LINES FROM
THE BOTTOM OF MOLD
2. WATER TO BE CONNECTED TO OPPOSITE
CORNER OF "O.O"
1. MIN MOLD BASE HGT TO BE 10.3

NOTE:

LEVEL	DCN	BY	DATE	CHKD	REVISION
3					
2					
1					

DRAWN	UFE	APPR.	<i>RGS</i>
DATE	8/94	DATE	2-20-95
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE #N	
FRACTIONAL		CUSTOMER	
2 PLG.DEC. ±.010		PART NO.	
3 PLG.DEC. ±.005		PART NAME	
4 PLG.DEC. ±.0002		SCALE	
ANGULAR ±1° 00'		DRWG. NO.	
		SHEET OF	

ufe® UFE Incorporated
STILLWATER, MN

TITLE
VERTICAL MOLD

SEC J PG 11

SECTION K – TOOL CHECK LISTS

<u>CONTENTS</u>	<u>PAGE</u>
CERTIFICATION FORMS	2 - 3
TESTING STANDARDS, ELECTRICAL AND HYDRAULIC	4
HYDRAULIC SYSTEMS	5

TOOL ACCEPTANCE CHECKLIST

SEE UFE FORM 510185

TOOL STEEL CERTIFICATION FORM

SEE UFE FORM 522007

ELECTRICAL SYSTEMS

A. New tools

1. Check for shorts with the V.O.M. before attempting any type of heating.
2. All thermocouples will be tested with a hand held pyrometer.
3. Check to see that required temperature can be attained by heaters. Slo-start should be used (Kona equipment has insulated tips).
4. A temperature standard will be set via the engineering dept. This will be the minimum number the manifold can operate at and still insure proper material processing.

B. Tools in shop for repair and revision

1. Any time a tool comes into the shop for repair or revision, it will be tested for shorts in the heaters and proper function of thermocouples before being sent out.

C. Training

1. Engineering will instruct selected toolmakers in the correct use of required meters.
2. Engineering will also instruct same toolmakers in UFE Incorporated wiring standards.

HYDRAULIC SYSTEMS

A. Testing

1. All hydraulics will be bench tested after plumbing.

B. Timely ordering of components

1. All components for hydraulic jobs should be ordered at the same time as the cylinders. This includes fittings, hoses, couplers, etc.
The crib does not stock this material. This is especially important on jobs built by vendors.

SECTION L – MOLD IDENTIFICATION

<u>CONTENTS</u>	<u>PAGE</u>
RULES	2, 2A
RULES – UFE TO ADD	3
PLATE SERIES NUMBERS, MARKING WATER LINES & BUBBLERS	4

MOLD I.D. & MARKINGS

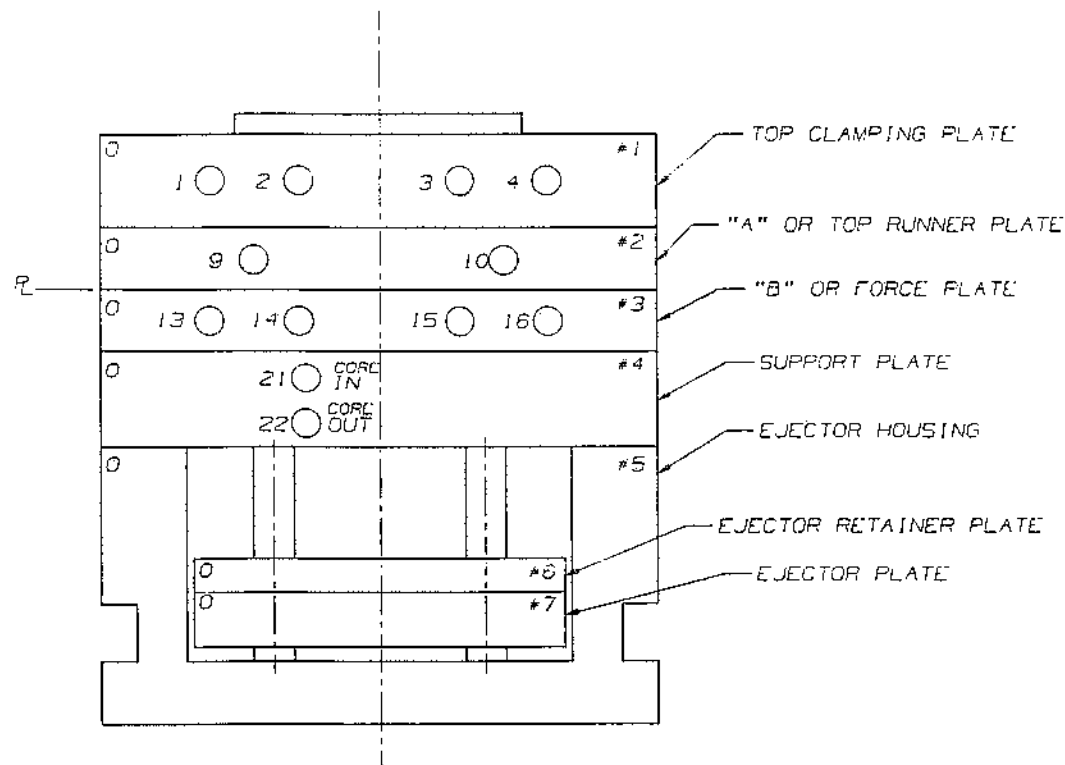
- A. Stamp "UP" on surface to be mounted up in the press.
- B. Stamp customer name and customer part number on top edge of "B" or force plate.
- C. Stamp plate series numbers. (Don't use letters) on plate edges starting with top clamping plate as #1. See example this section page 4..
- D. Stamp or mark identity numbers on all pick out blocks, extra cavities and extra forces.
- E. On 3 plt. Or stripper plt., stamp mold height in open position on top surface of mold. (EX: Mold ht. Open pos. 20").
- F. Stamp a series of numbers next to all inlet and outlet water connections. Each inlet or outlet to have its own number. See Section L, page 4.
- G. On molds with water in cores, stamp next to inlet and outlet connections; core 1, 2, ext. Numbers to correspond to cavity identification.
- H. Molds with air or hydraulic activated core must be stamped "Core In" and "Core Out" next to the respective cylinder's port.
- I. Cavity part identification number to be engraved in reverse on cavity or force. Don not put on ejector pin unless requested.
- J. On second molds with
- K. Cavity part identification number to be stamped on back face of cavities, forces and their components; likewise, receptive chase holes to have respective numbering. Numbers shall correspond (example: Cavity #3 shall be #3). Areas of identification shall be depressed .020" min. so as to provide for stock removal at a later date without destroying existing number.
- L. Mark in depressed areas type of steel and hardness on the plates and the mold components. If it is not possible to mark on the component because of size limitation, it may be marked on the top edge of support plate.
- M. Mold components requiring shims must have UFE approval & must be marked with thickness of the shim on surface requiring shimming. Ex: "Shim .010". (We may ask for plating to replace the shims after the mold is approved). If UFE does allow shims, the min. thickness allowed will be .005.
- N. To identify standard molds and components which are constructed to metric and use metric components, paint a black line on top-front corner.
- O. For soft or prehard cavities, same as "N" above but with an orange stripe.

MOLD IDENTIFICATION & MARKINGS

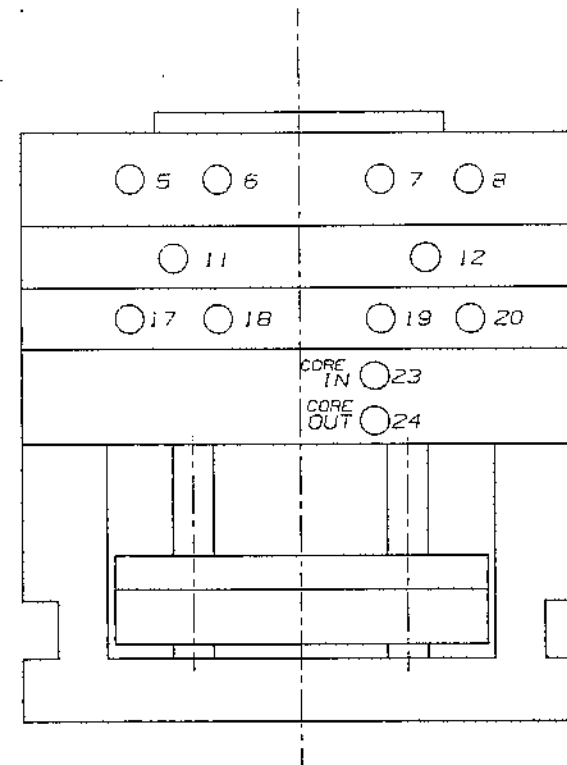
- P. For certified dimensions same as "N" and "O" above except color will be yellow.
- Q. For tools which require special assembly or disassembly procedures (which will be damaged using normal accepted assembly/disassembly procedures), paint a white stripe same as "N", "O" and "P" above. This also requires a written procedure describing in detail with sketches or drawing if necessary to clarify assembly and disassembly.
- R. For tools, which have special tool repair requirements: Florescent green paint replaces red paint on the 00 corner of the mold.

MOLD IDENTIFICATION & MARKINGS

- A. Paint one red line across the top corners of the mold on the side marked "UP" in the direction of travel to identify standard molds and components.
- B. Stamp mold identification number or computer number, (see form #122), on four right outside edges of the top clamping plate and the support plate. For informational code breakdown, see Systems and Procedures #226.
- C. Stamp all switches on mold core in or core out which ever applies.
- D. Stamp maximum air or hydraulic pressures for automatic unscrewing molds, or minimum pressure necessary to overcome molding force on air or hydraulic activated cores.
- E. On molds that have air or hydraulic cylinders attached, stamp cycle number and note letter on end of cylinder or adjacent to plug box.
- F. Medical or special cosmetic parts where grease is not to be used are to have silver stripe painted on top-front corner. These tools are to be cleaned prior to running.



FRONT SIDE



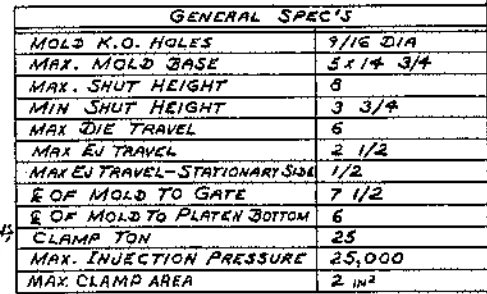
BACK SIDE

1. WATER LINES TO BE NUMBERED USING THE SYSTEM SHOWN.
2. BUBBLERS AND BAFFLES TO BE STAMPED "CORE IN" AND "CORE OUT".

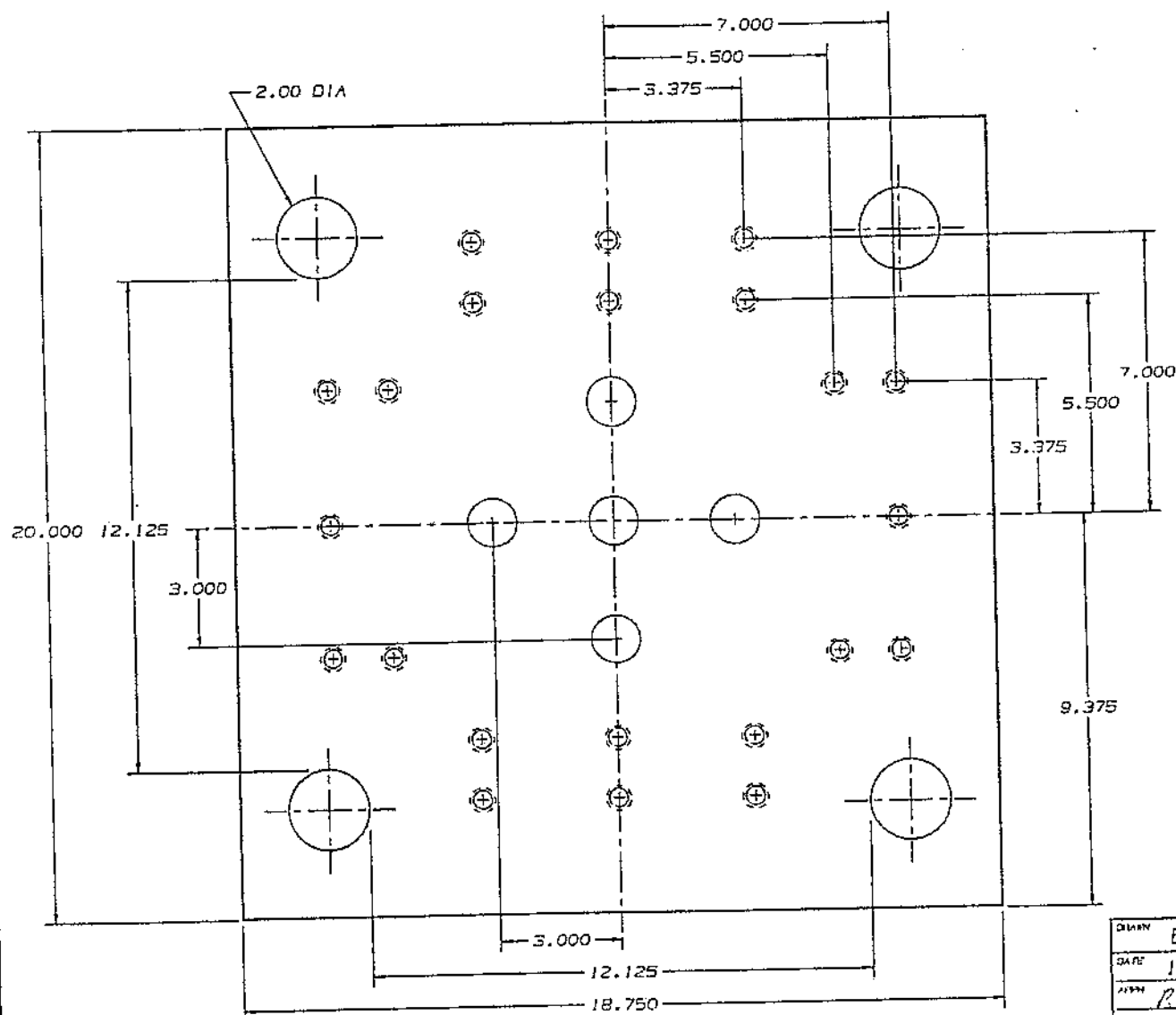
DRAWN J. SOGGS	APP.	ufe UFE Incorporated, STILLWATER, MN
DATE 8/23/85	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:	UFE J/N	TITLE
FRACTIONAL .51/32	CUSTOMER	MOLD IDENTIFICATION FOR STD. 2 PLT. MOLD
2 PLUG DEC. 2.514	PART NO.	SCALE NONE
3 PLUG DEC. 2.545	PART NAME	DWG. NO.
4 PLUG DEC. 2.545		PAGE NO. 4
ANGULAR 2.1° MAX		SHEET 1 OF 1

SECTION M – PRESS DATA

<u>CONTENTS</u>	<u>PAGE</u>
25 TON NEWBURY (PRESS SIZE 1)	2
75 TON VAN DORN PRESS (PRESS SIZE 2)	3
150 TON VAN DORN PRESS (PRESS SIZE 3)	4
125 TON VAN DORN PRESS (PRESS SIZE 3)	4A
150 TON VAN DORN PRESS (PRESS SIZE 3, 8 OZ)	4B
250 TON VAN DORN PRESS (PRESS SIZE 4)	5
300 TON CINCINNATI PRESS (PRESS SIZE 4)	6
ADAPTER PLATE, 50 TON PRESS (PRESS SIZE 6)	6A, 6B
28 TON ENGEL (PRESS SIZE 7)	7
66 TON DEMAG PRESS (PRESS SIZE 2)	8
40 TON JSW (UFE INCORPORATED ONLY)	9
150 TON JSW (UFE INCORPORATED ONLY)	10
150 TON ENGEL VERTICAL PRESS	11



A		5-10-76 TRJ	
ISSUE	REVISION	DATE	BY
DRAWN <i>R. Robinson</i>	 UFE Incorporated, Farmington, Connecticut STILLWATER, MINN.		
DATE <i>11-17-72</i>			
CHK'D			
DATE			
APPR.			
DATE	TITLE		
	25 TON <i>NEWBURY DATA</i> (PRESS SIZE 1)		
SCALE	SIZE	DWG NO.	
NONE	SECT. M	PAGE NO. 2	



GENERAL SPECIFICATIONS

MOLD K.O. HOLE CLEARANCE	1.25 DIA
MAX. MOLD BASE	12.0 X 18.0
MAX. SHUT HEIGHT	16.0
MIN. SHUT HEIGHT	4.0
MAX. STROKE	8.0
MIN. STROKE	4.0
MAX. EJECTOR TRAVEL	4.0
LOCATING RING DIA.	3.990
C/L OF MOLD TO FRONT DOOR	12.4
C/L OF MOLD TO BACK DOOR	19.5
C/L OF MOLD TO PRESS BOTTOM	39.6
CLAMP TONNAGE	75 TONS
MAX. INJECTION PRESSURE	20,000 PSI
MAX. CLAMP AREA	7.5 IN ²
PLASTICIZING CAPACITY	82 LB/HR
INJECTION CAPACITY	3-5 OZ.
MIN. MOLD BASE AREA	15 IN ²

NOTE: THIS DATA HAS BEEN UNIVERSALLY FORMULATED TO INCLUDE ALL PRESSES OF THIS TYPE. INDIVIDUAL PRESSES MAY VARY OUTSIDE OF THESE LIMITS. SEE UFE ENGINEERING FOR ADDITIONAL INFORMATION.

NOTE: K.O. COUPLER SPACING OF 6" & 7" REQUIRED FOR ALL MOLDS SPECIFIED FOR PRESS SIZE #2.

DESIGN BY BRETT N.

