

## **PS Injection Mold Tool Standards**

### **Supplier Managed Tooling**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

## TITLE: TABLE OF CONTENTS

Specific information & views are shown in the following sections:

### I. INTRODUCTION

- Introduction .....	1
- Introduction Continued.....	2

### II. MOLD BASE INFORMATION **3**

A) SURFACE SPECS .....	4
B) TOOL STEELS.....	5
C) TYPICAL MOLD CONSTRUCTION MATERIALS.....	6
D) MOLD SURFACE TREATMENTS.....	7
E-1) MOLD BASE TYPICAL FEATURES.....	8
E-2) MOLD BASE TYPICAL FEATURES.....	9
F) INSULATION PLATE.....	10
G-1) MOLD BASE TOOL LABELING & IDENTIFICATION.....	11
G-2) MOLD BASE TOOL LABELING & IDENTIFICATION.....	12
H) SUPPORT PILLARS.....	13
I) LEADER PIN & BUSHINGS.....	14
J-1) GUIDE BARS - NOTES.....	15
J-2) GUIDE BAR - DESIGN & LOCATION.....	16
K) STEEL EXPANSION NOTE.....	17
L-1) SAFETY STRAPS - NOTES.....	18
L-2) SAFETY STRAPS .....	19
M-1) EYE BOLTS & EYE BOLT HOLES - NOTES.....	20
M-2) EYE BOLTS & EYE BOLT HOLES .....	21
N) LIFT BAR.....	22
O) OFF SET SPRUES.....	23
P) LOCATION RING AND LOCATIONS.....	24
Q-1) POSITIVE LOCATION HOLES.....	25
Q-2) POSITIVE LOCATION LOCK BUTTONS.....	26
R) PORCERAX INSERTS TAG .....	27
S) PORCERAX VENTING.....	28
T) CENTER LINE / PARTING LINE LOCKS.....	29
U) EJECTOR HOUSING OPENING COVER .....	30

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

## TITLE: TABLE OF CONTENTS

Specific information & views are shown in the following sections:

<b>III. CAVITY AND CORE CONSTRUCTION</b>	<b>31</b>
A-1) TYPICAL FEATURE NOTES.....	32
A-2) TYPICAL FEATURES - VIEWS.....	33
B) CAVITY / CORE LABELING AND IDENTIFICATION .....	34
C) TYPICAL CAVITY / CORE FEATURES - SIDE VIEW.....	35
D) WEDGE / PARTING LINE INSERTS.....	36
E) VENT REQUIREMENTS / PRESSURE PLATES.....	37
F) VENT DEPTH CHART.....	38
<b>IV. INJECTION SYSTEMS - HR / DROPS / SPRUES / GATES</b>	<b>39</b>
A) Overview.....	40
B-1) Cold Sprue Bushing and Locating Ring - EU and Asia.....	41
B-2) Cold Sprue Bushing and Locating Ring - N. America.....	42
C) Runners.....	43
D) Default Runner Diameter Chart.....	44
E) Trapezoid Runner.....	45
F) Subgates.....	46
G) Edge Gates.....	47
H) Jump Gates.....	48
I) Cashew and Winkles.....	49
J) Hot Sprue.....	50
K-1) Typical Hot Manifold System - NOTES.....	51
K-2) Typical Hot Manifold System - DESIGN NOTES.....	52
L) Electrical Schematic for 2 or More Drops (N. America).....	53
M) Valve Gate Connectors.....	54

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

## TITLE: TABLE OF CONTENTS

Specific information & views are shown in the following sections:

<b>V. EJECTION</b>	<b>55</b>
A) LIMIT SWITCH LOCATIONS - FOR EJECTION.....	56
B-1) PULL BACKS AND KNOCK LOCATIONS.....	57
B-2) PULL BACK PUCK DESIGN.....	58
C) EJECTOR PINS.....	59
D) EJECTOR GUIDE PINS & BUSHINGS.....	60
E) EJECTION RETURN PINS & SPRINGS.....	61
F) SLEEVE AND DEEP DRAW EJECTION.....	62
G) TECHNICAL GRAIN SLEEVE DESIGN.....	63
H) EJECTOR PIN KEYING METHOD.....	64
I) NON -SPRING RETURN EJECTION.....	65
J) HYDRAULIC EJECTION.....	66
K) HYDRAULIC EJECTION COUPLER.....	67
L) HYDRAULIC EJECTION CYLINDER.....	68
M) ROBOTIC REMOVAL - SUGGESTED FEATURES.....	69
N) RUNNER PIN FEATURES.....	70
O) DELAYED EJECTION -- 2 PLATE SYSTEM.....	71
P) DELAYED EJECTION -- 1 PLATE SYSTEM.....	72
Q) EJECTOR PIN EXTENSION TOWERS.....	73
R) POSITIVE EJECTION RETURNS - PREFERED METHOD.....	74
S) SPRING LOADED RETURN PINS & TAPPED PULL BACKS.....	75
T) EJECTOR HOUSING OPENING COVER.....	76
<b>VI. COOLING SYSTEMS</b>	<b>77</b>
A) COOLING SYSTEM REQUIREMENTS.....	78
B) WATERLINE CONNECTORS.....	79
C) WATERLINE ROUTING.....	80
D) WATERLINE BAFFLE.....	81
E) O - RINGS.....	82
F) WATER MANIFOLDS.....	83

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

## TITLE: TABLE OF CONTENTS

Specific information & views are shown in the following sections:

### **VII. SLIDES AND LIFTERS 84**

A-1) TYPICAL CAM SLIDE NOTES.....	85
A-2) TYPICAL CAM SLIDE DESIGN REFERENCE.....	86
B) CAM SLIDE WITH INSERTED HEEL BLOCK.....	87
C) PURCHASED LIFTERS.....	88
D-1) TYPICAL LIFTER & ROD NOTES.....	89
D-2) TYPICAL LIFTER ROD DESIGN REFERENCE.....	90
E) ANGLED LIFTER RETAINER.....	91
F) LIFTER WATER LINES.....	92

### **VIII. CORE PULLS AND HYDRUALIC 93**

A) HYDRAULIC SLIDE.....	94
B) LIMIT SWITCH ASSEMBLY.....	95
C) MOLD SEQUENCE PLAQUE.....	96
D) LIMIT SWITCH CONNECTOR WIRING.....	97

### **IX. ENHANCED / REVISION REQUEST 98**

A) REQUEST FORM.....	99
----------------------	----

### **X. TOOL DRAWINGS 100**

A) TOOL DRAWING NOTES.....	101
B) TOOL DRAWING TITLE BLOCK.....	102

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: INTRODUCTION

SECTION # I

DATE: 12/1/2011

Johnson Controls requires plastic part suppliers to provide the highest quality built molds in a timely and cost effective manner. These tools must be structurally and mechanically sound as well as being highly capable of providing a quality part with a stable process for the life of the project.

These are the minimum expectations of our customers. In today's marketplace, nothing less is acceptable. We are committed to working as partners with our tool and parts suppliers to meet and/or exceed these expectations.

The standards on the following pages are intended to enhance this partnership by clarifying expectations regarding the standard practices to be used when designing and building Johnson Controls Global and OEM injection mold tooling.

All corresponding construction views and notes are to be consider minimum requirements and must be used in conjunction with generally accepted design and build practices.

Please note that these standards are meant to be a starting point for mold design and construction. It is not possible, with this , to capture all of the possible conditions that exist in various tooling situations. Therefore, the content of these documents are NOT intended to eliminate the need for sound engineering judgment. It is our expectation that molds produced for Johnson Controls and our OEM customers function correctly, are robust in nature, follow JCI purchasing documents, etc. It is our further expectation that parts run automatically, and that parts, and runners, can be ejected from the mold by normal ejection or robotic means when specified. Any substantial deviation from the intent of these tooling standards should be reviewed and approved the JCI Tool Engineer.

## **Plastic Part Supplier Tooling Quality Expectations**

Continuous improvement is the underlying philosophy at JCI, which assures the delivery of defect-free, competitive products and services on time, and enhances our customer's success in a dynamic global market.

## **Dimensional Specification Requirements**

All tools must be built to the measurement standard of the that region, North America tools to be built in standard, English. - Europe and Asia tools to be built in metric , and their native language.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: INTRODUCTION CONTINUED

SECTION # I

DATE: 12/1/2011

## Revision Request

These standards will be reviewed annually by the Johnson Controls Global Injection Mold Tooling Standard Team.

Revisions recommendations are encouraged and should be forwarded to Mike Sneller. Section X contains the form required for submission, suggestions, as well as instructions for submitting these suggestions. All request need to be in by November 1st, and reviewed with the Advance Manufacturing Engineers from EU, Asia and NA for approval. (As to any changes will be affected globally).

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **II MOLD BASE INFORMATION**

SECTION # **II**

VIEWS **A-U**

FILE:

DATE: 12/01/11

This section outlines the basic construction expectations of the **MOLD BASE** details and features.

Specific views shown on the following pages are:

- A) SURFACE SPECS**
- B) TOOL STEELS**
- C) TYPICAL MOLD CONSTRUCTION MATERIALS**
- D) MOLD SURFACE TREATMENTS**
- E-1) MOLD BASE TYPICAL FEATURES**
- E-2) MOLD BASE TYPICAL FEATURES**
- F) INSULATION PLATE**
- G-1) MOLD BASE TOOL LABELING & IDENTIFACATION**
- G-2) MOLD BASE TOOL LABELING & IDENTIFACATION**
- H) SUPPORT PILLARS**
- I) LEADER PIN & BUSHINGS**
- J-1) GUIDE BARS - NOTES**
- J-2) GUIDE BAR - DESIGN & LOCATION**
- K) STEEL EXPANSION NOTE**
- L-1) SAFETY STRAPS - NOTES**
- L-2) SAFETY STRAPS -**
- M-1) EYE BOLTS & EYE BOLT HOLES - NOTES**
- M-2) EYE BOLTS & EYE BOLT HOLES -**
- N) LIFT BAR -**
- O) OFF SET SPRUES**
- P) LOCATION RING AND LOCATIONS**
- Q-1) POSITIVE LOCATION HOLES**
- Q-2) POSITIVE LOCATION LOCK BUTTONS**
- R) PORCERAX INSERTS TAG**
- S) PORCERAX VENTING**
- T) CENTER LINE / PARTING LINE LOCKS**
- U) EJECTOR HOUSING OPENING COVER**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **SURFACE SPECS**

SECTION # **II** VIEW # **A** FILE: DATE: 12/1/2011

**SURFACES:**

**Cavity:**

- \* If graining is required, the tool supplier is responsible for a fluid test.
- \* EDM or cutting other than HSC, must be careful not to stress the underlying steel in the cavity that may affect the uniformity of the textured surfaces.  
ALL EDM & cutter marks need to be removed

**Core:**

- \* If not otherwise agreed, HSC milling is preferred. The step should be approximately 0.5mm , but actual dimension of the step is dependent on the part geometry.
- \* Polishing is only required for functional demold.
  - \*Ribs are to be polished in the line of draw for demolding
  - \*Dog house / attachment features of all kinds and shapes that are in solid. or require inserts, or require action. Are required to be polished in the line of draw for demolding.
  - \* All EDM & cutter marks must be removed , that affect the part from demolding.
  - \*The tool supplier is responsible for the part to demold properly and not cause any quality issues.

**Cavity & Core:**

- \* Welding is only allowed after a Tool Engineer approval. In case of welding in a grained area the welding material should be the same as the master steel. Tool maker stays responsible for all the following consequences, even after JCI approval.
- \* Surface nitrid ( or other spec'd) is only allowed after JCI Tool Engineer approval. even for guiding systems.

<b>Mold Surface Finish</b>	<b>Typical JCI Application</b>	<b>Notes</b>
400	General Surface finish (including most areas to be textured)	Contact texture source for proper texture surface preparation
600	Vertical part surfaces less than 15 degrees	
SPL-SPE #1 (Diamond Polish)	"Mirror Finish" Lens Optics	Polishing source should be considered

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TOOL STEELS**

SECTION # **II**      VIEW # **B**      FILE:      DATE: 12/1/2011

## UDDEHOLM / ASSAB / AISI - Steel Quality

UDDEHOLM / UHB	ASSAB	AISI / SAE-USA	Germany / DIN	(HB) HARDNESS	(HRC) HARDNESS
ARNE	DF-3	O1	1.2510	HB 190	HRC 56-60
VANADIS 4	VANADIS 4			HB 235	HRC 56-58
IMPAX SUPREME	718S	P20 MODIFIED / 413	1.2311 /1.2738	HB 290-330	HRC 28-32
IMPAX HIGH HARD	718HH	P20 MODIFIED	1.2738 H	HB 330 -370	HRC 34-38
STAVAXESR	S-136	420ESR	1.2083 ESR	HB 215	HRC 48-52
MOLDMAX HH	MM40				HRC 40
ORVAR SUPREME	8407	PREMIUM H 13	1.2343 ESR	HB 185	HRC 48-52
		4140	1.1730	HB 190	HRC 28
	AMPCO	AMPCO	AMPCO - M 4	HB 286	

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TYPICAL MOLD CONSTRUCTION MATERIALS**

SECTION # **II** VIEW # **C** FILE: DATE: 12/1/2011

Ref. Sec. II, View B

Tool Material	HB Hardness Range	RC Hardness Range	Typical JCI Application	Notes
IMPAX SURPREME / 718S / P20 /4130/ 1.2311/1.2738	290-330	28-32	Cavity & Core for low to medium volume parts, with un-filled resins	Cut into solid or used as inserts
IMPAX HIGH HARD / 718HH / P20 MODIFIED /1.2738H	330 - 370	34-38	Cavity & Core for medium to High volume parts, with un-filled resins	Cut into solid or used as inserts
ORVAR SUPREME / 8407 / Prem H 13 / 1.2343 ESR	185	44-46 48-52	Cavity & Core for high volume parts and some filled resins.	Warp / moves during heat treat
S7 ( NA only)		44-58	Cavity& Core insert material for small to medium size high volume parts. - High amount of part shutoff	Texturing sources do not prefer this material
STAVAX ESR / S-136 / 420 ESR / 1.2083 ESR	215	44-58	Lens Optics (52-54) / - Vac metalized parts / - PVC parts Nylon materials- parts	Lens usually require SPI-SPE#1 surface finish or EDM finish in some cases
4140 / 1.1730	190	28-33	Mold base for inserted cavity sets	
Porcerax PM35 ( NA only)		35 (treatable to 55Rc)	Porous cavity / core inserts for venting	1/2",5/8",3/4". Should be EDM for porosity. Inserts to be slotted and vented to
MOLDMAX HH / MM40		40	High heat areas with none or little water	the inserts when ever feasible, cooling lines as close as
VANADIS 4	235	56-58	Tube pinch	Powered metal
AMPCO / AMPCO 845 / AMPCO - M4	286		NOT Typical - Special Consideration ONLY High heat area of mold	May need stainless inserted for shut off areas. Shut off areas do not hold up.
ARNE / DF-3 / 01 / 1.2510	190	56-60		
Only)		30-35	Core Pins	
(NA Only)		50-55	Core Pins	
Only)			Large Prototype parts	
QC Aluminum	167		Prototype inserts	Not readily weld able

JOHNSON CONTROLS CONFIDENTIAL INFORMATION -- DO NOT COPY OR DISCLOSE WITHOUT AUTHORIZATION

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **MOLD SURFACE TREATMENTS**

SECTION # **II**

VIEW # **D**

FILE:

DATE: 12/1/2011

Surface Treatment	Hardness / Additional material	Typical JCI Application	Notes
Titanium Nitride	2300 Vickers / 1-5 micron	Ejector pins & slides of VAO metalized parts. - Textured ejector pins. - Aesthetlo parts w/tools > 100' F /38' C	If any pins are titanium nitride, all pins have to be titanium nitride and the ejector box on the tool should be stamped " Do Not Grease these pins"
Dicronite	No Change	Lubrication without grease	
Chrome plate	.001 to .005" .025 to .127mm	Corrosion protection / increase surface wear	Requires removal before engineering changes and added back on.
Armaloy	1020 /1100 Vickers .0001 to .0002" .0025 to .005mm	Caustic / Corrosive plastic materials without 420SS	Requires removal before engineering changes and added back on.
Armor Clad	70 Rc / 190 HB .0002" .005mm	Coating ejector pins for galling problems	Removable it sent back to the manufacture is Applied at 200'F / 93' C
Ni -on ( Melco NA Only)	38-60 Rc / 185 HB .0002" .005mm	Non stick coating commonly used on speaker grille tools	

**\* Important Note:**

Some of these treatments are not available in EU or Asia, but have comparable alternatives,  
All Countries will be required to use a high quality supplier, to meet the hardness  
range required for there specific application. This must be approved by the JCI Tool  
Engineer.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **MOLD BASE TYPICAL FEATURES**

SECTION # **II**

VIEW # **E-1**

FILE:

DATE: 12/1/2011

- \* Plates / Blocks to typically be the equivalent of a AISI P20 ( ref. Sec II, View B for EU & Asia) when cavity / core details are cut into solid.  
( alternate cav/core material to be spec'd by the Tool Engineer if necessary)
- \* All cavity materials are to be certified steel from approved supplier.  
( I.E. Bohler Uddholm)
- \* All locks are to be cut into the solid to provide adequate alignment and protect for injection pressures. (Center line & parting line locks Do NOT)
- \* All protrusions ( i.e.. Limit switches , cylinders, connectors) are to have guards / blocks for protection during handling ( moving, tipping, etc.)
- \* Stand offs & legs are to be included and reviewed with the processing site or Tool Eng.
- \* Base size & KO pattern are to meet specs for the targeted machine - per the Tool Eng.
- \* Corners of all the plates are to be chamfered. 0.09" (2.28mm)
- \* Cover clamp plate & Ejector clamp plate are to be parallel within .003" (.0762mm).  
Check diagonally in two directions.
- \* Capture plates / Wire channel covers are to be .250" /5.0 mm thick unless approved by the Tool Engineer.
- \* Capture plates / Wire channel covers are to be flush to the clamp plate surface  
+0.000 to -0.001" / -0.1 to 0.3 mm
- \* For Mag platens only, all sensor locations , must have cover plates over every opening as required - Review manufacturing and press specifications with the JCI Tool Engineer.
- \* Clamp slots are to be installed on all tools regardless of magnetic platen utilization.  
Always refer to press specifications for pattern.
- \* Electrical boxes and connectors must be placed on top of mold (or high as possible) to avoid electric disturbance or damage.
- \* The use of standard parts is mandatory ( Hasco, Strack- Norma, DME, Meusburger for Europe and DME , PCS, Progressive for the North America parts).
- \* The use of self made standards is not allowed. A set of critical spare parts must be supplied with the tool at no additional cost if requested.
- \* Over size clamp plate dimensions are to meet the plant specifications. See Tool Eng.

***Important Note : Always review manufacturing and press specifications with the JCI Tool Engineering for details and approvals.***

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **MOLD BASE TYPICAL FEATURES**

SECTION # **II**

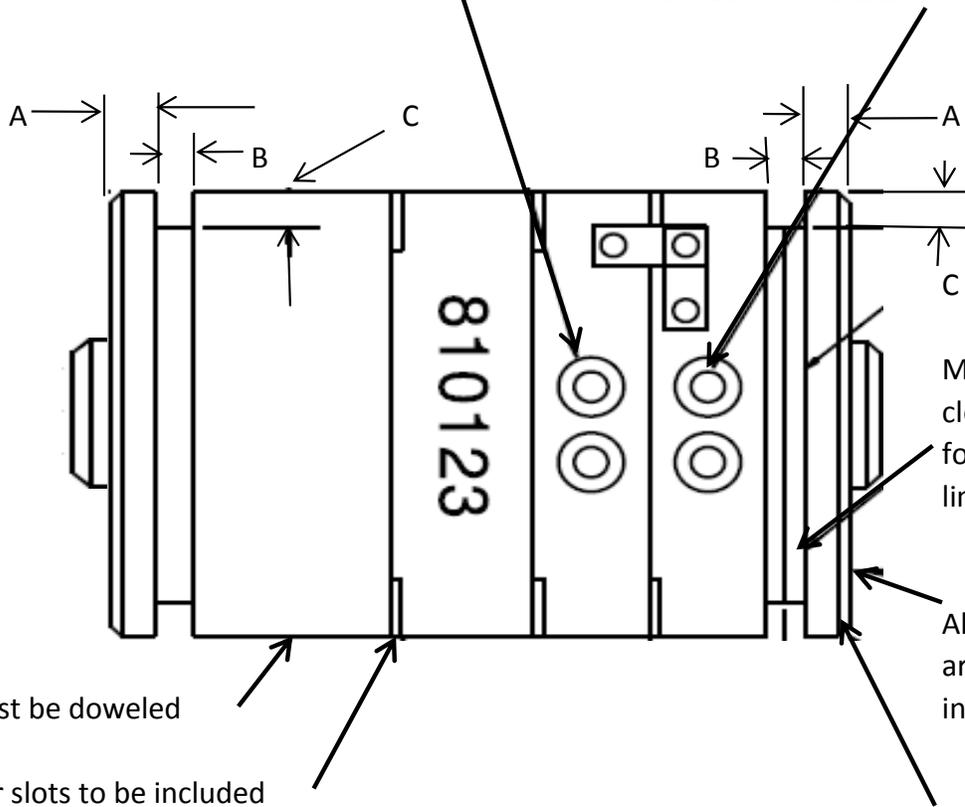
VIEW # **E - 2**

FILE:

DATE: 12/1/2011

Adequate finger clearance required around all fittings ( Water , Air, N2, etc) ( 0.25" - (6.0 mm) per side minimum)

All connections / fittings are to be recessed so they are flush with the outside of the base.



Must have adequate clearance around for clamps: water lines, fittings etc.

All clamps plates are to be doweled in place

Rails must be doweled

\* Pry bar slots to be included between each plate to the ejector block ( 1" (25.0mm) X 1" (25.0mm) X 0.38" (5.0mm) deep where possible

**Plate edges.**

Require a .09" / 2.0 mm Min Chamfer on the outer edges

**Clamp Plates,**

Require a .12" (3.0mm)

Chamfer on the outer edges

\* **Clamp Slots are required on ALL four sides**

Dimension			
	A	B (minimum)	C (minimum)
<500 TON	0.875 (22.225mm)	0.812 (20.625mm)	0.5 (12.7mm)
≥500 TON	1.375 (34.925mm)	1.0 (25.4mm)	0.75 (19.05mm)
≥880 TON	2.50" (63.5mm) plate w/ bolt slots		

Any deviations from these dimensions to be approved by the Tool Engineer  
Dimension 'A' on molds for Visor Molding is not standard, reference Tool Engineer.

\* EU uses oversize clamp plates, Always review press specs and with a Tool Engineer.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **INSULATION PLATE**

SECTION # **II**

VIEW # **F**

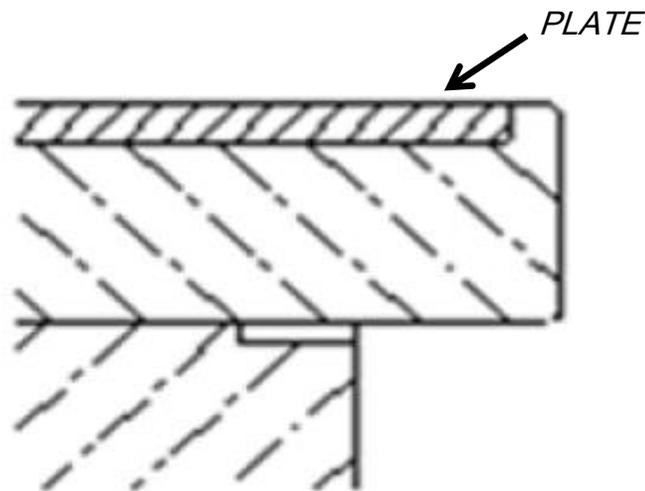
FILE:

DATE: 12/1/2011

Insulation Plate:

If the processing temperatures  $> 131^{\circ}\text{F} / 55^{\circ}\text{C}$ . An embedded insulation plates are required on both sides. Injection and Ejector side.

Holes for the tools assembly must be accessible.



## Important Notes:

- \* When a magnetic platen is require, This insulation plate must be put on the inside of the clamp plate if possible.
- \* They are only required when using high tool temps of  $> 131^{\circ}\text{F} / 55^{\circ}\text{C}$
- \* The Insulation plates are not required on all tools.  
This must be reviewed and approved by a JCI Tool Engineer.
- \* The insulation plates are used to prevent heat transfer to the platen.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **MOLD BASE TOOL LABELING & IDENTIFICATION**

SECTION # **II**

VIEW # **G -1**

FILE:

DATE: 12/1/2011

\* All water , air and hydraulic connections are to be identified by stamping a .250" / 6.0mm high letters in the base next to the fitting.

(A smaller size stamp can be used on smaller tools, But a Larger size is better. These must be approved by a JCI Tool Engineer.)

\* Information plaques required for the following:

- \* Tool info (- can be stamped in a 0.05" / 1.0 mm recessed pocket)
- \* Cylinder / tool action sequence
- \* Hydraulic schematics - Located on Operator Side
- \* Hydraulic systems to have maximum pressure rating engraved on the Operator Side
- \* Pneumatic schematics ( gas assist, valve gates, CAP, etc.)
- \* Electrical schematics ( any / all wiring) - Located on the Operator Side
- \* Water schematics ( any / all water) - Located on the Operator Side.
- \* Porcerax in the tool. - Plaque required - see Sec. II, View R.
- \* Warning plaques for all possible failure modes, ( i.e. Ejector pins under slide critical tool sequence, etc)
  
- \* OEM PROPERTY OF TAG & ASSET TAG.  
Are required on all tools, the detail information required on these tags must follow the OEMs requirements. These will be provided by the JCI Tool Engineer.

All plaques are to be recessed & cannot be over clamp slots, access holes, etc.

*Information Plaque* - "**This tool was built with Metric or Standard components**"

- \* The core side must be constructed with scribe marks ( longest distance) to control the shrinkage. ( Consider the position of the injection point).

**All Plaques - Must be in there Native language for the country this tool is running in.**

***Important Note : Always review manufacturing and press specifications with the JCI Tool Engineering for details and approvals.***

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **MOLD BASE TOOL LABELING & IDENTIFICATION**

SECTION # **II**

VIEW # **G-2**

FILE:

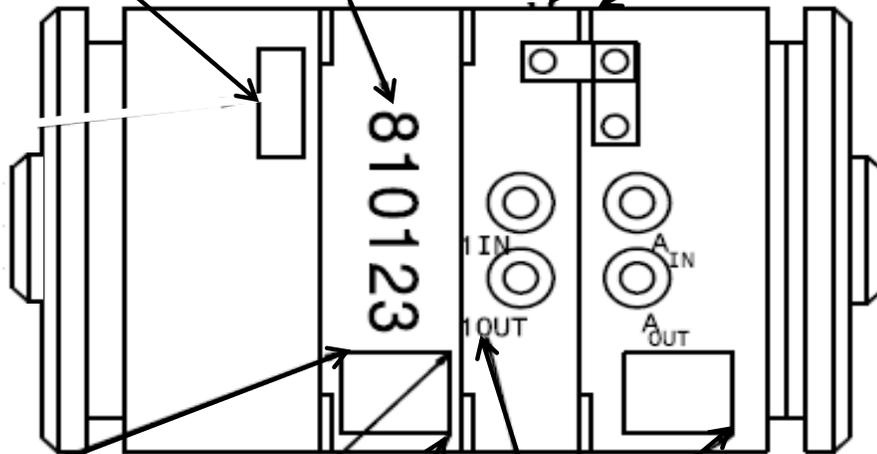
DATE: 12/1/2011

"TOP OF MOLD" painted w/ 3.0" / 75.0mm high white letters.

Tool # painted w/ 3.0" / 75.0mm High  
or as tall as possible.  
Using white letters on all sides

Zero "0" corner and Tool #  
must be stamped on ALL  
Plates & Blocks

OEM & ASSET TAG -



Tool Info to be stamped on  
both operator / Non op sides  
of mold - Cover & Ejec

Water line ID's to be stamped  
w/.250" / 6.0 mm high letters

\* Cover = Alpha : A IN, A OUT etc.