DATE 1-31-90

BY R.M. Lier

ufe
THERMOPLASTIC TECHNOLOGY

UFE Incorporated,

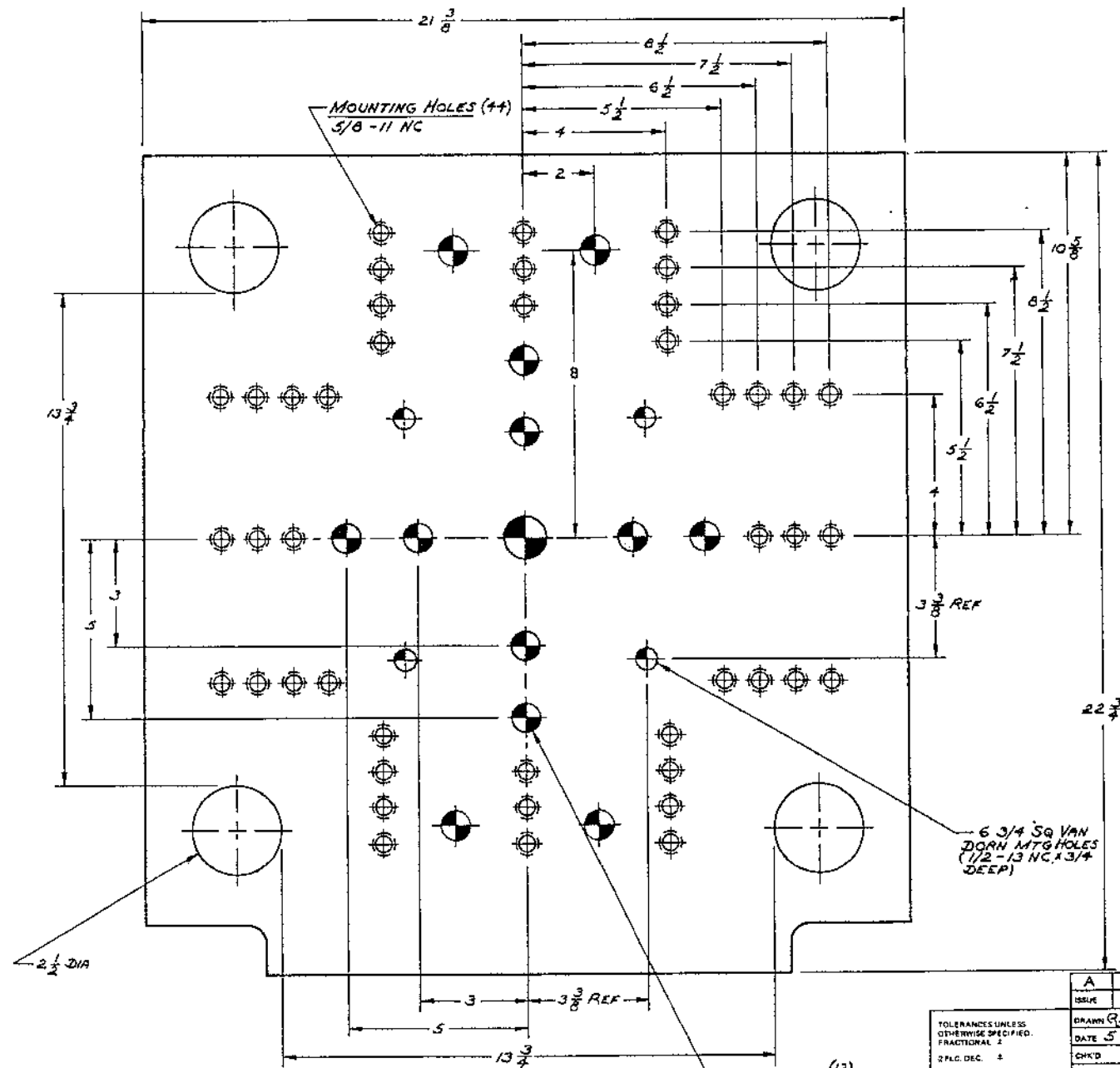
STILLWATER, MN

PLATEN: (PRESS SIZE #2)
75 TON VAN DORN

SCALE NONE

SECT. M

PAGE 3



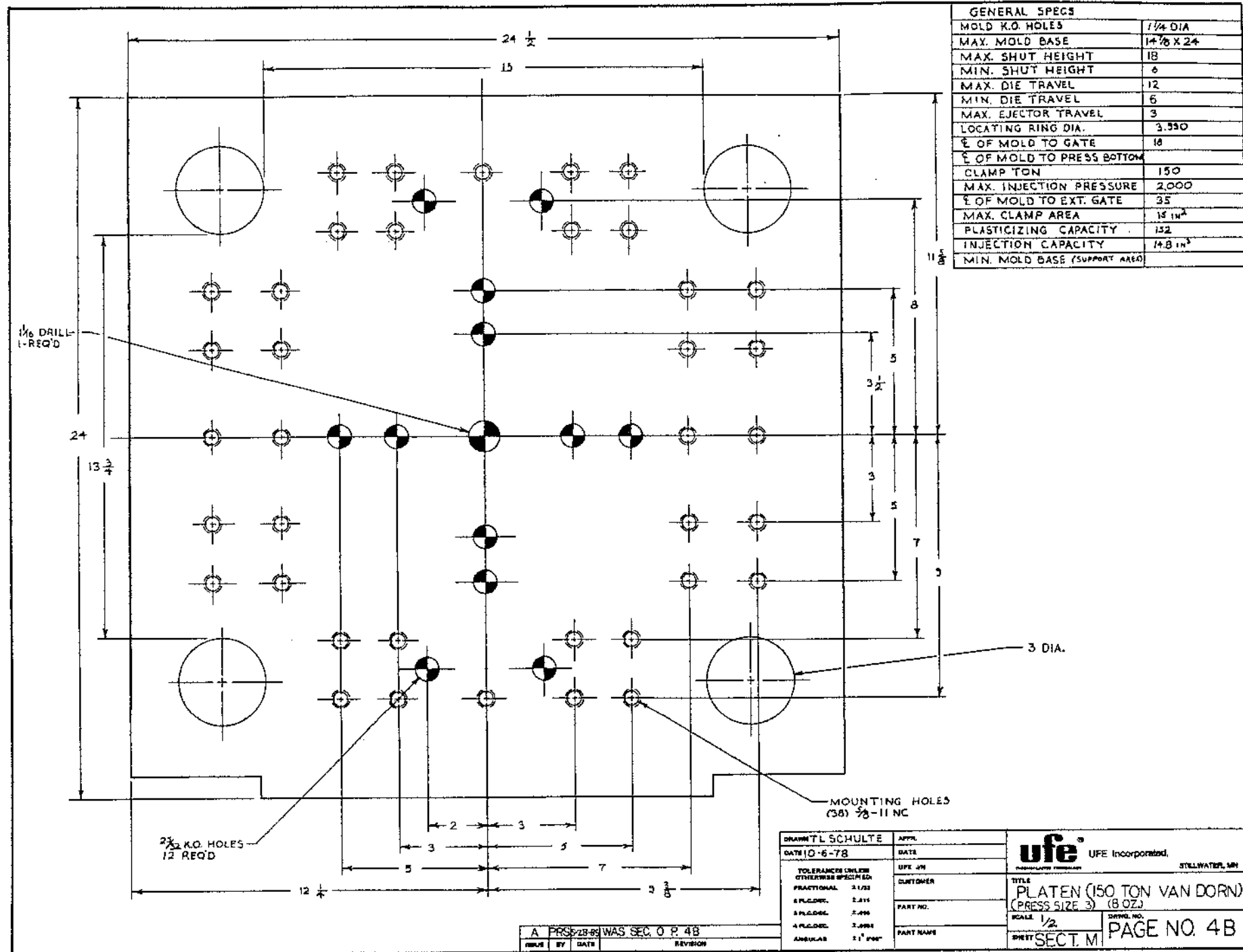
GENERAL SPECS	
MOLD K.O. HOLES	1 1/4 DIA
MAX. MOLD BASE	13 x 21
MAX. SHUT HEIGHT	18
MIN. SHUT HEIGHT	5
MAX. DIE TRAVEL	9
MIN. DIE TRAVEL	5
MAX. EJECTOR TRAVEL	4 HYD.
LOCATING RING DIA	3.990
E OF MOLD TO GATE	14 7/16
E OF MOLD TO PRESS BOTTOM	41
CLAMP TON	125
MAX. INJECTION PRESSURE	18,100
E OF MOLD TO EXT. GATE	35
MAX. CLAMP AREA	13.8 IN ²
PLASTICIZING CAPACITY	124 LB/HR
INJECTION CAPACITY	375 LB/HR (PARTS)
MIN. MOLD BASE (SUPPORT AREA)	25 IN ²

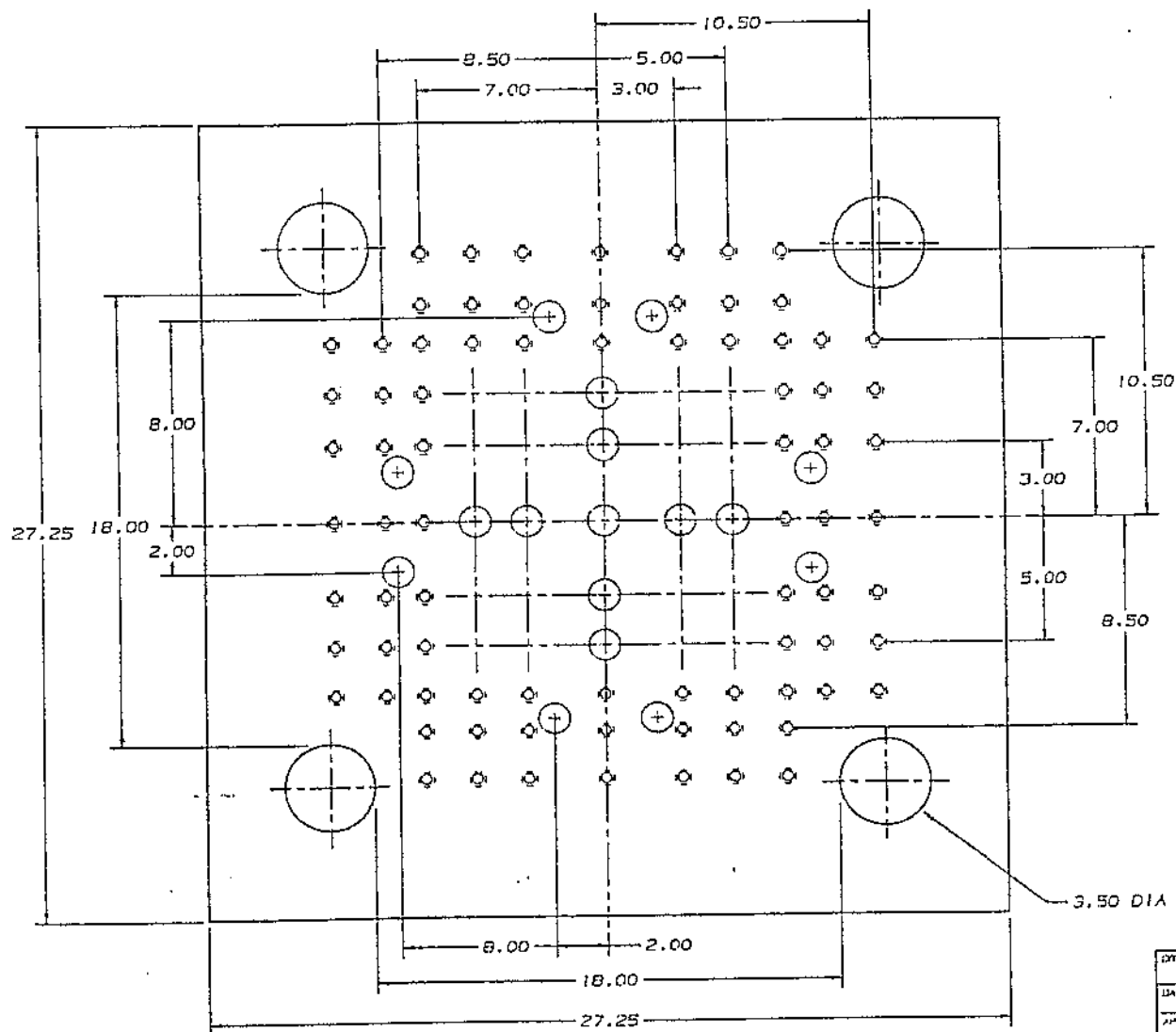
C	WAS SEC. 0 P. 4A	5-28-77	ERS
B		3-1-77	TRJ
		5-7-76	TAL

A		REVISION		DATE	BY	CHKD
ISSUE		DATE				
DRAWN R. Robinson		DATE 5-16-72				
CHK'D		DATE				
2 PLC. DEC. 3		APPR.				
3 PLC. DEC. 3		DATE				
4 PLC. DEC. 3						
ANGULAR 3						
USED ON		SCALE				
		NONE				
		SIZE				
		SECT. M				
		DRAWING NO.				
		PAGE NO. 4A				

ufe UFE Incorporated, STILLWATER, MN

TITLE
PLATEN (125 TON VAN DORN)
(PRESS SIZE 3) (6 OZ.)





GENERAL SPECIFICATIONS

MOLD K.O. HOLE CLEARANCE	1.25 DIA
MAX. MOLD BASE	17.9 X 29.5
MAX. SHUT HEIGHT	21.0
MIN. SHUT HEIGHT	8.0
MAX. STROKE	15.0
MIN. STROKE	
MAX. EJECTOR TRAVEL	5.0
LOCATING RING DIA.	3.990
C/L OF MOLD TO FRONT DOOR	21.5
C/L OF MOLD TO BACK DOOR	26.0
C/L OF MOLD TO PRESS BOTTOM	44.0
CLAMP TONNAGE	200-260 TONS
MAX. INJECTION PRESSURE	20,000 PSI
MAX. CLAMP AREA	25 IN ²
PLASTICIZING CAPACITY	200 LB/HR
INJECTION CAPACITY	12-20 OZ.
MIN. MOLD BASE AREA	55 IN ²

NOTE: THIS DATA HAS BEEN UNIVERSALLY FORMULATED TO INCLUDE ALL PRESSES OF THIS TYPE. INDIVIDUAL PRESSES MAY VARY OUTSIDE OF THESE LIMITS. SEE UFE ENGINEERING FOR ADDITIONAL INFORMATION.

DESIGN BY BRETT N.

DATE 1-31-90

APPROVED R. Miller

ufe

UFE Incorporated,

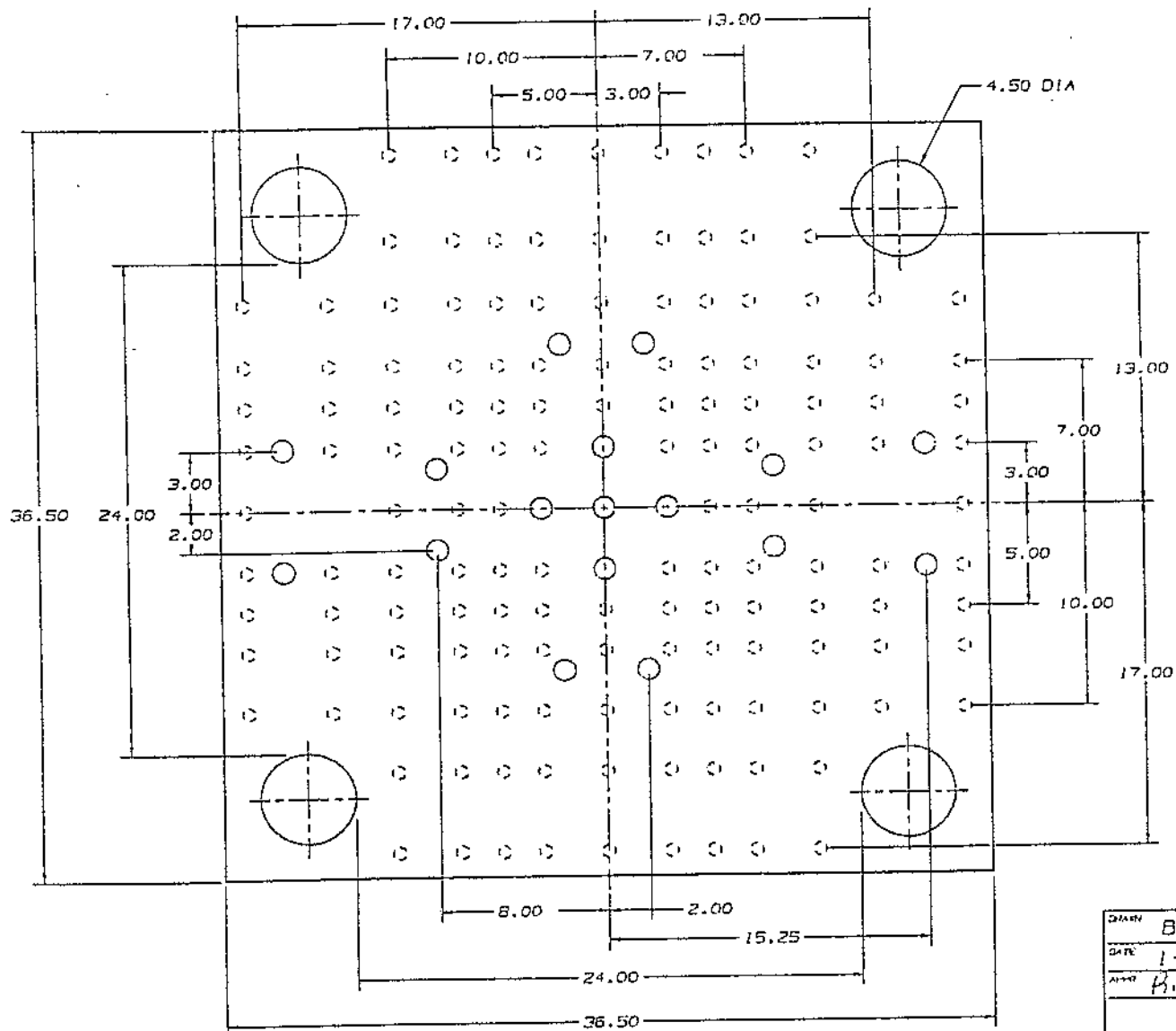
STILLWATER, MN

PLATEN: (PRESS SIZE 4)
200-260 TON VAN DORN

SCALE NONE

SECT. M

PAGE 5



GENERAL SPECIFICATIONS

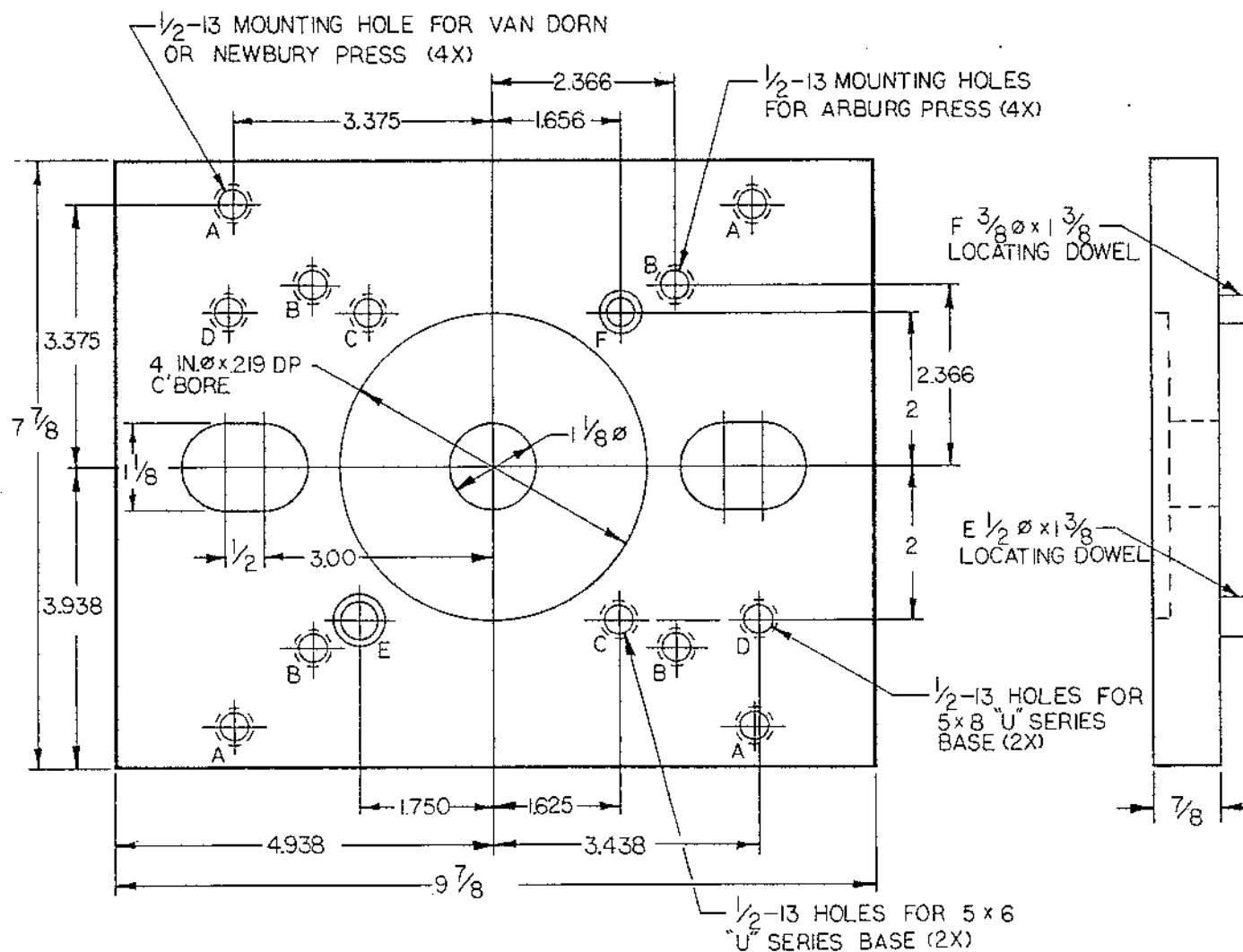
MOLD K.O. HOLE CLEARANCE	1.08 DIA
MAX. MOLD BASE	24.0 X 36.5
MAX. SHUT HEIGHT	24.0
MIN. SHUT HEIGHT	8.0
MAX. STROKE	20.0
MIN. STROKE	
MAX. EJECTOR TRAVEL	5.0
LOCATING RING DIA.	3.990
C/L OF MOLD TO FRONT DOOR	27.7
C/L OF MOLD TO BACK DOOR	29.7
C/L OF MOLD TO PRESS BOTTOM	57.2
CLAMP TONNAGE	300 TONS
MAX. INJECTION PRESSURE	20,000 PSI
MAX. CLAMP AREA	30.0 IN ²
PLASTICIZING CAPACITY	
INJECTION CAPACITY	20.0 OZ.
MIN. MOLD BASE AREA	60 IN ²

NOTE: THIS DATA HAS BEEN UNIVERSALLY FORMULATED TO INCLUDE ALL PRESSES OF THIS TYPE. INDIVIDUAL PRESSES MAY VARY OUTSIDE OF THESE LIMITS. SEE UFE ENGINEERING FOR ADDITIONAL INFORMATION.

* TO BE USED AS PRESS SIZE #4 ONLY BY APPROVAL OF UFE ENGINEERING

DATE	BRETT N.	ufe UFE Incorporated. INDUSTRIAL PLASTIC TECHNOLOGY STILLWATER, MN
DATE	1-31-90	
BY	B. Miller	
		PLATEN: (PRESS SIZE 4") 300 TON CINCINNATI
		SCALE NONE
		SECT. M

PAGE 6



ADAPTER PLATE FOR
EJECTOR SIDE
DME CAT NO. AP-5658-E

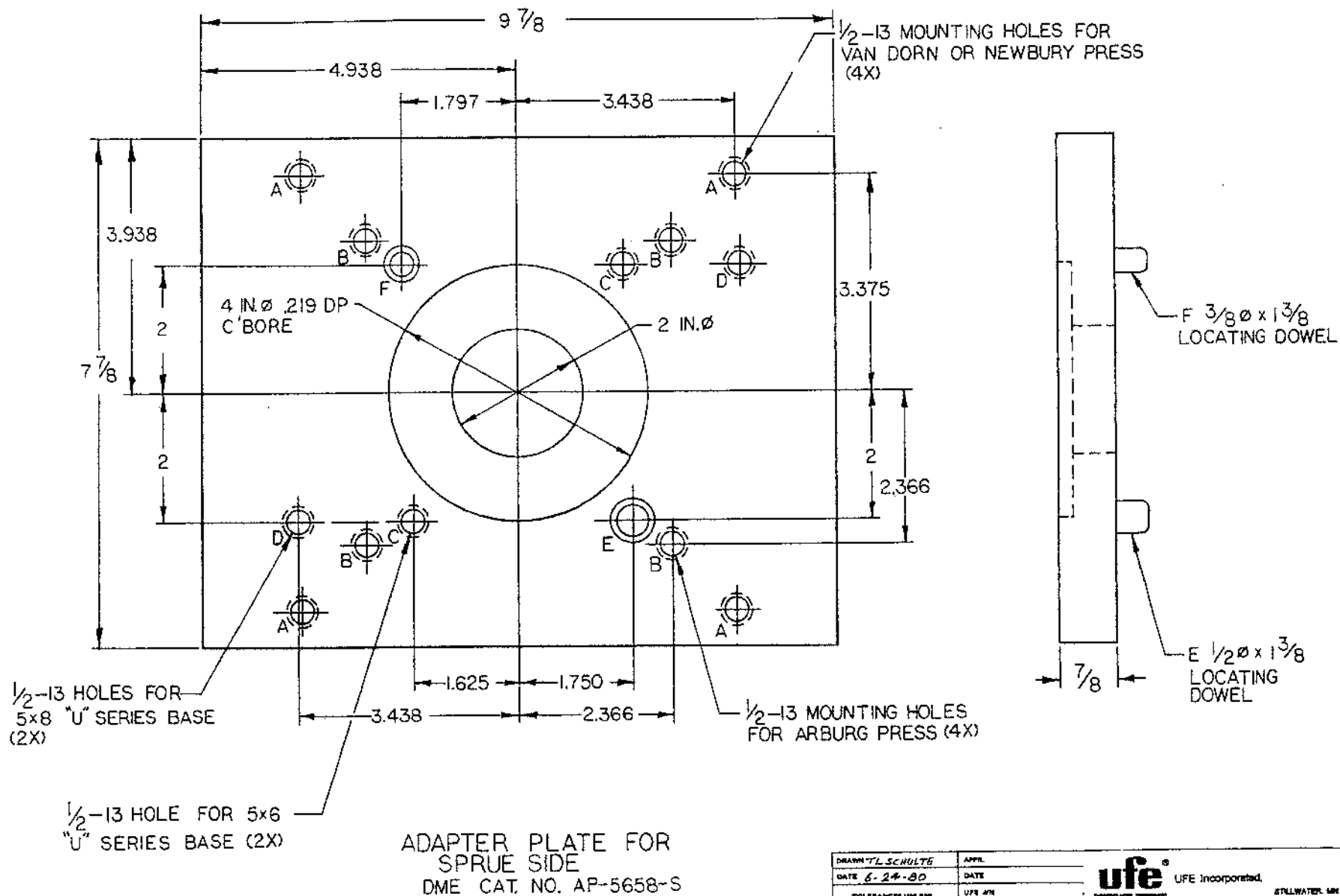
GENERAL SPECS	
MOLD K.O. HOLES	6 IN. HOR.
MAX. MOLD BASE	5x8
MAX. SHUT HEIGHT	9 3/4
MIN. SHUT HEIGHT	6
MAX. DIE TRAVEL	
MIN. DIE TRAVEL	
MAX. EJ TRAVEL	3 IN.
LOCATING RING DIA.	3.990
Q OF MOLD TO GATE	
CLAMP TON	50
MAX. INJ. PRESSURE	
MAX. CLAMP AREA	5 SQ. IN.
PLASTICIZING CAP	
INJ. CAPACITY	
MIN. MOLD BASE SUR	

NOTES:

1. MOLD TO BE LOW VOLUME, 2 PLATE ONLY, TO FIT AMC'S 50 TON PRESS.
2. SAMPLING TO BE DONE AT UFE IN OUR NO. 2 PRESS.
3. ADAPTER PLATE WILL BE THE RESPONSIBILITY OF THE MOLDING PLANT.
4. USE DME'S 5x8 "U" SERIES BASE, DME CAT NO. 58U2 AND 58U3.
5. INSTALL KEEPER FOR EJ. SYSTEM.