\* Ejector = Numeric: 1 IN, 1 OUT, etc.

```

TOOL # 8XXXXX
PROPERTY OF "XXXXX"
PART # VXXXX
PART DESCRIPTION XXXXXXXX
MOLD WEIGHT XXX (LBS.)
SHRINK RATE: . . . OXX
BUILT BY: XXXX
CAVITY STEEL:
ROCKWELL:
    
```

(see black line on bottom)

**All Plaques - Must be in there Native language for the country this tool is running in.**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **SUPPORT PILLARS**

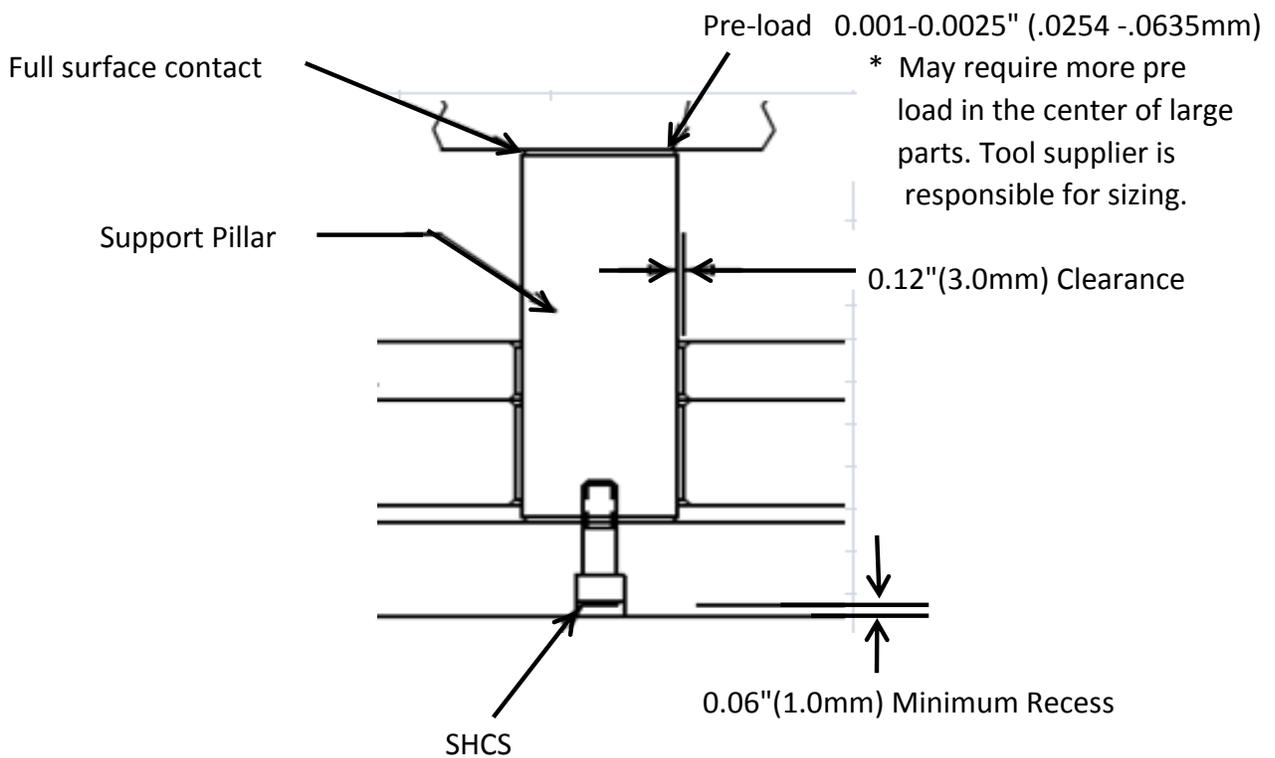
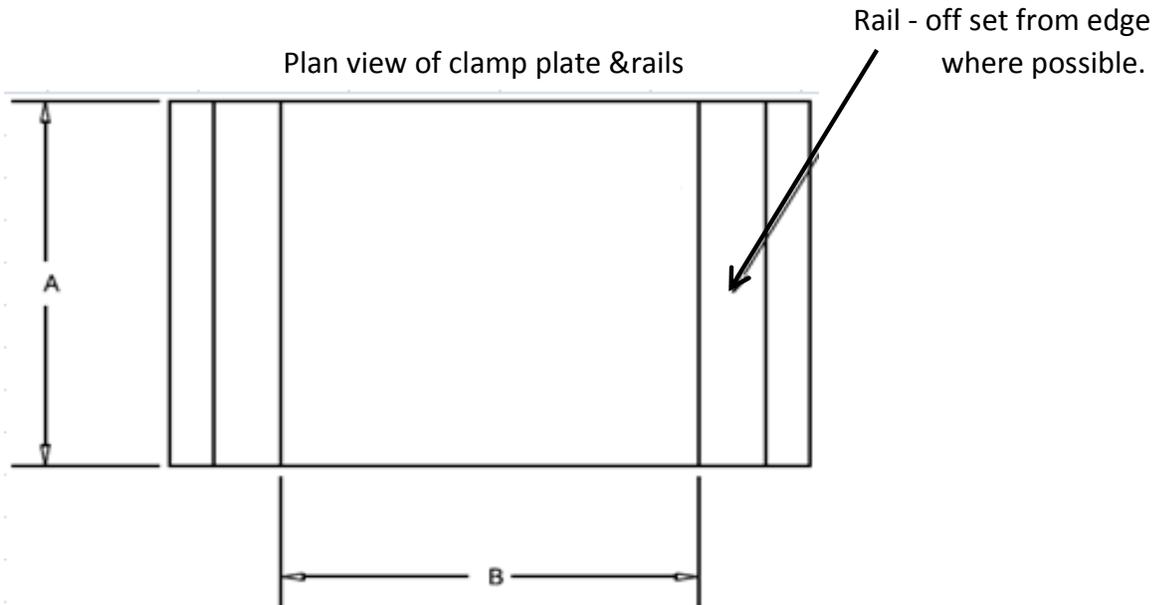
SECTION # **II**

VIEW # **H**

FILE:

DATE: 12/1/2011

- \* The amount and spacing of the support pillars must be adequate to keep the plates from deflecting under shot pressure.
- \* Pre-load spec based on steel spec of support pillar, and tool size
- \* Pre-load always needs approval from a Tool Engineer
- \* Support pillar area to be > 10% of A x B.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

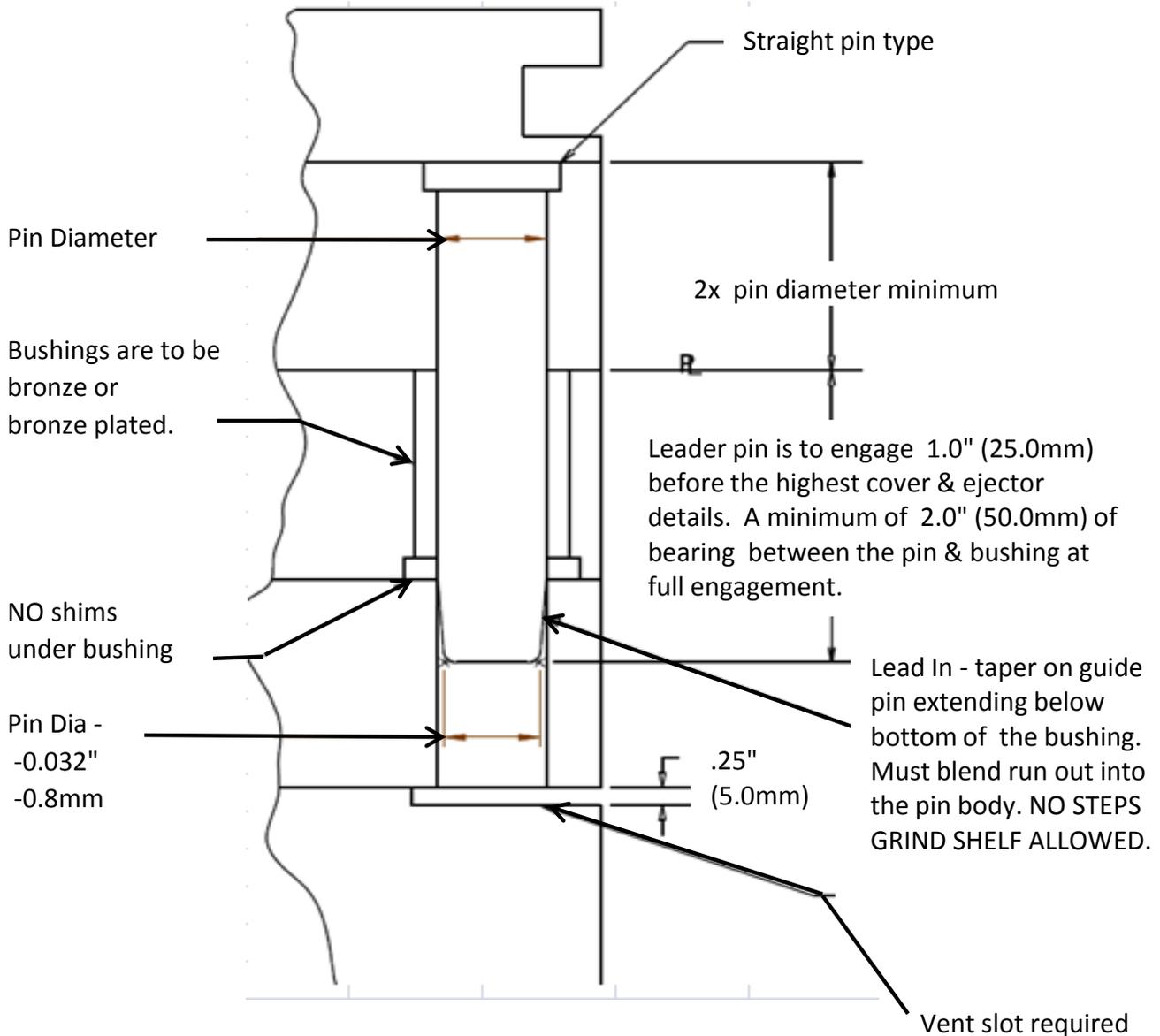
TITLE: **LEADER PIN & BUSHING**

SECTION # **II**

VIEW # **I**

FILE:

DATE: 12/1/2011



- \* All bushing & pins are to be standard ( DME / Hasco etc.)
- \* Bushings can be shoulder style (mounted from the back) or straight with snap rings or screws to retain the bushings ( mounted from the front).
- \* "Zero Corner" pin & bushing are to be off set.
- \* > 500 Ton molds will have 2.0" ( 50.0mm) diameter leader pins.
- \* < 500 Ton molds will have standard DME or equivalent leader pin sizes.
- \* All bushings are to have grease fittings that are accessible without disassembly.
- \* For EU all bushings are to be have self lubricated - bronze.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **GUIDE BARS**

SECTION # **II**

VIEW # **J-1**

FILE:

DATE: 12/1/2011

## **Guiding Bars:**

From 800 ton of clamping force on up, guiding blocks are mandatory. Guiding blocks and plates need pre-guiding. Guiding blocks are required to be in the center of the tool, ( Sec II View J-2) to allow for the difference in thermal expansions(Sec II View K) of the mold plates caused by the different mold plate temperatures.

In case of handling disturbance, ( Hoist ring / Eye bolt at the top of mold) the top guiding block can be eliminated. Must be approved by the JCI Tool Engineer.

Tools with process temperatures  $\geq$  122°F or 50°C, will always require block guiding.

Slider guiding must allow slider expansion. ( Central Guiding System - Sec II View J-2)

Tool Shops must use standard components.

Guiding Pins and Blocks are always on one side.  
(Correct locations - see Sec II View J-2)

Self lubricated bronze is mandatory for all guiding plates and gibs. Exceptions are only allowed with the JCI Tool Engineers approval.

The width dimension of the guide / slider are important and are required on the tools. - see pic / Detail #3 ( Sec II View J-2) . This must be approved by the JCI Tool Engineer.

\* NOTE: Verify Robot clearance / open day light in the press for part removal. - This must be reviewed and verified with Plant & JCI Tool Engineer. ( This stays the Tool Suppliers responsibility)

\* NOTE: NOT required on all tools. Only when higher process temperatures are required driven by different type of materials. ( Ref. steel expansion chart - Sec II View K ).

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

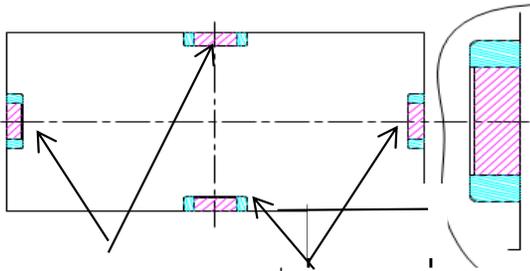
TITLE: **GUIDE BAR - Design & Location**

SECTION # **II**

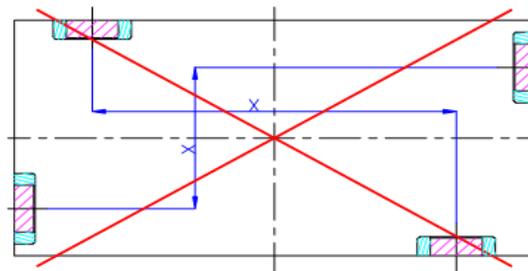
VIEW # **J-2**

FILE:

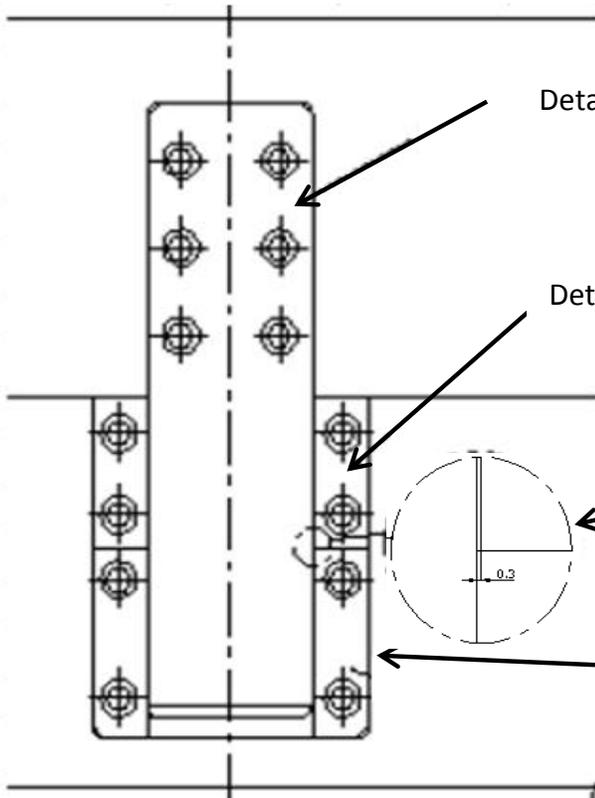
DATE: 12/1/2011



CORRECT Locations of the guides.



WRONG locations of the guides



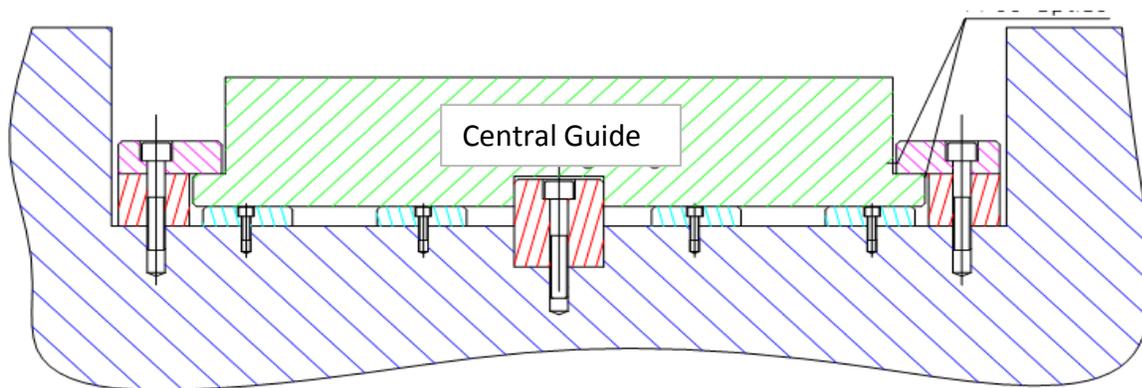
Detail #-1 Inductive harden

Detail #2 Harden 2 Hrc - less than

.010" or 0.3mm  
Clearance

Detail #3 - Self lubricated bronze

Clearance Between  
gib and guide



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **STEEL EXPANSION NOTE:**

SECTION # **II**

VIEW # **K**

FILE:

DATE: 12/1/2011

**\* The Coefficient of thermal expansion for all Steel , Harden Steels , Cooper & Aluminum. Must be taken into consideration when designing / building all tools. This is very important and must be reviewed with the JCI Tool Engineer.**

**\* The differences can cause damage / un-even wear to all components if not calculated properly which can affect - Hot Runner Systems, Actions ( Slides / Lifters etc), Ejector plates / pins, etc.**

**\***

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **SAFETY STRAPS**

SECTION # **II**

VIEW # **L-1**

FILE:

DATE: 12/1/2011

\* Safety straps are to be located on two sides - opposite corners of the mold, mounted on the "operator" and "non operator" sides.

\* For Safety Strap recommended sizes - (ref.Sec II View L-2)

\* ALL safety straps must have the TOOL ID # stamped on it. ( Sec II View L-2)

\* Safety Straps - must be straight in line with opening of the mold with two fasteners- NOT diagonally or rotated in any way for screw alignment.

\* All safety straps must have a SAFE storage position / location, on the stationary half, NOT to interfere with "OPENING & CLOSING" of the tool. or any clamping, hoses, fittings, connectors, etc. (ref - Sec II View L-2)

\* Mold weights greater than 4,500 lbs or 2042 kg Will require safety straps on all four corners of the mold. - "operator" and "non operator" sides.

\* The straps must NOT interfere with any clamping, hoses, fittings, connectors, etc.

\* All Safety straps must be recessed, For any reason they can not, there must an approval by the JCI Tool Engineer.

\* For hot runner systems, safety straps are to be included between Cover Cavity plate and manifold system( hot half rails) to allow for in press maintenance.

\* Straps are to be painted RED or YELLOW depending on the following:

- Straps to be painted YELLOW for all locations NOT restraining spring pressure.
- Straps to be painted RED for all locations where spring pressure is restrained.
- Straps to be painted WHITE used across split lines on the manifold systems.

\*\* LYNCH pins for locking - Sizing needs to be reviewed and approved by the JCI Tool Engineer. The size ranges vary between countries.( ref. Sec II View L-2)

***Important Note : Always review manufacturing and press specifications with the JCI Tool Engineering for details and approvals.***

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

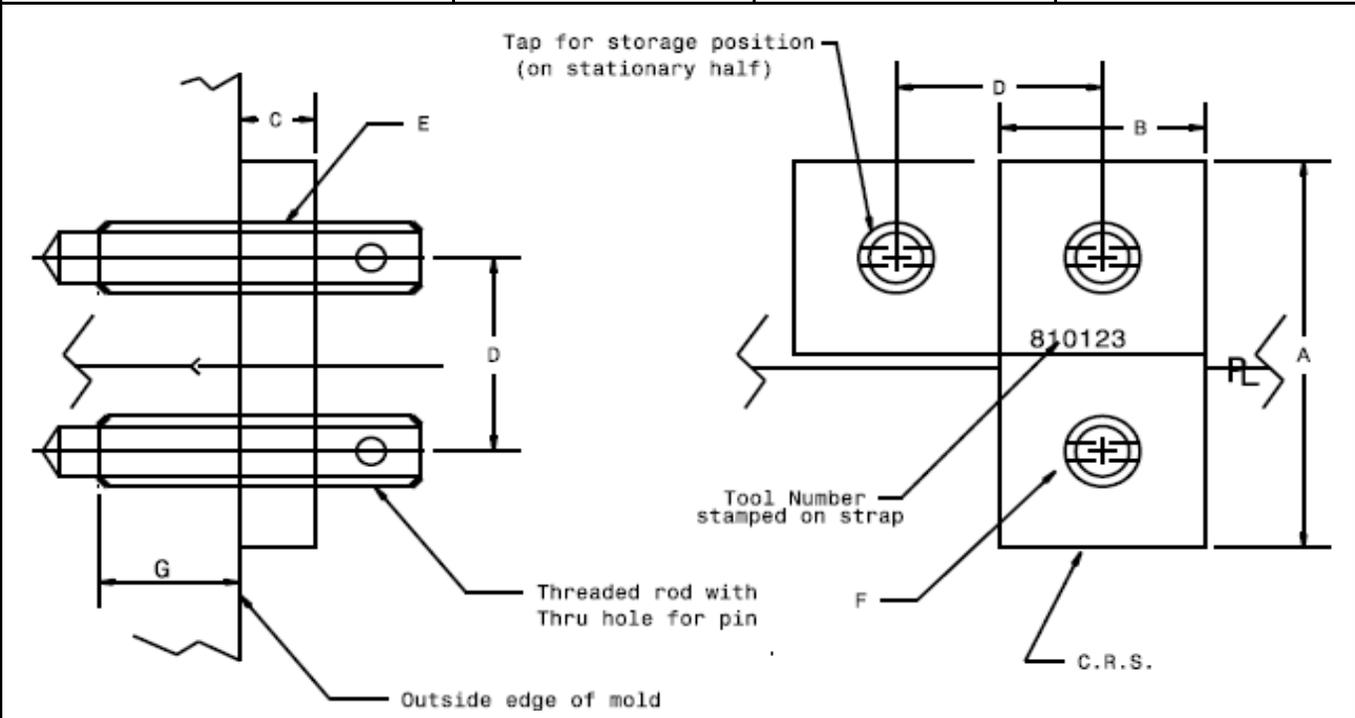
TITLE: **SAFETY STRAPS**

SECTION # **II**

VIEW # **L-2**

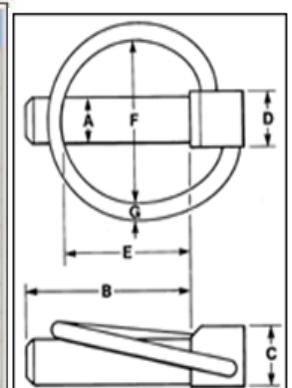
FILE:

DATE: 12/1/2011



A	B	C	D	E	F -thd Rod	G	
2.25" / 57.0mm	1.25" / 32.0mm	0.25" / 7.0mm	1.25" / 32.0mm	0.35" / 9.0mm	5/16"-18 / M18 x 2	0.7" / 18.0mm	
3.00" / 76.0mm	2.00" / 51.0mm	0.50" / 13.0mm	2.00" / 51.0mm	0.40" / 10.0mm	1/2"-13 / M14 x 2	1.1" / 28.0mm	
5.50" / 140.0mm	2.50" / 64.0mm	0.75" / 19.0mm	3.00" / 76.0mm	0.81" / 21.0 mm	3/4"-10 / M20 x 2.5	1.7" / 43.0mm	
5.50" / 140.0mm	3.00" / 76.0mm	0.75" / 19.0mm	3.00" / 76.0mm	1.06" / 27.0mm	1"-8 / M24 x 3	2.5" / 64.0mm	
<b>Ref ONLY</b>		<b>MOLD WEIGHTS</b>			<b>Ref Sizes</b>		
		1,500 lbs / 681 kg			1/2"-13 / M14 x 2		
		4,500 lbs / 2042 kg			1/2"-13 / M14 x 2		
		20,000 lbs / 9072 kg			3/4"-10 / M20 x 2.5		
		39,000 lbs / 17692 kg			1"-8 / M24 x 3		

Lynch Pins - Zinc with Yellow Chromate								
Nominal Dimensions								
Stock Code	A Pin Diameter	B Shank Length	C Head Height	D Head Width	E Capture Length	F Ring Width	G Wire Diameter	Approx. Weight/Lbs. Per 100 pcs.
HANG-1	3/16	1-1/4	1/2	11/32	1	1-1/8	.109	3.2
HANG-2	3/16	1-9/16	1/2	11/32	1-5/16	1-7/16	.138	4.4
HANG-4	1/4	1-3/4	1/2	11/32	1-5/16	1-7/16	.138	5.5
HANG-6	5/16	1-3/4	1/2	13/32	1-3/8	1-1/2	.138	7.0
HANG-8	7/16	1-3/4	9/16	1/2	1-3/8	1-1/2	.138	10.8
HANG-SL	7/16	1-15/16	9/16	1/2	1-5/8	1-7/8	.138	12.0
HANG-SHD*	7/16	1-15/16	19/32	1/2	1-1/2	1-21/32	.193	14.2



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **EYE BOLTS & EYE BOLT HOLES**

SECTION # **II**

VIEW # **M-1**

FILE:

DATE: 12/1/2011

- \* Eyebolts must be located so the tool can be lifted and loaded into a press with one eyebolt . - Exceptions for larger tools - Needs a Tool Engineer approval.
- \* (4) Eyebolts holes on the cover and ejector block / plates, clamp plates, ejector plates. On all tools sized for 250 Ton or larger, for splitting and rolling the tool.
- \* Eyebolt holes on both halves on all (4) sides of the mold thru the center of gravity so the mold hangs straight ( within 5 degrees).
- \* Threaded handling holes to be provide on all plates / details .> 50 lbs / 30 kg
- \* Include adequate number of eyebolt holes for easy handling, flipping, etc.
- \* Threads must be taped to full depth. ( IMPORTANT SAFETY ISSUE).  
( ref chart Sec II, View M2 )
- \* If eyebolt holes are in rails, they must be plugged ( NOT THRU) so the tip of the eyebolt cannot interfere with the ejector plate.
- \* Eyebolt holes must be located so the rings and chains DO NOT interfere with water lines hoses, hydraulic lines, electrical, etc.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

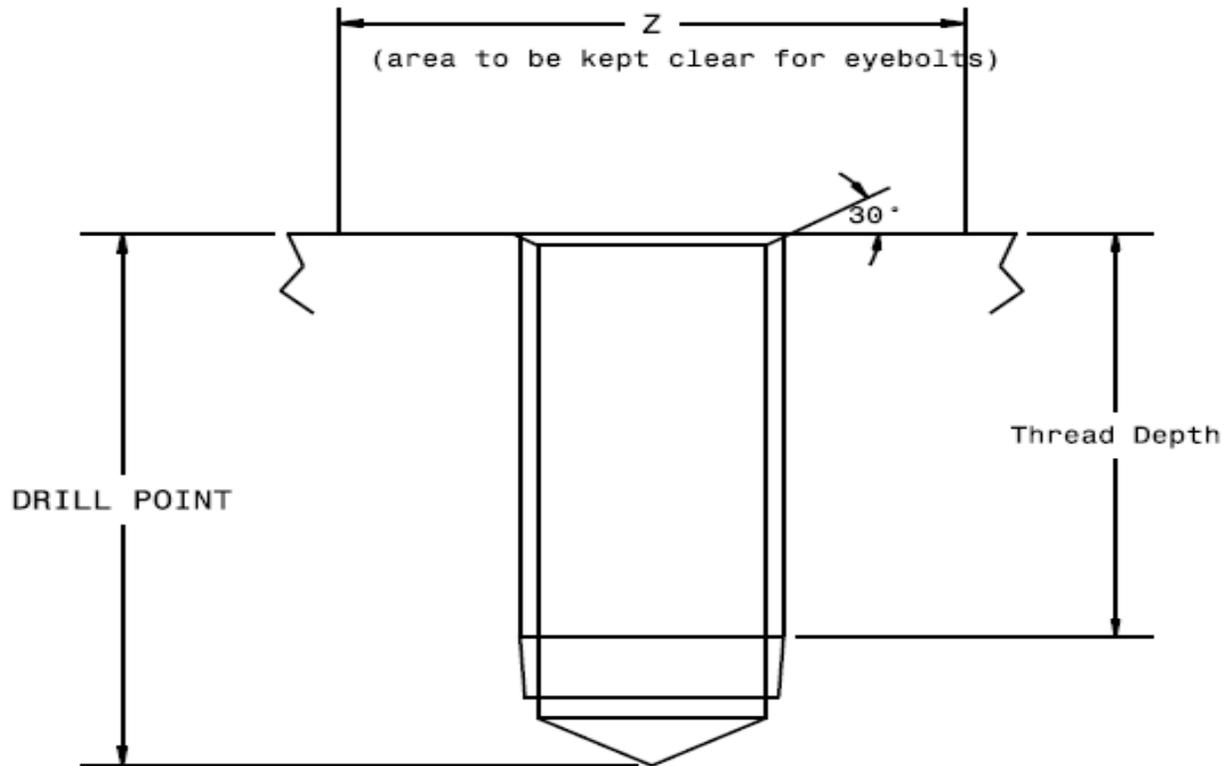
TITLE: **EYE BOLTS & EYE BOLT HOLES**

SECTION # **II**

VIEW # **M-2**

FILE:

DATE: 12/1/2011



**EYE BOLT HOLES SIZES LISTED ON THIS SHEET ARE FOR STEEL TOOLS ONLY !!**

Eye Bolt size	THREAD	Max Mold Weight lbs	Max Mold Weight kg		THREAD DEPTH	DRILL POINT
20 mm	1.5	5,020	2300			
24 mm	3	7,050	3200		48 mm	60 mm
36 mm	4.25	15,430	7000		72 mm	90 mm
48 mm	6	24,640	12000		78 mm	90 mm
	NC					
3/4"	10	5,070	2300		1.5"	2.0"
1"	8	7,050	3200		2.0"	2.5"
1-1/2"	6	15,430	7000		3.0"	3.75"
2"	4-1/2	24,640	12000		3.25"	3.75"

**\*\* NOTE: Metric sizes are for EU & Asia plants & Standard are for NA plants, Refer to country safety requirements \*\***

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

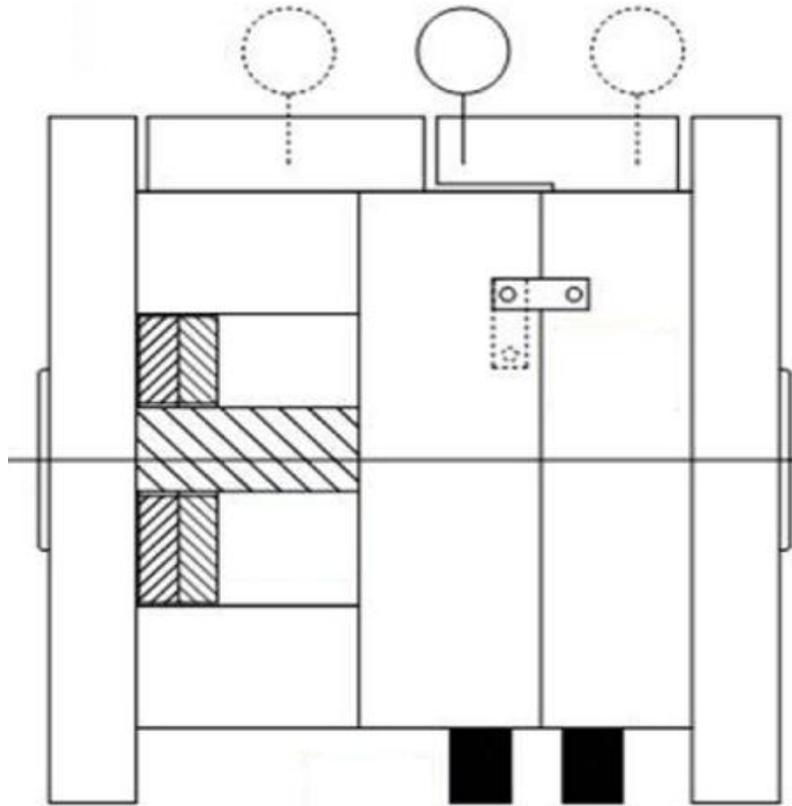
TITLE: **LIFT BARS**

SECTION # **II**

VIEW # **N**

FILE:

DATE: 12/1/2011



- \* Lift bars - Adds additional lift points for picking the tool up in halves.
- \* Lift bars - Are required when you CAN NOT have a center lift point.
- \* Required on tools with external mountings - slide actions, electric boxes, water, hydraulic, etc.
- \* Design - It must be a tongue and groove ( locking) design for weight. - This design must allow the tool to open and close freely. - Most importantly the tool vendor must supply a design / calibrated to support the weight of the tool.
- \* This is NOT required on all tool designs.

***Important Note : Always review manufacturing and press specifications with the JCI Tool Engineering for details and approvals.***

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **OFF SET SPRUES**

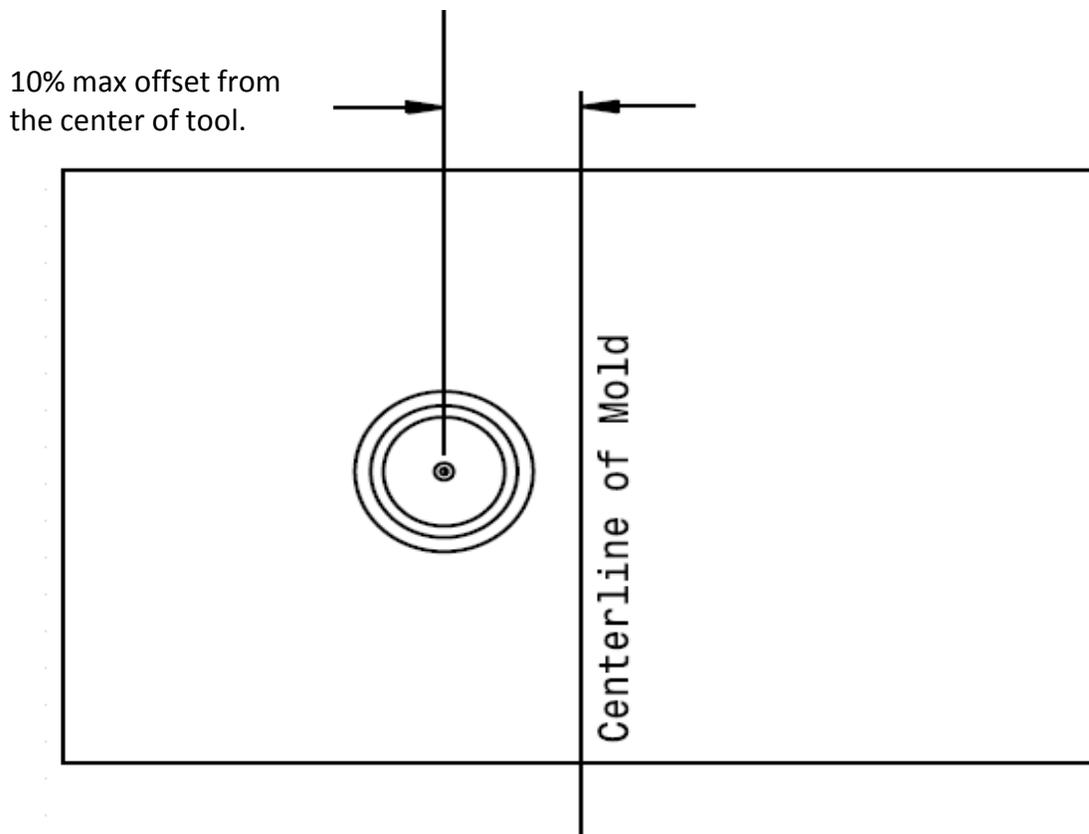
SECTION # **II**

VIEW # **O**

FILE:

DATE: 12/1/2011

- \* All sprues NOT located on centerline of the tool must be reviewed and approved by the JCI Tool Engineer.
- \* Offset of the Sprue, can not exceed the maximum of 10% of length from the center of the tool.
- \* Knock out patterns for ejection will need to be reviewed to ensure good balance within the guide ejection pins.
- \* Knock out patterns - Needs to line up and match the offset. (possible Hydraulic ejection will be required).
- \* Guide pins and return pins keep symmetrical around the center line of the press , not the mold. Whenever possible. ( Ejection actions will need to be reviewed to ensure a good balance).