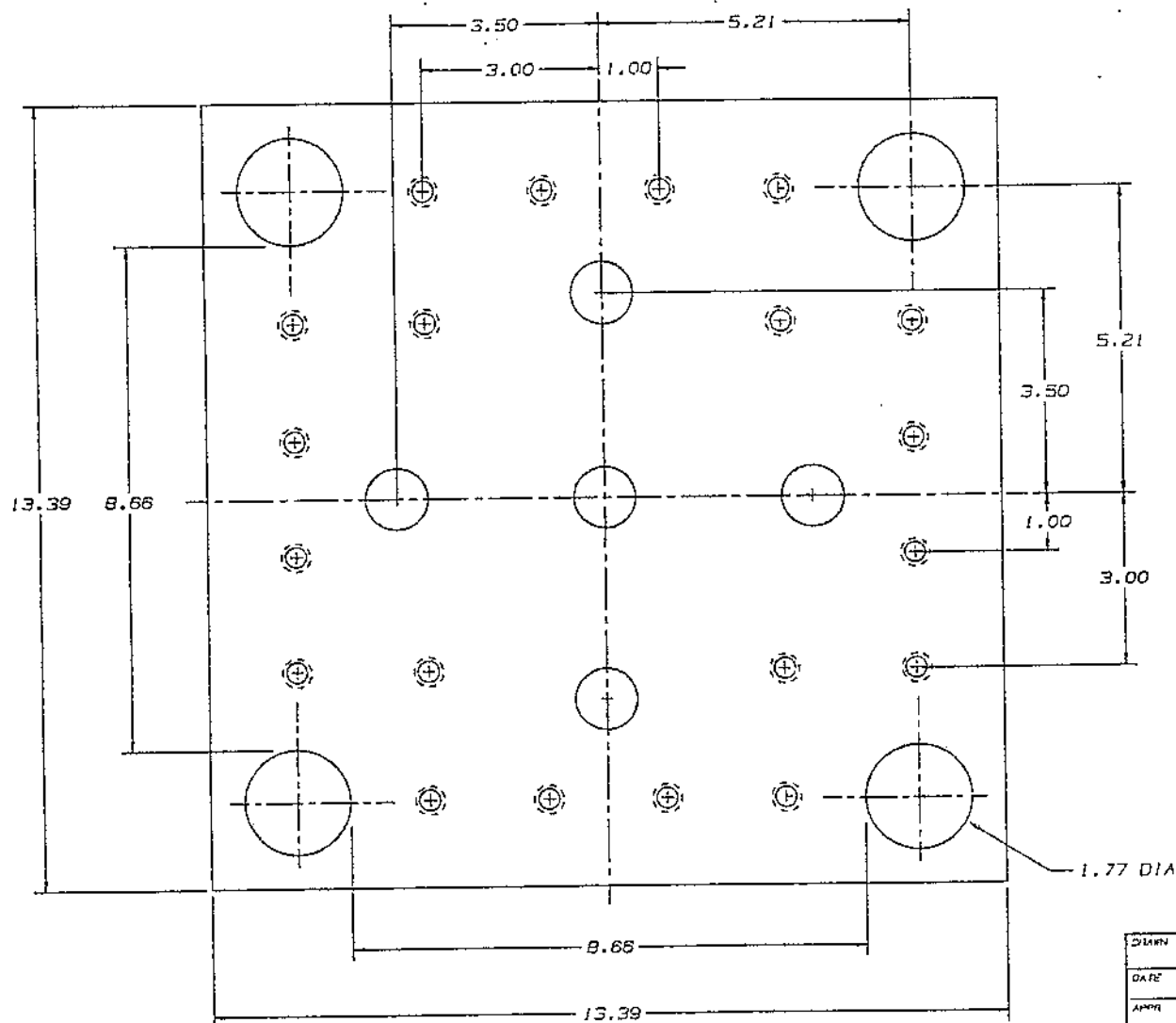
DRAWN T. SCHULTZ	APPR.	ufe UFE Incorporated. STILLWATER, MN
DATE 6-24-80	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:	UFE JIN	TITLE ADAPTER PLATE (50 TON PRESS SIZE 6)
FRACTIONAL 3/16	CUSTOMER	
2 PL. DEC. 2.012	PART NO.	SCALE NONE
3 PL. DEC. 2.004	PART NAME	DWG. NO.
4 PL. DEC. 2.002		SHEET SECT. M
ANGULAR 1/16"		PAGE NO. 6A

A	FRS-5-28-81	WAS SEC. O P. 6A
ISSUE	BY	DATE
		REVISION



A PRS-28-88 WAS SEC. 0 P. 6B

DRAWN: T. L. SCHULTE	APPR.	ufe [®] UFE Incorporated, STILLWATER, OK	TITLE ADAPTER PLATE (50 TON PRESS SIZE 6)
DATE 6-24-80	DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:	UFE #78	CUSTOMER	SCALE NONE
FRACTIONAL 2/32	CUSTOMER		
3 PLACE DEC. 2.010	PART NO.	PART NAME	DRWG. NO.
5 PLACE DEC. 3.000			
6 PLACE DEC. 2.0002			
ANGULAR 2.1° MAX			
			PAGE NO. 6B



GENERAL SPECIFICATIONS

MOLD K.O. HOLE CLEARANCE	.675 DIA
MAX. MOLD BASE	8.0 X 11.0
MAX. SHUT HEIGHT	17.9 (13.9" / 16.5")
MIN. SHUT HEIGHT	8.9 (4.9" / 7.5")
MAX. STROKE	9.0
MIN. STROKE	
MAX. EJECTOR TRAVEL	2.76
LOCATING RING DIA.	3.990
C/L OF MOLD TO FRONT DOOR	11.0
C/L OF MOLD TO BACK DOOR	17.0
C/L OF MOLD TO PRESS BOTTOM	37.7
CLAMP TONNAGE	28 TONS
MAX. INJECTION PRESSURE	22,000 PSI
MAX. CLAMP AREA	2.5 IN ²
PLASTICIZING CAPACITY	82 LB/HR
INJECTION CAPACITY	1.58 OZ.
MIN. MOLD BASE AREA	10 IN ²

* DRESSER PRESSES
(REQUIRES 4.00
SPACER BLOCK)

** STILLWATER PRESSES
(REQUIRES 1.375
SPACER BLOCK)

NOTE: THIS DATA HAS BEEN UNIVERSALLY
FORMULATED TO INCLUDE ALL PRESSES
OF THIS TYPE. INDIVIDUAL PRESSES
MAY VARY OUTSIDE OF THESE LIMITS.
SEE UFE ENGINEERING FOR ADDITIONAL
INFORMATION.

NOTE: K.O. COUPLER SPACING OF 6" & 7"
REQUIRED FOR ALL MOLDS SPECIFIED
FOR PRESS SIZE #7.

DESIGN BRETT N.
DATE 1-31-90
APPROV R. Miller

ufe
THE UNIVERSAL FLOW ENGINEERING

UFE Incorporated,

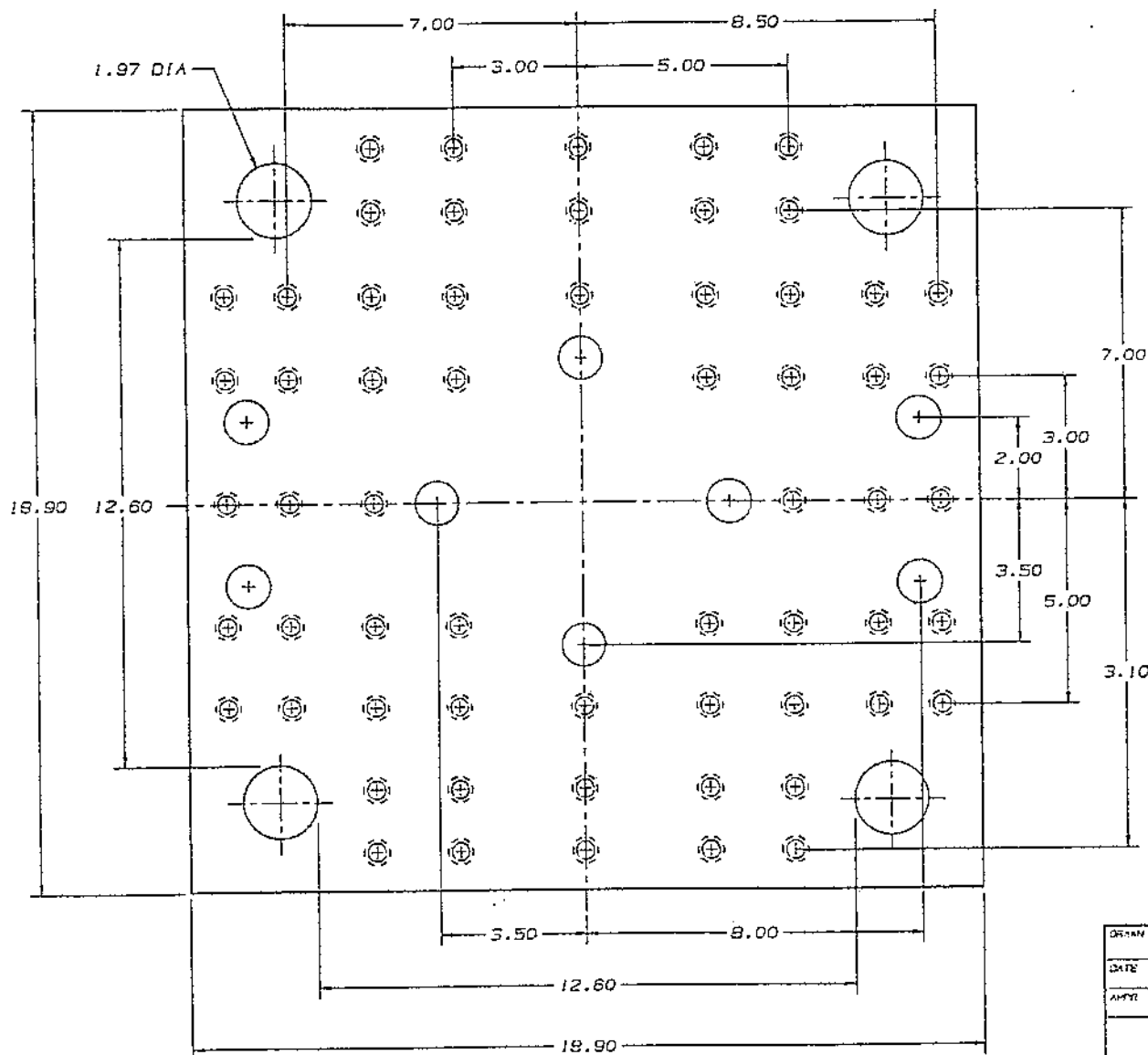
STILLWATER, MN

PLATEN: (PRESS SIZE #7)
28 TON ENGEL

SCALE NONE

SECT. M

PAGE 7



GENERAL SPECIFICATIONS

MOLD K.O. HOLE CLEARANCE	1.25 DIA
MAX. MOLD BASE	12.0 X 18.0
MAX. SHUT HEIGHT	13.78
MIN. SHUT HEIGHT	7.09
MAX. STROKE	12.2
MIN. STROKE	
MAX. EJECTOR TRAVEL	3.94
LOCATING RING DIA.	3.990
C/L OF MOLD TO FRONT DOOR	
C/L OF MOLD TO BACK DOOR	
C/L OF MOLD TO PRESS BOTTOM	
CLAMP TONNAGE	66 TONS
MAX. INJECTION PRESSURE	24,000 PSI
MAX. CLAMP AREA	5.5 IN ²
PLASTICIZING CAPACITY	
INJECTION CAPACITY	1.87 & 3.07 OZ.
MIN. MOLD BASE AREA	15 IN ²

NOTE: THIS DATA HAS BEEN UNIVERSALLY FORMULATED TO INCLUDE ALL PRESSES OF THIS TYPE. INDIVIDUAL PRESSES MAY VARY OUTSIDE OF THESE LIMITS. SEE UFE ENGINEERING FOR ADDITIONAL INFORMATION.

NOTE: K.O. COUPLER SPACING OF 6" & 7" REQUIRED FOR ALL MOLDS SPECIFIED FOR PRESS SIZE #2.

DRN: BRETT N.
DATE: 1-31-90
APP: R. M. H. C.

ufe
THERMOPLASTIC TECHNOLOGY

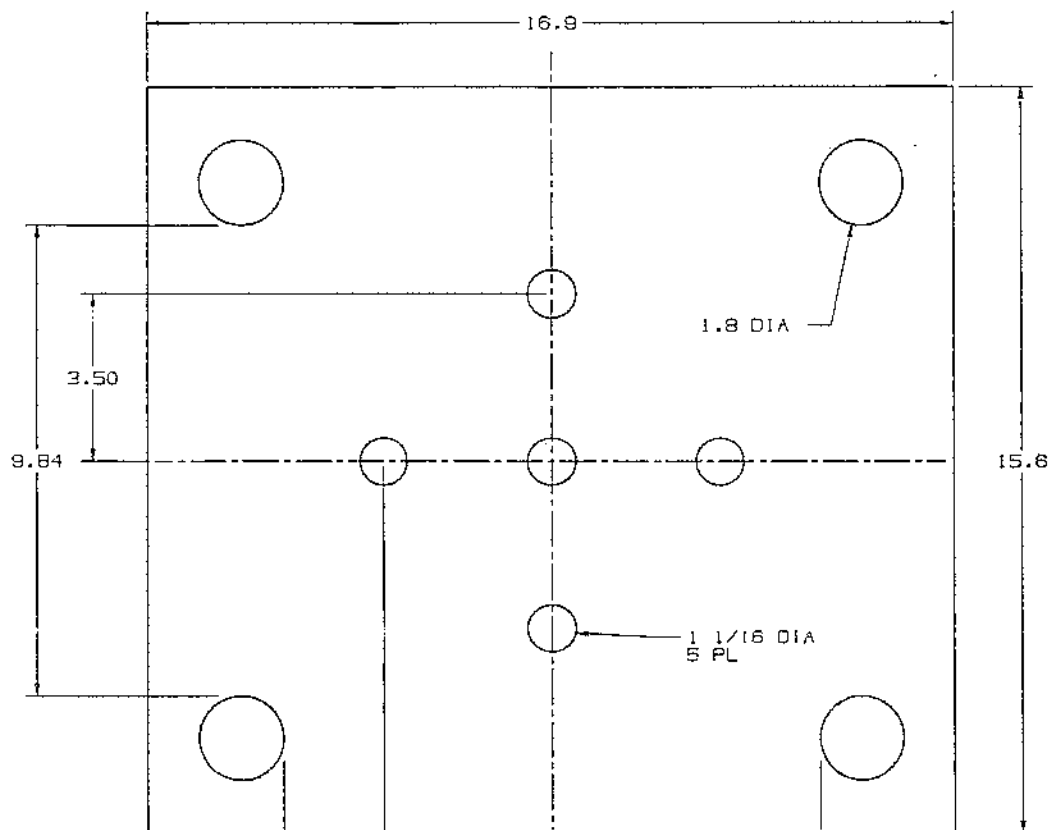
UFE Incorporated,
STILLWATER, MN

PLATEN: (PRESS SIZE 2)
66 TON DEMAG

SCALE: NONE

SECT. M

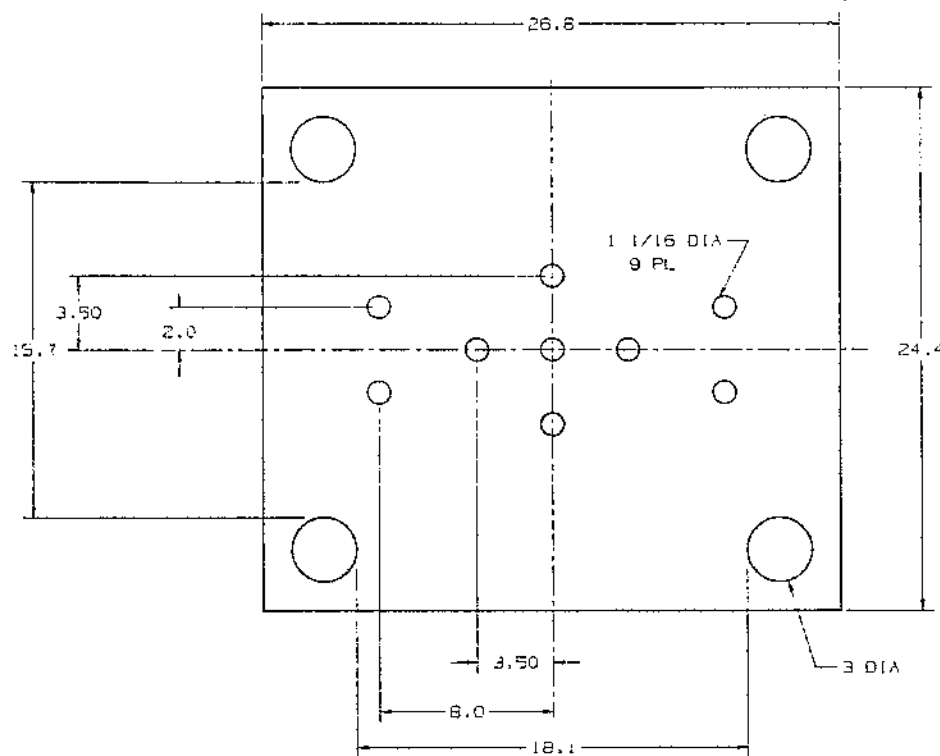
PAGE 8



GENERAL SPECS	
MOLD K.O. HOLES	7.00 IN.
MAX. MOLD BASE	
MAX. SHUT HEIGHT	11.00 IN.
MIN. SHUT HEIGHT	6.30 IN.
MAX. DIE TRAVEL	9.8 IN.
MAX. EJECTOR TRAVEL	2.4 IN.
LOCATING RING DIA.	3.990 IN.
CLAMP TONNAGE	44
MAX. INJECTION PRESSURE	27,200 PSI

DRAWN	J. ROGGS	APPR.	
DATE	9/23/85	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL $\pm 1/32$ 3 DEC. $\pm .015$ 2 DEC. $\pm .008$ 4 DEC. $\pm .002$ ANGULAR $1/4^\circ$		UFE W/N	
		CUSTOMER	
		PART NO.	
		PART NAME	
		ufe UFE Incorporated. HYDROPLASTIC EQUIPMENT STILLWATER, MN	
		TITLE	PLATEN, 40 TON JSW PRESS
		SCALE	NONE
		DRWG. NO.	
		SHEET	SECT. M
		PAGE 9	

A	PRS	11/85	UPDATED GENERAL SPECS
ISSUE	BY	DATE	REVISION



GENERAL SPECS	
MOLD K.O. HOLES	7 IN.
MAX. MOLD BASE	
MAX. SHUT HEIGHT	17.7 IN.
MIN. SHUT HEIGHT	6.7 IN.
MAX. DIE TRAVEL	15.8 IN.
MAX. EJECTOR TRAVEL	3.2 IN.
LOCATING RING DIA.	3.990 IN.
CLAMP TONNAGE	150

DRAWN J. BOGGS		APPR.		ufe [®] UFE Incorporated, HYDRAULIC TECHNOLOGY STILLWATER, MN	
DATE 9/23/95		DATE			
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL 1/32 3 PL. DEC. 1.013 3 PL. DEC. 1.003 4 PL. DEC. 1.001 ANGULAR 1/2° MIN		LIFE MAN		TITLE	
		CUSTOMER		PLATEN, 150 TON JAW PRESS	
		PART NO.		SCALE NONE	
PART NAME		SHEET 25 OF 25		DRWG. NO. PAGE 10	