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **LOCATING RINGS and LOCATIONS**

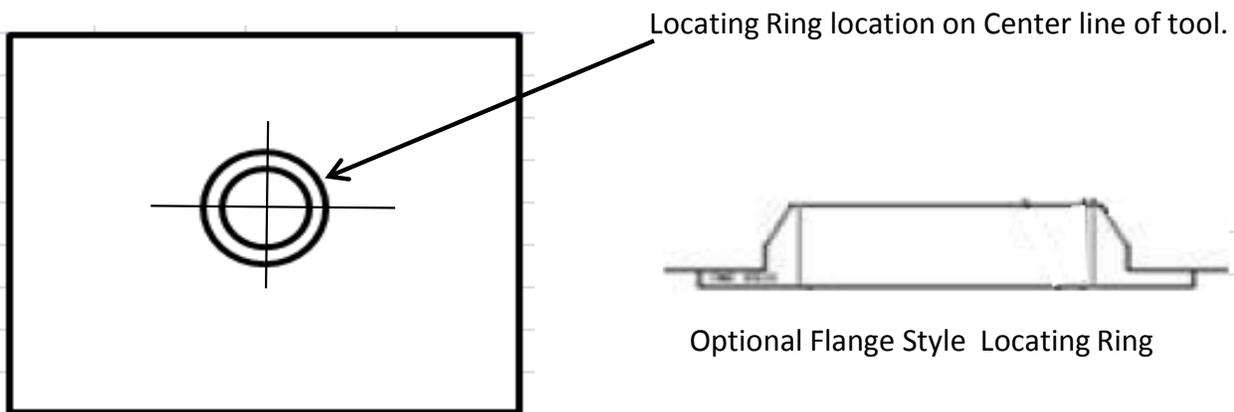
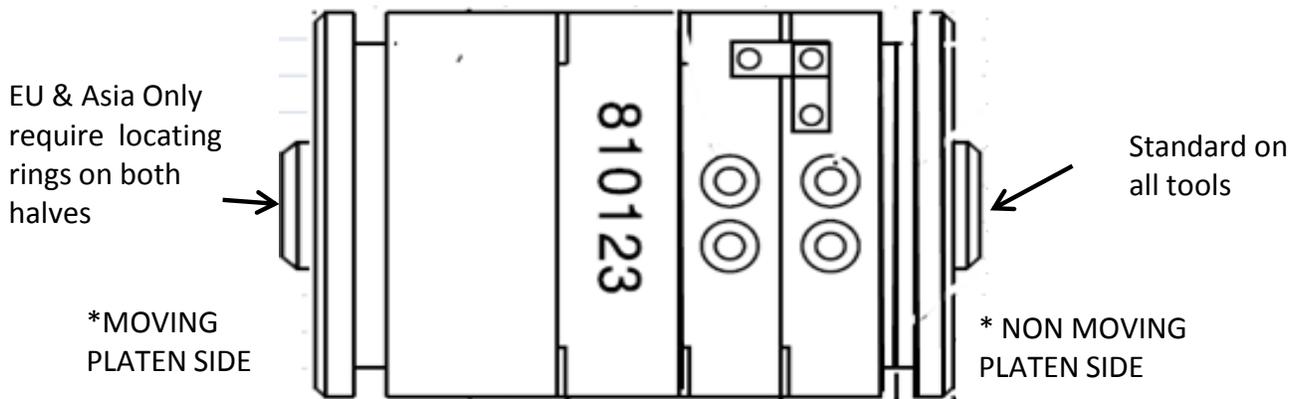
SECTION # **II**

VIEW # **P**

FILE:

DATE: 12/1/2011

- \* Locating rings are standard components from DME / Global Suppliers
- \* Locating rings - Flange style are an option . The flange should be flush with the back surface of the block / plate if used. ( Not required for EU)
- \* Locating rings are located at the center of the block / plate
- \* Locating rings are for locating the tool to the press, the alignment is very important. (Barrel & knock out patterns).
- \* Number of locating rings required, This needs to be reviewed with the JCI Tool Engineer. ( Native countries vary).
  - \*\* NA only requires ( 1) locating ring on the cavity side or Non moving platen side of the press.
  - \*\* EU & Asia requires (2) locating rings, 1 on both halves. Moving & Non moving platens
- \* NOTE: Ref all Plant & Press specs for the proper LOCATING RING SIZE, The JCI Tool Engineer will supply this information.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **POSITIVE LOCATION HOLES**

SECTION # **II**

VIEW # **Q-1**

FILE:

DATE: 12/1/2011

\* Below specifications are standard lock sizes. ( Used in NA, NOT in EU)

\* There are 4 available locations that are best suited for the tool.

( Always review Press Specs)

\*\* Below specifications are for 150T thru 550T.

\*\* Always review press specifications with the plant and JCI Tool

Engineer.

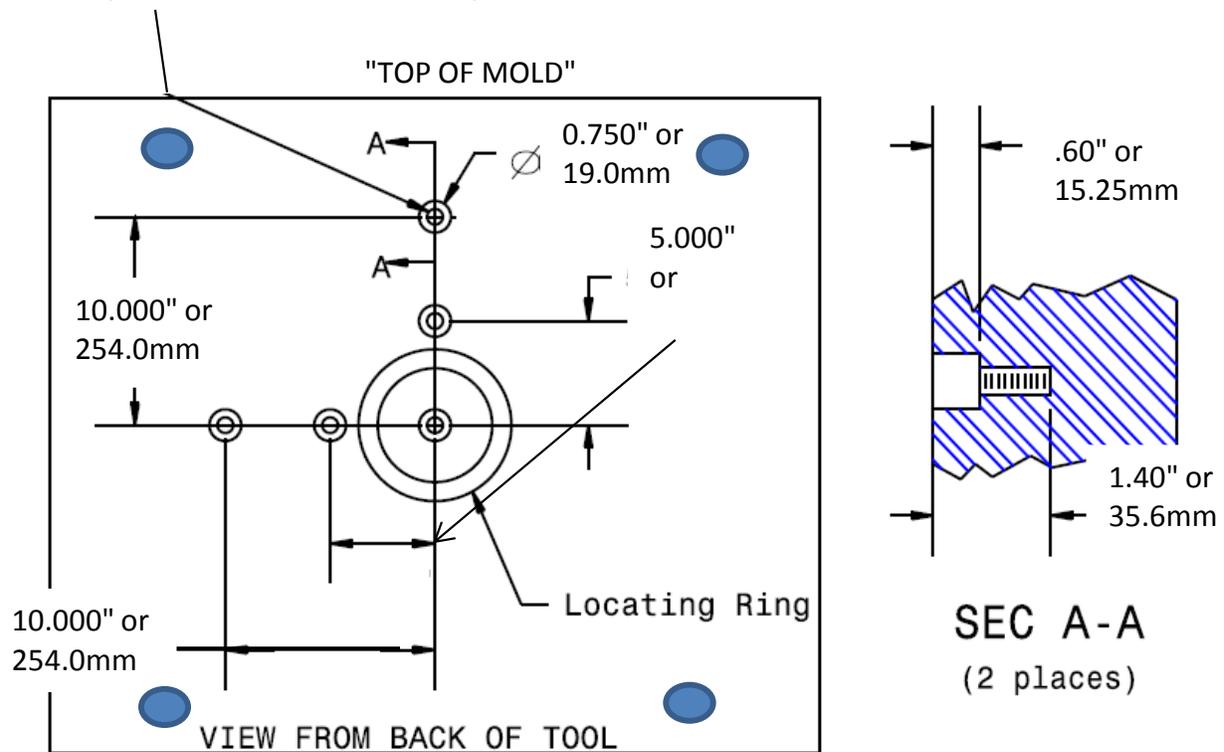
\*\* All Press / Tonnage sizes and specifications may vary .

\*  Include (4)handling holes , sized to support entire tool on tools 250Ton and greater. (2) handling holes required on tools under 250 Ton.

\* When location holes and locks are used, Example- 2 shot , pick in place. ( Used in NA)

\* NOTE: Not all tools require the locations holes and locks.

Drill and tap for a 5/16"-18 / 8.0mm cap screw



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **POSITIVE LOCATION LOCK BUTTON**

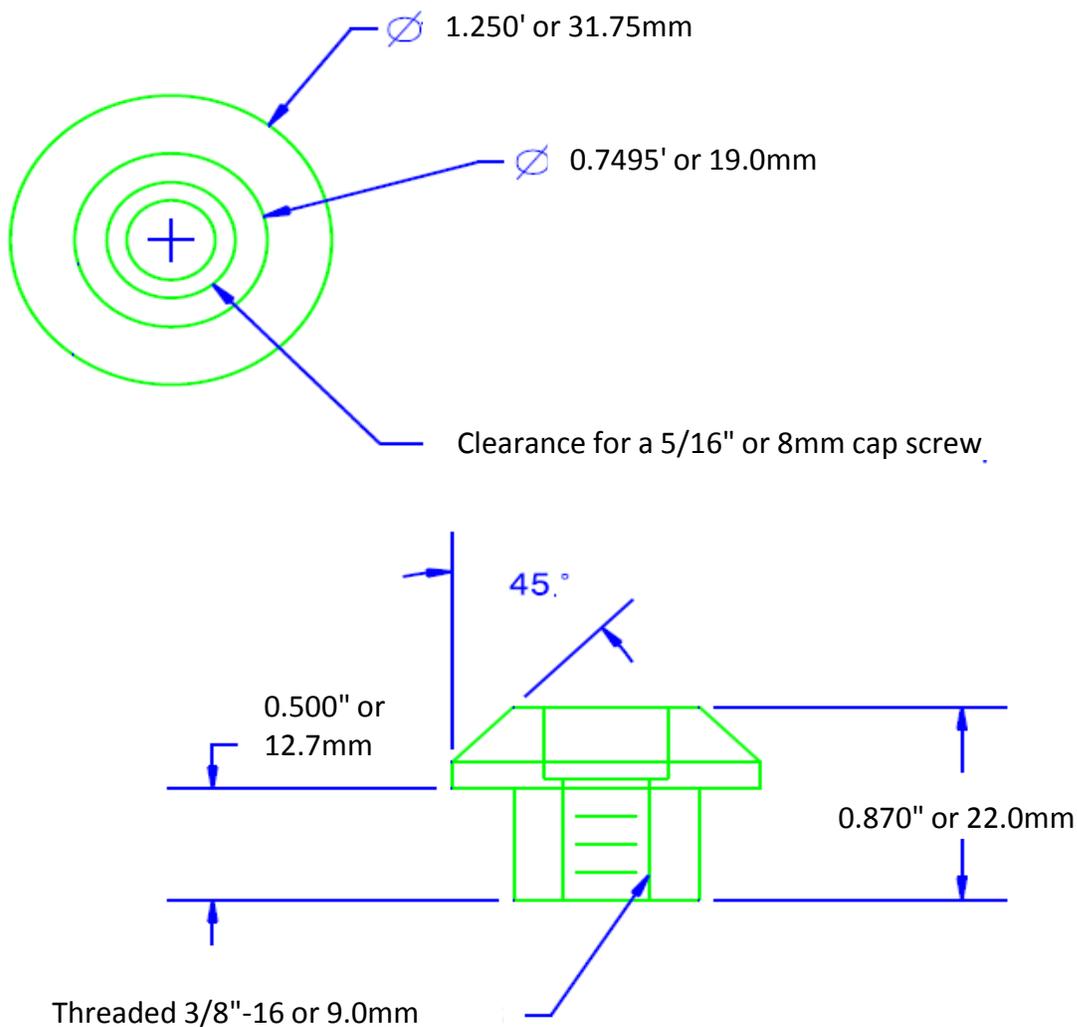
SECTION # **II**

VIEW # **Q-2**

FILE:

DATE: 12/1/2011

- \* Below specifications are standard lock sizes. ( Used in NA, NOT in EU)
- \* Always review press specifications with the plant and JCI Tool Engineer.
  - \*All Press / Tonnage sizes and specifications may vary .
- \* Standard components through DME.
- \* When location holes and locks are used, Example- 2 shot , pick in place.  
(Used in NA)
- \* NOTE: Not all tools require the locations holes and locks.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **PORCERAX INERTS TAG - EXAMPLE**

SECTION # **II**

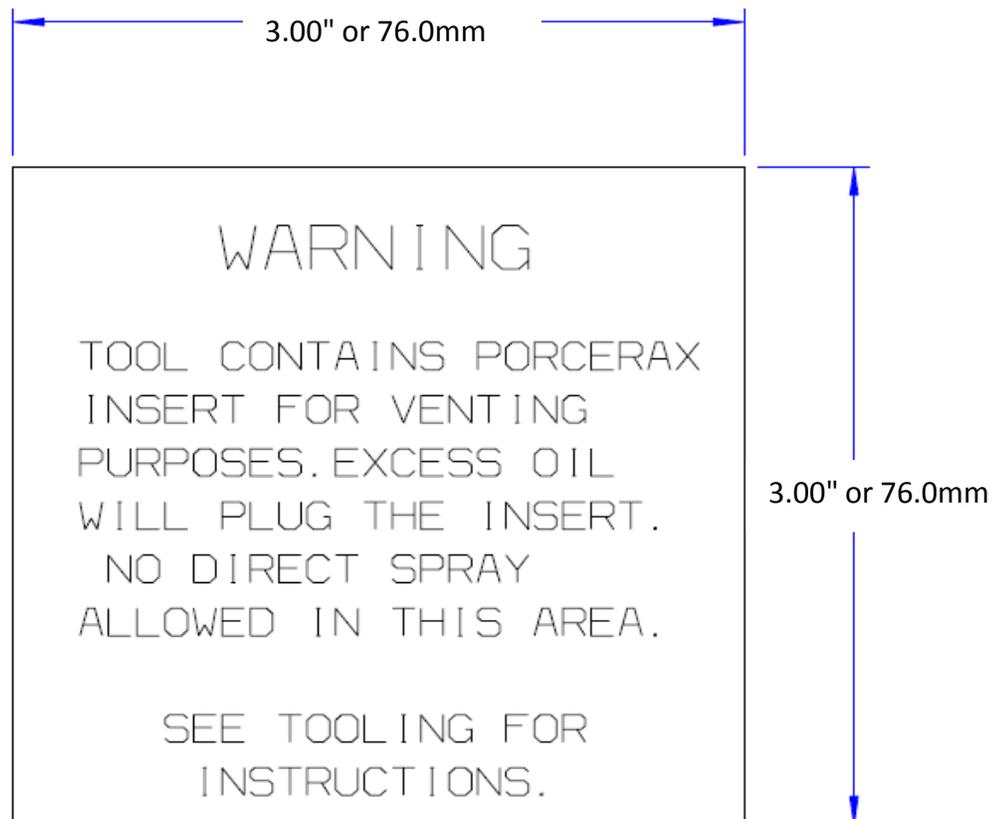
VIEW # **R**

FILE:

DATE: 12/1/2011

## " FOR REFERENCE ONLY"

\* A RED tag with WHITE letters must be placed on every tool containing PORCERAX inserts.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **PORCERAX VENTING**

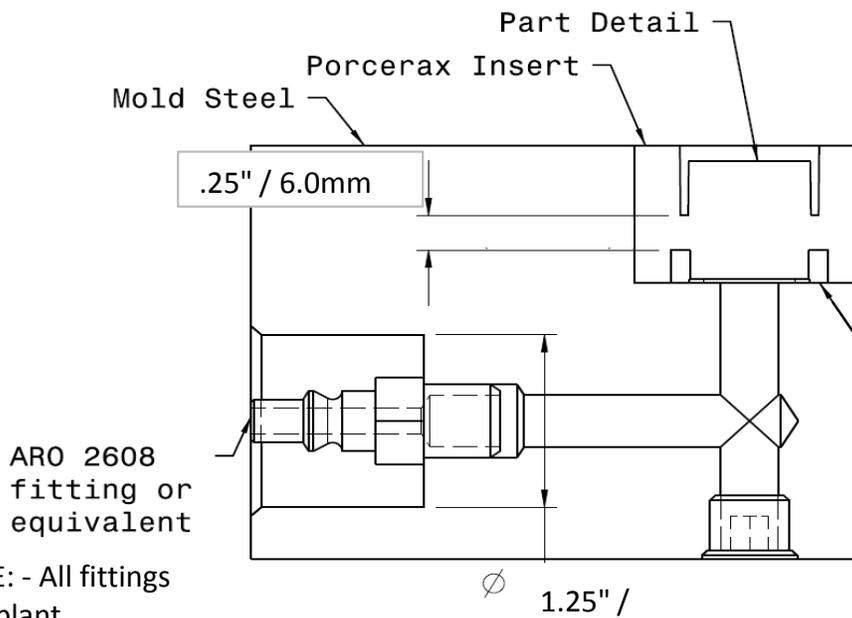
SECTION # **II**

VIEW # **S**

FILE:

DATE: 12/1/2011

\* All PORCERAX insert are to have "BLOW OUT" holes with air fittings that run to the outside of the mold. Must be Identified.



\* NOTE: - All fittings are to plant specifications.

\* Must have channels machined into the back of the insert to with in 0.25" or 6.4mm of vent area. Inserts must maintain there structural integrity.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **CENTER LINE / PARTING LINE LOCKS**

SECTION # **II**

VIEW # **T**

FILE:

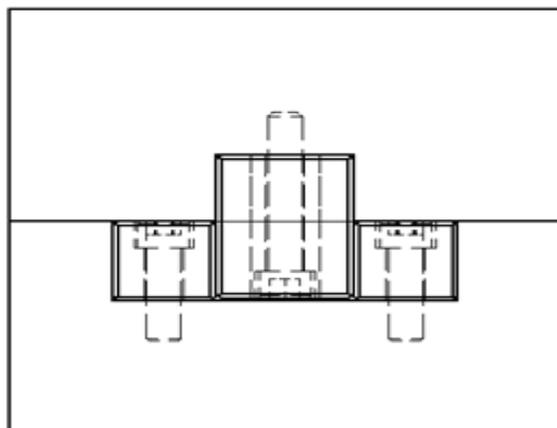
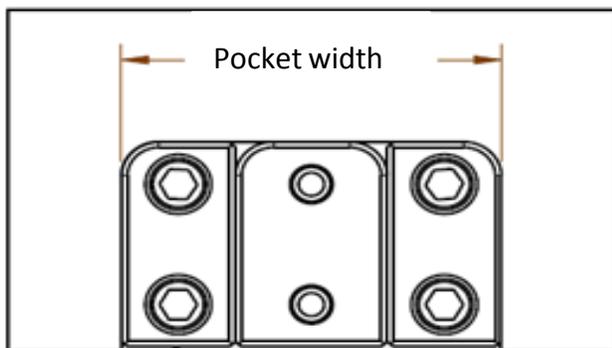
DATE: 12/1/2011

- \* All locks must be purchased components from PCS, DME, Progressive, Hasco, Meusburger, Strack Norma, or Selflube.
- \* 2 piece locks are preferred when possible.
- \* Location - Placed at the outside center lines of the tool.
- \* Ensure that the locks are to the right specification for the proper tool size.

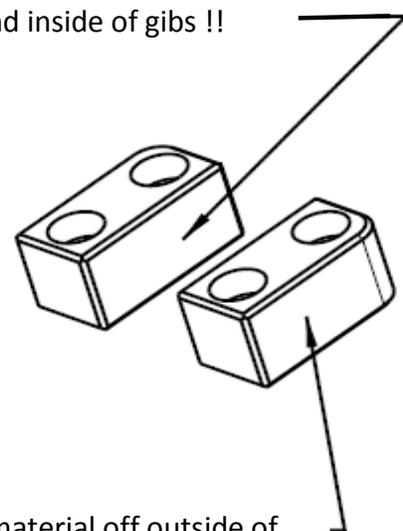
\* **Install Notes:** In case of 2 piece locks are used. Otherwise follow supplier specifications.

- 1) Install male half to fit tightly in its pocket.
- 2) Machine female pocket width .010" or 0.25mm small. (.005" or .127mm per side)
- 3) Grind outside of female gibs to fit the pocket size.
- 4) Measure the three blocks. The pocket width should be equal the sum of the three blocks +0.001 / -0.000" or +0.025 / -0.000mm
- 5) Blocks must be flush, or sub flush to edge of the mold steel.

**\*\* NOTE - These DO NOT take the place of standard locks cut into solid tool steel for alignment and injection pressure requirements.**



Do NOT grind inside of gibs !!



Grind extra material off outside of gibs

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **EJECTOR HOUSING OPENING COVER**

SECTION # **II**

VIEW # **U**

FILE:

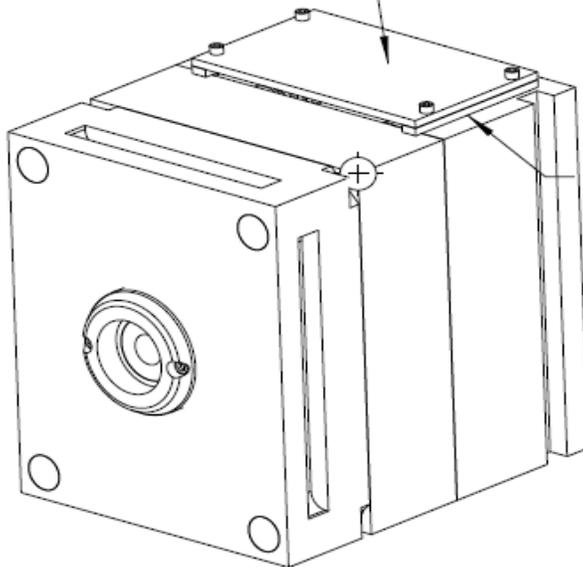
DATE: 12/1/2011

\* When an open end of the box faces the "TOP OF MOLD", a cover is required. This will keep dirt and other objects from falling into the ejectors.

\* Cover requirements are:

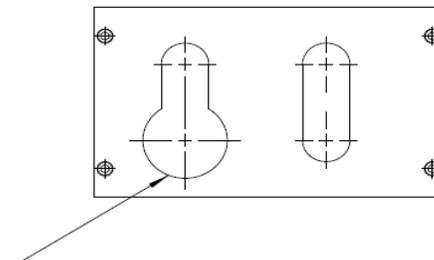
- 1) a .250" or 6.0mm thick acrylic cover.
- 2) Spacer between the acrylic cover and the rails will require a .250" or 6.0mm thick aluminum plates. This is to prevent rubbing between the ejectors plates and cover.
- 3) Equal Clearances are required as needed for water pipes, connectors, limit switches. ( Not to be excessive to allow anything to fall in)
- 4) Top & bottom of the cover must overlap onto the steel.
- 5) NO WASHERS ARE ALLOWED TO BE USED.

Acrylic Cover



Aluminum Spacer

Slots may be needed for water pipes , fittings , transducer, etc.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **III CAVITY AND CORE CONSTRUCTION**

SECTION # **III**

VIEWS **A-F**

FILE:

DATE: 12/01/11

This section outlines the basic construction expectations of **CAVITY** and **CORE** details and features.

Specific views shown on the following pages are:

**A-1) TYPICAL FEATURES - NOTES**

**A-2) TYPICAL FEATURES - VIEWS**

**B) CAVITY / CORE LABELING AND IDENTIFICATION**

**C) TYPICAL CAVITY / CORE FEATURES - SIDE VIEW**

**D) WEDGE / PARTING LINE INSERTS**

**E) VENT REQUIREMENTS / PRESSURE PLATES**

**F) VENT DEPTH CHART**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TYPICAL FEATURES - NOTES**

SECTION # **III**

VIEW # **A-1**

FILE:

DATE: 12/01/11

- Vent as required to minimize air back pressure during fill(especially end of fill).  
Minimum of 20% of part and 30% of runner to be vented.
  
- Threaded handling holes to be provided in all details weighing more than 50 .lbs (23kg).
  
- Tool to be stress relieved after roughing.
  
- All welding must be approved by a JCI Product Engineer BEFORE any welding is done. All welding must be documented (including weld map, temperatures used for color matching and rod type used) & provided to the Tooling Engineer before texture and with tool drawing package.
  
- \* Internal shutoff features to be relieved and vented whenever possible.
  
- \* Shutoff around leader pins, return pins and cavity perimeter. Shutoff area to be >20% of A X B.  
Note: Take into account when using Pressure pads
  
- \* Finished Cavity & Core detail features to held with in +/- .005" / .12 mm or 15% of commercial molding tolerance of the material specified, whichever is greater. This applies only to features that are dimensioned on the part print and do not have tolerances attached. For dimensions with tolerances; the tool is allowed 25% of the tolerance in the drawing. Unless other wise specified. NOTE : When graining is required - the wallstock should be offset to meet the nominal wallstock call out on the print.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

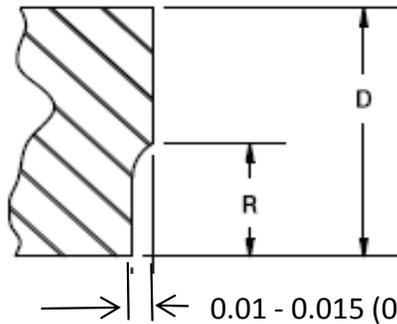
TITLE: **TYPICAL FEATURES - VIEWS**

SECTION # **III**

VIEW # **A-2**

FILE:

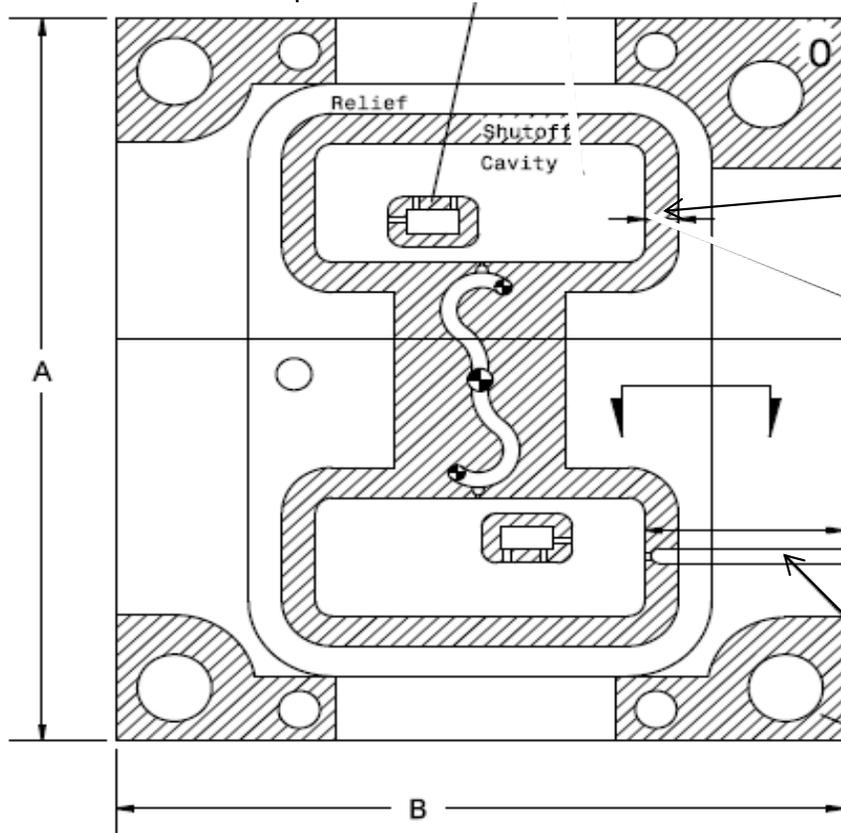
DATE: 12/01/11



Cavities must be relieved as shown above. Relieve all sides when possible  
 $R(\text{Relief height}) = 1/3 D$ ,  
 $D = \text{Cavity insert depth}$ .

Cavity Insert Relief

Internal shutoff features to be relieved and vented whenever possible.



Shutoff areas around the cavities are to be , (0.5" / 12.5mm - presses <90 Ton). (1.0" / 25.0 mm presses 90 to 500Ton), (1.5" / 37.5 mm presses > 500 Tons). Relieve other areas .25 - .75 mm.

3.00" / 75.0 mm Min from the edge of mold to cavity detail. Actual requirements may vary. Depending tool size. Always vent to atmosphere. -

Shutoff around leader pins, return pins and cavity perimeter. Shutoff area to be >20% of A X B. Note: Take into account when using

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **CAVITY / CORE LABELING & IDENTIFICATION - PLAN**

SECTION # **III**

VIEW # **B**

FILE:

DATE: 12/01/11

When using a date stamp it must be approved by the Tooling Engineer and Plant.

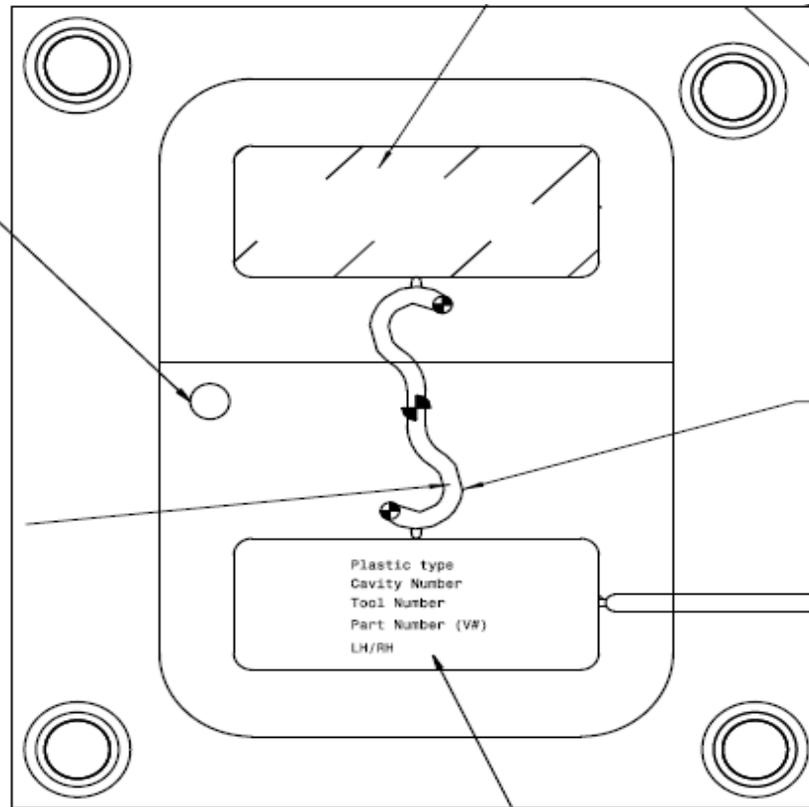
Approved types are:

PCS Cumsa Double Date Stamp  
Date Calendar scribed or EDM'd

Off set leader pin and stamp 0/0 on outside corner of all plates.

Stamp location of X,Y,Z datum hole in steel (also work lines)

Stamp or engrave material recycle code in runner.



Stamp zone, valve gate and drop numbers into runner or in steel near drop if there is

At Tool Engineer request, stamp all inserted details with:

- Tool #
- Cavity #
- Steel type
- Steel Hardness
- Built by:

This information to be added per design and in a customer approved location. Must be on no-show surface of each cavity using method approved by Tooling Engineer. Must be visible after sub-assembly operations are completed.

Faces of ejector pins with pressure transducers behind them to be center punched for identification (unless pin is on a visible or functional surface, then review with Tooling Engineer).

***All Plaques - Must be in there Native language for the country this tool is running in.***

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TYPICAL CAVITY / CORE FEATURES - SIDE**

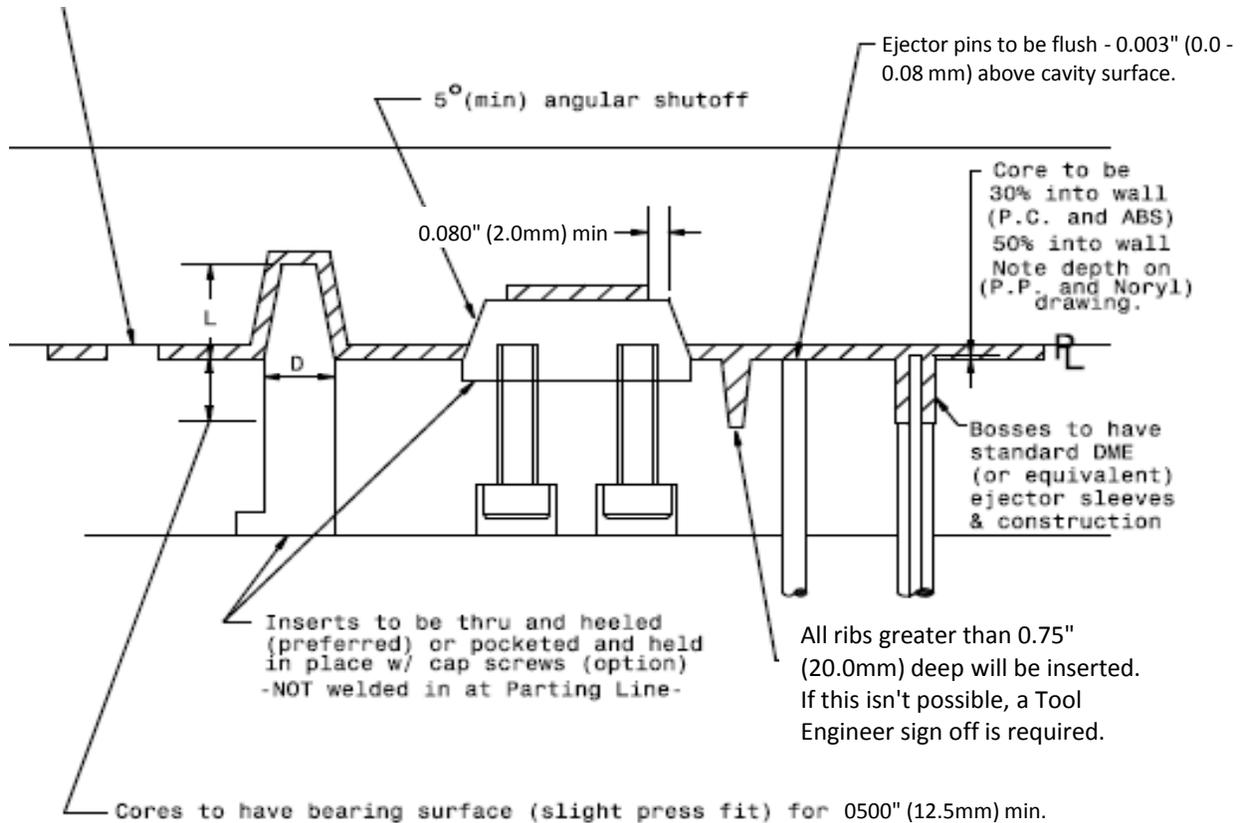
SECTION # **III**

VIEW # **C**

FILE:

DATE: 12/01/11

Thru holes to be cored from ejector side where possible (with draft).



- Maximum standing steel height to width ratio is 3:1 . Anything greater requires Tool Engineer approval.
- Ratios greater than 2:1 will be inserted where possible.
- \* Shut off angles < 5 degrees must be approved by a JCI Tool Engineer.
- Do not media blast ribs and deep draw areas during texture process.
- No knife edge steel conditions are allowed without Tool Engineer approval. If knife edge steel conditions are required then they must be inserted with a spare insert provided.
- A minimum of 2 parting line interlocks are required to protect minimum shut off angles and to provide alignment of cover and ejector.
- Inserts and plates to be stamped for identification and orientation to assist with correct assembly of the tool.
- Vent and relieve internal shutoffs where possible.
- Pin and sleeve combinations must be readily available. If custom or long lead time combinations are required then Tool Engineer approval is required and a spare set provided with the tool.
- The Tool Engineer will specify the type of steel used for inserts.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

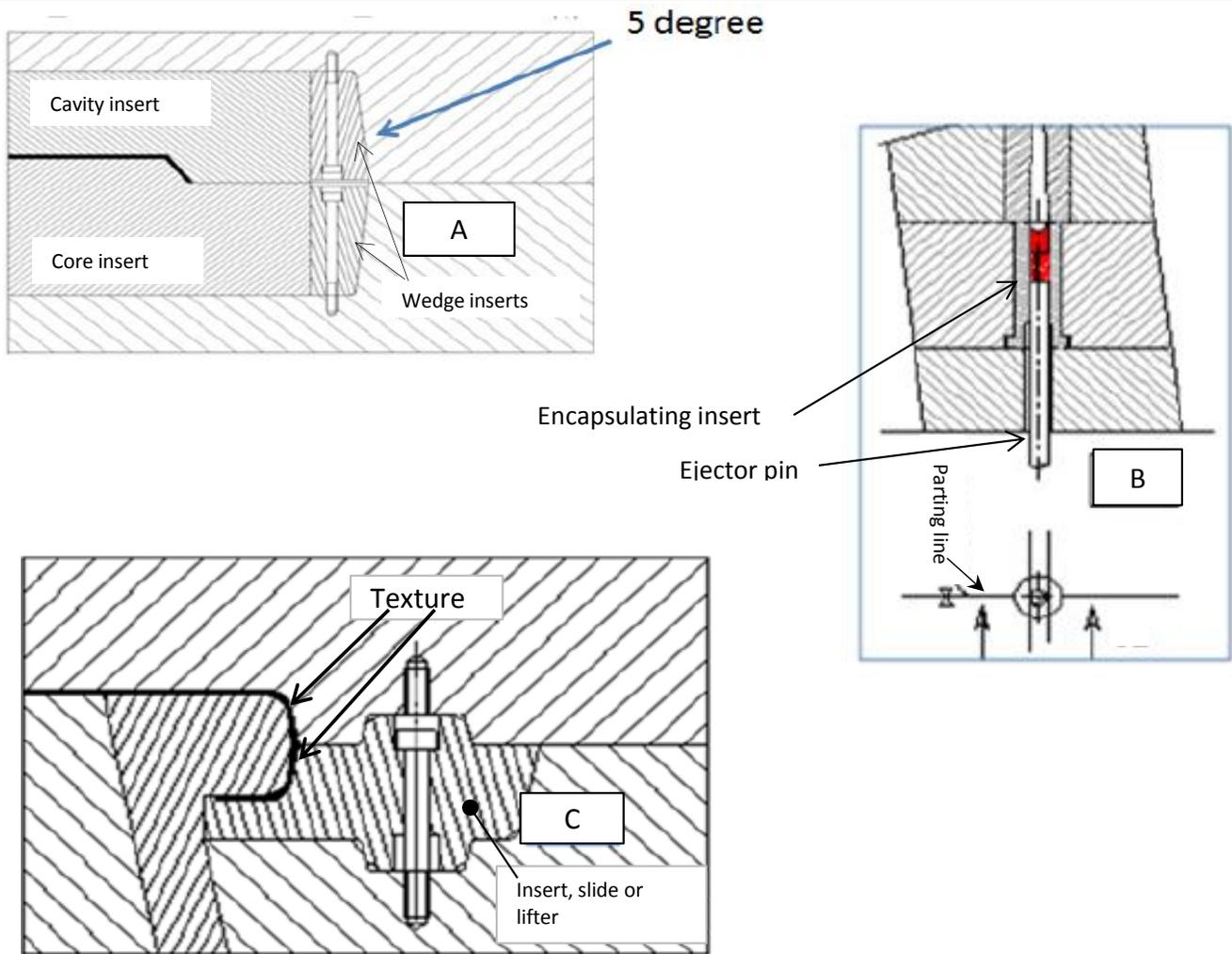
TITLE: **WEDGE INSERTS AND TEXTURE SPLIT LINES**

SECTION # **III**

VIEW # **D**

FILE:

DATE: 12/01/11



Pattern graining across a parting line

A - To allow ease of assembly and disassembly, large inserts should have wedge inserts on opposing sides with 5° of draft. Each insert will have threaded holes in the top to assist in removal. The intersecting corners of the wedge inserts will have a radius relief.

B - When an ejector pin is bisected by two inserts, it is a requirement that there be a bushing style insert encapsulating the ejector pin.

C - When texture is required to crossover a parting line then an insert that can mount to both the cavity and the core will be used for matching purposes. This method must also be used if a core side lifter or slide is textured.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: VENT REQUIREMENTS AND PRESSURE PLATES

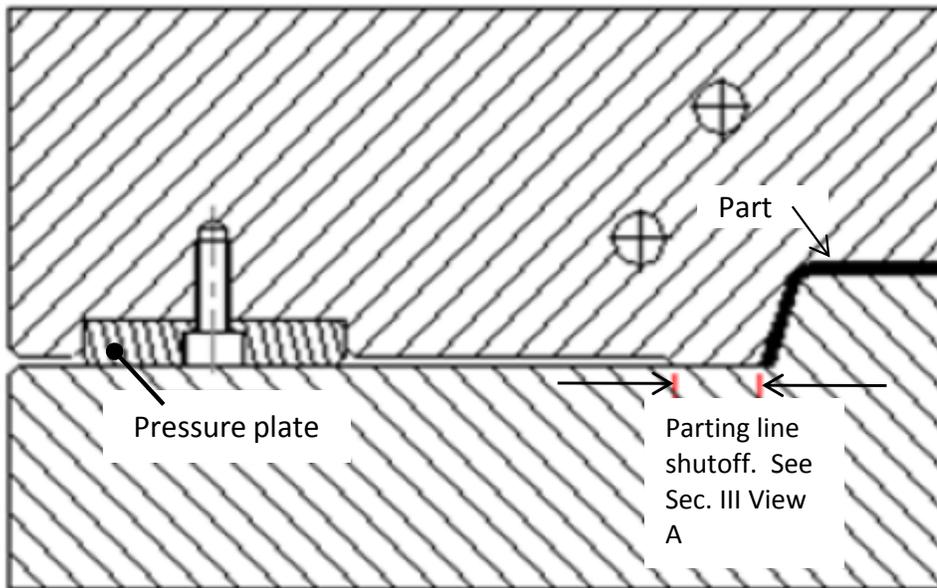
SECTION # III

VIEW # E

FILE:

DATE: 12/01/11

In order to allow gases to escape the cavity without causing burn or requiring slow injection speeds, the parting line and all other areas of the tool must be properly vented. To help accomplish this it is required to have hardened and adjustable pressure plates, mounted on the parting line, that will protect it from excessive clamp force and ensure adequate venting along the tool parting line. The total area of the pressure plates must be equal or higher than the shutoff area.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

## TITLE: VENT DEPTH CHART

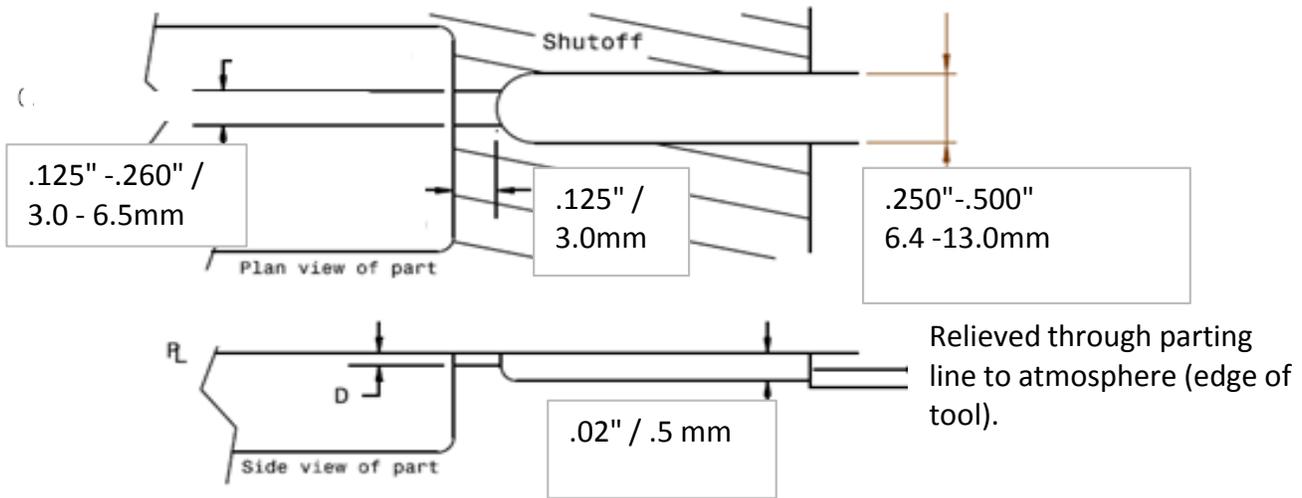
SECTION # III

VIEW # F

FILE:

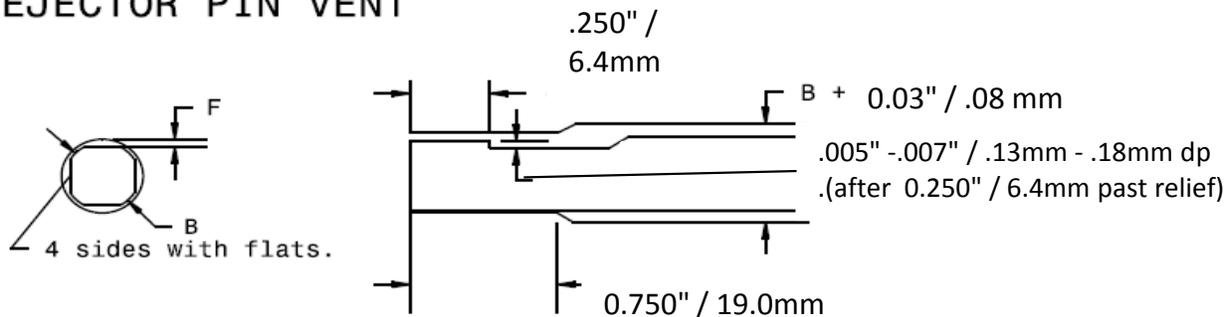
DATE: 12/01/11

### PARTING LINE VENT



- Vents to be placed 2.00" (50.0mm) on center around the entire perimeter of the part.
- Vents to be placed at the end of fill.
- must be opened to standard depth when mounted in machine under clamp pressure.
- All vents must be open to the atmosphere.

### EJECTOR PIN VENT



- Must be a moving pin (example: not a core pin).
- Do not vent core pins  $0.125$  (0.4mm) in diameter when used with a sleeve. Vent the sleeve instead.
- For ejector pins  $.125''$  (0.4mm) in diameter or less, minimize bearing surface to reduce vent relief length.

VENT DIMENSIONS (ENGLISH)		
Material	D	F
ACETAL	0.0005	0.0010
ABS	0.0015	0.0015
NYLON	0.0005	0.0010
PC	0.0015	0.0015
PP	0.0005	0.0010
PPO	0.0020	0.0015
PS	0.0010	0.0010
PC/ABS	0.0015	0.0015

VENT DIMENSIONS (METRIC)		
Material	D	F
ACETAL	0.1270	0.0254
ABS	0.0380	0.0380
NYLON	0.1270	0.0254
PC	0.0380	0.0380
PP	0.1270	0.0254
PPO	0.0508	0.0380
PS	0.0254	0.0254
PC/ABS	0.0380	0.0380

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **IV INJECTION SYSTEM**

SECTION # **IV**

VIEWS **A-M**

FILE:

DATE: 12/01/11

This section outlines the basic construction expectations of the **MATERIAL DELIVERY** process from the machine nozzle to the cavity.

Specific views shown on the following pages are:

- A) Overview**
- B1) Cold Sprue Bushing and Locating Ring - EU and Asia**
- B2) Cold Sprue Bushing and Locating Ring - N. America**
- C) Runners**
- D) Default Runner Diameter Chart**
- E) Trapezoid Runner**
- F) Subgates**
- G) Edge Gates**
- H) Jump Gates**
- I) Cashew and Winkles**
- J) Hot Sprue**
- K-1) Typical Hot Manifold System - NOTES**
- K-2) Typical Hot Manifold System - DESIGN NOTES**
- L) Electrical Schematic for 2 or More Drops (N. America)**
- M) Valve Gate Connectors**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **OVERVIEW**

SECTION # **IV**

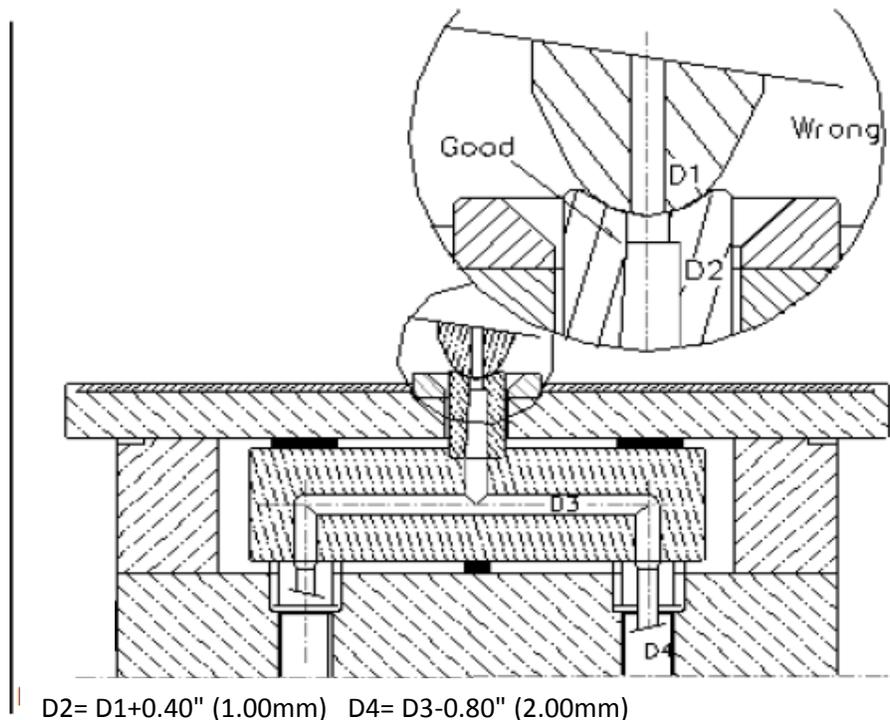
VIEW # **A**

FILE:

DATE: 12/01/11

## Injection 1:

- 1) The injection concept must consider the position of weld lines, customer requirements, dimensional tolerance of parts and the injection process in order to meet the raw material manufacturers shrink rates, the melt pressure and flow lengths so they do not vary more than 25%. The values are to be proved using mold flow analysis.
- 2) The gate type should be based on successfully implemented concepts. No sink marks, dull or glossy areas on the "A" surface are allowed. Supplier must propose alternate systems when no proven system is available.
- 3) The use of torpedo style drops are to be avoided and requires JCI Tool Engineer approval.
- 4) The runner system shall not have any sharp corners or dead zones.
- 5) Cold runners shall incorporate a sufficient cross section to avoid pressure drops. Take the injection pressure in to account for required molding pressures needed to make an acceptable part.
- 6) Cold runners need to be kept as short as possible.
- 7) Injection gates need a sufficient cross section to ensure a melt flow for holding pressure as long as required for an acceptable part. (Amorphous materials minimum is 4 seconds, crystalline material minimum is 6 seconds).
- 8) Total volume of the hot runner channels = (part volume + sprues)X 0.8
- 9) Hot runner pressure drop must allow for quick color change.
- 10) Hot runner flow balance must allow for constant flow of material through the mold.
- 11) The residence time of the material in the hot runner system cannot negatively affect the material.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

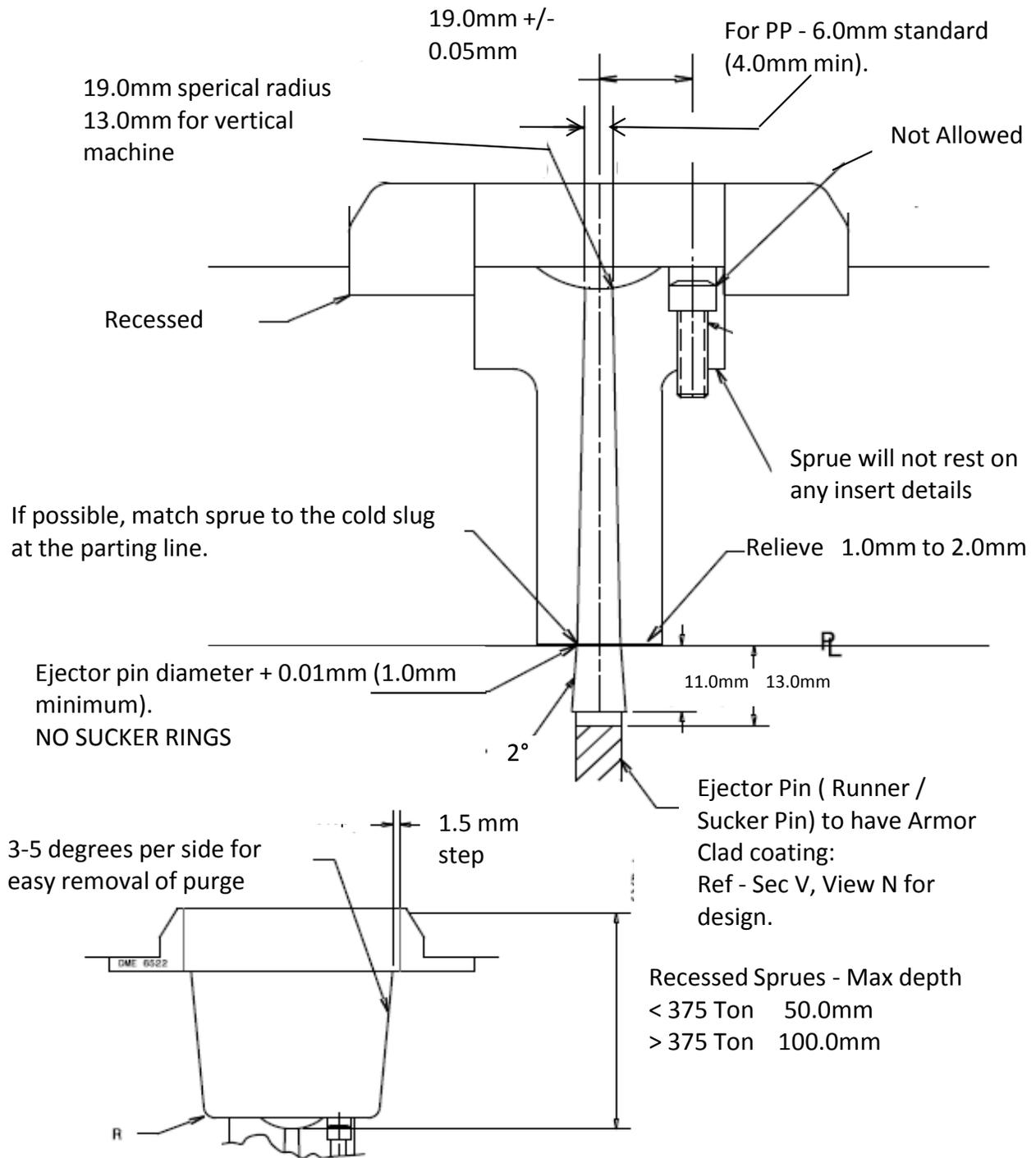
TITLE: **COLD SPRUE BUSHING AND LOCATING RING - EU AND ASIA**

SECTION # **IV**

VIEW # **B-1**

FILE:

DATE: 12/01/11



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

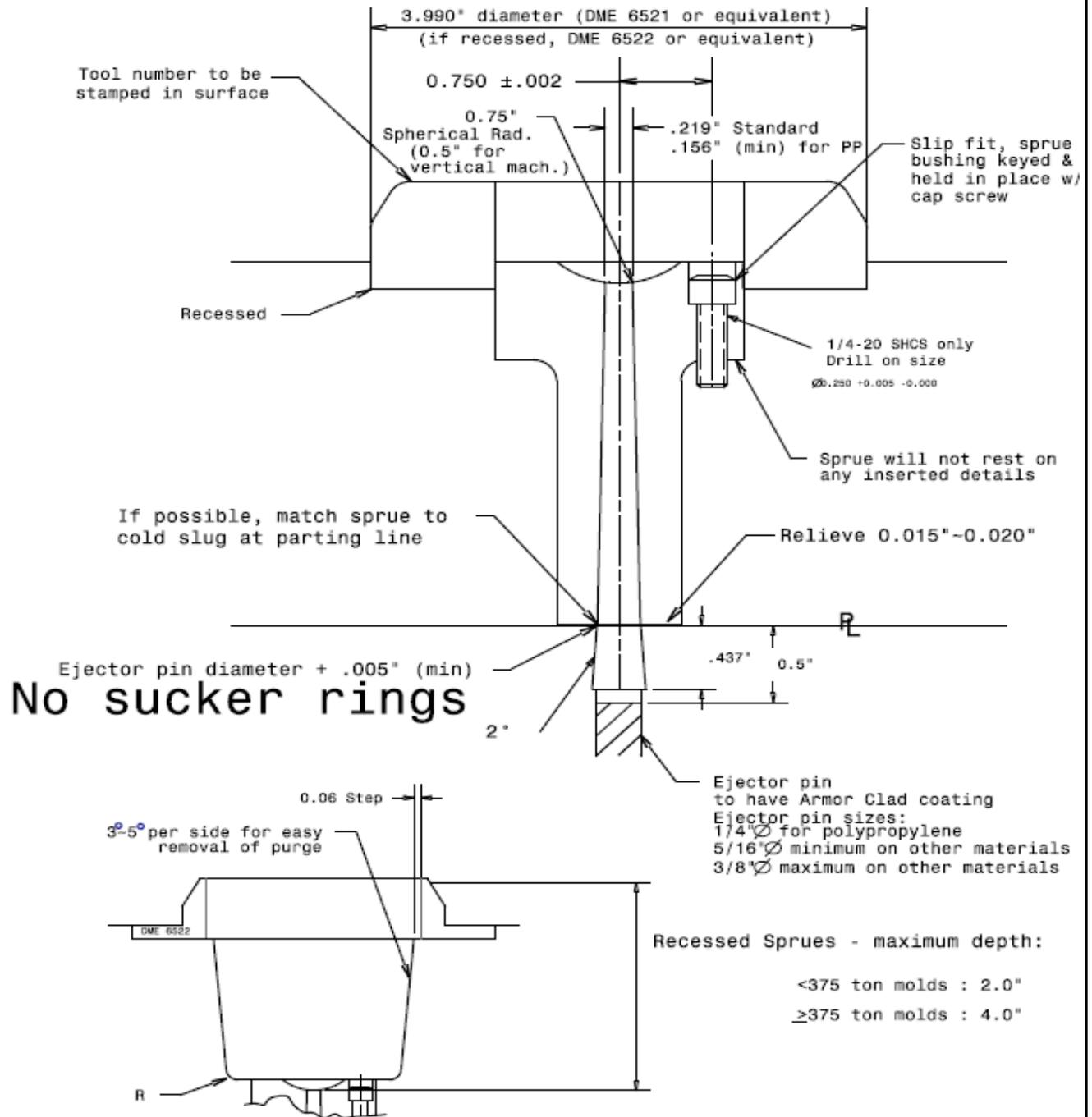
TITLE: **COLD SPRUE BUSHING AND LOCATING RING - N. AMERICA**

SECTION # **IV**

VIEW # **B2**

FILE:

DATE: 12/01/11



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **RUNNERS**

SECTION # **IV**

VIEW # **C**

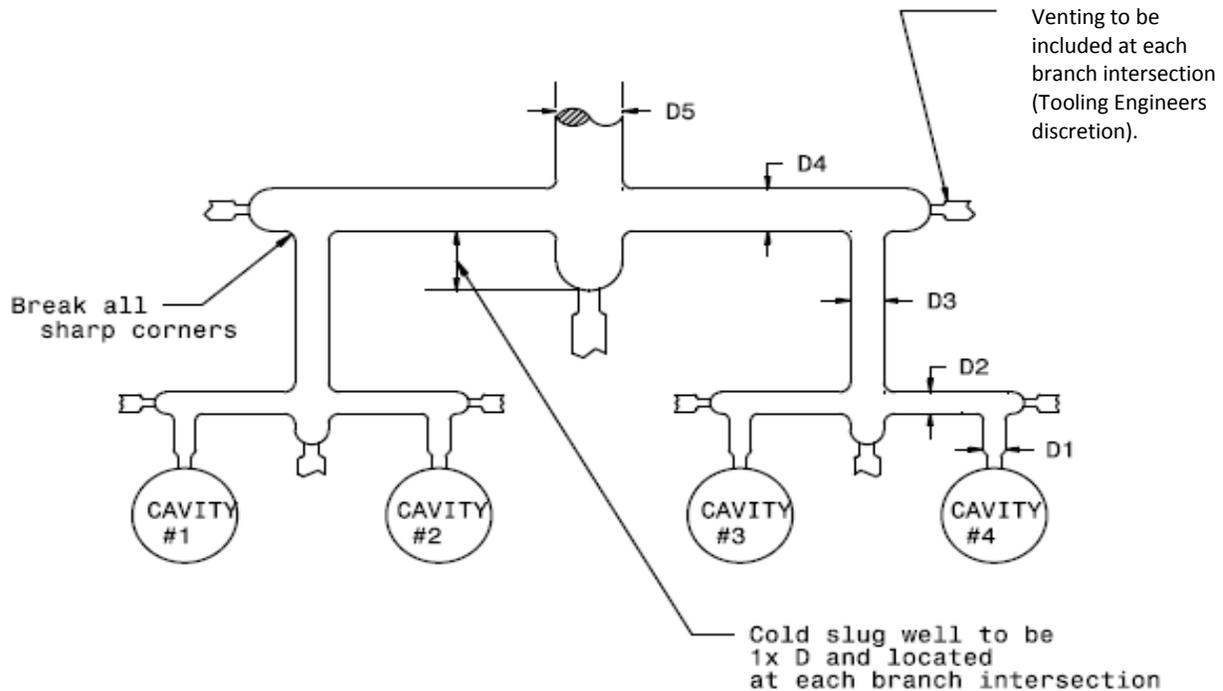
FILE:

DATE: 12/01/11

## RUNNERS: NATURALLY BALANCED RUNNER SYSTEM

- To be full round whenever possible
- Flow distances, volumes & pressure loss to each cavity to be equal (naturally balanced runner system)

Consider pressure drops in cold runners.