ISSUE	BY	DATE	REVISION
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3

2

1

SEE NOTE 3

SEE NOTE 4,5

SEE NOTE 8

GENERAL SPECIFICATIONS

MOLD K.O. HOLE CLEARANCE	1 3/16
MAX. MOLD BASE SIZE, QUAN	13 3/8 X 15, 3 MOLD
MIN. MOLD BASE SIZE, QUAN	8 X 9 7/8, 4 MOLD
MAX. SHUT HEIGHT	17.0
MIN. SHUT HEIGHT	7.85
MAX. STROKE	
MIN. STROKE	
MAX. EJECTOR TRAVEL ROTARY	6.3
MAX. EJECTOR TRAVEL MOVING	2.36
CLAMP TONNAGE	150
MAX. INJECTION PRESSURE	22,043 PSI
LOCATING RING DIA	4.0
PLASTICIZING CAPACITY	270 LBS/HR
INJECTION CAPACITY	8.5 OZS

8. MOLD BASE & ANY ADD-ONS NOT TO EXCEED PLATEN DIA. SEE UFE ENGINEERING FOR EXCEPTIONS
7. ROTARY TABLE MACHINE PLATEN AND TABLE LAYOUT SEE UFE ENGINEERING FOR ADDITIONAL INFORMATION
6. NO WATERLINES OUT SPRUE SIDE OF MOLD BASE
5. 4 RETURN PINS-NO CENTER COUPLER REQ- SPRING LOAD EJ SYSTEM
4. 2 RETURN PINS PERP. TO SPRUE- NO COUPLER REQ
3. 2 RETURN PINS INLINE WITH COUPLER & SPRUE
2. CLAMP SLOT INLINE WITH SPRUE & PLATEN C/L
1. SEE ALSO SEC J PG 11

NOTE:

SPRUE, CLAMP SLOT
2 KNOCKOUTS &
COUPLER INLINE
PREFERRED DESIGN

REV

DRAWN	LIFE	APPR. <i>RKS</i>	ufe ® UFE Incorporated STILLWATER, MN
DATE	8/94	DATE 2-20-95	
TOLERANCES UNLESS OTHERWISE SPECIFIED:			TITLE
FRACTIONAL	± 1/32	UFE #/N	VERTICAL PRESS
2 PLC.DEC.	± .010	CUSTOMER	SCALE
3 PLC.DEC.	± .008	PART NO.	DRWG. NO.
4 PLC.DEC.	± .0002	PART NAME	SHEET OF
ANGULAR	± 1" 0'00"		SEC M PG 11

LEVEL	DCN	BY	DATE	CHKD	REVISION
-------	-----	----	------	------	----------

3

2

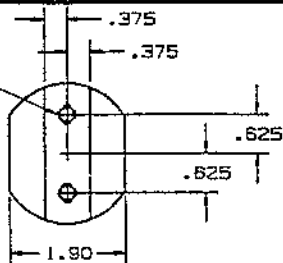
1

SECTION N – UFE STANDARD MOLD SET COMPONENTS

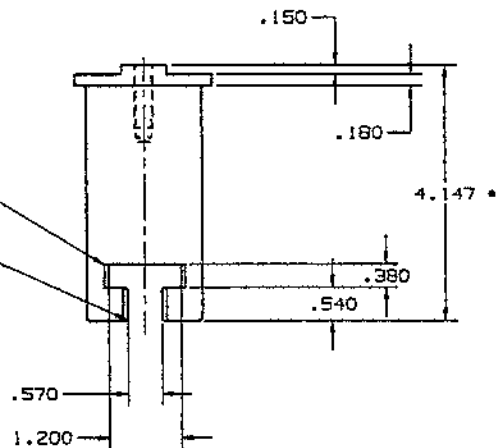
All of the following components are stocked and supplied by UFE Incorporated, except as noted.

<u>DESCRIPTION</u>	<u>PAGE</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
HYD. COUPLER (VERTICAL PRESS)	2	TAPER HEAD PINS	16
NEW SPRUE	3	SS TUBING	17
SPRUE BUSHING	4	BACK PRESSURE UNIT (EARLY RETURNS)	18
QUICK COUPLER SPACER	5	SLIDING RACK UNITS	19
HYD. RETURN COUPLER	6		20
CUSHIONED RETURN DISK	7	NIPPLE (OIL HEAT APPLICATIONS)	21
PLUG “O” RING	8		22
1/8 AND 1/4 CONNECTOR PLUGS	9 & 10	SPRUE PLATE	23
HOT MANIFOLD POWER CONNECTIONS	11	SPRING PADS	24
LIMIT SWITCHES	12		
HYD. RETURN COUPLERS	13		
TOOL STEEL COLOR CODE CHART	14		
1/16 AND 1/32 O-RINGS	15		

DRILL & TAP
5/16-18
1" DEEP
2X



.015 RAD TYP
.040 X 45 DEG
TYP

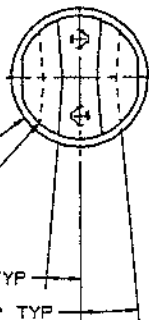


R 1.125

R 1.000

5° TYP

5° TYP



2. 1 RED H-13 STL 48-50 RC

1. * DIM DETERMINED BY NEED FOR INSULATE
BOARD (FOR OIL HEATED MOLD)

NOTE:

DRAWN	UFE	APPR.	<i>[Signature]</i>
DATE	8/92	DATE	11/20/92
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JWN	
		CUSTOMER	
		PART NO.	
		PART NAME	
FRACTIONAL	± 1/32		
2 PLC.DEC.	± .010		
3 PLC.DEC.	± .008		
4 PLC.DEC.	± .0002		
ANGULAR	± 1° 0'00"		

ufe UFE Incorporated
STILLWATER, MN

TITLE
HYD COUP VERT

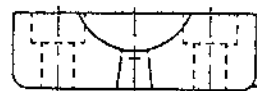
SCALE
SHEET OF
DRWG. NO.
SEC N PG 2

LEVEL	DCN	BY	DATE	CHKD	REVISION
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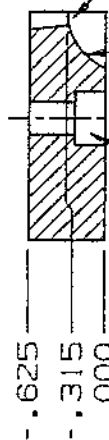
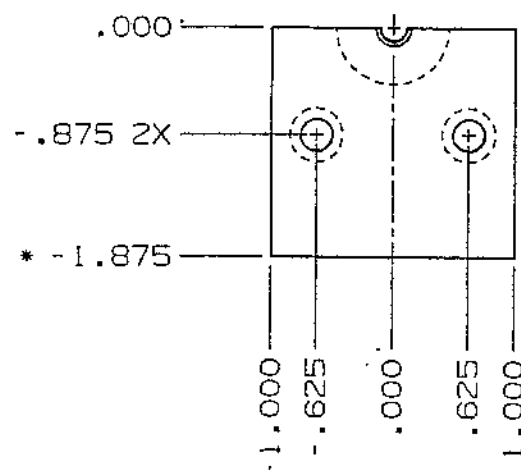
3

2

1



.130 R 2X

SEE MOLDFLOW
FOR "O" DIM

R 1/2

DRILL & C'BORE
FOR 1/4 -20 SHCS
2X

2. 1 REQ /S OF MOLD S-7 STL 54-56 RC

1. * DIM DETERMINED BY NEED FOR INSULATE
BOARD (FOR OIL HEATED MOLD)

NOTE:

LEVEL	DCN	BY	DATE	CHKD	REVISION
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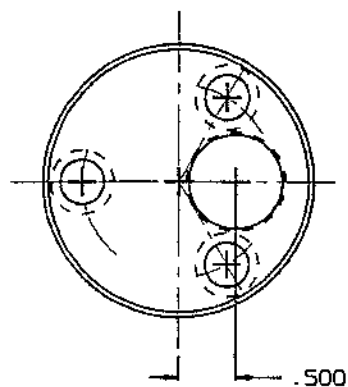
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2

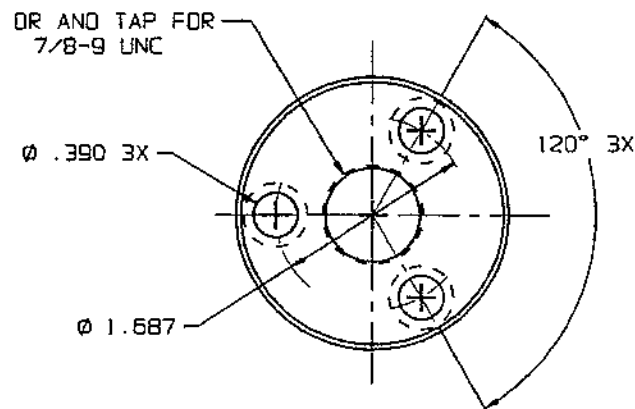
1

DRAWN	UFE	APPR.	R&S
DATE	9/94	DATE	2-20-95
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE J/N	
FRACTIONAL	± 1/32	CUSTOMER	
2 PLG.DEC.	± .018	PART NO.	
3 PLG.DEC.	± .005	PART NAME	
4 PLG.DEC.	± .0002		
ANGULAR	± 1° 00"		

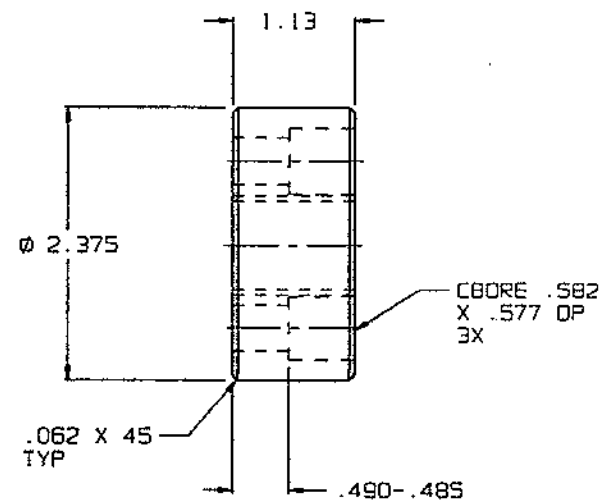
ufe® UFE Incorporated
STILLWATER, MN
TITLE
SPRUE BUSHING VERTSCALE
SHEET OFDRWG. NO.
SEC N PG 4



STYLE "B"



STYLE "A"



NOTE:

1. MATL TO BE CRS
2. SEE SEC G PG 13 FOR FINISHED LG REQ
3. NOTE BOLT PATTERNS FOR 6 & 7 KNOCK-OUT DISTANCE

DRAWN UFE		DATE 6/99		UFE INC		UFE Incorporated STILLWATER, MN	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		FRACTIONAL ±1/32		2 PLC. DEC. ±.010		3 PLC. DEC. ±.005	
4 PLC. DEC. ±.0002		ANGULAR ±1°0'00"		PART NO.		PART NAME	
TITLE QUICK COUPLER SPACER STYLE A,B				SCALE		DRWG. NO.	
SHEET OF				SECTION N PG 5			

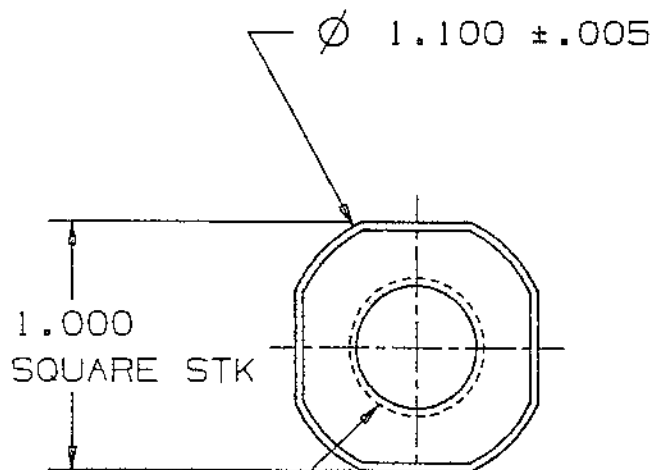
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2

1

C

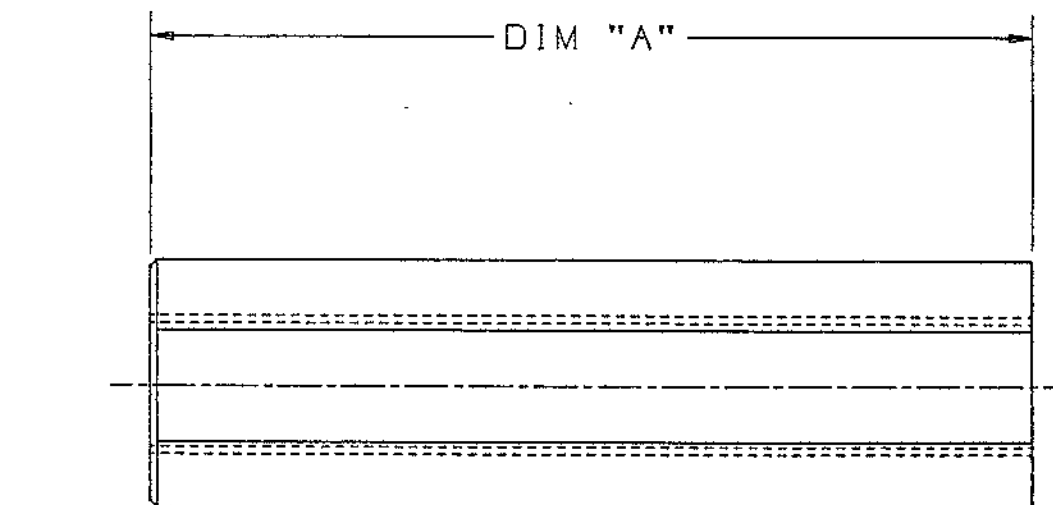
C



B

B

DR AND TAP FOR
1/2-13 UNC



DASH NO	DIM "A"
02	3.62

NOTE:

MATL CRS
BREAK ALL SHARP EDGES

LEVEL	DCN	BY	DATE	CHNG	REVISION
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3

2

1

A

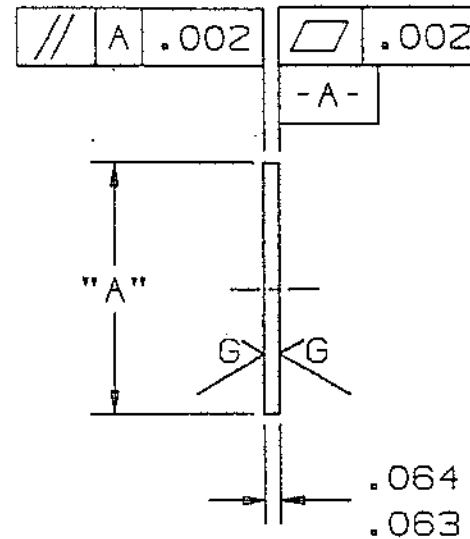
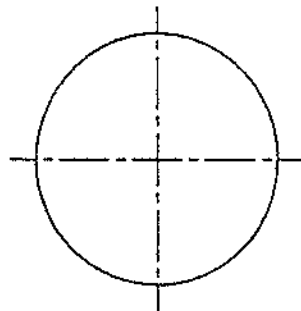
A

DRAWN <u>JJR</u>		APPR. <u>[Signature]</u>		ufe ® UFE Incorporated STILLWATER, MN	
DATE <u>11/92</u>		DATE <u>11/20/92</u>			
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ± 1/32 2 PL. DEC. ± .010 3 PL. DEC. ± .005 4 PL. DEC. ± .0002 ANGULAR ± 1' 00"				UFE J/N	
				CUSTOMER	
				PART NO. <u>C-11925</u>	
PART NAME				TITLE COUPLING HYD RETURN	
SHEET OF				DRWG. NO. SEC N PG 6	

3

2

1



DASH NO	DIM "A"
-01	$\frac{.733}{.748}$
-02	$\frac{1.170}{1.185}$

NOTE:

MATL C-1015 OR C-1030 STL
CASE HARDENED .010 TO .015 DP

DRAWN	JJR	APPR.	<i>[Signature]</i>	ufe ® UFE Incorporated STILLWATER, MN
DATE	11/92	DATE	11/20/92	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE #N		
FRACTIONAL $\pm 1/32$ 2 PLC.DEC. $\pm .010$ 3 PLC.DEC. $\pm .005$ 4 PLC.DEC. $\pm .0002$ ANGULAR $\pm 1' 00"$		CUSTOMER		
		PART NO.		TITLE
		C-11790-		DISK CUSH RETURN
		PART NAME		SCALE
				SHEET OF
				DRWG. NO.
				SEC N PG 7

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3

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1

PLUG	A	B	C	D	E	F	G
1/4	.308	.202	.311	1/4	43x3/16DP	4-40	008
11/32	.370	.270	.373	11/32	36x3/16DP	6-32	010
7/16	.494	.270	.498	7/16	36x3/16DP	6-32	012

OR NO. E
BOTTOM TAP FOR F

O-RING NO. G

.025 X 45° CHAM (2)

B $\pm .002 \varnothing$

A $\pm .002 \varnothing$

C $\begin{matrix} +.002 \\ -.000 \end{matrix} \varnothing$

60° C'SINK X
.030 MIN.

D $\varnothing$ WATERLINE

5/16 TYP

.090 $\pm .001$ TYP

.250 $\pm .001$ TYP

NOTES:

1. MATERIAL: BRASS
2. PLUG CAN ONLY BE USED IF IT IS BACKED UP
3. BREAK ALL SHARP EDGES IN .090 O-RING GROOVE

REV

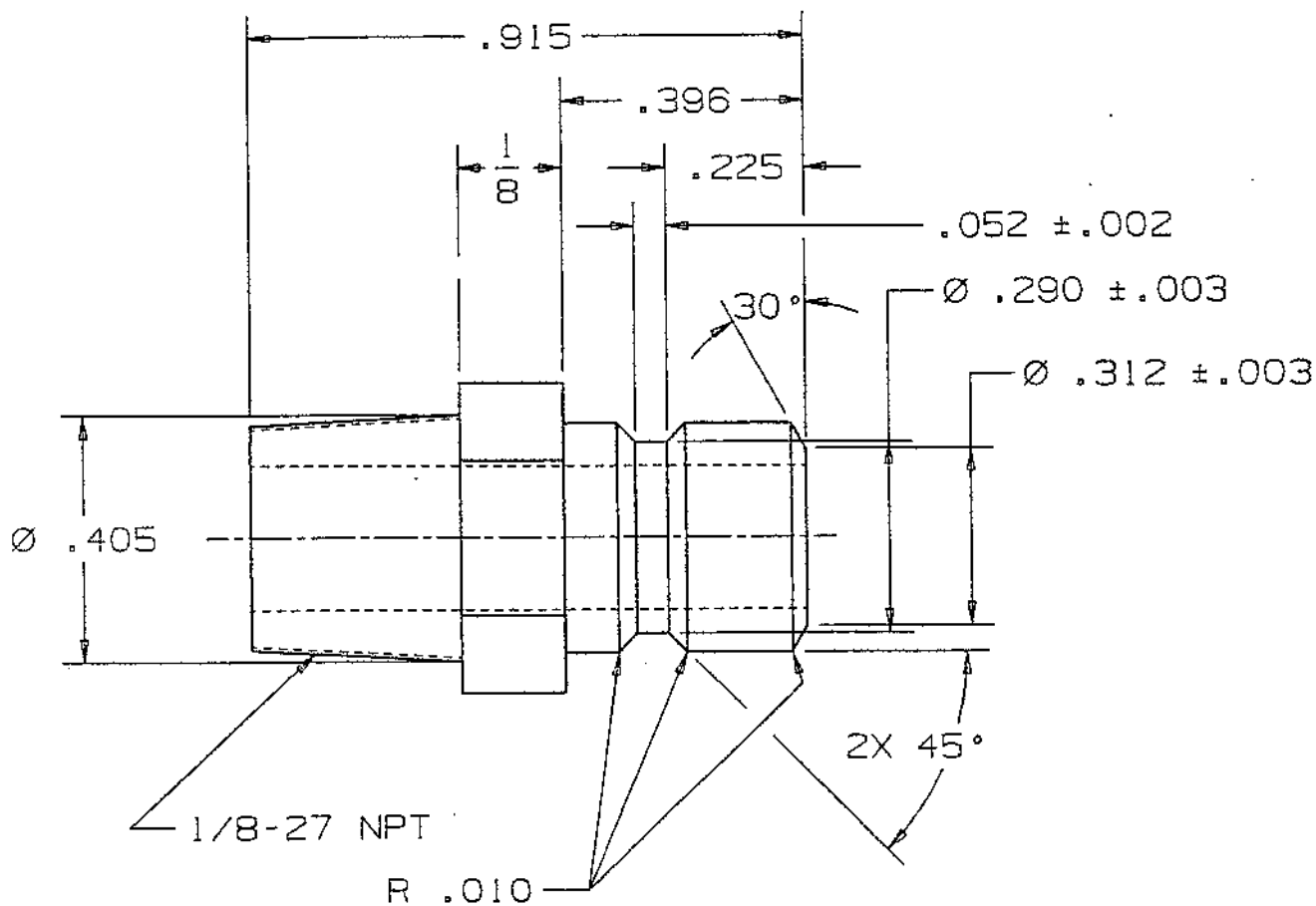
DRAWN	JJR	APPR.	<i>[Signature]</i>	ufe ® UFE Incorporated STILLWATER, MN	
DATE	11/92	DATE	11/20/92		
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL $\pm 1/32$ 2 PLC.DEC. $\pm .010$ 3 PLC.DEC. $\pm .005$ 4 PLC.DEC. $\pm .0002$ ANGULAR $\pm 1' 00"$				UFE #/N	TITLE PLUG "O" RING
				CUSTOMER	
				PART NO.	SCALE 2/1
				PART NAME	DRWG. NO. SEC N PG 8
				SHEET OF	

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3

2

1



NOTE:

1. MATL 7/16 HEX BRASS ROD
2. UFE USE ONLY (NOT SUPPLIED)

DRAWN	JJR	APPR.	<i>[Signature]</i>
DATE	11/92	DATE	11/20/92
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE #N	
FRACTIONAL	± 1/32	CUSTOMER	
2 PLC.DEC.	± .010	PART NO.	
3 PLC.DEC.	± .005	PART NAME	
4 PLC.DEC.	± .0002	SCALE	
ANGULAR	± 1° 0'00"	SHEET OF	
		DRAWG. NO.	
		SEC N PG 9	

ufe UFE Incorporated

STILLWATER, MN

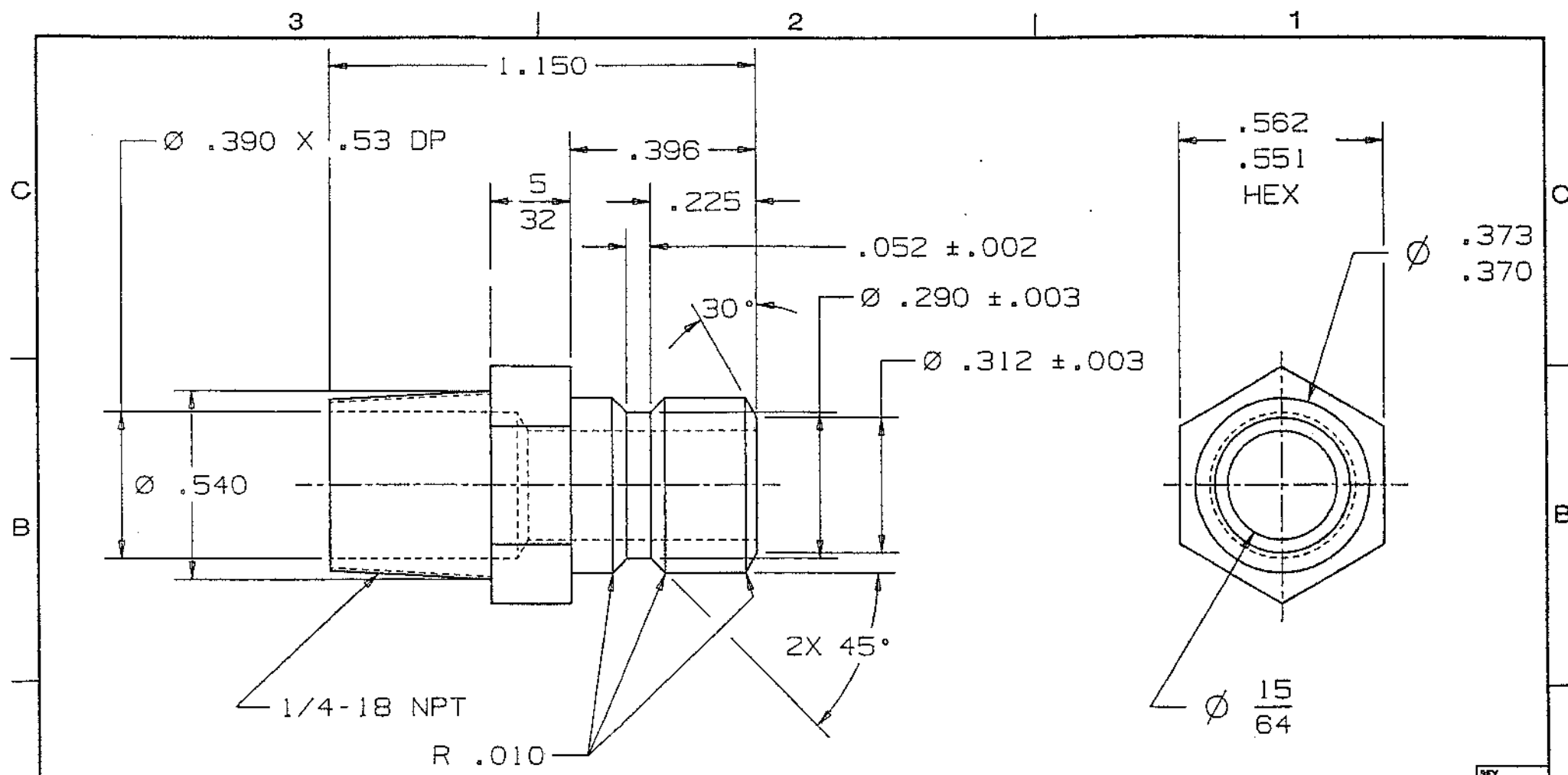
TITLE
CONNECTOR PLUG 1/8 NPT

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3

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1

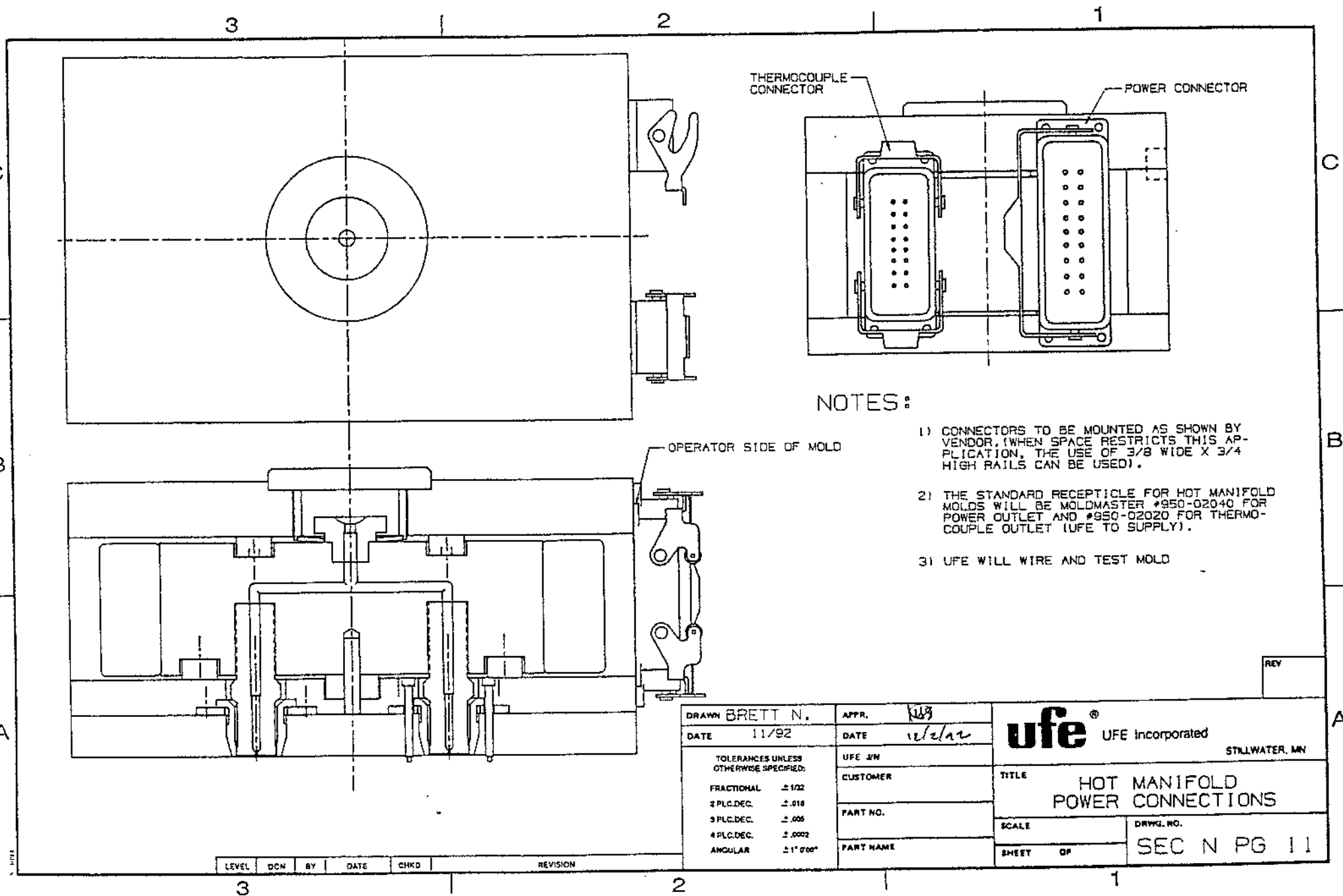


NOTE :

1. MATL 9/16 HEX BRASS ROD
2. UFE USE ONLY (NOT SUPPLIED)

DRAWN JJR		APPR. <i>[Signature]</i>		ufe ® UFE Incorporated STILLWATER, MN	
DATE 11/92		DATE 11/20/92			
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL $\pm .102$ 2 PLG.DEC. $\pm .016$ 3 PLG.DEC. $\pm .005$ 4 PLG.DEC. $\pm .0002$ ANGULAR $\pm 1' 00"$				TITLE CONNECTOR PLUG 1/4 NPT	
UFE J/M CUSTOMER PART NO. PART NAME				SCALE DRWG. NO. SHEET DF SEC N PG 10	

LEVEL	DCN	BY	DATE	CHKD	REVISION
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THERMOCOUPLE
CONNECTOR

POWER CONNECTOR

NOTES:

- 1) CONNECTORS TO BE MOUNTED AS SHOWN BY VENDOR, (WHEN SPACE RESTRICTS THIS APPLICATION, THE USE OF 3/8 WIDE X 3/4 HIGH RAILS CAN BE USED).
- 2) THE STANDARD RECEPTACLE FOR HOT MANIFOLD MOLDS WILL BE MOLDMASTER #950-02040 FOR POWER OUTLET AND #950-02020 FOR THERMOCOUPLE OUTLET (UFE TO SUPPLY).
- 3) UFE WILL WIRE AND TEST MOLD

OPERATOR SIDE OF MOLD

DRAWN BRETT N.

DATE 11/92

APPR.

DATE

TOLERANCES UNLESS
OTHERWISE SPECIFIED:

FRACTIONAL $\pm 1/32$
2 PLC.DEC. $\pm .010$
3 PLC.DEC. $\pm .005$
4 PLC.DEC. $\pm .0002$
ANGULAR $\pm 1' 000''$

UFE J/W
CUSTOMER

PART NO.

PART NAME

ufe® UFE Incorporated
STILLWATER, MN

TITLE
HOT MANIFOLD
POWER CONNECTIONS

SCALE

DRWG. NO.

SHEET OF

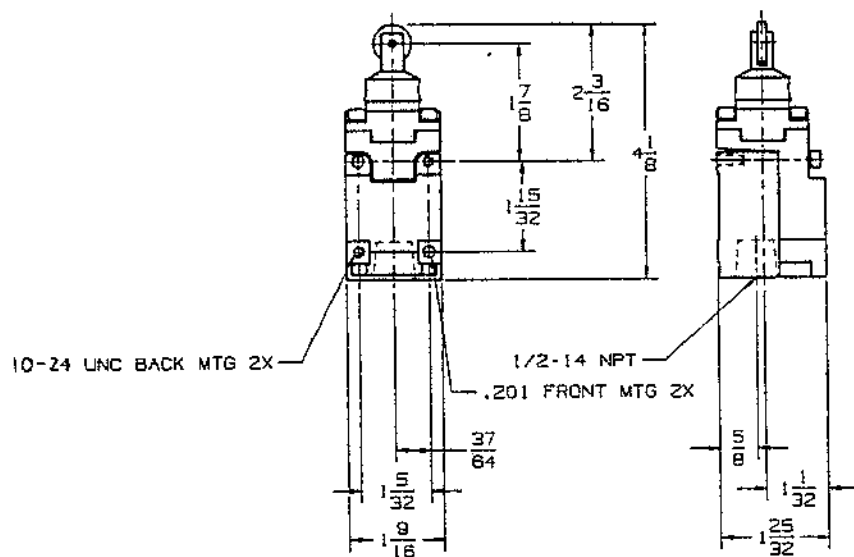
SEC N PG 11

LEVEL	CON	BY	DATE	CHKD	REVISION
3					
2					
1					

3

2

1



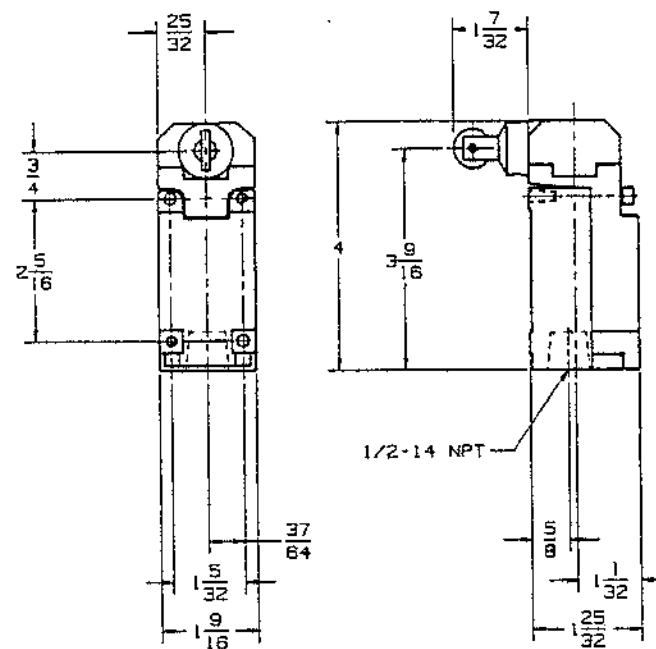
BACK VIEW

SIDE VIEW

SQUARE "D" LIMIT SWITCH
TYPE C52D CLASS 9007

NOTE:

1. CONTACTS: 2 SETS N.O. & 2 SETS N.C.
2. PRE TRAVEL = .080, TOTAL TRAVEL = .250



BACK VIEW

SIDE VIEW

SQUARE "D" LIMIT SWITCH
TYPE C54F CLASS 9007

REV

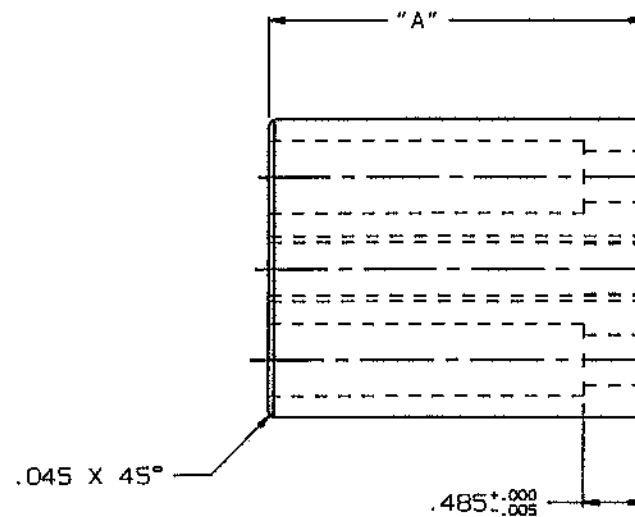
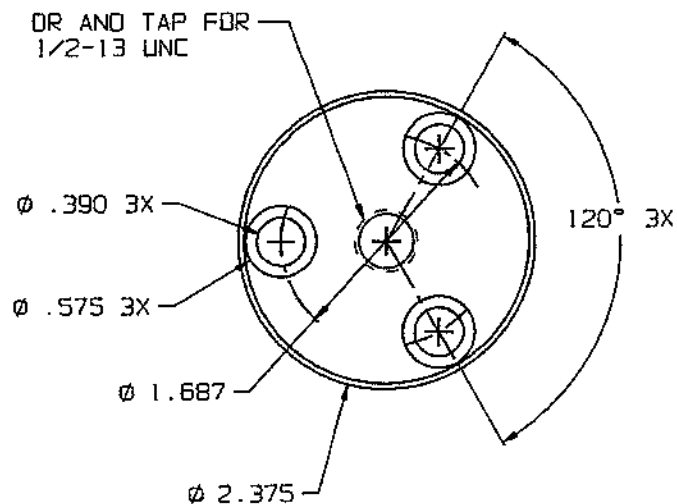
DRAWN	APPR.	ufe ® UFE Incorporated STILLWATER, MN	
DATE	DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		TITLE	
FRACTIONAL ± 1/32		LIMIT SWITCHES	
2 PLC.DEC. ± .010		CUSTOMER	SCALE
3 PLC.DEC. ± .005		PART NO.	SHEET OF
4 PLC.DEC. ± .0002		PART NAME	DRWG. NO.
ANGULAR ± 1° 0'00"			SEC N PG 12

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3

2

1



NOTE:

- MATL TO BE CRS
- A DIM= STYLE A = 3.000
STYLE B = 1.077

DRAWN	LFE	APPR.	ufe ® UFE Incorporated UNITED FOR EXCELLENCE STILLWATER, MN
DATE	2/01	DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE JPN	TITLE LIFE COUPLER
FRACTIONAL ±1/32		CUSTOMER	
2 PLC. DEC. ±.010		PART NO.	SCALE
3 PLC. DEC. ±.005		C-12559-02	
4 PLC. DEC. ±.0002		PART NAME	DRWG. NO. SECTION N PG 13
ANGULAR ±1°0'00"			
SHEET			OF

UFE INCORPORATED TOOL STEEL COLOR CODE CHART

<u>STEEL TYPE</u>	<u>COLOR</u>
P-20 (Prehard)	White Stripe
O-1	Pink Stripe
A-2	Grey and Red Stripes
A-6	Purple Stripe
S-7	Blue and Yellow Stripes
L-6 (RDS)	Purple Field, Green Stripe
H-13 (Pre-hardened) Viscount 44	Green and Black Stripes
M-2	Orange Stripe
H-13	Yellow Stripe
H-21	Green Stripe
D-2	Red and Black Stripes
D-3	Orange and Black Stripes
Stainless (All Types)	Black Stripe

O-RING SIZE 1/16	GROOVE DIAS FOR INTERNAL PRESSURE		GROOVE DIAS FOR EXTERNAL PRESSURE		O-RING SIZE 3/32	GROOVE DIAS FOR INTERNAL PRESSURE		GROOVE DIAS FOR EXTERNAL PRESSURE	
	DIA.		DIA.			DIA.		DIA.	
	+.000	-	-.000	+		+.000	-	-.000	+
006	.243	.002	.119	.002	133	1.989	.004	1.809	.008
007	.274	.002	.150	.002	134	2.052	.005	1.872	.009
008	.305	.002	.181	.002	135	2.115	.005	1.935	.009
009	.337	.002	.213	.002	136	2.177	.006	1.997	.010
010	.368	.002	.244	.002	137	2.240	.007	2.060	.010
011	.430	.002	.306	.002	138	2.302	.007	2.122	.011
012	.493	.002	.369	.002	139	2.365	.008	2.185	.012
013	.555	.002	.431	.002	140	2.427	.008	2.247	.012
014	.618	.002	.494	.002	141	2.490	.009	2.310	.013
015	.680	.002	.556	.002	142	2.552	.010	2.372	.014
016	.743	.002	.619	.002	143	2.615	.010	2.435	.014
017	.805	.002	.681	.002	144	2.677	.011	2.497	.015
018	.868	.002	.744	.002	145	2.740	.012	2.560	.016
019	.929	.002	.807	.002	146	2.802	.012	2.622	.016
020	.992	.002	.870	.002	147	2.860	.008	2.690	.012
021	1.054	.003	.932	.003	148	2.922	.008	2.752	.012
022	1.117	.003	.995	.004	149	2.985	.009	2.815	.013
023	1.179	.003	1.057	.005	150	3.047	.010	2.877	.014
024	1.242	.003	1.120	.005	151	3.172	.011	3.002	.015
025	1.304	.003	1.182	.006	152	3.422	.013	3.252	.017
026	1.367	.003	1.245	.006	153	3.672	.016	3.502	.020
027	1.429	.003	1.307	.007	154	3.922	.018	3.752	.022
028	1.492	.003	1.370	.008	155	4.172	.021	4.002	.025
029	1.613	.003	1.499	.005	156	4.422	.023	4.252	.027
030	1.738	.003	1.624	.006	157	4.672	.026	4.502	.030
031	1.863	.003	1.749	.007	158	4.922	.028	4.752	.032
032	1.988	.004	1.874	.009	159	5.172	.031	5.002	.035
033	2.113	.005	1.999	.010	160	5.414	.025	5.260	.029
034	2.238	.007	2.124	.011	161	5.664	.028	5.510	.032
035	2.363	.008	2.249	.012	162	5.914	.030	5.760	.034
036	2.488	.009	2.374	.014	163	6.164	.033	6.010	.037
037	2.613	.010	2.499	.015	164	6.414	.035	6.260	.039
038	2.738	.012	2.624	.016	165	6.664	.038	6.510	.042
039	2.858	.008	2.754	.012					
040	2.983	.009	2.879	.014					

TAPERED HEADED PINS - (4" SPECIAL)

.032	.0635	.105
.034	.064	.106
.035	.065	.108
.036	.066	.113
.038	.0665	.115
.040	.067	.116
.041	.068	.120
.045	.070	.1255
.047	.072	.127
.048	.077	.129
.049	.079	.130
.050	.080	.1305
.052	.082	.131
.053	.084	.1315
.054	.086	.1325
.055	.089	.136
.056	.094	.140
.057	.095	.143
.058	.097	.146
.060	.099	.149
.0605	.100	.160
.061	.102	.1635
.062	.104	.1665

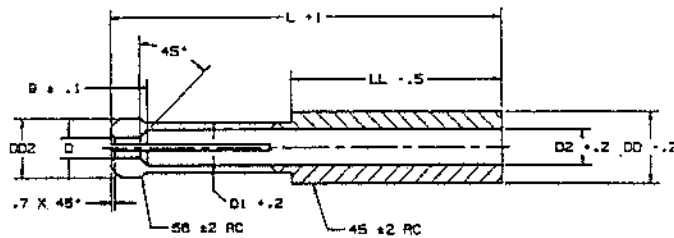
TUBING NO.	TUBING	
	O.D.	I.D.
050120	.032	.020
050170	.065	.047
050190	.083	.063
050200	.095	.071
050210	.109	.085
050230	.134	.106
050260	.180	.150
050670	.250	.194
051130	.375	.245
051360	.500	.370
051570	.625	.495

3

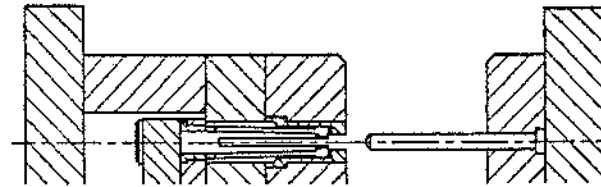
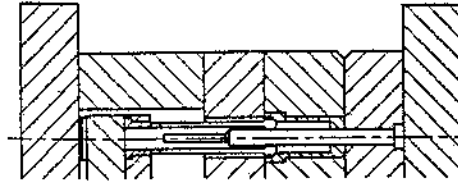
2

1

BACK PRESSURE UNITS



LL	DD2	DD	D2	D1	D	L	LL	DD2	DD	D2	D1	D	L
2.87	.63	.703	.394	.512	.369	4.92	73	16	18	10	13	6	125
3.94	.22	.394	.492	.668	.394	6.35	100	20	24	12.5	17	10	160

NOTE:
ALL DIMENSIONS IN INNOTE:
ALL DIMENSIONS IN MM

USES:

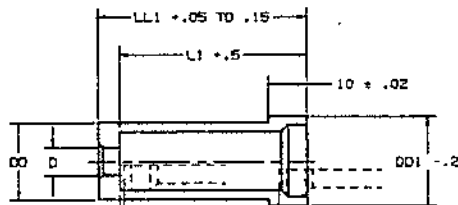
THE HASCO BACK PRESSURE UNIT CAN BE USED AS A POSITIVE EARLY RETURN SYSTEM FOR A MOLD WITH SLIDES THAT INTERFERE WITH EJECTOR PINS. THEY CAN ALSO BE USED IN SEQUENCING STRIPPER PLATE MOLDS AND IN DOUBLE EJECTION SYSTEMS.