- If cavities are not identical or mirror images, moldflow must be done to size runners and gates
  - Any 90 degree turn should have a runner diameter increase of 20% coming from the cavity to the sprue (any "T" should have 40% increase)
  - Include runner shut offs that mold LH and RH parts in the same shot.
  - Include runner shut offs on all family tools.
- \* No cutter marks in the runners

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **DEFAULT RUNNER DIAMETER CHART**

SECTION # **IV**

VIEW # **D**

FILE:

DATE: 12/01/11

\* Runner diameter at the gate to be defined by the tool engineer or based on Mold Flow analysis ( Preferred).

\*If this information is unavailable - the following chart can be used to provide default minimum diameter ( at gate):

\* This information doesn't include the manifold system. ( Mold Flow needed )

## DEFAULT RUNNER DIAMETER @ GATE

RESIN	LENGTH FROM NOZZEL TIP TO GATE		
	3.0" / 75.0 mm	6.0" / 150 mm	>10.0" / 250 mm
ABS -GE 6400	1/4" / 6.0 mm	3/8" / 10.0 mm	Refer to Mold Flow
AB S-GE6500	1/4" / 6.0 mm	3/8" / 10.0 mm	
ABS HH-DOW 344	1/4" / 6.0 mm	3/8" / 10.0 mm	
ACETAL Celon			
M90	1/4" / 6.0 mm	3/8" / 10.0 mm	
NYLON 33% GF			
70G33	1/8" / 3.0 mm	3/16" / 5.0 mm	
NYLON ST -408	3/16" / 5.0 mm	1/4" / 6.0 mm	
PC-GE 141	3/8" / 10.0 mm	1/2" / 12.0 mm	
PC-GE EM3110	1/4" / 6.0 mm	3/8" / 10.0 mm	
PP HIMONT SB891	3/16"/5.0 mm	1/4" / 6.0 mm	
PPO -NORYL 844	3/16" / 5.0 mm	3/8" / 10.0 mm	
PPO - NORYL 7100	3/16" / 5.0 mm	3/8" / 10.0 mm	
PS -MOBIL 5350	1/8" / 3.0 mm	1/4" / 6.0 mm	

Assumptions: (1) Max. 3000 psi loss between nozzle & gate (does not include gate)  
 (2) Average fill rate of 10 cubic inches / sec ( faster fill rate would require larger diameter runner.

Mold Flow Simulation according to the raw material specifications when required.

- The reference clamping force = "the part projected surface "X" max 98% melt pressure"

Maximum reference values for cavity Mold Flow calculation:

MATERIAL	PROCESS PRESSURE	FLOW LENGTH
* PP	300 Bar / 4500psi	300 mm
* PP TV	300 Bar / 4500psi	250 mm
* ABS	500 Bar / 7500psi	200 mm
* PA	450 Bar / 6500psi	250 mm
* PA GF	550 Bar / 8200psi	250 mm
* PC / ABS	600 Bar / 9000psi	150 - 200 mm

- Values by 2.5mm wall thickness

- Mold flow calculation include welding lines & warp analyze.

- Pay special attention to pressures, flow length, position of injection points and position of

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TRAPEZOID RUNNER**

SECTION # **IV**

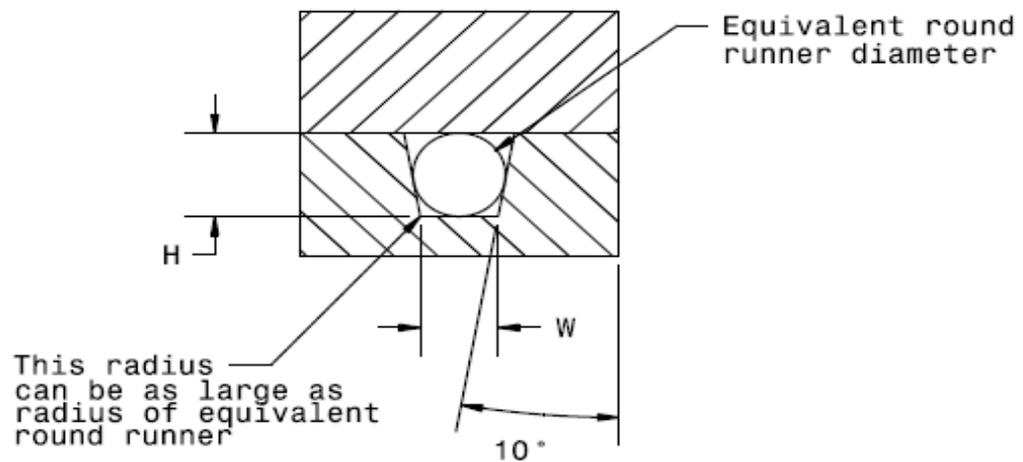
VIEW # **E**

FILE:

DATE: 12/01/11

## OPTIONAL TRAPEZOIDAL RUNNER

- ° NOT TO BE USED WITHOUT TOOL ENGINEER APPROVAL.



- ° To be cut in ejector half (unless otherwise approved by Tool Engineer)
- ° To be sized per inscribed circle equivalent to desired full round runner

	English	
Equivalent round runner	H	W
0.188	0.188	0.158
0.250	0.250	0.210
0.312	0.312	0.262
0.375	0.375	0.315

	Metric	
Equivalent round runner	H	W
5.00	5.00	4.00
6.00	6.00	4.50
8.00	8.00	6.50
10.00	10.00	8.00

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **SUBGATES**

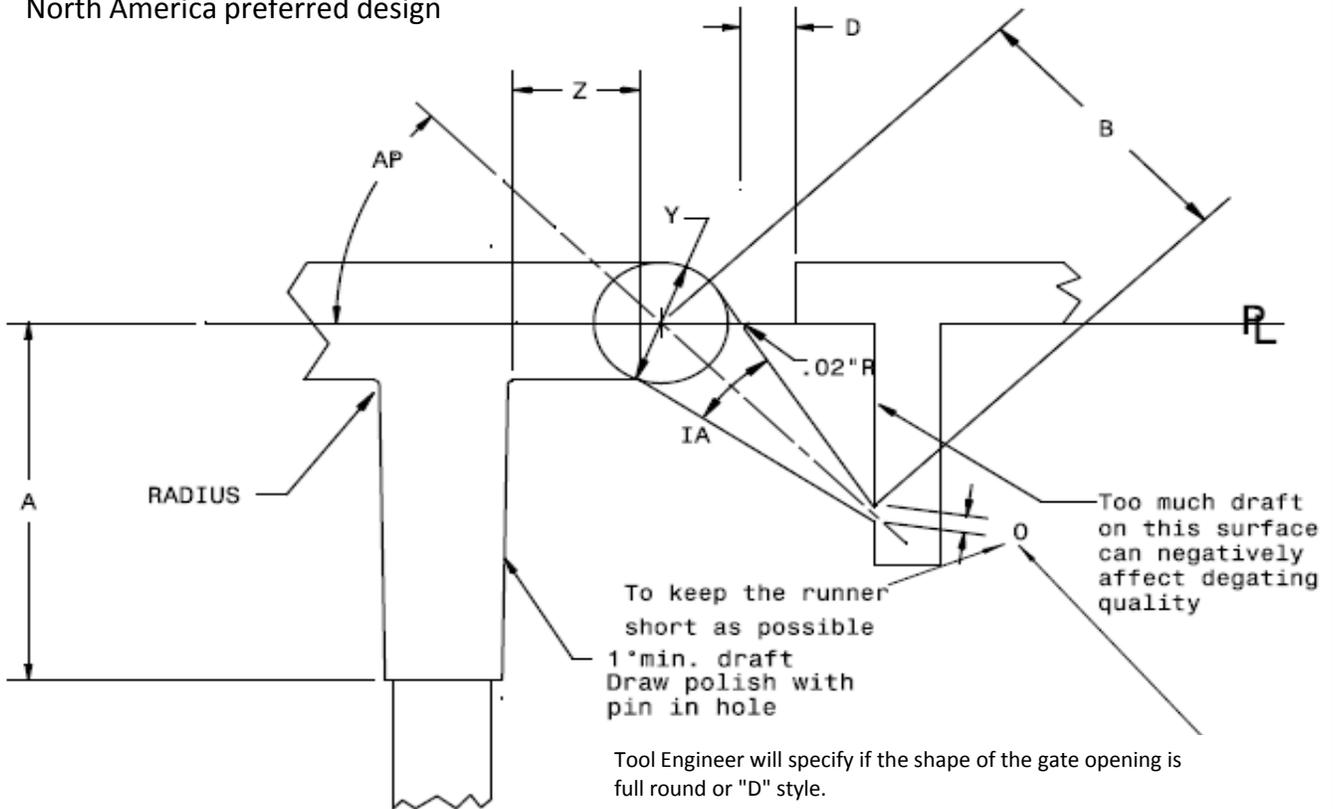
SECTION # **IV**

VIEW # **F**

FILE:

DATE: 12/01/11

North America preferred design



STANDARD SUBGATES

- IA = 15 -25° Use upper range for poor flowing materials
- AP Minimum is 38° 45° is preferred
- O > .050 " (1.25mm) specified by Tool Engineer
- D > .125" (3.00mm)
- A > B
- Z = .250" - .500" (6.35mm - 12.70mm)
  - Polypropylene approximately .250" (6.355mm)
  - Polycarbonate approximately .500" (12.70mm)

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

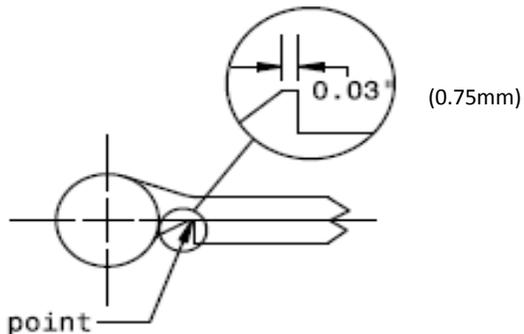
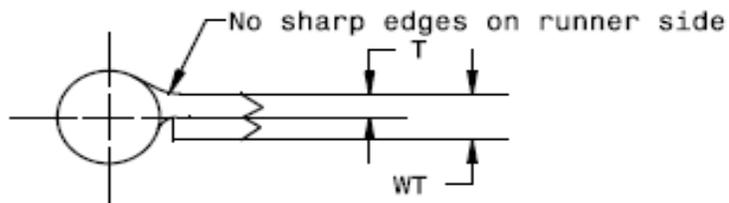
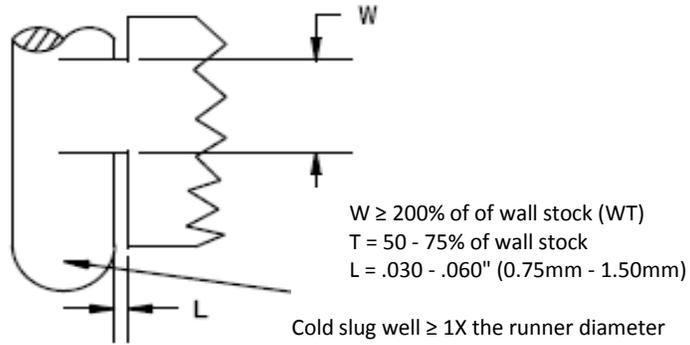
TITLE: **EDGE GATES**

SECTION # **IV**

VIEW # **G**

FILE:

DATE: 12/01/11



Improve vestige by chiseling

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

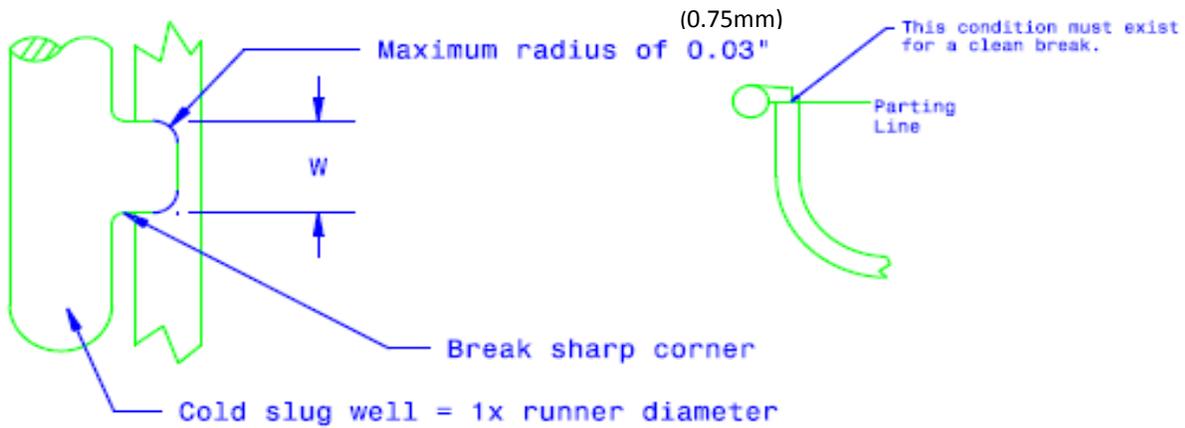
TITLE: **JUMP GATES**

SECTION # **IV**

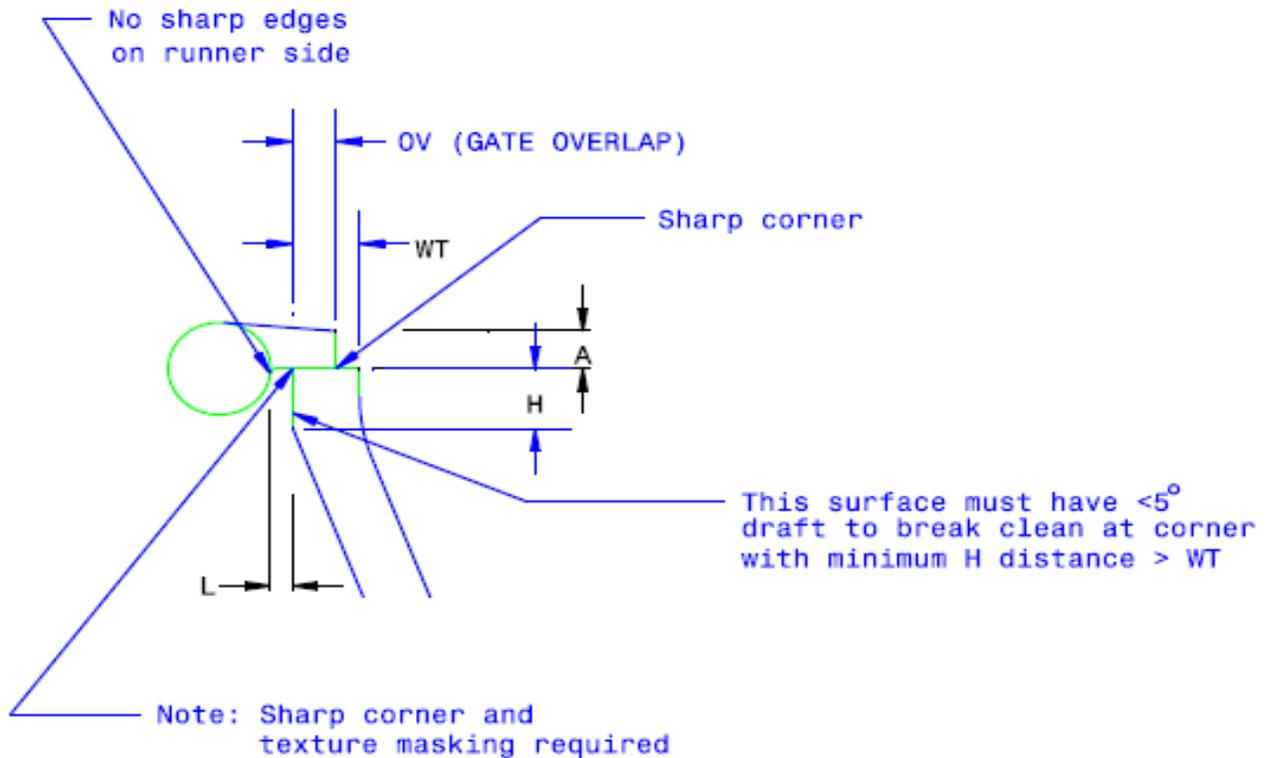
VIEW # **H**

FILE:

DATE: 12/01/11



- L = 0.030" - 0.060" (0.75 - 1.50mm)
- W = 100% - 150% of WT (wall thickness)
- A = 125% of OV
- OV = 70-100% of WT for visible, aesthetic parts  
50-100% of WT for non-visible parts  
(larger OV = better aesthetics)



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

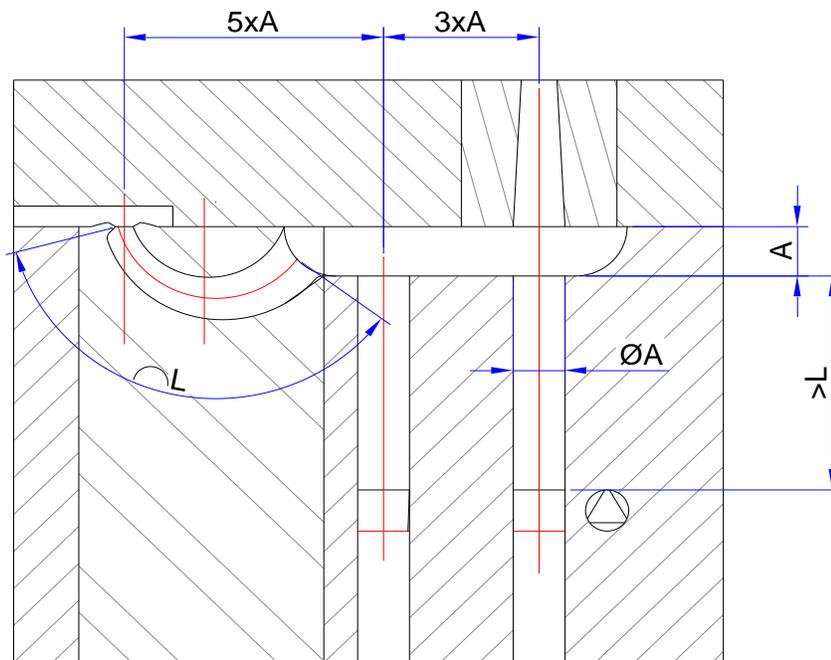
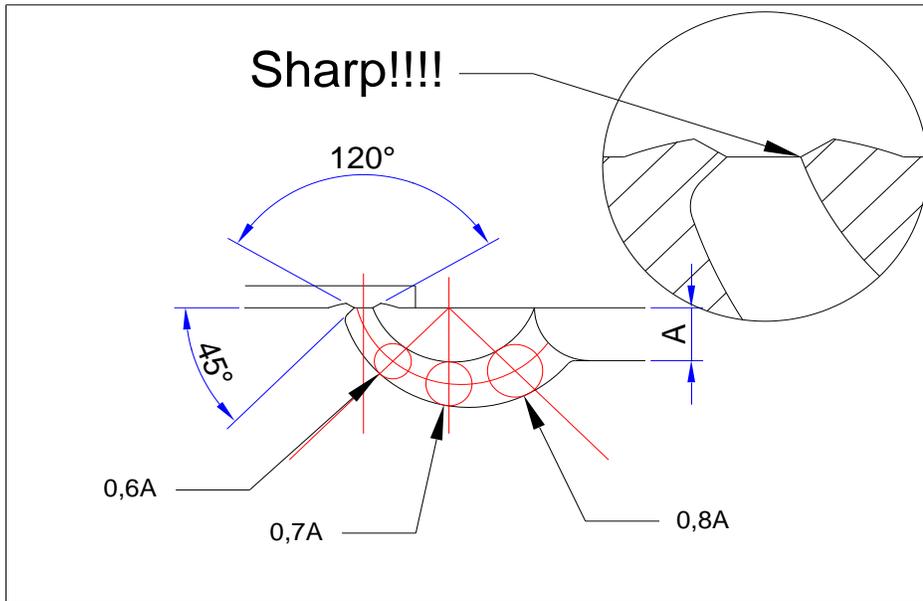
TITLE: **CASHEW AND WINKLE GATES**

SECTION # **IV**

VIEW # **I**

FILE:

DATE: 12/01/11



- Using a delayed ejection system to start runner eject before part eject may be necessary to ensure proper degating without deforming the part.
- Add ejector pins close to to gate see above to minimize deflection. For a sinlge cavity, gate should be balanced with an additional slug. ( Ref. Sec VI, View N)
- Purchased cashew gate Split inserts are acceptable with JCI Tooling Engineer approval.
- Gate must be polished to a minimum finish approximating a 300 - 320 stone.
- Cashew / Winkle gates require a sharp cutting point to avoid pull marks.
- Gate to be inserted with split construction and recessed in to the part approximately 25% of wall stock.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **HOT SPRUE ( North America ONLY)**

SECTION # **IV**

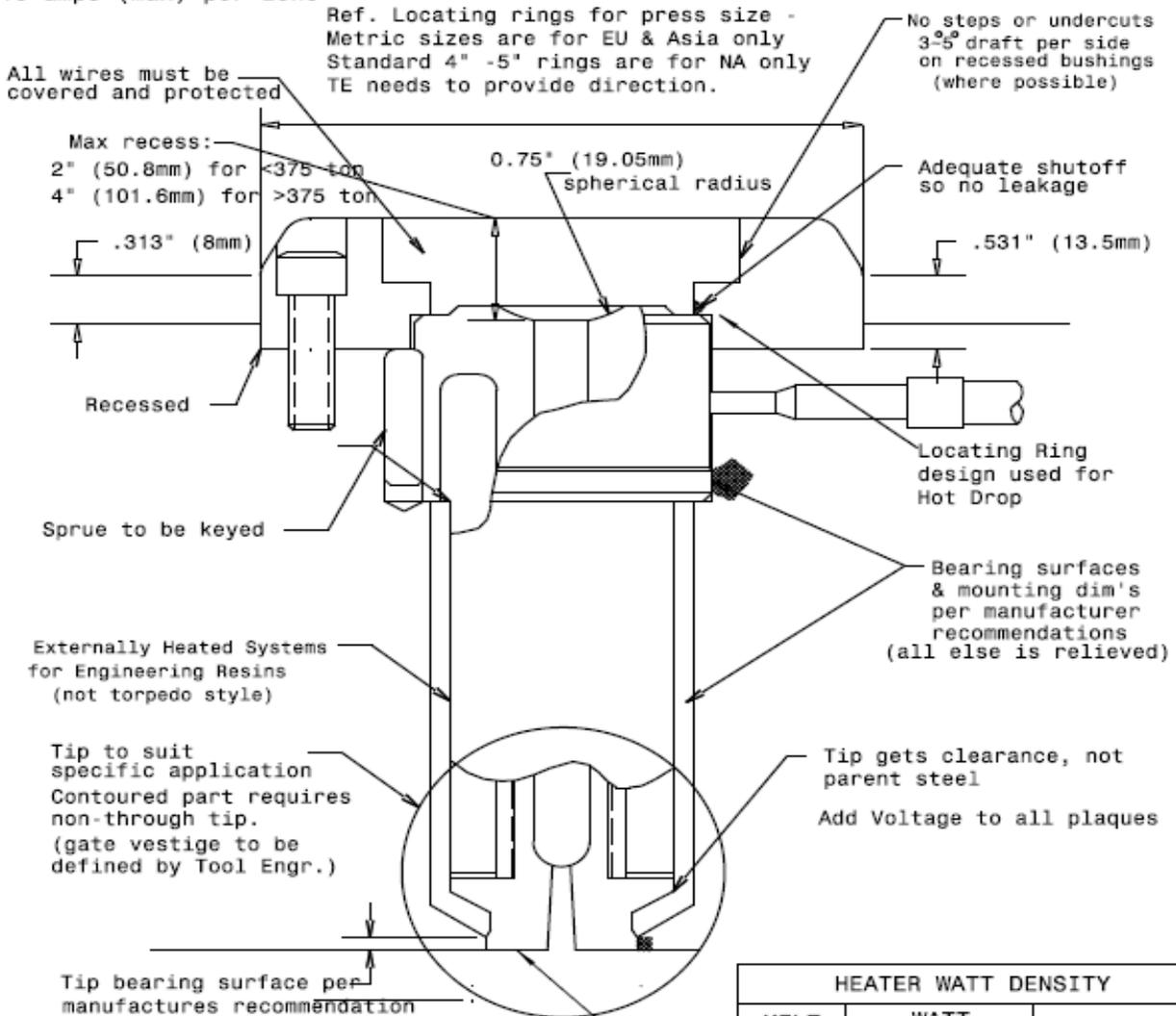
VIEW # **J**

FILE:

DATE: 12/01/11

\* Europe doesn't require a locating ring along with different wattage requirements, Refer to the JCI Tool Engineer in EU & ASIA. When working in these Regions.

- One thermocouple required for each heater, one heater per zone
- 10 amps (max) per zone



All hot halves must have leader pins at least .50" (12.7mm) longer than the longest drop for protection.

Use Manufacturing recommends on design and assembly / install for all Hot drops & runners systems

HEATER WATT DENSITY		
MELT TEMP. (DEG F)	WATT DENSITY (Watts/in. )	MATL.
400-450	34	PS
450-500	36	ABS, PP
500-550	38	PPO
550-600	40	PC, NYLON
600-650	42	
650-700	44	PFC, PMMA

Watt density per zone = Heater wattage / Cubic inches of plastic to be heated

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TYPICAL HOT MANIFOLD SYSTEM - NOTES**

SECTION # **IV**

VIEW # **K-1**

FILE:

DATE: 12/01/11

- \* Important to always follow manifold suppliers specification.
- \* Heater elements to extend 2" beyond drop and Sprue
- \* Channel size and orifice bore diameter (Mold Flow). Typical is .500" / 13mm.
- \* External heated systems required of engineering resins.
- \* Some Regions are limited to their electric power. Manifold suppliers will be required to build units that comply with those requirements. This must be reviewed with the manufacturing site and JCI Tool Engineer.
- \* Flow distances, volumes & pressure loss to each drop tip to be equal (naturally balanced). (Mold Flow)
- \* Manifold to have handling holes for any components greater than 50 lbs / 24 kg
- \* Drops will require to have its own thermocouple (one heater per zone), when Engineered resins are being used.
- \* Cut wire channels as wide as possible.
- \* Use Anti seize lube on all manifold bolts.
- \* Zone #s are to be stamped in the manifold & plates for identification.
- \* Stamp ID information - drop number, -valve gate number, into the runner also, - hydraulic lines (if required), - cooling lines, - watt density required,
- \*see manufacturing recommendations on design and assembly / install for ALL hot drops & runner systems.
- \* All corners contoured - No sharp corners or hang ups
- \* Split construction preferred (and required if the part is mold in color.)
- \* Bearing surfaces and relief - are per the manufactures recommendations.
- \* Locating rings - Ref, press specs at the manufacturing site, review with JCI Tool Engineer. (Metric sizes are for EU & ASIA only) (Standard 4"-5" rings are of NA only)

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TYPICAL HOT MANIFOLD SYSTEM - DESIGN NOTES**

SECTION # **IV**

VIEW # **K-2**

FILE:

DATE: 12/01/11

All locating rings for press size -  
 -Metric sizes for EU & ASIA only  
 -Standard size 4"-5" for NA only

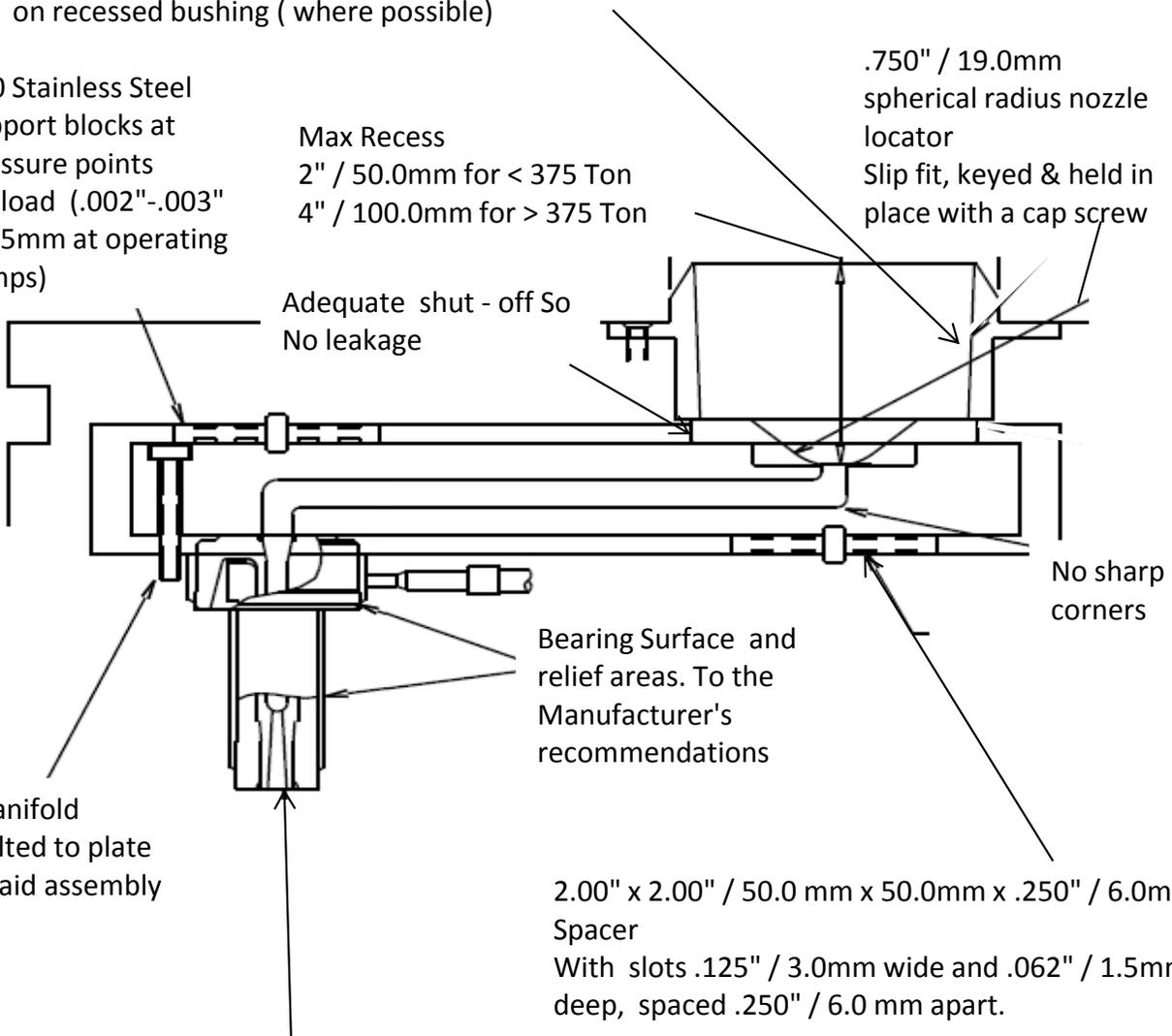
- No steps or undercuts, - 3' - 5' of draft per side  
 on recessed bushing ( where possible)

440 Stainless Steel  
 support blocks at  
 pressure points  
 preload (.002"-.003"  
 / .05mm at operating  
 temps)

Max Recess  
 2" / 50.0mm for < 375 Ton  
 4" / 100.0mm for > 375 Ton

.750" / 19.0mm  
 spherical radius nozzle  
 locator  
 Slip fit, keyed & held in  
 place with a cap screw

Adequate shut - off So  
 No leakage



No sharp  
 corners

Bearing Surface and  
 relief areas. To the  
 Manufacturer's  
 recommendations

Manifold  
 bolted to plate  
 to aid assembly

2.00" x 2.00" / 50.0 mm x 50.0mm x .250" / 6.0mm  
 Spacer  
 With slots .125" / 3.0mm wide and .062" / 1.5mm  
 deep, spaced .250" / 6.0 mm apart.

Nozzle tip, lands, and hidden vestige  
 feature to suit specific application. (   
 to be spec'd by the JCI Tool

**\* Important Note: Always refer the manifold suppliers specifications.**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **ELECTRICAL SCHEMATIC FOR 2 OR MORE DROPS N. AMERICA ONLY**

SECTION # **IV**

VIEW # **L**

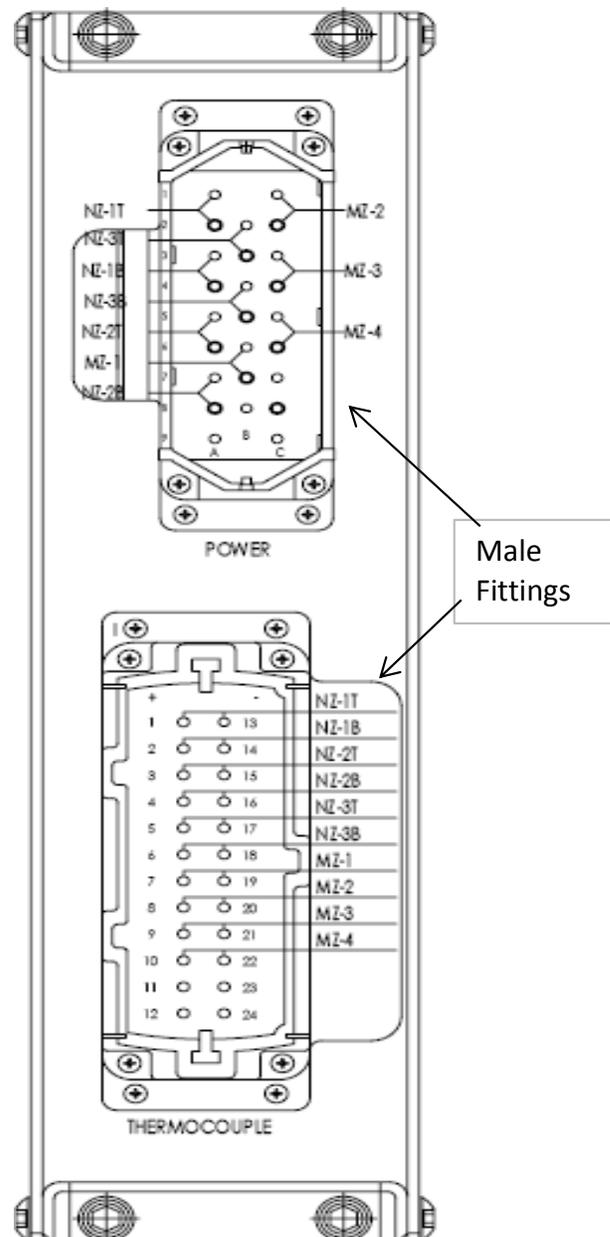
FILE:

DATE: 12/01/11

- \* Note - Hot runner system must be electrically tested before shipment of the tool to ensure proper wiring and sensing.
- \* Note - Water connector fittings must not be located in proximity to electrical connections to avoid possibility of injury or damage.
- \* All manifolds designs require Tool Engineer approval and alignment with the molding site, injection molding press specifications.
- \* Aluminum Schematic plate is required for all hot sprues and manifolds. This must be recessed & staked or screwed adjacent to system connections. Plate size can vary but **MUST** be legible.
- \* All connections must be recessed or protected by mold base.

CONTROLLER ZONE	ZONE	PIN CONNECTOR
1	NZ-1T	ROW A 1-2
2	NZ-1B	ROW A 3-4
3	NZ-2T	ROW A 5-6
4	NZ-2B	ROW A 7-8
5	NZ-3T	ROW B 2-3
6	NZ-3B	ROW B 4-5
CONTROLLER ZONE	ZONE	PIN CONNECTOR
7	MZ-1	ROW B 6-7
8	MZ-2	ROW C 1-2
9	MZ-3	ROW C 3-4
10	MZ-4	ROW C 5-6

T/C	PIN CONNECTOR
NZ-1T	1-13
NZ-1B	2-14
NZ-2T	3-15
NZ-2B	4-16
NZ-3T	5-17
NZ-3B	6-18
T/C	PIN CONNECTOR
T/C-1	7-19
T/C-2	8-20
T/C-3	9-21
T/C-4	10-22



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **VALVE GATE CONNECTORS**

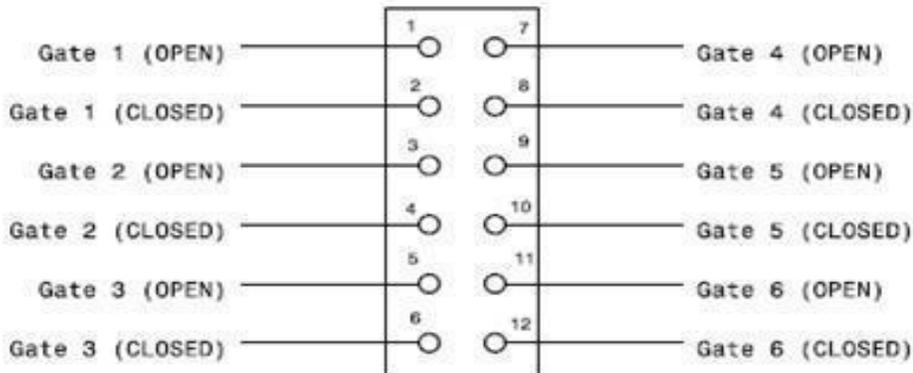
SECTION # **IV**

VIEW # **M**

FILE:

DATE: 12/01/11

- Valve gate suppliers are approved by Tool Engineer and molding site representative.
- Hydraulic systems to have maximum pressure rating engraved on outside of the tool.
- Single drop valve gates to use Rectus type 21 (21SFAN13MXX) to set pin and Foster 24-2 to retract pin
- All pneumatic manifolds to have a Staubli air fitting to operate the valves.
- \*\*Hydraulics according to plant specifications
- If only 1 gate is used, or if there is not room for a Staubli manifold, get approval from the T.E. and the molding site for alternatives.
- For up to 12 zones, utilize a second Staubli connector manifold. If more than 12 zones are required, consult the production molding facility for approval.
- Consult the chart below for connection requirements
- Unused zones need to have the pins removed, or have plugs placed in them.
- High heat hoses to be used on all connections



- Requires Tooling Engineer approval and alignment with the molding site injection molding machine.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **V EJECTION**

SECTION # **V**

VIEWS **A-T**

FILE:

DATE: 12/01/11

This section outlines the basic construction expectations of the **EJECTION** details and features.

Specific views shown on the following pages are:

- A) LIMIT SWITCH LOCATIONS - FOR EJECTION**
- B-1) PULL BACKS AND KNOCK LOCATIONS**
- B-2) PULL BACK PUCK DESIGN**
- C) EJECTOR PINS**
- D) EJECTOR GUIDE PINS & BUSHINGS**
- E) EJECTION RETURN PINS & SPRINGS**
- F) SLEEVE AND DEEP DRAW EJECTION**
- G) TECHNICAL GRAIN SLEEVE DESIGN**
- H) EJECTOR PIN KEYING METHOD**
- I) NON -SPRING RETURN EJECTION**
- J) HYDRAULIC EJECTION**
- K) HYDRAULIC EJECTION COUPLER**
- L) HYDRAULIC EJECTION CYLINDER**
- M) ROBOTIC REMOVAL - SUGGESTED FEATURES**
- N) RUNNER PIN FEATURES**
- O) DELAYED EJECTION -- 2 PLATE SYSTEM**
- P) DELAYED EJECTION -- 1 PLATE SYSTEM**
- Q) EJECTOR PIN EXTENSION TOWERS**
- R) POSITIVE EJECTION RETURNS - PREFERRED METHOD**
- S) SPRING LOADED RETURN PINS & TAPPED PULL BACKS**
- T) EJECTOR HOUSING OPENING COVER**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **LIMIT SWITCH LOCATIONS - FOR EJECTION**

SECTION # **V**

VIEW # **A**

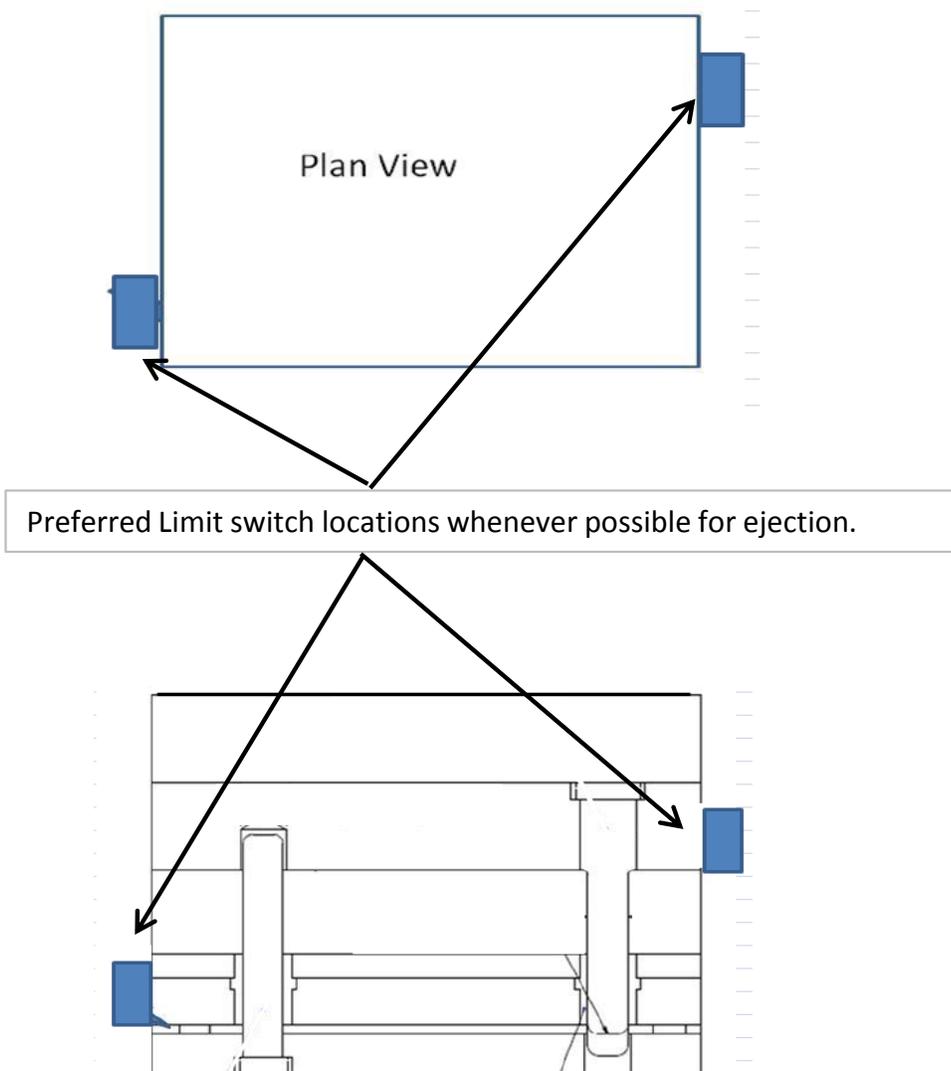
FILE:

DATE: 12/1/2011

\* The ejector plates back position is always secured with diagonal placed limit switches. use the production plant specifications for type and the need for front position detection.

\* All limits need to be adjustable for full ejection stroke and reduced ejection stroke.

\* All locations must be approved by the plant and JCI Tool Engineer.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **PULL BACKS AND KNOCK LOCATIONS**

SECTION # **V**

VIEW # **B-1**

FILE:

DATE: 12/1/2011

\* All pull backs require pull back pucks ( Sec. VI, View B-2), to ensure that we get the maximum stroke from the press , to eject the part off the tool cleanly.

\* Knock out patterns are very important, verify plant / press specifications.

\*\*Reference only - Knock out/ pull back bar diameter

(Verify press Spec)

1.0" / 25.0mm

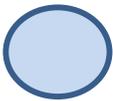
1.75" / 45.0mm

2.0" / 50.0mm

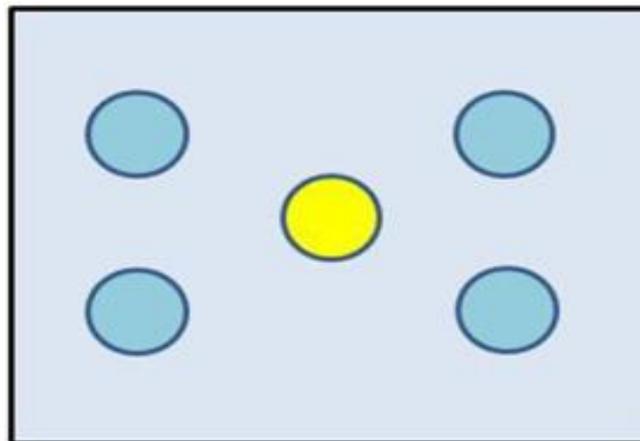
\*\*Clamp plate clearance KNOCK OUT hole for the puck is +.200" or +5.0mm per side. ( and for the knock out / pull back bars)



\* Yellow Ref for EU & ASIA only - 1 center pull back location, with the additional (4) is possible.



\* Blue Ref for NA only - 4 places for the pull backs are



EJECTOR SIDE / MOVING PLATTEN SIDE

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **PULL BACK PUCK DESIGN**

SECTION # **V**

VIEW # **B-2**

FILE:

DATE: 12/1/2011

\* Machine Press sizes may vary for the puck requirements. ( example - thread size for the pull back bars, diameter of the puck, thickness of the puck) This must be verified with the plant and JCI Tool Engineer.

\* Always verify press specifications

\* Puck sizing will be built to the requirements ( Metric or Standard dimensions) of the Native country in which the tool will run.

\*\* Metric dimensions for EU & ASIA

\*\* Standard dimensions for NA

\* Dimensional Notes:

\*\* The puck must be recessed into the back of the ejector plate by .125" or 3.0mm.

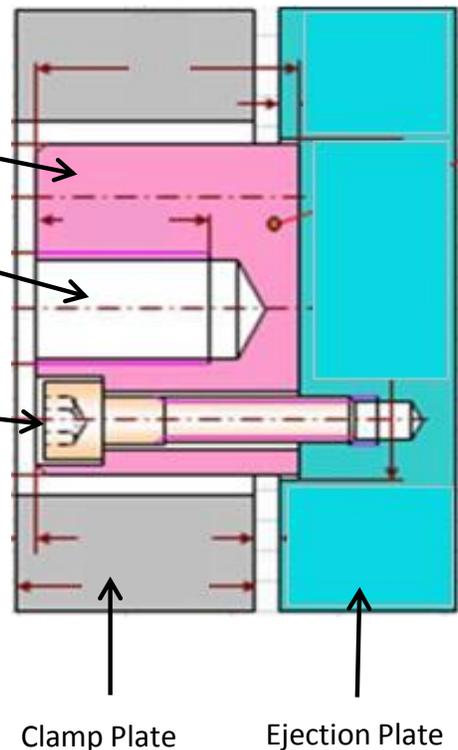
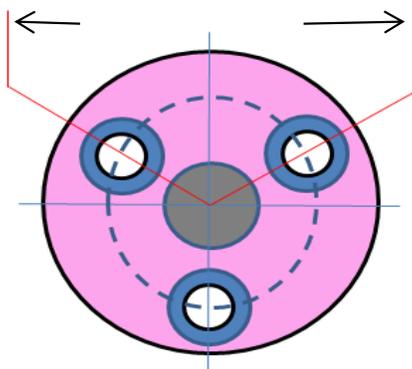
\*\* There must be ( 3 ) socket head screws that secure the puck to the ejector plate.

\*\* Clamp plate clearance KNOCK OUT hole for the puck is +.200" or +5.0mm per side. ( and for the knock out / pull back bars)

Reference only  
Knock out / pull back  
bar diameter  
(Verify press Spec)  
1.0" / 25.0mm  
1.75" / 45.0mm  
2.0" / 50.0mm

Ejector PUCK  
Threaded hole for Pull  
back bars  
Attachment screw (3)  
places / securing the  
puck to the ejector  
plate

120° equally spaced attachment holes



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **EJECTOR PINS**

SECTION # **V**

VIEW # **C**

FILE:

DATE: 12/1/2011

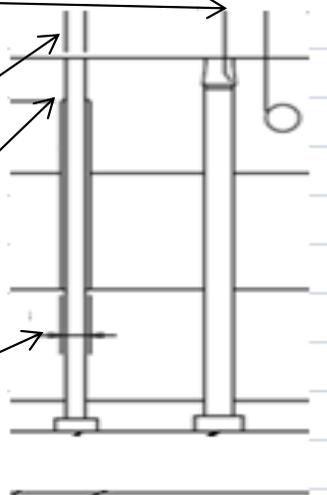
- \* Use Only standard ejector pins. - Example -DME , PCS,
- \* All mold construction for - Lenses, Painted, Laminated, Vacuum metalized, or Chrome parts are to use ArmorClad ejector pins ( appear a dull grey).
- \*\* The procedure for installation is to very lightly grease the pins.
- \*\* Stamp on the end of the ejector plate " ArmorClad pins - Apply Grease Lightly"
- \* In some cases , A titanium nitride (TiN) coating made be used ( appears gold) . This coating builds up the surface of the ejector pins 0.0002" -0.0004" or 0.005mm per side. Additional hole clearance must be applied to compensate.
- \*\* DO NOT apply grease to TiN coated ejector pins.
- \*\* Stamp on the end of the ejector plate " TiN Coated Pins - DO NOT Grease"
- \* Ejector pins beneath sliders must be avoided if at all possible. If absolutely necessary for an ejector pin to be used under a slide or other action, (A) Must use a micro switch safety system. (B) Approval from a JCI Tool Engineer.
- \* Label each pin head and hole on the ejector plate for ease of assembly.
- \* All Contoured ejector pins must be keyed in place.
- \* Ejectors are to be round.
- \*\* Stepped ejector pins should be consider first in this application.
- \* All ejector pins must be one solid piece, NO screwed on heads.
- \* Reference supplier specifications for all pins.

.250" / 6.5mm - MIN.  
from water lines, cores  
etc.

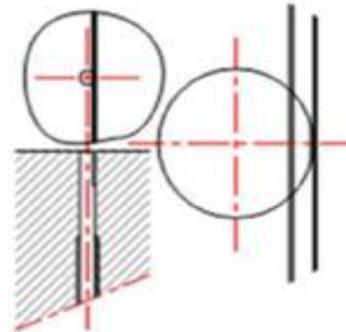
Nominal dia ref  
+0.0005 / +0.005mm

Bearing surface  
0.75"-1.00" / 19.0-  
25.0mm

Nominal dia ref  
Clearance for pin



Use for added rib ejection as needed.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

## TITLE: EJECTOR GUIDE PINS & BUSHINGS

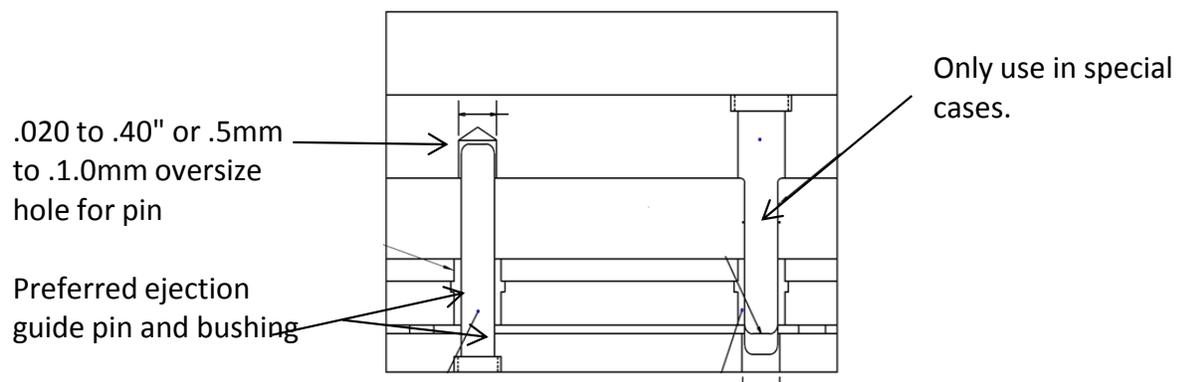
SECTION # **V**

VIEW # **D**

FILE:

DATE: 12/1/2011

- \* Only pins that are engineered and designed for use in this application are to be utilized as ejector guide pins. Use standard components . NO self made guides or bushings.
- \*\* Over -length guide pins that are cut off to length are NOT to be used.
- \*\* Fits for guide pin installation are to follow manufactures specifications.
  
- \* Thick wall bronze ejector bushings or bronzed steel bushings ( with Grease groves .003" or .08mm clearance) are the preferred components for use in JCI - ASG plants.
- \*\* The bushing are to be shouldered , between both ejector plates.
- \*\* Hardened steel bushings are NOT allowed without written consent.
- \*\* Graphite plug bushings are required in EU, as long as they are standard components.
  
- \* Guide pins are to be centrally located around the center of the machine on offset tools whenever feasible.
  
- \* All guide bushings are to have grease fittings, and must be able to be greased without disassembly of the tool. Except self lubricated bronze bushings.
  
- \* There are two style shown in the drawing. These are NOT to be used in the same tool.
- \*\* The head of the guide pin coming thru the clamp plate , is the PREFERRED style. With clearance for the pin in the back of block/plate. (.020 to .040" or .5 to 1.0 mm )
- \*\* The head of the guide pin coming thru the Block / plate is NOT recommended. But can be used if needed. With clearance for the pin in the clamp plate. Approval from a JCI Tool Engineer.
  
- \* Tools without expected risk for ejection problems are connected to the ejection system of the machine for a positive pull back of the ejector plates.(must meet machine specifications).
  
- \* Tools with unbalanced ejection forces and /or long ejection plates must have Hydraulic ejection system. Refer to plant / press specifications. Equal length of hydraulic lines is mandatory. Drilled lines in distance bars, rails or plates is preferred.
  
- \* For ejection plates with risk of heat expansion . All guide pins are mounted the clamp plate.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **EJECTION RETURN PINS & SPRINGS**

SECTION # **V**

VIEW # **E**

FILE:

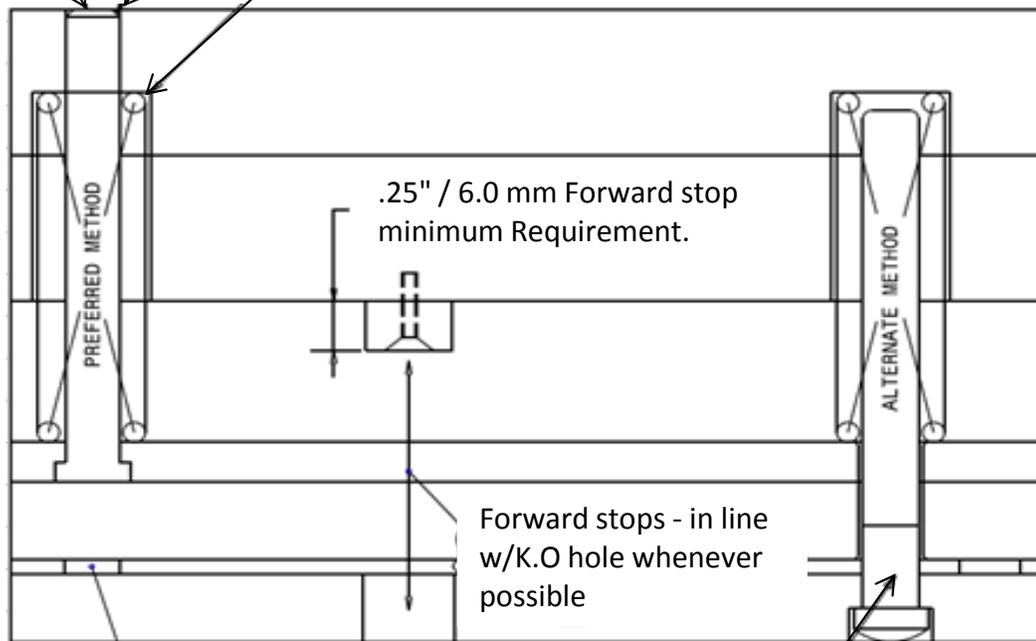
DATE: 12/1/2011

- \* Total force required > 150% of the ejector plate weight.
- \* DO NOT include springs on molds with pocketed lifters.
- \* Positive returns ARE REQUIRED on all molds using lifters.
- \*\* DME external type preferred, DME internal type optional.
- \*\* Machine pull back optional at mold site request.
- \* DO NOT use spring cages. Springs must use guide rods.
- \* Spring pocket must not break through the side on mold.
- \*\* DME standard bases require pin relocation of 3/16" or 5.0mm
- \* Return pins should be centrally located around the machine centerline on offset tools whenever possible.
- \* The requirement of (4) return pins , larger tools may require additional. (max distance between pins = 32")
- \* There should be return buttons under all return pins, sucker pins, and lifters or as close as they can be. Appropriately spaced to minimize deflection.
- \* Option when using draw / pull back bars - No springs required. MUST verify with

Flat , perpendicular to shut off  
pre-load - 0.000"-0.001" / 0.00 - 0.02mm

0.06 / 1.5mm x 45' chamfer

Medium duty die spring ( danly orange,  
lamina blue etc) required on each return  
pin ( Preferred method) Max compression  
of 36& including 5-10% preload.



Alternate method of providing spring containment. Must be approved by  
plant and JCI Tool Engineer.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **SLEEVE AND DEEP DRAW EJECTION**

SECTION # **V**

VIEW # **F**

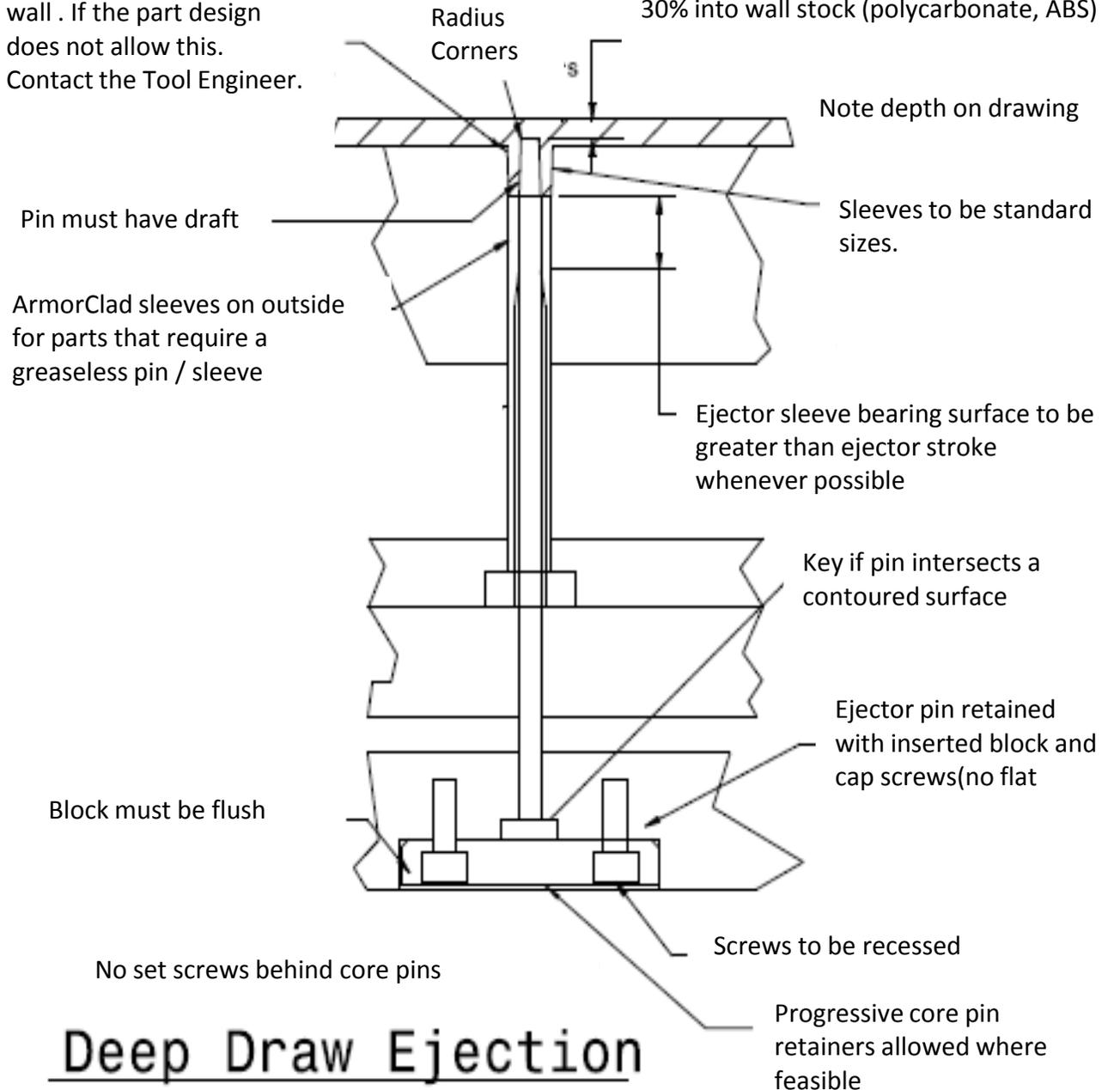
FILE:

DATE: 12/1/2011

- \* Sleeves to be located behind every cylindrical boss
- \* Sleeves and cores to be standard sizes ( DME, Hasco, Meusburger etc.)
- \* Ejector sleeves to be long lead style (Equivalent to DME)

Maintain standard rib to wall . If the part design does not allow this. Contact the Tool Engineer.