OPERATION:

WHEN EJECTING, THE SLOTTED BACK PRESSURE BUSH SLIDES INTO THE RETAINING BUSH THUS DECREASING ITS FRONTAL AREA. UPON CLOSING THE MOLD, THE PRESSURE PIN PASSES ON THIS NARROWED FRONTAL AREA AND PUSHES THE EJECTOR SYSTEM BACK UNTIL THE SLOTTED BUSH CAN EXPAND AGAIN (AT A DISTANCE OF Hmax). THE PRESSURE PIN THEN SLIDES FREELY THROUGH THE SLOTTED BUSH UNTIL THE MOLD CLOSES COMPLETELY.

FITTING:

- 1) THE MAX WORKING STROKE (Hmax) IS DETERMINED BY THE LENGTH OF THE RETAINING BUSHING AND/OR THE PRESSURE PIN. ALWAYS ALLOW A SAFETY TOLERANCE OF APPROX. .5MM.
- 2) THE REAR END OF THE SLOTTED BUSHING CAN BE ALTERED ACCORDING TO REQUIREMENTS. WHEN MACHINING, VIBRATION OF SEGMENTS SHOULD BE AVOIDED, TAPE THEM OR USE AN "O" RING.
- 3) THE PRESSURE PINS SHOULD HAVE A DIAMETER "D" AND A 2MM X 45° BEVELED END.



SAFETY TOLERANCE Hmax

Hmax	t	L1	DD1	DD	D	LL1	Hmax	t	L1	DD1	DD	D	LL1
.95	.26	1.22	.87	.71	.24	1.42	24	6.7	31	22	18	6	36
1.34		1.61				1.81	34		41				46
1.73		2.00				2.21	44		51				56
.95	.26	1.18	1.14	.95	.39	1.42	24	6.7	30	29	24	10	36
1.34		1.59				1.81	34		40				46
1.73		1.97				2.21	44		50				56
2.52		2.76				2.30	64		70				76

NOTE:
ALL DIMENSIONS IN INNOTE:
ALL DIMENSIONS IN MM

DRAWN	UFE	APPR.	UFE
DATE	8/92	DATE	11/20/92
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE 3/IN	
FRACTIONAL		± 1/32	
2 PLG.DEC.		± .018	
3 PLG.DEC.		± .008	
4 PLG.DEC.		± .004	
ANGULAR		± 1° 00'	
CUSTOMER		TITLE	
PART NO.		BACK PRESSURE UNITS	
PART NAME		SCALE	
		SHEET OF	
		DRWG. NO.	
		SEC N PG 18	

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3

2

1

3

2

1

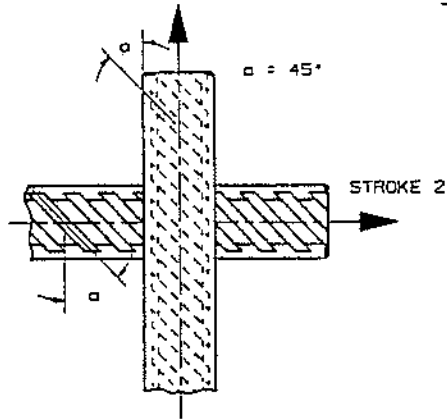
STROKE 1

MECHANICAL SLIDING RACK UNIT

Z1755

Z1756

STROKE 1 = TIE ROD
STROKE 2 = STROKE 1



Z1752

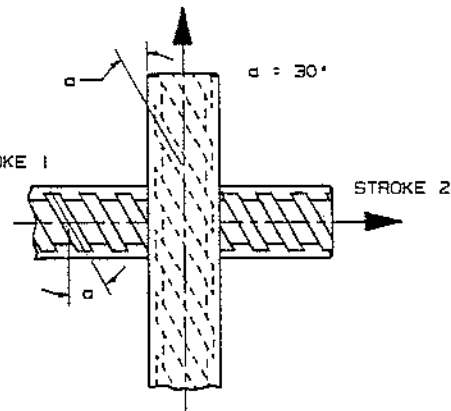
Z1751

Z1754

 $\alpha = (1-2^\circ)$

STROKE 1

STROKE 1 = TIE ROD
STROKE 2 = $0.5774 \times \text{STROKE 1}$



THE HASCO MECHANICAL SLIDING DEVICE CAN BE USED TO ADVANTAGE WHEN RELATIVELY LONG SLIDING DISTANCES ARE TO BE COVERED BY THE OPENING MOVEMENT OF THE MOLD. THIS SLIDING DEVICE CAN ALSO BE USED TO ADVANTAGE WHERE MOVEMENTS AND FORCES MUST BE DIVERTED THROUGH 90° .

FUNCTION

TWO RACKS WITH ANGULAR TEETH ENGAGE EACH OTHER AT AN ANGLE OF 90° IN THE GUIDE BLOCK. MOVEMENT OF ONE RACK IS PRECISELY TRANSFERRED TO THE OTHER RACK. IN THE CASE WHERE $\alpha = 45^\circ$, THE RATIO OF TRAVEL IS 1:1. WHEN $\alpha = 30^\circ$, THE SLIDING RACK COVERS ONLY APPROXIMATELY HALF OF THE DISTANCE OF THE DRIVING RACK. THE STROKE LENGTHS CAN BE DETERMINED FROM THE PITCH P OF THE RACKS. THE RATIO OF THE STROKES EQUALS THAT OF THE PITCHES. THE RACK-FASTENING DIMENSION W DETERMINES THE LENGTHS.

IT IS NOT POSSIBLE TO GEAR UP!
THE TOOTHING MUST REMAIN ENGAGED AT ALL TIMES!

FITTING INSTRUCTIONS

THE RACKS ARE FASTENED BY MEANS OF THE LOCATING BLOCK. THEY MUST BE SECURED AGAINST TWISTING AND MUST ENGAGE PRECISELY AT RIGHT ANGLES. TWISTING IS AVOIDED BY MEANS OF THE Z1558 TWIST KEYS. THE MECHANICAL SLIDING DEVICE CAN BE USED INDIVIDUALLY OR IN PAIRS. THE LOCKING DEVICES OF THE SLIDE MUST HAVE A SHALLOWER ANGLE $(1-2^\circ)$ THAN THE TOOTHING ANGLE. THE SLIDING DEVICE MUST BE GREASED WELL AND PROTECTED AGAINST DIRT.

REV

DRAWN UFE		APPR. <i>KJB</i>		ufe ® UFE Incorporated STILLWATER, MN	
DATE 6/92		DATE 11/20/92			
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL $\pm 1/32$ 2 PLG.DEC. $\pm .010$ 3 PLG.DEC. $\pm .005$ 4 PLG.DEC. $\pm .0002$ ANGULAR $\pm 1' 00''$		UFE JVN		TITLE	
		CUSTOMER		SLIDING RACK UNITS	
		PART NO.		SCALE	
PART NAME		DRWG. NO.		SEC N PG 19	

LEVEL	DCN	BY	DATE	CHKD	REVISION
-------	-----	----	------	------	----------

3

2

1

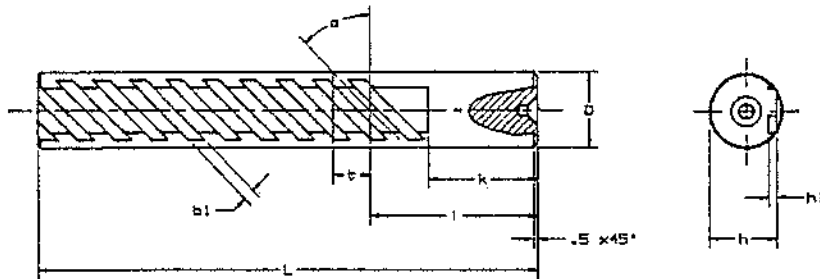
3

2

1

SLIDING RACK COMPONENTS

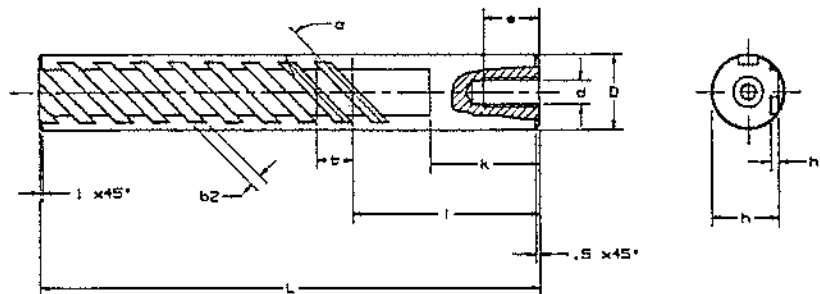
Z1751 FOLLOWING RACK



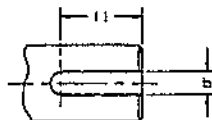
k	b1	h	h1	t	l	D	L	a
16	3	15	2.5	6.93	25	16	180 200 250	30
16	3	15	2.5	8.48	29	16	180 200 250	45
20	4	22	3	9.24	33	25	200 250 315 400	30
20	4	22	3	11.31	40	25	200 250 315 400	45

NOTE:
ALL DIMENSIONS IN mm

Z1752 DRIVING RACK



k	h	h1	d	e	b	b2	t	l	l1	D	L	a
16	15	2.5	M8	15	5	3	12	37	16	16	200 250 315	30
16	15	2.5	M8	15	5	3	8.48	29	16	16	180 200 250	45
20	22	3	M12	18	8	4	16	49	20	25	200 250 315 400 500	30
20	22	3	M12	18	8	4	11.31	40	20	25	200 250 315 400	45

NOTE:
ALL DIMENSIONS IN mm

REV

DRAWN	UFE	APPR.	<i>[Signature]</i>	ufe ® UFE Incorporated STILLWATER, MN
DATE	6/92	DATE	11/20/92	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE M/N		
FRACTIONAL ± 1/32		CUSTOMER		
2 PLC.DEC. ± .010		PART NO.		TITLE
3 PLC.DEC. ± .005		PART NAME		SLIDING RACK COMPONENTS
4 PLC.DEC. ± .0002				SCALE
ANGULAR ± 1° 0'00"				DRWG. NO.
				SHEET OF
				SEC N PG 20

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3

2

1

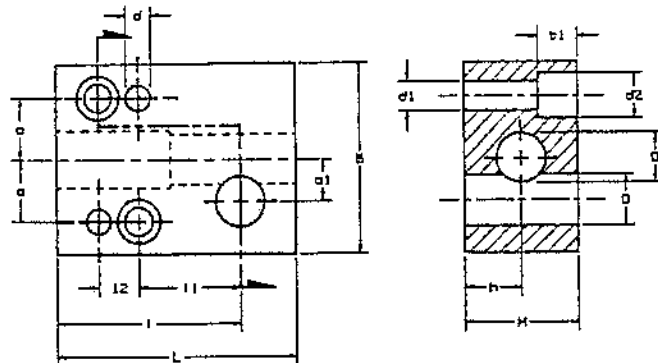
3

2

1

SLIDING RACK COMPONENTS

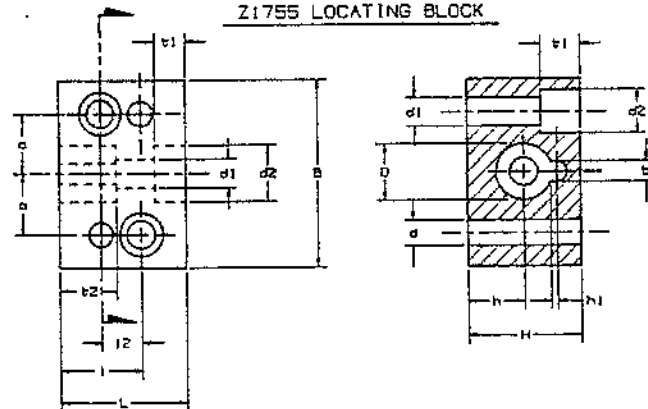
Z1754 GUIDE BLOCK



a	a1	l	l1	l2	d	d1	d2	t1	h	B	H	L	D
18	11.6	50	27	13	8	9	15	11	18	56	32	67	16
27	16.1	67	35	19	10	14	20	15.5	22.5	60	45	80	25

NOTE:
ALL DIMENSIONS IN mm

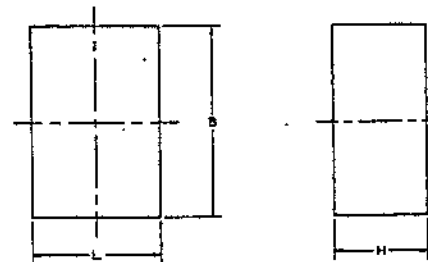
Z1755 LOCATING BLOCK



a	b	l	l2	d	d1	d2	t1	t2	h	h1	B	H	L	D
18	5	23	13	8	9	15	11	16	2.2	56	32	36	16	
27	8	32	19	10	14	20	15.5	22	22.5	2	60	45	45	25

NOTE:
ALL DIMENSIONS IN mm

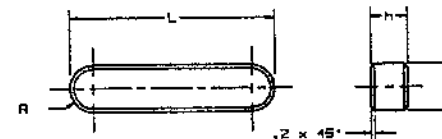
Z1756 MOUNTING BLOCK



B	L	H
58	38	25
		40
		63
80	45	32
		50
		80

NOTE:
ALL DIMENSIONS IN mm

Z1558 TWIST KEY



b	h	L
5	5	14
		18
		34
		40

b	h	L
10	8	40
		45
		50
		60
		65

NOTE:
ALL DIMENSIONS IN mm

KEY

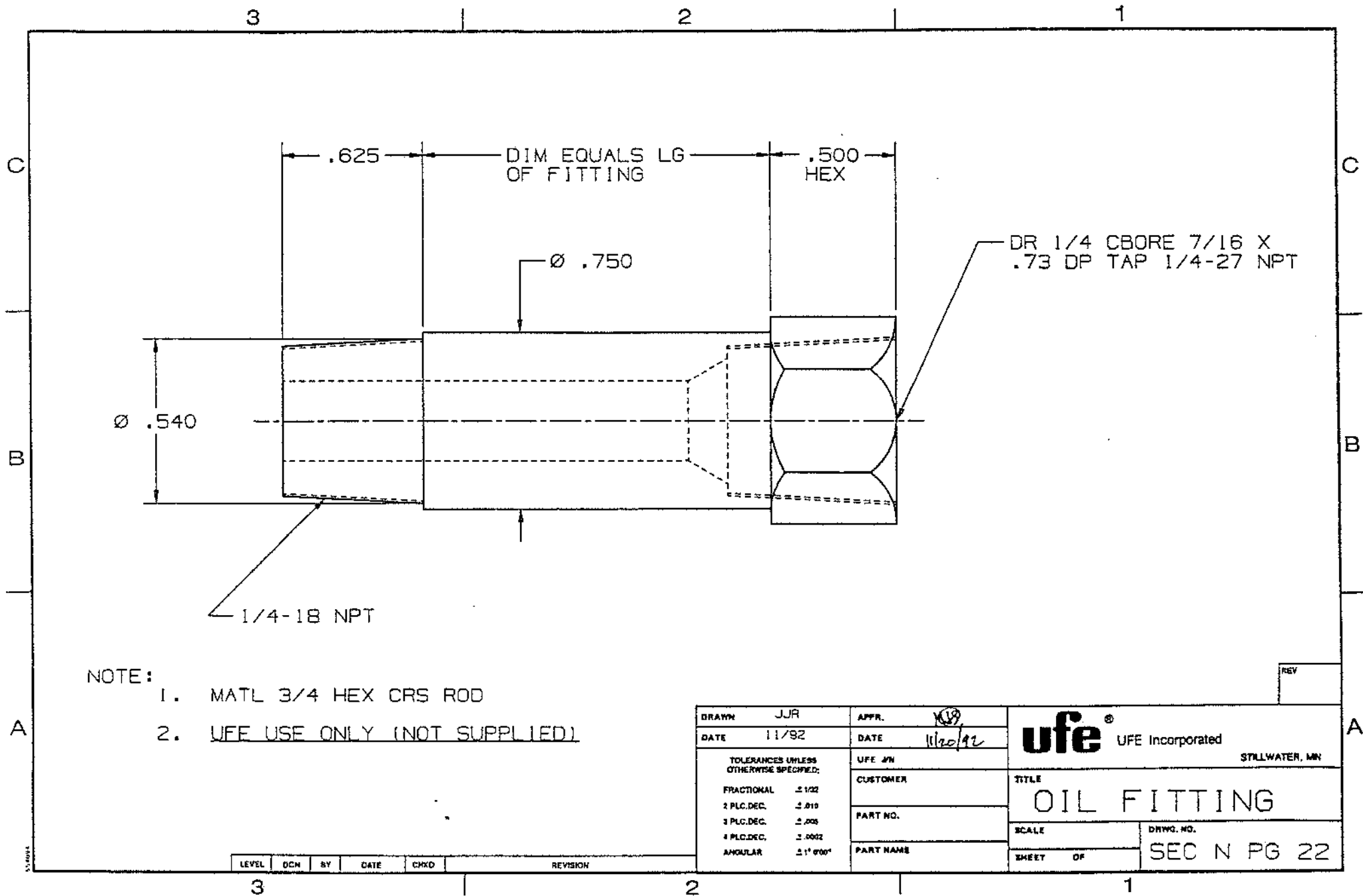
DRAWN UFE		APPR. <i>[Signature]</i>		ufe ® UFE Incorporated STILLWATER, MN	
DATE 6/92		DATE 11/20/92			
TOLERANCES UNLESS OTHERWISE SPECIFIED:				TITLE	
FRACTIONAL ± 1/32				SLIDING RACK COMPONENTS	
2 PLC DEC. ± .010				SCALE	
3 PLC DEC. ± .005				SHEET OF	
4 PLC DEC. ± .0002				DRAWG. NO.	
ANGULAR ± 1° 0'00"				SEC N PG 21	
PART NO.				PART NAME	

LEVEL	DCN	BY	DATE	CHKD	REVISION
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3

2

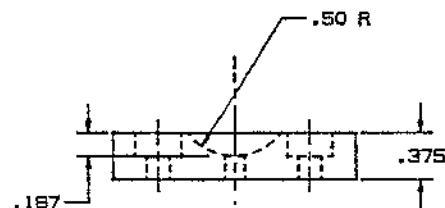
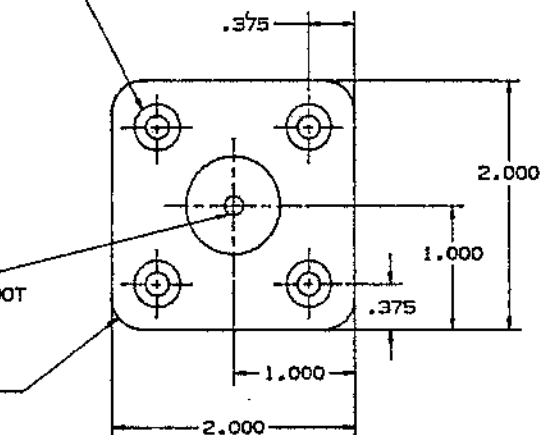
1



DRILL AND CORE FOR
10-24 SOCKET HEAD
BOLT (4X)

5/32 DIA.
1/2" TAPER/FOOT

.25 R



SPRUE PLATE

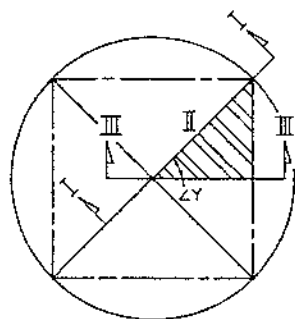
OPTION: TO REPLACE SPHERICAL RADIUS IN MUD SET.
A POCKET MUST BE MADE IN THE "A" SIDE
SO THAT THE SPRUE PLATE WILL MOUNT
FLUSH WITH THE BACK PLATE.