50% into wall stock (polypropylene, noryl)  
30% into wall stock (polycarbonate, ABS)



## Deep Draw Ejection

- \* For deep draw parts / features, standard ( equivalent to DME) , air poppets can be used to assist ejection or improve release from cover, they cannot be used to completely replace ejector pin

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TECHNICAL GRAIN SLEEVE DESIGN**

SECTION # **V**

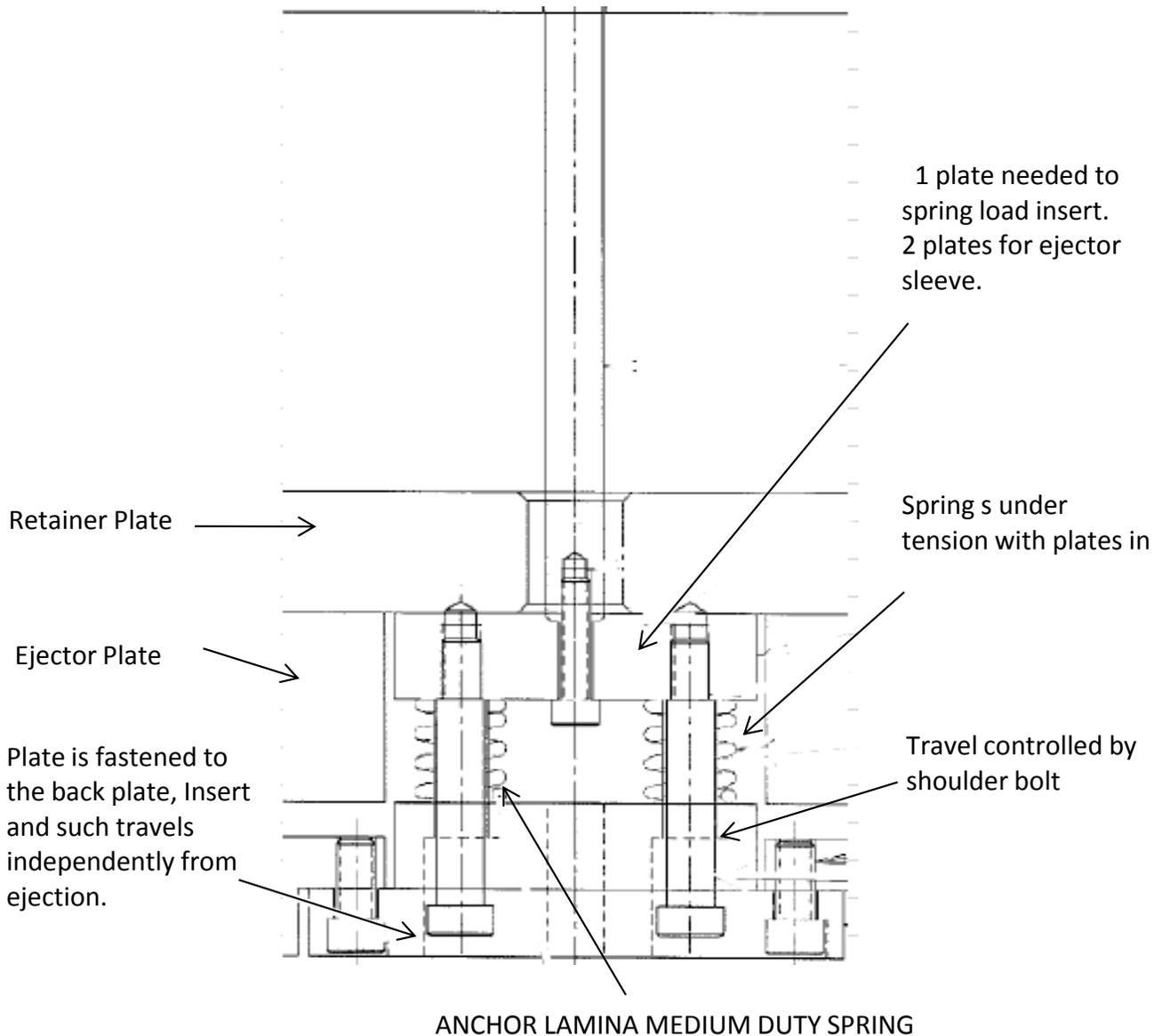
VIEW # **G**

FILE:

DATE: 12/1/2011

\* This sleeve design is to be used if the part contains a "Technical Grain"

\* This design must reviewed with / and approved by a JCI Tool Engineer.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

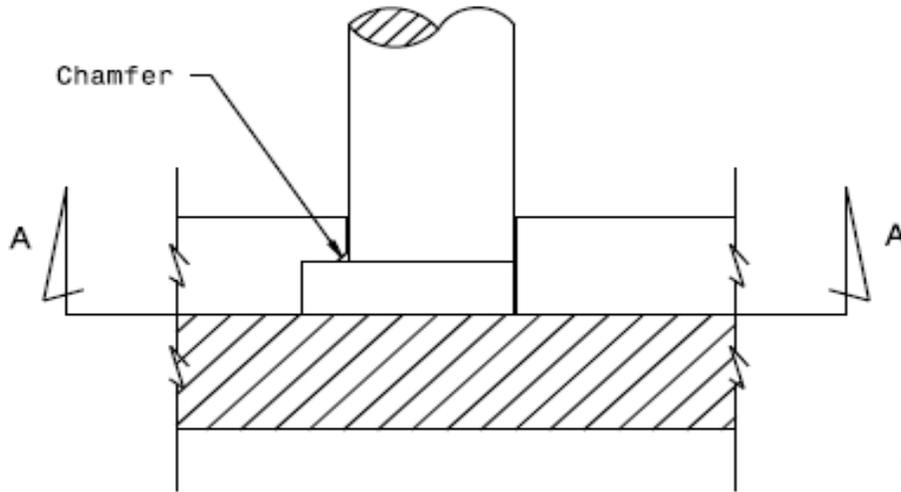
TITLE: **EJECTOR PIN KEYING METHOD**

SECTION # **V**

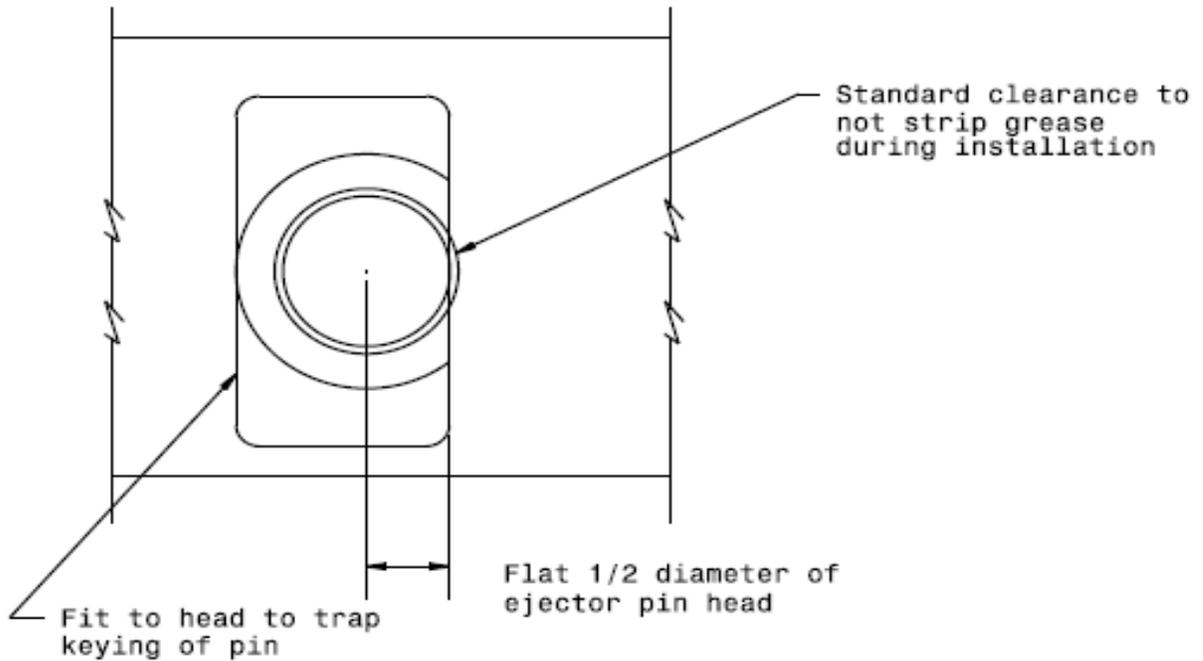
VIEW # **H**

FILE:

DATE: 12/1/2011



Number all pockets and pins



SECTION A-A

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **NON -SPRING RETURN EJECTION**

SECTION # **V**

VIEW # **I**

FILE:

DATE: 12/1/2011

\* Preferred methods of returning the ejection when spring loaded return is not feasible for any of the following reasons:

- \*\* Safety - pocketed lifters cannot have spring returns -They are consider pinch points.
- \*\* Lifter geometry prohibits return pins from protecting shutoff.

\* If positive returns must be used, check to make sure they DO NOT interfere with the end of arm tooling ( EOAT).

A) - MOLD Greater than 375 Tons

\*\* Use DME toggle lock positive early returns (or equivalent Sec. VI, View R) - external type is preferred. If it does not increase the machine size. (possible additional stack height).

Internal type is allowed with approval from a JCI Tool Engineer.

B)- MOLD 50 - 800 Tons

\*\* Use Knock Out bars pull back holes in ejector plate as shown below:

- when ejector plate pull backs are required. ( Pull Back pucks)
- Clamp plate clearance KNOCK OUT hole ( +.200" or +5.0mm per side.) for the knock out / pull back bars.

*Reference only:*

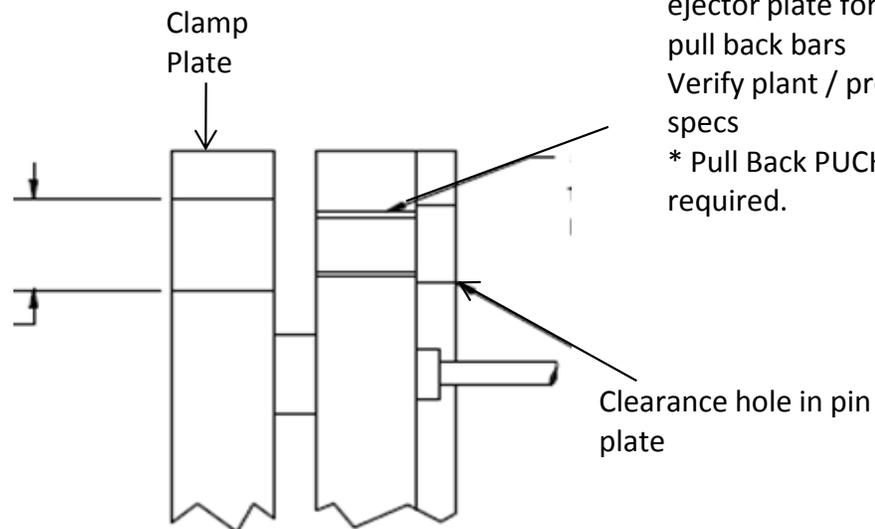
Knock out / pull back bar diameter

(Verify press Spec)

1.0" / 25.0mm

1.75" / 45.0mm

Clearance hole



Tapped hole in the ejector plate for pull back bars  
Verify plant / press specs  
\* Pull Back PUCK, is required.

C) Mold > 500 Tons

\*\* All tools over 500Ton use Hydraulic ejection unless specified on the RFQ . - JCI Tool Engineer.

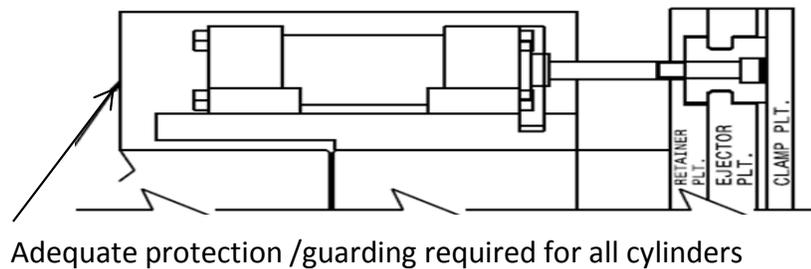
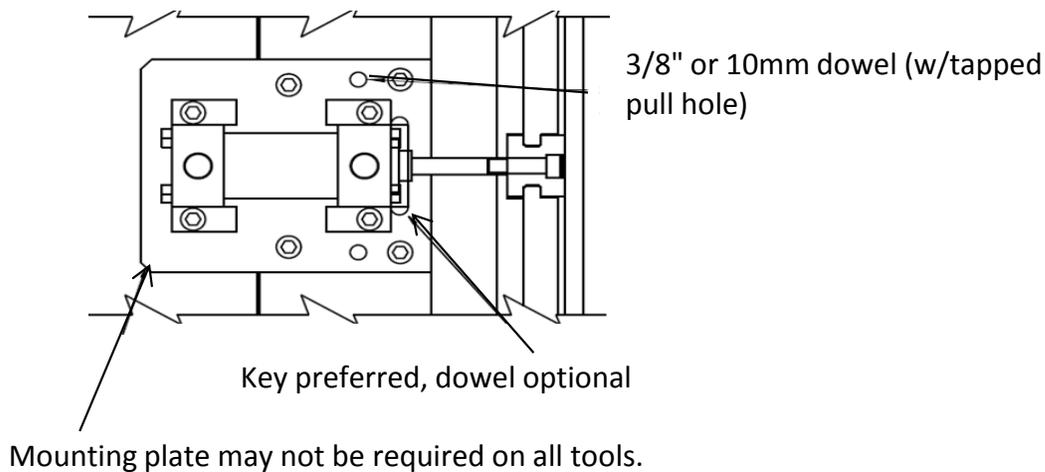
\* NA -ONLY - Use 5/8"-11 thru for all machines except Demag 440 Ton  
1/2"-13 for Demag 440Ton

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **HYDRAULIC EJECTION (NON PREFERRED)**

SECTION # **V** VIEW # **J** FILE: DATE: 12/1/2011

- \* All Hydraulic cylinders are to be plumbed in parallel always.
- \* Must have limit switches to indicate forward & retracted positions of ejector plates.
- \* Hydraulic hoses to be 1/2" / 12.7mm - ID. steel braided lines ( Avoid 90 degree turns in plumbing).
- \* Plumbing fitting to be straight hydraulic threads ( NO "O" rings, NO pipe threads)
- \* Use rails and plates as manifolds and oil line plumbing whenever possible. (0.75"/19.0mm diameter is preferred.)
- \*Cylinders for hydraulic ejection, need to use swivel type fittings to prevent stress.
- \* Flow regulators need to be applied to the hydraulic ejection. If the machine does not have the capability. ( Verify with the plant & JCI Tool Engineer.
- \* Position cylinders so they DO NOT interfere with falling parts, or (EOAT) end of arm tooling.
- \* Hydraulic ejections can be used on any press size. with Plant & JCI Tool Engineers approval.
- \* 500 Ton and above will require Hydraulic ejection 100%. NA only
- \* 750 Ton and above will require Hydraulic ejections 100% . EU & Asia Only
- \* Smaller tonnage tool that requires Hydraulic Ejection or not, will need to be reviewed by the plant & JCI Tool Engineer for direction & approval.
- \* If balance flow length can not be machined into the rails . plates. The flow divider must be used.
- \* All cylinders , lines , flow dividers must be protected / guarded .



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **HYDRAULIC EJECTION COUPLER**

SECTION # **V**

VIEW # **K**

FILE:

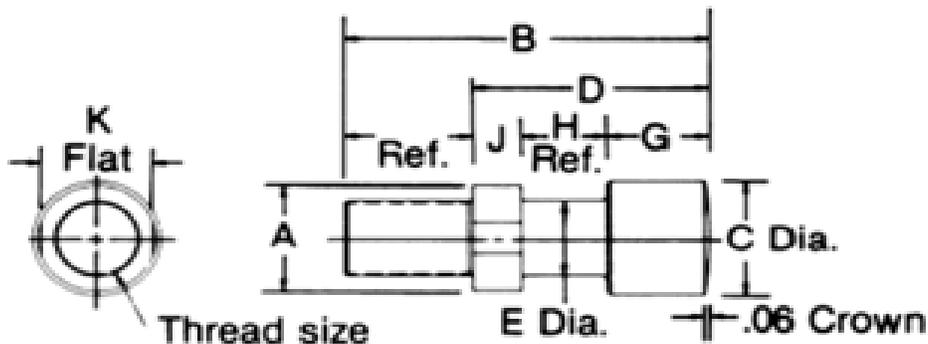
DATE: 12/1/2011

**Reference ONLY**

\* All fittings must meet the plant / press specifications for ; Water , Hydraulic and Electrical.

\* This info will be provided by the manufacturing site and the JCI Tool Engineer.

\* All fitting are to ensure maxium flow, Not restricting flow.



Noth America Chart Shown - Ref Only

DIMENSIONS										
THREAD	A	B	C	D	E	F	G	H	J	K
7/16 - 20 MALE	.62	2.38	.88	1.75	.44	.63	.44	.82	.50	.50
7/16 - 20 MALE	.62	2.38	.88	1.75	.44	.63	.68	.57	.50	.50
3/4 - 16 MALE	1.00	3.38	1.25	2.38	.75	1.00	.75	1.13	.50	.88
3/4 - 16 MALE	1.00	3.38	1.25	2.38	.75	1.00	1.00	.89	.50	.88
1 - 14 MALE	1.38	4.25	1.50	2.75	1.00	1.50	.88	1.26	.62	1.25
1 - 14 MALE	1.38	4.25	1.50	2.75	1.00	1.50	1.12	1.01	.62	1.25

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **HYDRAULIC EJECTION CYLINDER**

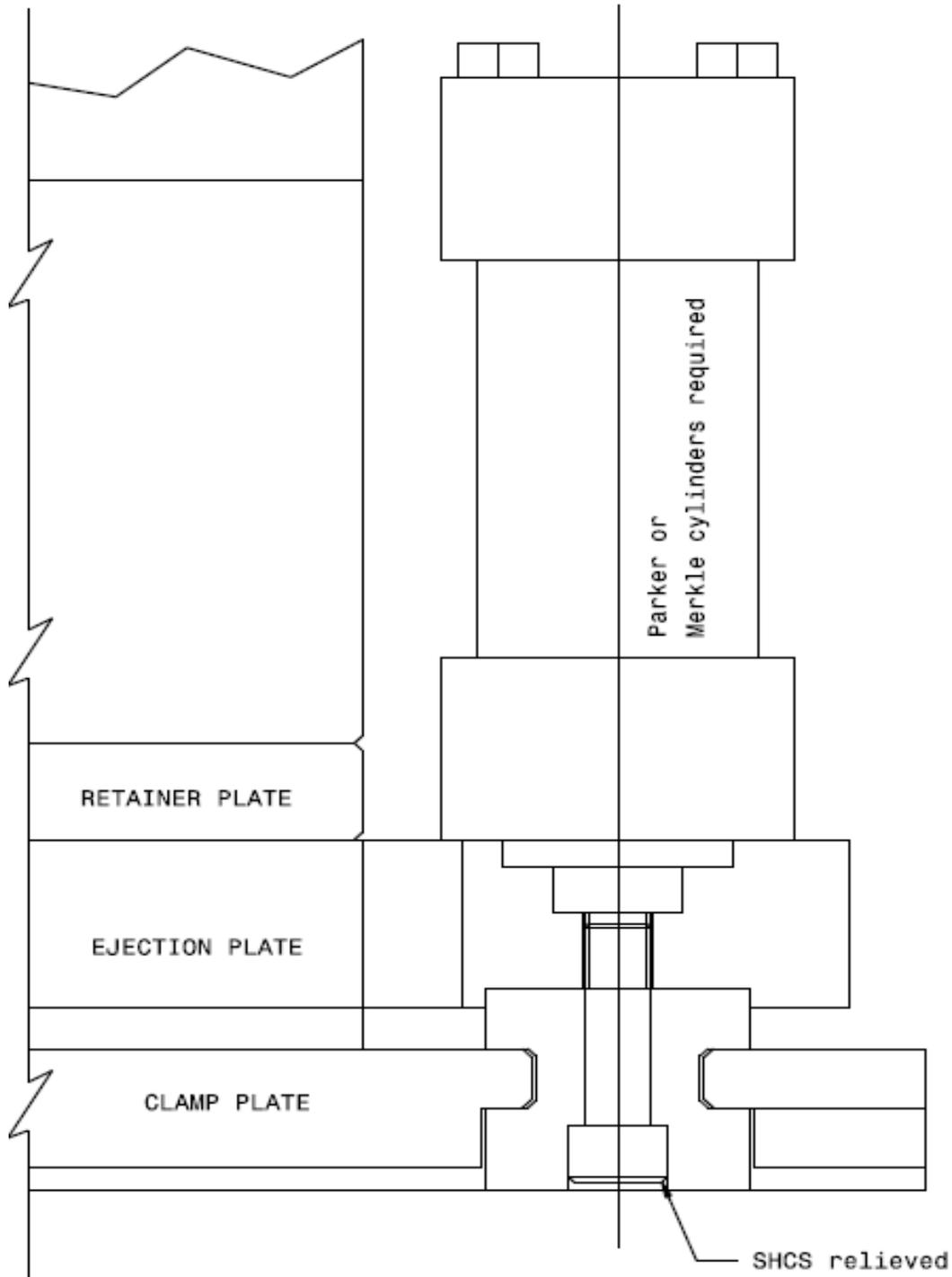
SECTION # **V**

VIEW # **L**

FILE:

DATE: 12/1/2011

\* Hydraulic cylinder positions for ejection ( also ref . Sec VI, View J). This is an example ,that can be used. This must be approved by the Plant & JCI Tool Engineer. Supplier is responsible for functionality.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **ROBOTIC REMOVAL - SUGGESTED FEATURES**

SECTION # **V**

VIEW # **M**

FILE:

DATE: 12/1/2011

\* If the part will be removed by a robot, the following optional features can be used to prevent the part from falling or slipping during ejection.

\* NOTE: Please review with the manufacturing site and JCI Tool Engineer for preference.

\* Add draft as required.

END OF EJECTOR PIN	SIDE CROSS SECTION OF EJECTOR PIN & PART	USE FOR
<p>0.04" / 1.0mm</p>	<p>0.04" / 1.0mm</p>	<p>ONE DIRECTION SUPPORT (1D) (no rotation)</p>
<p>0.04" / 1.0mm</p>	<p>0.04" / 1.0mm</p>	<p>SUPPORT IN A PLANE (2D) (no rotation)</p>
	<p>0.03" / 0.76mm ( or max of 30% of wall stock)</p>	<p>Only for un- visible parts SUPPORT IN A PLANE (2D)</p>
<p>DOWN ↓ PP- Wall thickness 40%</p>	<p>ED MAX. ED/2 MAX. WT/2 MAX. R WT (ROBOT LIFT REQ'D)</p>	<p>3 DIMENSIONAL SUPPORT (3D) (@ beginning of stroke only)</p>
<p>0.04" / 1.0mm max</p>	<p>0.060" / 1.5mm max</p>	<p>SUPPORT IN A PLANE (2D) Most Common</p>

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **RUNNER PIN FEATURES**

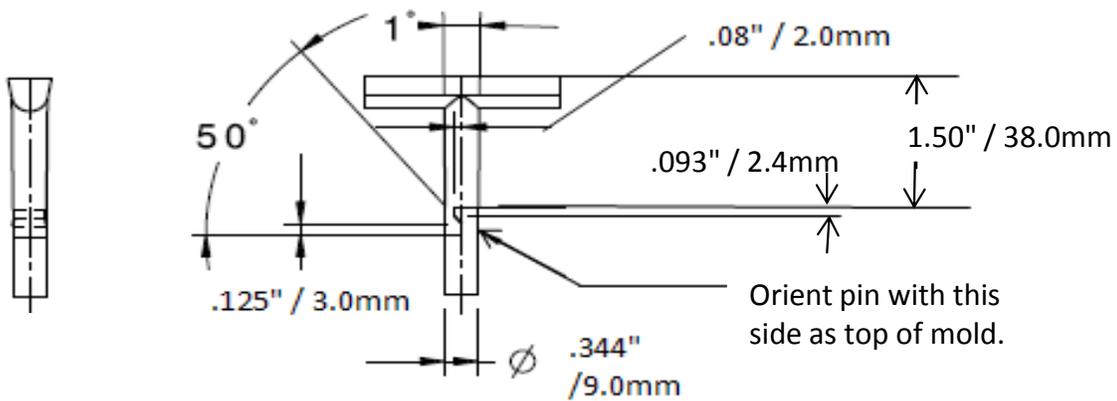
SECTION # **V**

VIEW # **N**

FILE:

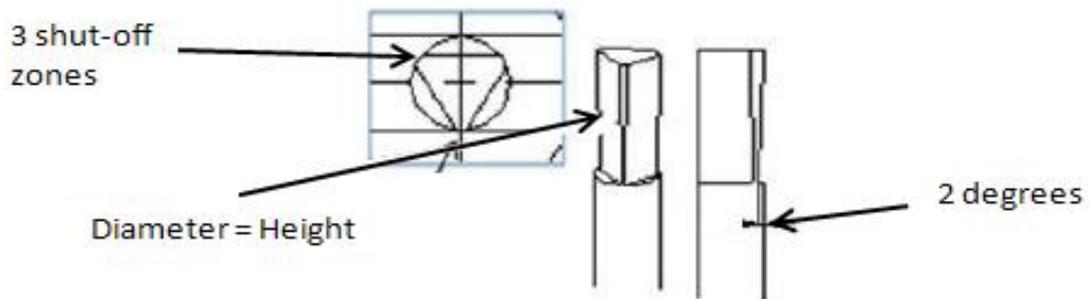
DATE: 12/1/2011

- \* There are many sucker pin designs to hold the runner on for robot removal. (examples - square shape, and "Z").
- \* Below are some preferred examples shown.
- \* The direction must be given by the manufacturing site & JCI Tool Engineer. (dimension may vary depending on size of pin & material)



- \* Sucker ring / pin , design needs to be in the data. This is used for robot removal, runner inter lock hold down feature shown.

- \* EU Preferred design shown below.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **DELAYED EJECTION -- 2 PLATE SYSTEM**

SECTION # **V**

VIEW # **O**

FILE:

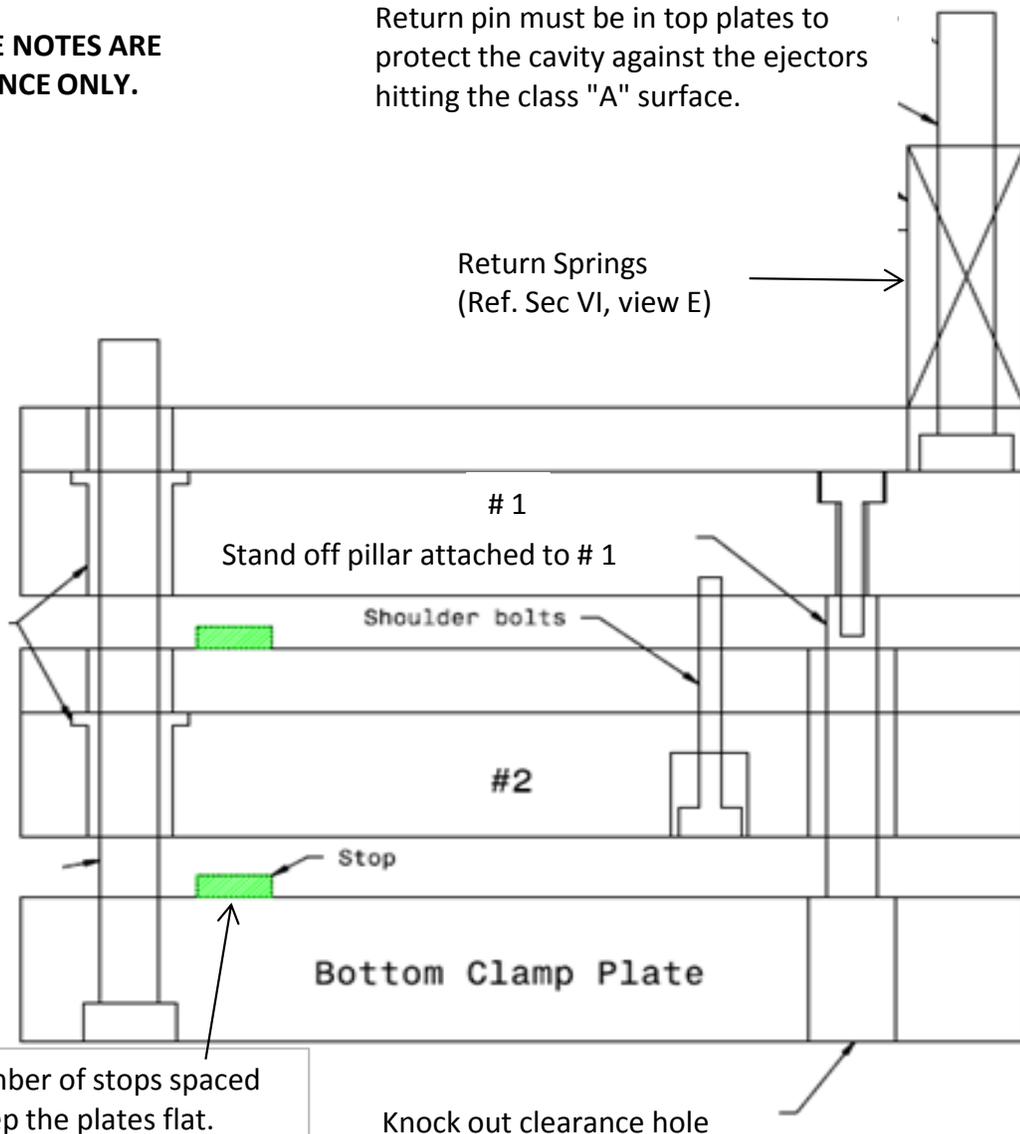
DATE: 12/1/2011

- \* 2 plate ejection system, required that standard components are used. ( Guide pins, bushing, return pins, shoulder bolts, springs , etc) (Follow springs note in Sec V, View E.)
- \* No self made components allowed.
- \* 2 plate systems - can be purchased through a Injection Mold component suppliers like DME, Hasco, Meusburger, Strack etc.(Pending size requirements needed) These systems are preferred.

**\*\* THESE NOTES ARE REFERENCE ONLY.**

Return pin must be in top plates to protect the cavity against the ejectors hitting the class "A" surface.

Return Springs  
(Ref. Sec VI, view E)



Equal number of stops spaced out to keep the plates flat.

Knock out clearance hole

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **DELAYED EJECTION -- 1 PLATE SYSTEM**

SECTION # **V**

VIEW # **P**

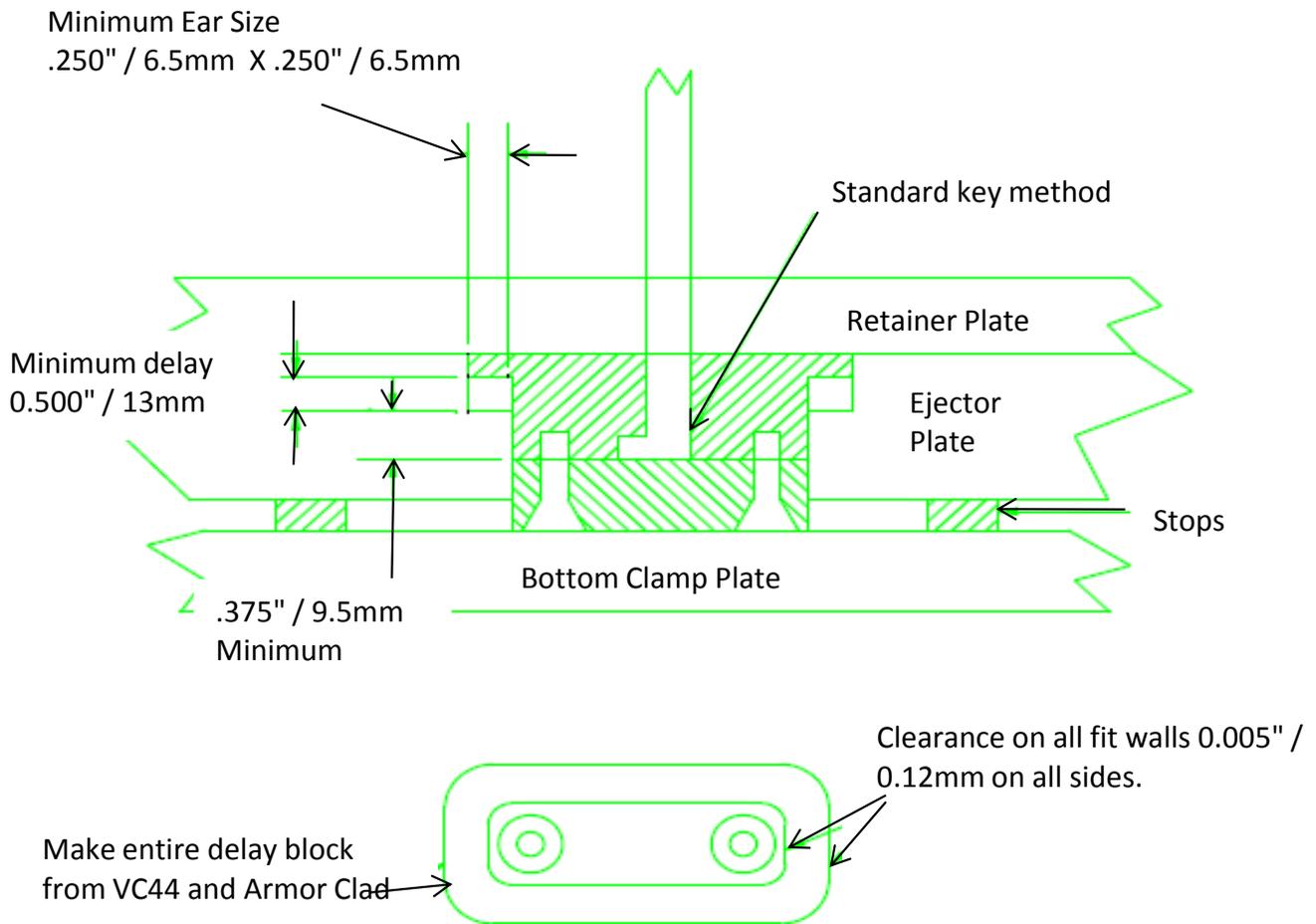
FILE:

DATE: 12/1/2011

**\*\* FOR REFERENCE ONLY**

\* Only an option if a 2 plate system is not feasible for ejection.