DRAWN	APPR. <i>[Signature]</i>	ufe UFE Incorporated. FORMERLY PLATE TECHNOLOGY STILLWATER, MN	
DATE	DATE <i>11/20/92</i>		
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL $\pm 1/32$ 2 PLC.DEC. $\pm .015$ 3 PLC.DEC. $\pm .005$ 4 PLC.DEC. $\pm .002$ ANGULAR $\pm 1^{\circ} 0'00''$		UFE #N	TITLE
		CUSTOMER	C-28
		PART NO.	SCALE
		PART NAME	DRWG. NO.
			SHEET OF
		SEC N PG 23	

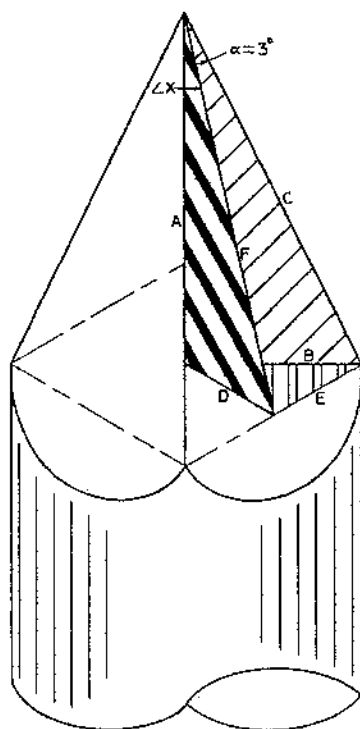
ISSUE	BY	DATE	REVISION

SECTION 0 – MISC. ITEMS AND TECHNICAL DATA

<u>DESCRIPTION</u>	<u>PAGE</u>
CUTTER ANGLE DATA	2
SPUR GEAR NOMENCLATURE	3
MINUTES & SECONDS TO DECIMALS OF DEGREE TABLE	4
TAPERS AND ANGLES	5
HARDNESS CONVERSION TABLE	6
ENGLISH – METRIC CONVERSION TABLE	7
GEOMETRIC CHARACTERISTICS & SYMBOLS	8-13
TOLERANCE CONVERSION	14



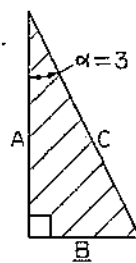
VIEW II



EX.
 $\alpha = 3^\circ$ USING A 4 SIDED
 CUTTER.

WHAT $\angle X$ DO WE SET
 FOR GRINDING CUTTER.
 SOLVE FOR X

I. KNOWN: $\alpha = 3^\circ$
 TO FIND: $B, D, \angle Y$



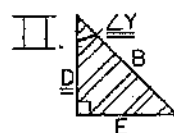
LET $A = 1.0000$
 & FIND B

$$\tan = \frac{B}{A}$$

$$B = A \times \tan \alpha$$

$$B = 1.0000 \times \tan 3^\circ$$

$$B = .05241$$



$$\angle Y = \frac{360^\circ}{\text{NO. OF SIDES} \times 2}$$

$$\angle Y = \frac{360^\circ}{(4 \times 2)}$$

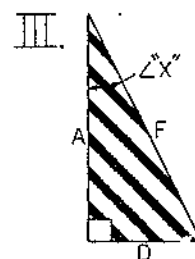
$$\angle Y = 45^\circ$$

$$\cos = \frac{D}{B}$$

$$D = B \times \cos Y$$

$$D = .05241 \times \cos 45^\circ$$

$$D = .03706$$



$X = \text{CUTTER GRINDER } \angle \text{ SETTING}$

$$\tan X = \frac{F}{A}$$

$$\tan X = \frac{.03706}{1.0000}$$

$$X = 2.12241$$

$$= 2^\circ 7' 21''$$

THEREFORE: 4 SIDED CUTTERS
 $\alpha = \text{KNOWN ANGLE}$
 $X = \text{CUTTER GRINDER } \angle \text{ SETTING}$

$$\text{FORMULA: } .70711 \times \tan \alpha = \tan X$$

$$\text{EX. } .70711 \times \tan 3^\circ = \tan X$$

$$.70711 \times .05241 = \tan X$$

$$.03705 = \tan X$$

$$2^\circ 7' 21'' = X$$

3 SIDED CUTTERS
 $\alpha = \text{KNOWN ANGLE}$
 $X = \text{CUTTER GRINDER } \angle \text{ SETTING}$

$$\text{FORMULA: } .5000 \times \tan \alpha = \tan X$$

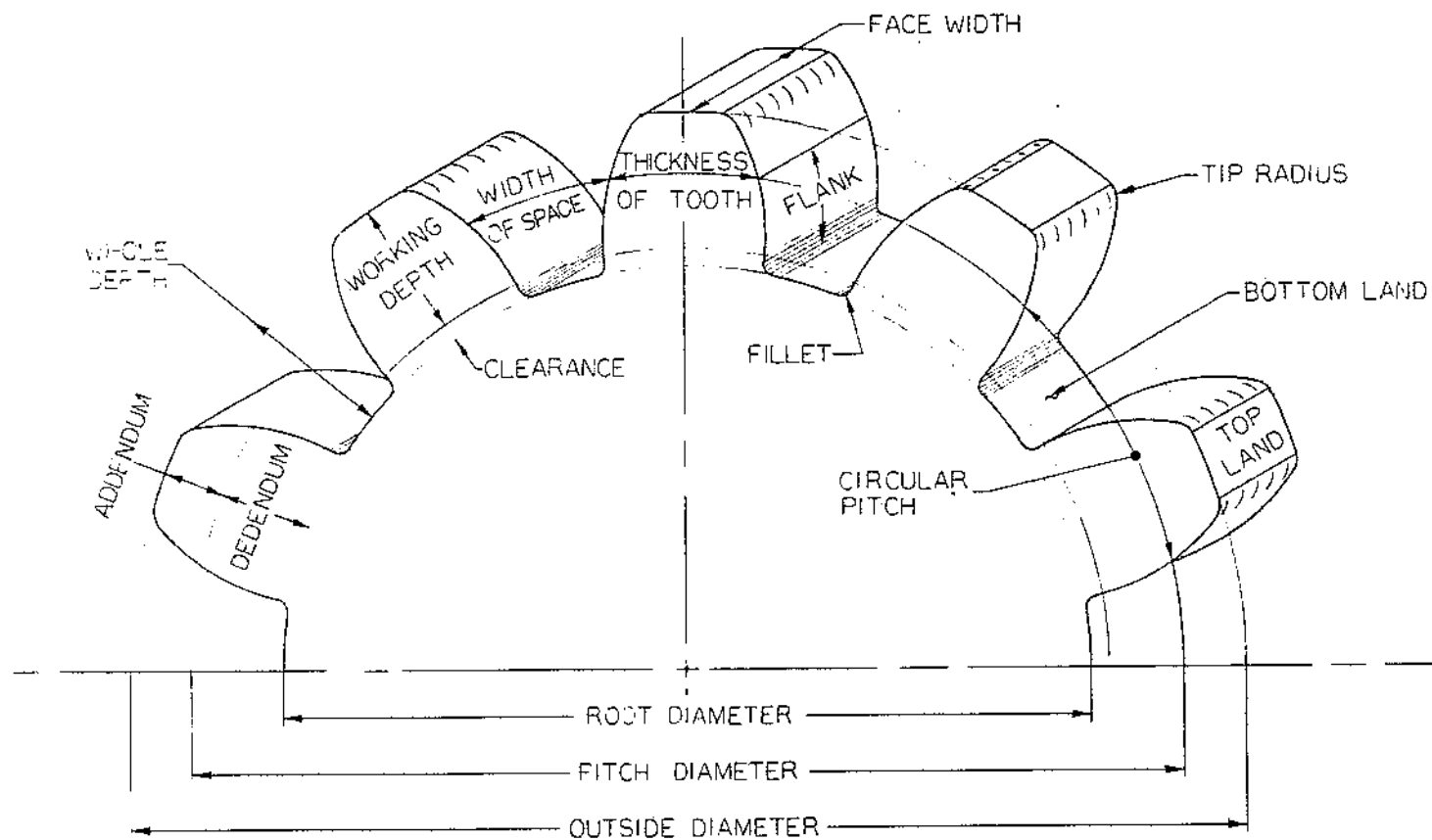
$$\text{EX. } .5000 \times \tan 3^\circ = \tan X$$

$$.5000 \times .05241 = \tan X$$

$$.02620 = \tan X$$

$$1^\circ 30' 3'' = X$$

DRAWN T. R. JAROSCH		APPR.		 UFE Incorporated, STILLWATER, OK
DATE 5-28-76		DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE #/N		TITLE CUTTER ANGLE DATA
FRACTIONAL 2/128		CUSTOMER		
8 DEC. DEC. 1/16		PART NO.		SCALE NONE SHEET SECT. 0
3 DEC. DEC. 3/64		PART NAME		
4 DEC. DEC. 1/8		ANGULAR 1/4"		DRWG. NO. PAGE NO. 2



SPUR GEAR NOMENCLATURE

A	PRS	5-28-85	WAS SEC Q PG 3
ISSUE	BY	DATE	REVISION

DRAWN T. R. JAROSCH	APPR.
DATE 5-25-76	DATE
TOLERANCES UNLESS OTHERWISE SPECIFIED:	UFE J/N
FRACTIONAL 21/32	CUSTOMER
2 PL. DEC. 0.015	PART NO.
3 PL. DEC. 0.008	PART NAME
4 PL. DEC. 0.003	
ANGULAR 21° 0'00"	

ufe UFE Incorporated, ENGINEERING TECHNOLOGY STILLWATER, MN	
TITLE	SPUR GEAR NOMENCLATURE
SCALE	NONE
SHEET	SECT. 0
DRWG. NO.	PAGE NO. 3

SECONDS IN DECIMALS OF A DEGREE

1. .00028	31. .00861
2. .00056	32. .00889
3. .00083	33. .00917
4. .00111	34. .00944
5. .00139	35. .00972
6. .00167	36. .01000
7. .00194	37. .01028
8. .00222	38. .01056
9. .00250	39. .01083
10. .00278	40. .01111
11. .00306	41. .01139
12. .00333	42. .00167
13. .00361	43. .01194
14. .00389	44. .01222
15. .00417	45. .01250
16. .00444	46. .01278
17. .00472	47. .01306
18. .00500	48. .01333
19. .00528	49. .01361
20. .00556	50. .01389
21. .00583	51. .01417
22. .00611	52. .01444
23. .00639	53. .01472
24. .00667	54. .01500
25. .00694	55. .01528
26. .00722	56. .01556
27. .00750	57. .01583
28. .00778	58. .01611
29. .00806	59. .01639
30. .00833	60. .01667

MINUTES IN DECIMALS OF A DEGREE

1. .01667	31. .51667
2. .03333	32. .53333
3. .05000	33. .55000
4. .06667	34. .56667
5. .08333	35. .58333
6. .10000	36. .60000
7. .11667	37. .61667
8. .13333	38. .63333
9. .15000	39. .65000
10. .16667	40. .66667
11. .18333	41. .68333
12. .20000	42. .70000
13. .21667	43. .71667
14. .23333	44. .73333
15. .25000	45. .75000
16. .26667	46. .76667
17. .28333	47. .78333
18. .30000	48. .80000
19. .31667	49. .81667
20. .33333	50. .83333
21. .35000	51. .85000
22. .36667	52. .86667
23. .38333	53. .88333
24. .40000	54. .90000
25. .41667	55. .91667
26. .43333	56. .93333
27. .45000	57. .95000
28. .46667	58. .96667
29. .48333	59. .98333
30. .50000	60. 1.00000

TAPERS AND ANGLES

TAPER per FOOT	INCLUDED ANGLE			ANGLE WITH CENTER LINE			TAPER per INCH	TAPER PER INCH FROM CENTER LINE
	DEG.	MIN.	SEC.	DEG.	MIN.	SEC.		
1/8	0	35	49	0	17	54	.010416	.005208
3/16	0	53	43	0	26	51	.015625	.007812
1/4	1	11	37	0	35	48	.020833	.010416
5/16	1	29	31	0	44	45	.026042	.013021
3/8	1	47	25	0	53	42	.031250	.015625
7/16	2	5	19	1	2	39	.036458	.018229
1/2	2	23	13	1	11	36	.041667	.020833
9/16	2	41	7	1	20	33	.046875	.023438
5/8	2	59	41	1	29	30	.052084	.026042
11/16	3	16	54	1	38	27	.057292	.028646
3/4	3	34	47	1	47	23	.062500	.031250
13/16	3	52	41	1	56	20	.067708	.033854
7/8	4	10	33	2	5	16	.072917	.036456
15/16	4	28	26	2	14	13	.078125	.039063
1	4	46	19	2	23	9	.083330	.041667
1 1/4	5	57	47	2	58	53	.104166	.052084
1 1/2	7	9	10	3	34	35	.125000	.062500
1 3/4	8	20	27	4	10	13	.145833	.072917
2	9	31	38	4	45	49	.166666	.083332
2 1/2	11	53	37	5	56	48	.208333	.104166
3	14	15	0	7	7	30	.250000	.125000
3 1/2	16	35	39	8	17	49	.291666	.145833
4	18	55	29	9	27	44	.333333	.166666
4 1/2	21	14	22	10	37	11	.375000	.187500
5	23	32	12	11	46	6	.416666	.208333
6	28	4	21	14	2	10	.500000	.250000

HARDNESS CONVERSION TABLE AND D-M-E HARDNESS DATA

Hardness Range of D-M-E STANDARDS	BRINELL 3000 Kg.	ROCKWELL			SHORE Sclero- scope No.	TENSILE STRENGTH (Approx.) p.s.i.
		"C" 150 Kg load	"B" 100 Kg load	15-N Super- ficial		
		80		96.5		
		78		96.0		
		76		95.5		
Ejector Pin SURFACE HARDNESS		74		95.0		
		72		94.5		
		70		94.0		
		69		93.5	96	
		67		93.0	95	
		66		92.5	92	
	739	65		92.0	91	
	722	64			88	
	705	63		91.5	87	
	688	62		91.0	85	
	670	61		90.5	83	
	654	60		90.0	81	336,000
	634	59		89.5	80	326,000
	615	58			78	315,000
	595	57		89.0	76	305,000
	577	56		88.5	75	295,000
	560	55		88.0	74	287,000
"CX" CORE PINS Hardness Range	543	54		87.5	72	278,000
	525	53		87.0	71	269,000
	512	52		86.5	69	262,000
	496	51		86.0	68	253,000
	481	50		85.5	67	245,000
	469	49		85.0	66	239,000
	455	48		84.5	64	232,000
	443	47		84.0	63	225,000
	432	46		83.5	62	219,000
	421	45		83.0	60	213,000
Ejector Pin Core Hardness	409	44		82.5	58	207,000
	400	43		82.0	57	201,000
	390	42		81.5	56	196,000
	381	41		81.0	55	191,000
	371	40		80.5	54	186,000

Hardness Range of D-M-E STANDARDS	BRINELL 3000 Kg.	ROCKWELL			SHORE Sclero- scope No.	TENSILE STRENGTH (Approx.) p.s.i.
		"C" 150 Kg load	"B" 100 Kg load	15-N Super- ficial		
	362	39		80.0	52	181,000
	353	38		79.5	51	176,000
	344	37		79.0	50	172,000
"C" CORE PIN HARDNESS	336	36		78.5	49	168,000
	327	35		78.0	48	163,000
	319	34		77.0	47	159,000
	311	33		76.5	46	154,000
	301	32		76.0	44	150,000
	292	31		75.5	43	146,000
	286	30		75.0	42	142,000
	279	29		74.5	41	138,000
	271	28		74.0	—	134,000
	264	27		73.5	40	131,000
	258	26		72.5	38	127,000
	253	25		72.0	—	124,000
	247	24		71.5	37	121,000
	243	23	100	71.0	36	118,000
	237	22	99	70.5	35	115,000
	231	21	98	70.0	—	113,000
	226	20	98	69.5	34	110,000
	201		94		31	98,000
	197		93		30	95,000
	192		92		29	93,000
	187		91		—	90,000
	183		90		28	89,000
	179		89		27	87,000
	174		88		—	85,000
	170		87		26	83,000
	167		86		—	81,000
	163		85		25	79,000
	156		83		24	76,000
	149		81		23	73,000
	143		79		22	71,000
	137		76		21	67,000
	131		74		—	65,000

English-Metric Conversion Table

Metric-English Conversion Table

Inches Dec.	mm	Inches Dec.	mm	Inches Frac.	Dec.	mm	Inches Frac.	Dec.	mm	mm	Inches	mm	Inches	mm	mm	Inches	mm	Inches	mm
0.01	0.2540	0.51	12.9540	1/64	0.015625	0.3969	33/64	0.515625	13.0969	0.01	.00039	0.41	.01614	0.81	.03189	21	.82677	61	2.40157
0.02	0.5080	0.52	13.2080	1/32	0.031250	0.7938	17/32	0.531250	13.4938	0.02	.00079	0.42	.01654	0.82	.03228	22	.86614	62	2.44094
0.03	0.7620	0.53	13.4620	3/64	0.046875	1.1906	35/64	0.546875	13.8906	0.03	.00118	0.43	.01693	0.83	.03268	23	.90551	63	2.48031
0.04	1.0160	0.54	13.7160	1/16	0.062500	1.5875	9/16	0.562500	14.2875	0.04	.00157	0.44	.01732	0.84	.03307	24	.94488	64	2.51968
0.05	1.2700	0.55	13.9700	5/64	0.078125	1.9844	37/64	0.578125	14.6844	0.05	.00197	0.45	.01772	0.85	.03346	25	.98425	65	2.55905
0.06	1.5240	0.56	14.2240	3/32	0.093750	2.3812	19/32	0.593750	15.0812	0.06	.00236	0.46	.01811	0.86	.03386	26	1.02362	66	2.59842
0.07	1.7780	0.57	14.4780	7/64	0.109375	2.7781	39/64	0.609375	15.4781	0.07	.00276	0.47	.01850	0.87	.03425	27	1.06299	67	2.63779
0.08	2.0320	0.58	14.7320	1/8	0.125000	3.1750	5/8	0.625000	15.8750	0.08	.00315	0.48	.01890	0.88	.03465	28	1.10236	68	2.67716
0.09	2.2860	0.59	14.9860	9/64	0.140625	3.5719	41/64	0.640625	16.2719	0.09	.00354	0.49	.01929	0.89	.03504	29	1.14173	69	2.71653
0.10	2.5400	0.60	15.2400	5/32	0.156250	3.9688	21/32	0.656250	16.6688	0.10	.00394	0.50	.01969	0.90	.03543	30	1.18110	70	2.75590
0.11	2.7940	0.61	15.4940	11/64	0.171875	4.3656	43/64	0.671875	17.0656	0.11	.00433	0.51	.02008	0.91	.03583	31	1.22047	71	2.79527
0.12	3.0480	0.62	15.7480	3/16	0.187500	4.7625	11/16	0.687500	17.4625	0.12	.00472	0.52	.02047	0.92	.03622	32	1.25984	72	2.83464
0.13	3.3020	0.63	16.0020	13/64	0.203125	5.1594	45/64	0.703125	17.8594	0.13	.00512	0.53	.02087	0.93	.03661	33	1.29921	73	2.87401
0.14	3.5560	0.64	16.2560	15/64	0.234375	5.5562	47/64	0.734375	18.2562	0.14	.00551	0.54	.02126	0.94	.03701	34	1.33858	74	2.91338
0.15	3.8100	0.65	16.5100	1/4	0.250000	5.9531	3/4	0.750000	19.0500	0.15	.00591	0.55	.02165	0.95	.03740	35	1.37795	75	2.95275
0.16	4.0640	0.66	16.7640	17/64	0.265625	6.3500	49/64	0.765625	19.4469	0.16	.00630	0.56	.02205	0.96	.03780	36	1.41732	76	2.99212
0.17	4.3180	0.67	17.0180	9/32	0.281250	6.7469	25/32	0.781250	19.8437	0.17	.00669	0.57	.02244	0.97	.03819	37	1.45669	77	3.03149
0.18	4.5720	0.68	17.2720	19/64	0.296875	7.1438	51/64	0.796875	20.2406	0.18	.00709	0.58	.02283	0.98	.03858	38	1.49606	78	3.07086
0.19	4.8260	0.69	17.5260	5/16	0.312500	7.5406	13/16	0.812500	20.6375	0.19	.00748	0.59	.02323	0.99	.03898	39	1.53543	79	3.11023
0.20	5.0800	0.70	17.7800	21/64	0.328125	7.9375	53/64	0.828125	21.0344	0.20	.00787	0.60	.02362	1.00	.03937	40	1.57480	80	3.14960
0.21	5.3340	0.71	18.0340	11/32	0.343750	8.3344	27/32	0.843750	21.4312	0.21	.00827	0.61	.02402	1	.03977	41	1.61417	81	3.18897
0.22	5.5880	0.72	18.2880	23/64	0.359375	8.7312	55/64	0.859375	21.8281	0.22	.00866	0.62	.02441	2	.07874	42	1.65354	82	3.22834
0.23	5.8420	0.73	18.5420	3/8	0.375000	9.1281	7/8	0.875000	22.2250	0.23	.00906	0.63	.02480	3	.11811	43	1.69291	83	3.26771
0.24	6.0960	0.74	18.7960	25/64	0.390625	9.5250	57/64	0.890625	22.6219	0.24	.00945	0.64	.02520	4	.15748	44	1.73228	84	3.30708
0.25	6.3500	0.75	19.0500	13/32	0.406250	9.9219	29/32	0.906250	23.0188	0.25	.00984	0.65	.02559	5	.19685	45	1.77165	85	3.34645
0.26	6.6040	0.76	19.3040	27/64	0.421875	10.3188	59/64	0.921875	23.4156	0.26	.01024	0.66	.02598	6	.23622	46	1.81102	86	3.38582
0.27	6.8580	0.77	19.5580	7/16	0.437500	10.7156	15/16	0.937500	23.8125	0.27	.01063	0.67	.02638	7	.27559	47	1.85039	87	3.42519
0.28	7.1120	0.78	19.8120	29/64	0.453125	11.1125	61/64	0.953125	24.2094	0.28	.01102	0.68	.02677	8	.31496	48	1.88976	88	3.46456
0.29	7.3660	0.79	20.0660	15/32	0.468750	11.5094	31/32	0.968750	24.6062	0.29	.01142	0.69	.02717	9	.35433	49	1.92913	89	3.50393
0.30	7.6200	0.80	20.3200	31/64	0.484375	11.9062	63/64	0.984375	25.0031	0.30	.01181	0.70	.02756	10	.39370	50	1.96850	90	3.54330
0.31	7.8740	0.81	20.5740	1/2	0.500000	12.7000	1	1.000000	25.4000	0.31	.01220	0.71	.02795	11	.43307	51	2.00787	91	3.58267
0.32	8.1280	0.82	20.8280							0.32	.01260	0.72	.02835	12	.47244	52	2.04724	92	3.62204
0.33	8.3820	0.83	21.0820							0.33	.01299	0.73	.02874	13	.51181	53	2.08661	93	3.66141
0.34	8.6360	0.84	21.3360							0.34	.01339	0.74	.02913	14	.55118	54	2.12598	94	3.70078
0.35	8.8900	0.85	21.5900							0.35	.01378	0.75	.02953	15	.59055	55	2.16535	95	3.74015
0.36	9.1440	0.86	21.8440							0.36	.01417	0.76	.02992	16	.62992	56	2.20472	96	3.77952
0.37	9.3980	0.87	22.0980							0.37	.01457	0.77	.03032	17	.66929	57	2.24409	97	3.81889
0.38	9.6520	0.88	22.3520							0.38	.01496	0.78	.03071	18	.70866	58	2.28346	98	3.85826
0.39	9.9060	0.89	22.6060							0.39	.01535	0.79	.03110	19	.74803	59	2.32283	99	3.89763
0.40	10.1600	0.90	22.8600							0.40	.01575	0.80	.03150	20	.78740	60	2.36220	100	3.93700

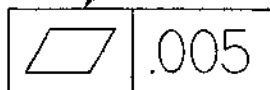
For converting decimal-inches in "thousandths", move decimal point in both columns to left.

For converting millimetres in "thousandths" move decimal point in both columns to left.

$$(.001" = .0254 \text{ MM})$$

$$(1\text{MM} = .03937")$$

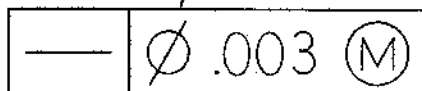
GEOMETRIC CHARACTERISTIC SYMBOL



.005

TOLERANCE

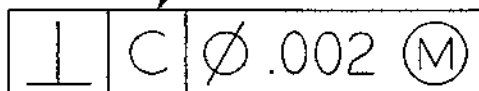
DIAMETER SYMBOL



Ø .003 (M)

MMC SYMBOL

SINGLE DATUM REFERENCE

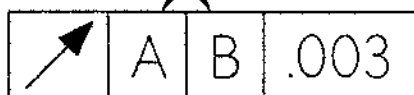


C

Ø .002 (M)

TOLERANCE

REFERENCE TO TWO DATUMS



A

B

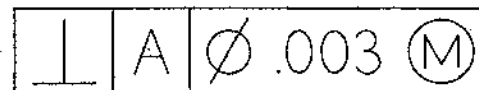
.003



AA

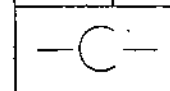
.002

SINGLE DATUM IDENTIFIED BY DOUBLE LETTER



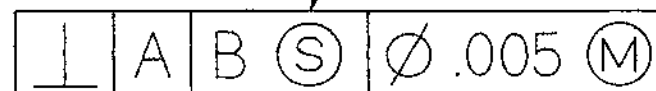
A

Ø .003 (M)



DATUM IDENTIFYING SYMBOL

RFS SYMBOL

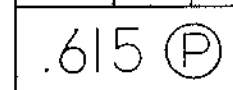


A

B

S

Ø .005 (M)

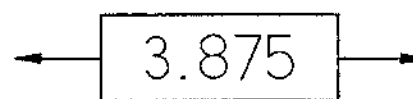


.615

P

PROJECTED TOLERANCE ZONE SYMBOL

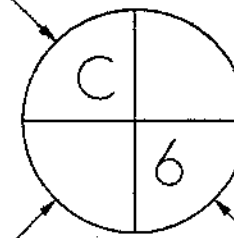
PROJECTED HEIGHT OF TOLERANCE ZONE



3.875

BASIC DIMENSION SYMBOL

ASSOCIATED DATUM IDENTITY



DATUM TARGET SYMBOL

TARGET IDENTITY

		CHARACTERISTIC	SYMBOL	NOTES
INDIVIDUAL FEATURES	FORM TOLERANCES	STRAIGHTNESS	—	1
		FLATNESS	▭	1
		ROUNDNESS (CIRCULARITY)	○	
		CYLINDRICITY	⌀	
INDIVIDUAL OR RELATED FEATURES		PROFILE OF A LINE	⌒	2
		PROFILE OF A SURFACE	⌒	2
RELATED FEATURES		ANGULARITY	∠	
		PERPENDICULARITY (SQUARENESS)	⊥	
		PARALLELISM	//	3
	LOCATION TOLERANCES	POSITION	⊕	
		CONCENTRICITY	◎	3,7
		SYMMETRY	≡	5
	RUNOUT TOLERANCES	CIRCULAR	↗	4
		TOTAL	↗	4,6

NOTE: 1) THE SYMBOL ~ FORMERLY DENOTED FLATNESS.

THE SYMBOL — OR — FORMERLY DENOTED FLATNESS AND STRAIGHTNESS.

2) CONSIDERED "RELATED" FEATURES WHERE DATUMS ARE SPECIFIED.

3) THE SYMBOL // AND ◎ FORMERLY DENOTED PARALLELISM AND CONCENTRICITY, RESPECTIVELY.

4) THE SYMBOL ↗ WITHOUT THE QUALIFIER "CIRCULAR" FORMERLY DENOTED TOTAL RUNOUT.

5) WHERE SYMMETRY APPLIES, IT IS PREFERRED THAT THE POSITION SYMBOL BE USED.

6) "TOTAL" MUST BE SPECIFIED UNDER THE FEATURE CONTROL SYMBOL.

7) CONSIDER THE USE OF POSITION OR RUNOUT.

WHERE EXISTING DRAWINGS USING THE ABOVE FORMER SYMBOLS ARE CONTINUED IN USE, EACH FORMER SYMBOL DENOTES THAT GEOMETRIC CHARACTERISTIC WHICH IS APPLICABLE TO THE SPECIFIC TYPE OF FEATURE SHOWN.

GEOMETRIC CHARACTERISTIC SYMBOLS

TERM	ABBREVIATION	SYMBOL
MAXIMUM MATERIAL CONDITION	MMC	Ⓜ
REGARDLESS OF FEATURE SIZE	RFS	Ⓢ
DIAMETER	DIA	⌀
PROJECTED TOLERANCE ZONE	TOL ZONE PROJ	Ⓟ
REFERENCE	REF	(1,250)
BASIC	BSC	3.875

OTHER SYMBOLS

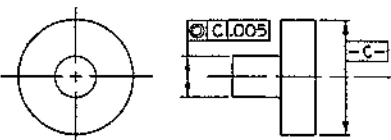
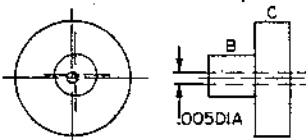
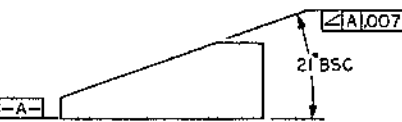
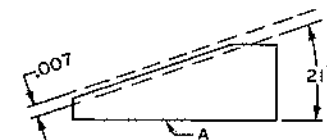
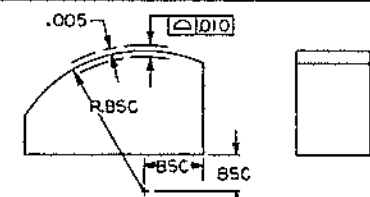
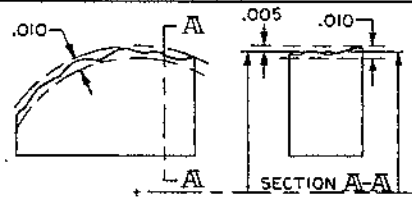
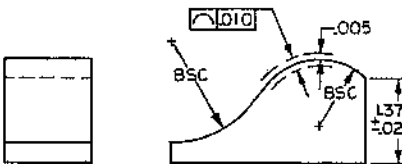
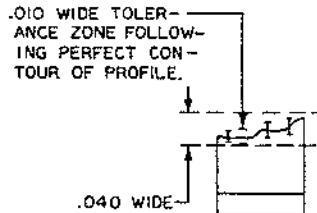
DRAWN T.R. JAROSCH		APPR.		 UFE Incorporated, STILLWATER, MN
DATE 7-14-76		DATE		
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE #N		TITLE
FRACTIONAL 3/16		CUSTOMER		SYMBOLS
3 PL. DEC. 3.015		PART NO.		SCALE
3 PL. DEC. 3.040		PART NAME		NONE
3 PL. DEC. 3.063				DRWG. NO.
ANGULAR 31° 30'				SHEET
				SECT. 0
				PAGE NO. 9

THE SYMBOL	HOW TO WRITE THE SYMBOL	THE MEANING
FLATNESS 		SURFACE MUST LIE BETWEEN TWO PLANES .005 APART.
STRAIGHTNESS 		LONGITUDINAL ELEMENTS OF SURFACE MUST LIE BETWEEN TWO PARALLEL LINES (.005 APART) WHERE THE TWO LINES AND THE NOMINAL AXIS OF THE FEATURE SHARE A COMMON PLANE.
ROUNDNESS 		THE PERIPHERY AT ANY CROSS SECTION PERPENDICULAR TO THE AXIS MUST BE BETWEEN TWO CONCENTRIC CIRCLES WHOSE RADII DIFFER BY .006.
CYLINDRICITY 		SURFACE MUST LIE BETWEEN TWO CONCENTRIC CYLINDERS WHOSE RADII DIFFER BY .006
PARALLELISM 		AXIS OF PIN MUST LIE WITHIN CYLINDER .002 DIA WHOSE AXIS IS PARALLEL TO AXIS B.
		SURFACE OF PART MUST LIE BETWEEN TWO PLANES THAT ARE .005 APART & PARALLEL TO DATUM Z. AXIS OF HOLE MUST LIE BETWEEN TWO PLANES THAT ARE .003 APART & PARALLEL TO DATUM Z.
PERPENDICULARITY 		SURFACE MUST LIE BETWEEN TWO PLANES .003 APART AND SQUARE WITH A.
(SQUARENESS) 		AXIS OF THE HOLE MUST LIE WITHIN A CYLINDER .003 DIA. AND SQUARE WITH A.

A PRS-20-85 WAS SEC Q PG 10
 ISSUE BY DATE REVISION

DRAWN T.R. JAROSCH		APPR.
DATE 7-17-76		DATE
TOLERANCES UNLESS OTHERWISE SPECIFIED		USE .IN
FRACTIONAL	1/32	CUSTOMER
1 PLACE DEC.	0.015	PART NO.
2 PLACE DEC.	0.0005	PART NAME
3 PLACE DEC.	0.0002	
ANGULAR	21° 45'	

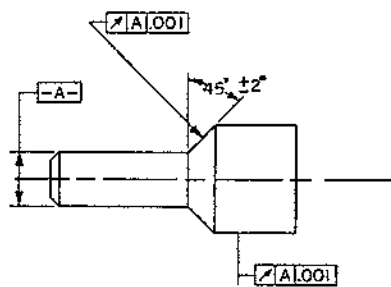
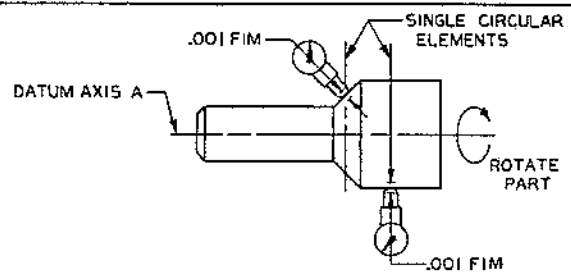
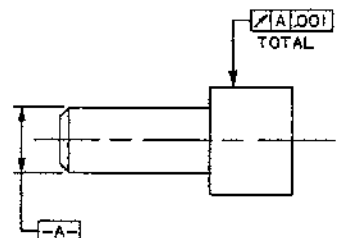
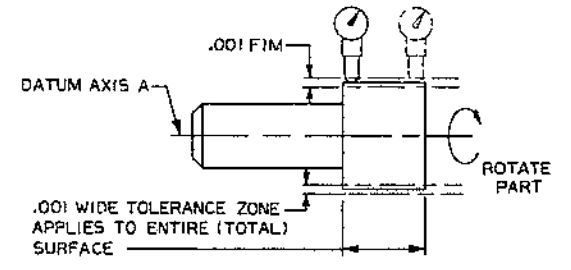
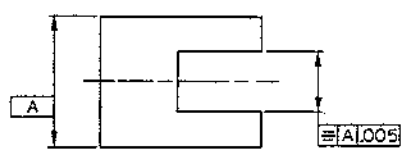
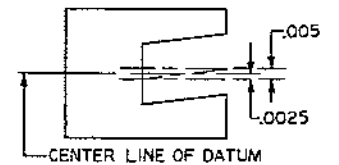
UFE Incorporated, STELLWATER, MN	
TITLE SYMBOL INTERPRETATION	
SCALE NONE	DWG. NO.
SHEET 0	PAGE NO. 10

THE SYMBOL	HOW TO WRITE THE SYMBOL	THE MEANING
CONCENTRICITY 		 AXIS OF B MUST LIE WITHIN A CYLINDER .005 DIA WHOSE AXIS COINCIDES WITH THE AXIS OF C.
ANGULARITY 		 SURFACE MUST LIE BETWEEN TWO PARALLEL PLANES THAT ARE .007 APART AND AT THE SPECIFIED ANGLE FROM THE DATUM.
PROFILE OF A SURFACE 		 THE ACTUAL FEATURE MUST LIE WITHIN A .010 WIDE CONTOUR ENVELOPE. THE EXACT POSITION OF THE ENVELOPE BEING DEFINED BY BASIC DIMENSIONS.
PROFILE OF A LINE 		 .010 WIDE TOLERANCE ZONE FOLLOWING PERFECT CONTOUR OF PROFILE. NOTE: THIS FORM TOLERANCE IS ACTUALLY A REFINEMENT OF A SIZE TOLERANCE OR A SURFACE CONTOUR TOLERANCE WHERE A TOLERANCE IN ONE DIRECTION IS MORE CRITICAL THAN IN ANOTHER DIRECTION.

A PRS-28-6 WAS SEC Q PG II
 ISSUE BY DATE REVISION

DRAWN T.R. JAROSCH		APPR.	
DATE 7-20-76		DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE INC.	
FRACTIONAL 1/32		CUSTOMER	
1 PL. DEC. 0.015		PART NO.	
2 PL. DEC. 0.005		PART NAME	
3 PL. DEC. 0.002			
ANGULAR 1/2° MIN.			

ufe [®] UFE Incorporated, STELLWATER, MN	
TITLE SYMBOL INTERPRETATION	
SCALE NONE	DRWG. NO.
SHEET SECT. 0	PAGE NO. 11

THE SYMBOL	HOW TO WRITE THE SYMBOL	THE MEANING
CIRCULAR  (RUNOUT)		THE FEATURES MUST BE WITHIN THE SPECIFIED TOLERANCE OF SIZE. AT ANY MEASURING POSITION EACH CIRCULAR ELEMENT OF THESE SURFACES MUST BE WITHIN THE SPECIFIED RUNOUT TOLERANCE (.001 FIM) WHEN THE PART IS ROTATED 360° ABOUT DATUM AXIS A.
		
TOTAL  (RUNOUT)		
		THE FEATURE MUST BE WITHIN THE SPECIFIED TOLERANCE OF SIZE. THE ENTIRE SURFACE MUST LIE WITHIN THE SPECIFIED RUNOUT TOLERANCE ZONE (.001 FIM) WHEN THE PART IS ROTATED 360° ABOUT DATUM AXIS A, WITHOUT RESET OF THE INDICATOR.
SYMMETRY 		 CENTER LINE OF SLOT MUST LIE BETWEEN TWO PLANES THAT ARE .005 APART AND EQUIDISTANT FROM THE CENTER LINE OF THE DATUM.

A PRS-28 WAS SEC Q PG 12
 ISSUE BY DATE REVISION

DRAWN T.R. JAROSCH DATE 7-21-76	APPR. DATE	ufe UFE Incorporated, STILLWATER, MN
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL 1/32 2 DEC. 0.015 3 DEC. 0.005 4 DEC. 0.002 ANGULAR 1° 15'	LIFE 3M CUSTOMER PART NO. PART NAME	

THE SYMBOL	HOW TO WRITE THE SYMBOL	THE MEANING
POSITION (TRUE)		FOUR CIRCLES (TOL.ZONE) OF .010 DIA. FOR .201(MIN) DIA HOLES. FOUR CIRCLES (TOL.ZONE) OF .020 DIA. FOR .211(MAX) DIA HOLES.
		AXES OF DATUM & FEATURE COAXIAL (.000 BASIC) .005 DIA TOL.ZONE WHEN FEATURE DIA AT LOW LIMIT .498 DATUM AT LOW LIMIT .998 .001 DIA TOL.ZONE WHEN FEATURE DIA AT .500MMC DATUM AT 1.000MMC. .003 DIA TOL.ZONE WHEN FEATURE DIA AT LOW LIMIT .498 DATUM AT 1.000MMC

DEFINITIONS:

BASIC DIM.— A NUMERICAL VALUE USED TO DESCRIBE THE THEORETICALLY EXACT SIZE, SHAPE OR LOCATION OF A FEATURE OR DATUM TARGET.

MAXIMUM MATERIAL CONDITION (MMC)— THE CONDITION WHERE A FEATURE OF SIZE CONTAINS THE MAXIMUM AMOUNT OF MATERIAL WITHIN THE STATED LIMITS OF SIZE.

REGARDLESS OF FEATURE SIZE (RFS)— THE TERM USED TO INDICATE THAT A FORM OR POSITIONAL TOLERANCE APPLIES AS FOLLOWS.

(A) AT ANY INCREMENT OF SIZE OF THE FEATURE WITHIN ITS SIZE TOLERANCE.

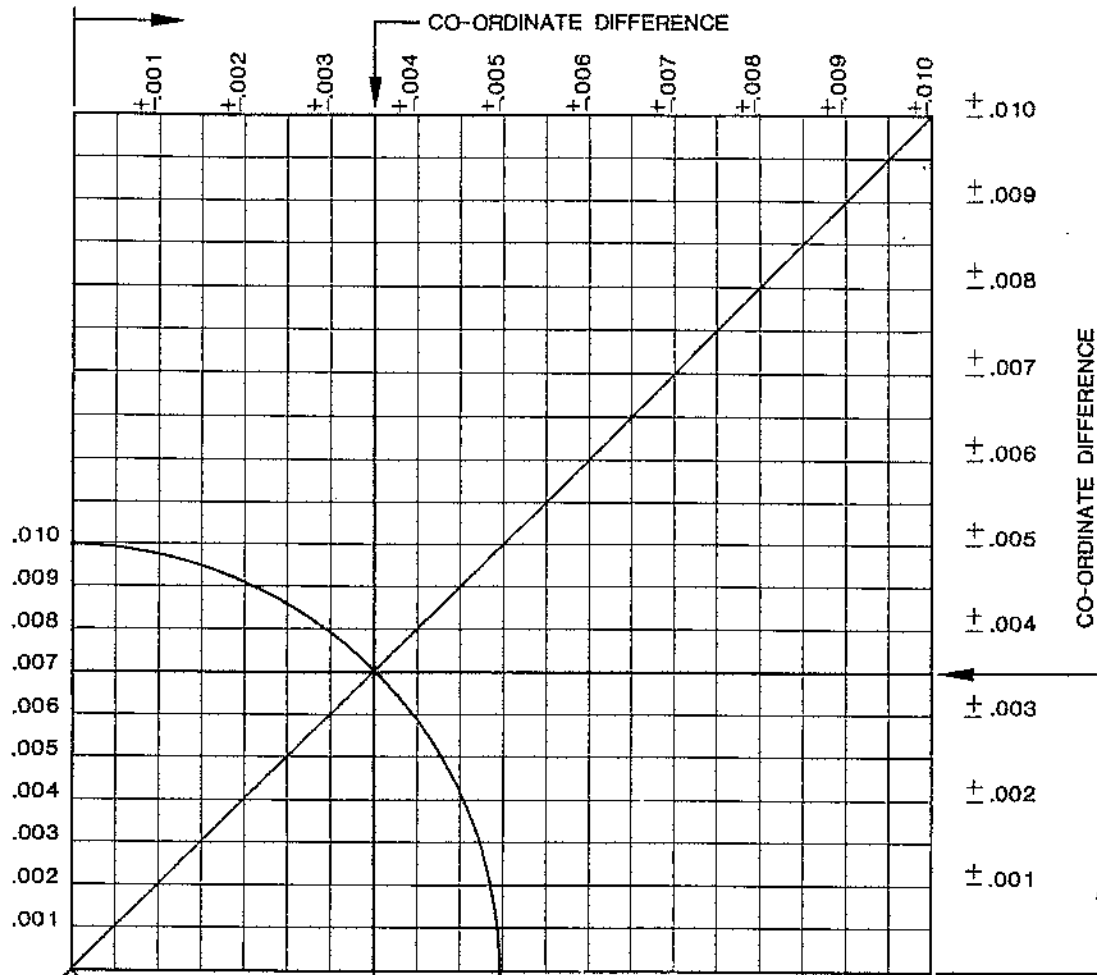
(B) AT THE ACTUAL SIZE OF A DATUM FEATURE.

A PRS-28-05 WAS SEC Q PG 13
REVISION

DRAWN T.R. JAROSCH		APPR.	
DATE 7-22-76		DATE	
TOLERANCES UNLESS OTHERWISE SPECIFIED:		UFE INC.	
FRACTIONAL	± 1/32	CUSTOMER	STILLWATER, MN
2 PL. DEC.	± .01	PART NO.	
3 PL. DEC.	± .005	PART NAME	
4 PL. DEC.	± .0005		
ANGULAR	± 1" / 100"		

UFE Incorporated, STILLWATER, MN	
TITLE SYMBOL INTERPRETATION	
SCALE NONE	DRAWG. NO.
SHEET SECT. 0	PAGE NO. 13

POSITIONAL TOLERANCE DIAMETER



.010 DIA TP TOL. =
.0035 COORDINATE TOL.

B	PRG 5-38-68	WAS SEC Q PG 14
A	787	3-78
ISSUE	BY	DATE
		REVISION

DRAWN <i>T. J. ZEPF</i>	APPV.
DATE 3-7-78	DATE
TOLERANCES UNLESS OTHERWISE SPECIFIED:	UFE 37N
FRACTIONAL 2/128	CUSTOMER
1 DEC. 2.018	PART NO.
2 DEC. 2.000	PART NAME
3 DEC. 2.000	
ANGULAR 2 1/2°	

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