\* This system can be manufactured by the tool supplier. The tool supplier is to ensure the integrity of the components. ( Must Supply Preventive Maintenance plan).



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **EJECTOR PIN EXTENSION TOWERS**

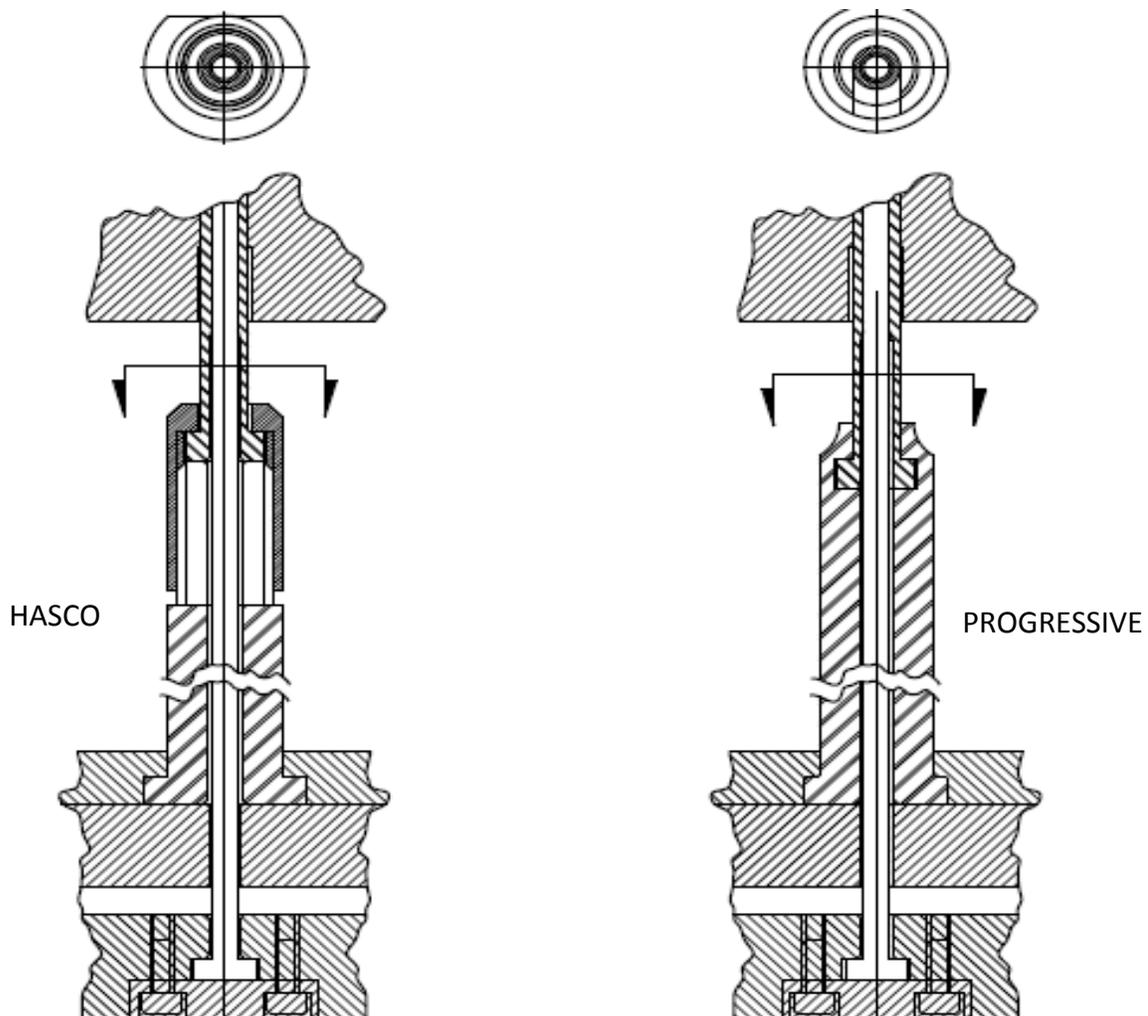
SECTION # **V**

VIEW # **Q**

FILE:

DATE: 12/1/2011

- \* Center loading or Slotted style extenders may be specified at the individuals discretion of the receiving manufacturing site, Tooling cost estimates should account for either specification.
- \* Purchased, catalogue extensions will be considered to be the "Preferred" component whenever available.
- \* If the standard component does not fit the application, and the tool supplier has to make one. (1) This must be approve by a JCI Tool Engineer (2) A spare is required. ( If needed)
- \* The ejection stroke must be reviewed and verified, also clearance into the back



Screw Cover Extension towers are manufactured by HASCO ( Alternative Method ( ID# Z47..) & Progressive (Standard Method( ID# SXT ...L3)

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **POSITIVE EJECTION RETURNS - PREFERRED METHOD**

SECTION # **V**

VIEW # **R**

FILE:

DATE: 12/1/2011

\* DME or Equivalent Positive Ejection Returns ( Togglelocks) are the preferred method to assure ejection return to home position when tooling conditions exist that require this function.

\* Use standard components / options that meet the requirements for manufacturing.

\* Limit switches are required.

\* Mold conditions that require the use of these components include, but are not limit to:

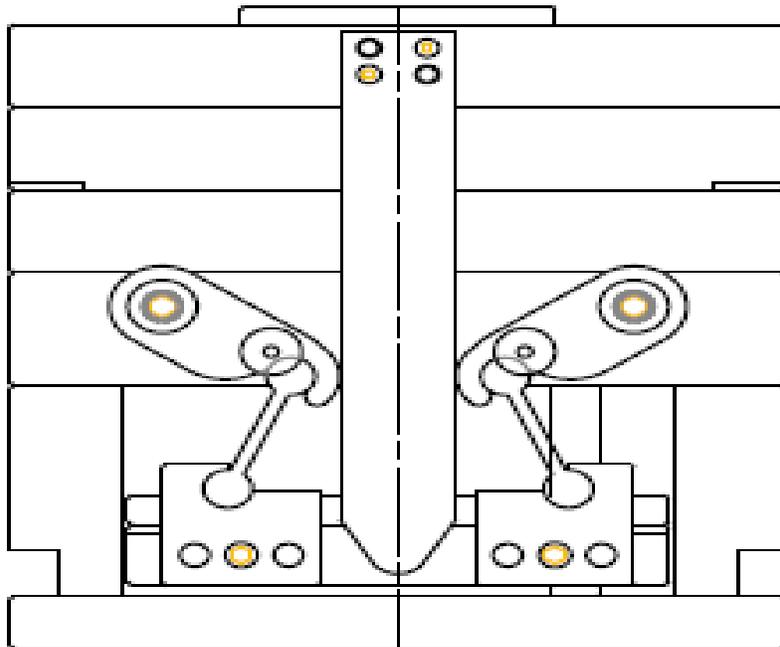
- Ejector pins under the slides.
- Hydraulic / pneumatically operated slides
- Large lifters

\* Other mechanisms, from other manufacture may be specified from time to time for use in this application.

\* Position positive returns so they DO NOT interfere with falling parts, or End of arm tooling. ( EOAT)

\* Actual definition of this requirement will be contained on the RFQ, and will be discussed at the Preliminary Design review.

\* NOT required on all tools.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **SPRING LOADED RETURN PINS & TAPPED PULL BACKS**

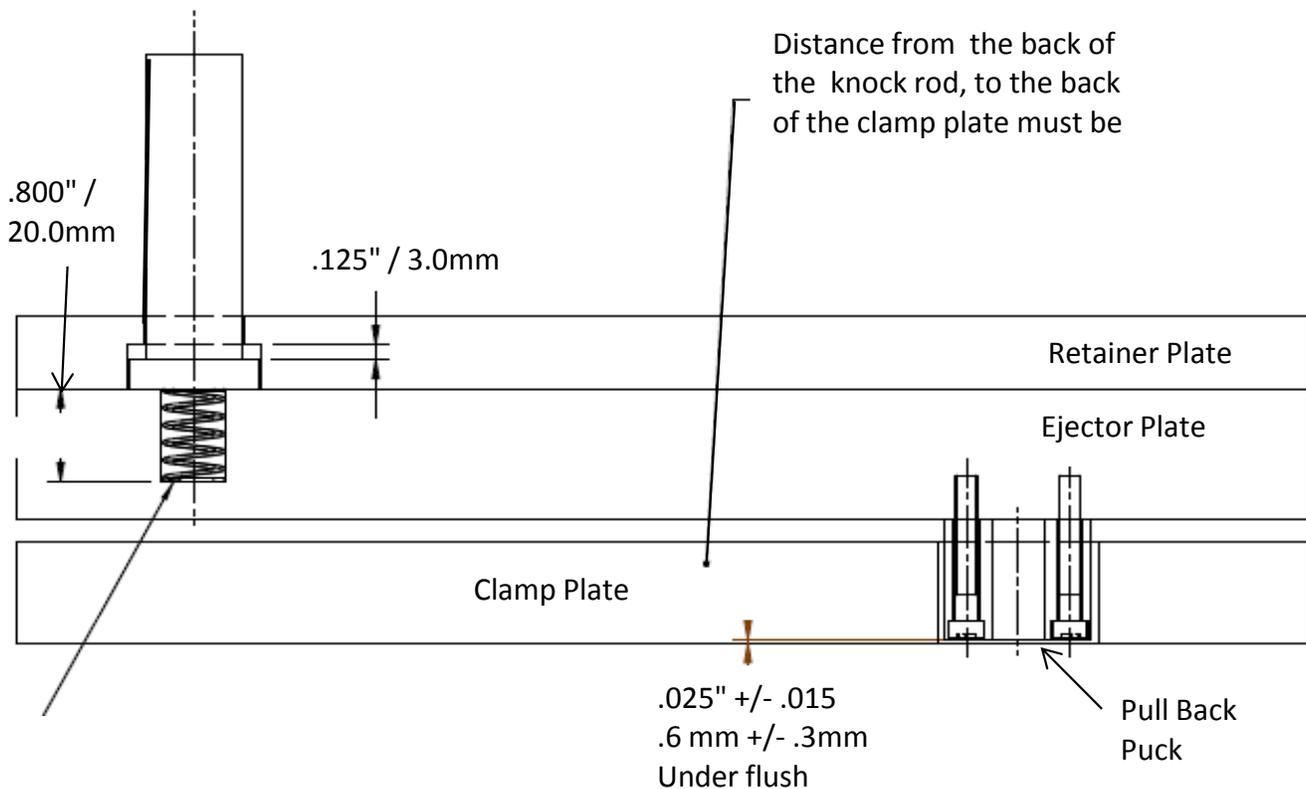
SECTION # **V**

VIEW # **S**

FILE:

DATE: 12/1/2011

- \* This is NOT required on all tools.
- \* This is an action that is required when your ejector pins are under SLIDES (Mechanical or Hydraulic)
- \* The spring loaded return pins are required whenever any form of ejection lands on the parting line, as well as in some lifter applications.
- \* Stop buttons are often located under the return pins and will need to be relocated when using the spring loaded return pins.



Use 1.0" / 25.0mm Long extra heavy duty ( DME -green ( Ref only) springs.

\* .500" / 13.0mm diameter springs for the .750" / 19.0mm and larger pins.

\* .375" / 9.5mm diameter springs for pins less than .750" / 19.0mm dia.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **EJECTOR HOUSING OPENING COVER**

SECTION # **II & V**

VIEW # **T**

FILE:

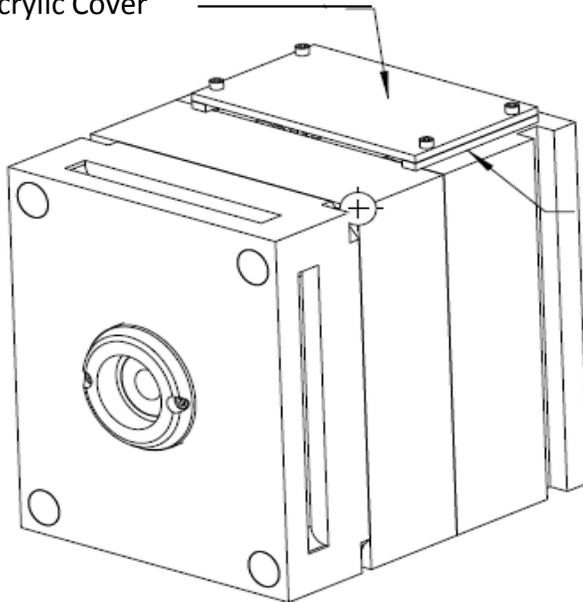
DATE: 12/1/2011

\* When an open end of the box faces the "TOP OF MOLD", a cover is required. This will keep dirt and other objects from falling into the ejectors.

\* Cover requirements are:

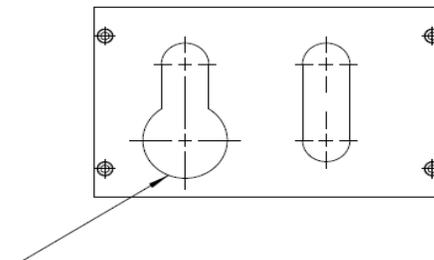
- 1) a .250" or 6.0mm thick acrylic cover.
- 2) Spacer between the acrylic cover and the rails will require a .250" or 6.0mm thick aluminum plates. This is to prevent rubbing between the ejectors plates and cover.
- 3) Equal Clearances are required as needed for water pipes, connectors, limit switches. ( Not to be excessive to allow anything to fall in)
- 4) Top & bottom of the cover must overlap onto the steel.
- 5) NO WASHERS ARE ALLOWED TO BE USED.

Acrylic Cover



Aluminum Spacer

Slots may be needed for  
water pipes , fittings ,  
transducer, etc.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: VI COOLING SYSTEMS

SECTION # VI

VIEWS A-F

FILE:

DATE: 12/01/11

This section outlines the basic construction expectations of the **CAVITY and CORE COOLING SYSTEMS**.

Specific views shown on the following pages are:

**A) COOLING SYSTEM REQUIREMENTS**

**B) WATERLINE CONNECTORS**

**C) WATERLINE ROUTING**

**D) WATERLINE BAFFLE**

**E) O - RINGS**

**F) WATER MANIFOLDS**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **COOLING SYSTEM REQUIREMENTS**

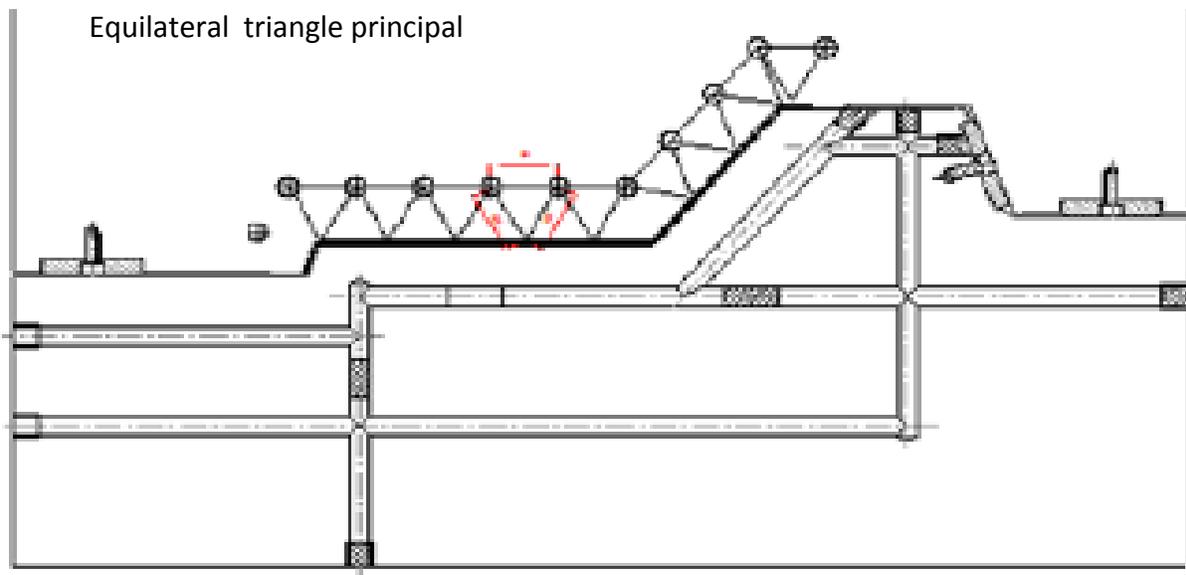
SECTION # **VI**

VIEW # **A**

FILE:

DATE: 12/01/11

- If a cooling system begins leaking for any reason, it must not affect the tool electrical system in any way.
- Cooling connectors are to meet molding site specifications for size and style.
- All cooling system connectors must be on the non-operator side. Any deviation requires Tooling Engineer and molding site approval.
- Only standard cooling connectors may be used.
- Cooling channels should be equally divided, parallel to the tooling surface according to the equilateral triangle principal. The tool surface must be evenly cooled (within 5° C from hottest to coolest area).
- Each cooling circuit must achieve turbulent waterflow.
- The pressure drop in the cooling system must not exceed 35psi (2.5 bars).
- Water system inlets and outlets must be clearly marked per SECTION II View G-2.
- Cooling circuits are required on all steel lifter heads. All non-steel lifter heads require cooling lines near by. See SECTION VII View D.
- Lifter head cooling connectors must be standard and affixed to the ejector plates.
- Hoses must be process temperature resistant without expanding.
- When used, cooling manifold diameters must be 5 times the diameter of the largest cooling channel.
- Maintain short cooling circuit lengths and avoid over use of jumpers between circuits.
- Test each cooling circuit at mold process temperature for 1 hour with 70psi (5 bars) of pressure.
- Pulse cooling can only be used with Tooling Engineer and molding site approval.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

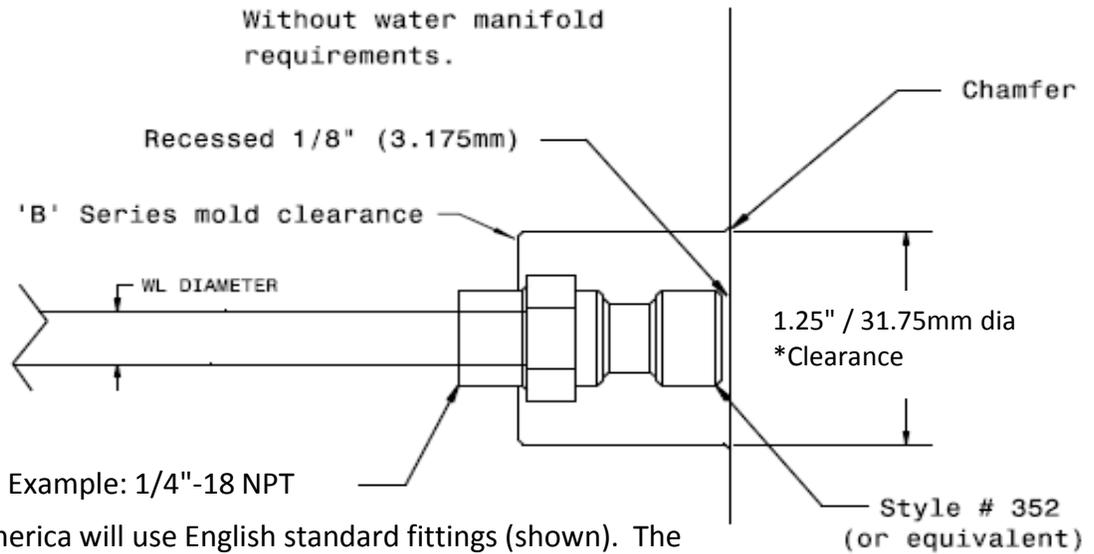
TITLE: **WATERLINE CONNECTORS**

SECTION # **VI**

VIEW # **B**

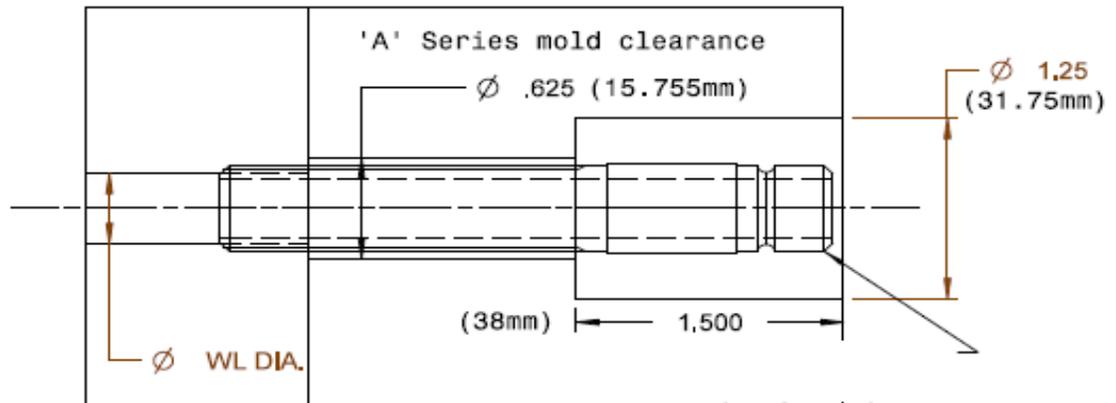
FILE:

DATE: 12/01/11



Note: North America will use English standard fittings (shown). The EU and Asia will use metric standard fittings.

\* Clearance according supplier specification, whichever is larger.



\* Standard JCI water line diameters are 7/16" / 12 mm. (This size may vary pending mold size)

\* If plug connector is connected to a pipe it must be brazed.

\* Verify adequate clearance to allow for mold clamps, tie bars, etc. to stay clear of all waterline connections and hoses.

\* If water-cooled elements ( inserts) are used inside or on top of the tool, Vertical discharge channels must be created to avoid tool or process disturbance.

\* All fittings must be to the manufacturing site and press specifications.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **WATERLINE ROUTING**

SECTION # **VI**

VIEW # **C**

FILE:

DATE: 12/01/11

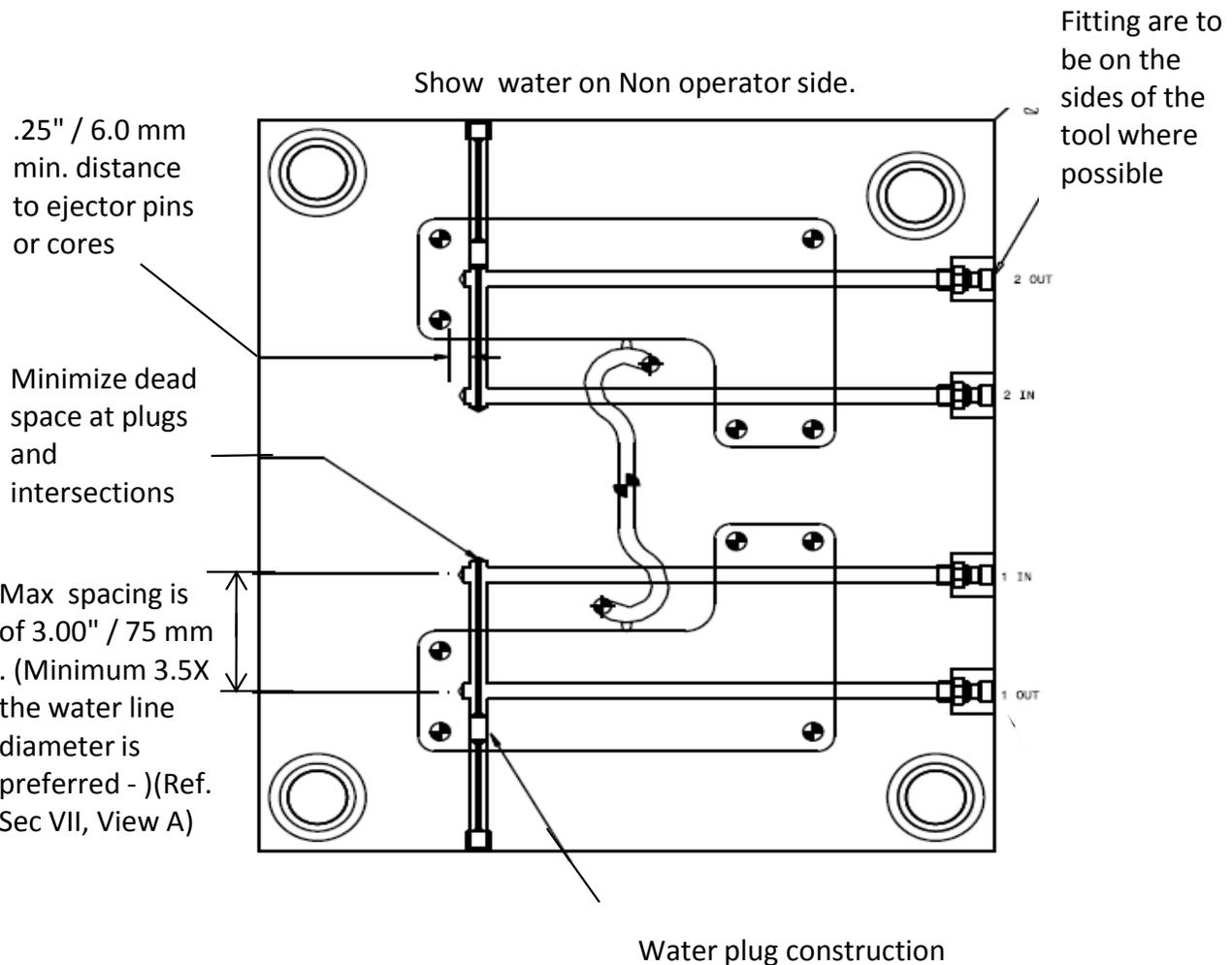
\*Cooling line locations & spacing are to be primarily dictated by ability to maximize water flow thru the mold and ability to rapidly cool the part, Ref. Sec VII, View A (i.e.. More water is better)

\* All fittings should come out on the Non -operator side or bottom of mold.

\* Water line patterns to be equivalent for each cavity ( if multi - cavity mold).

\* Multiple circuits to be plumbed in parallel ( Depending use of manifold)

\* No "O" rings unless no other option exists, ( If "O" rings are needed and high temps are being used , then VITON Rings are required).



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **WATERLINE BAFFLE**

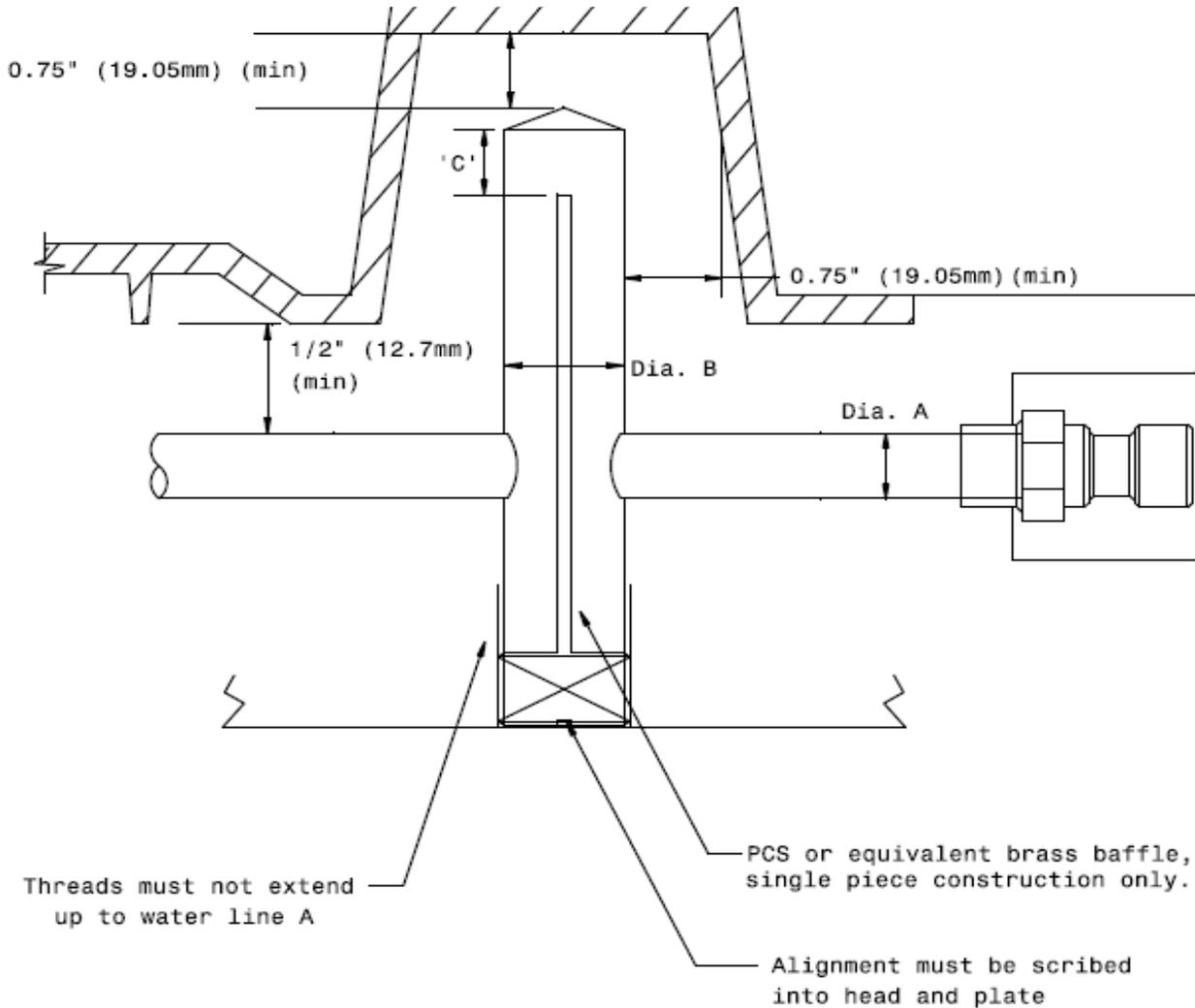
SECTION # **VI**

VIEW # **D**

FILE:

DATE: 12/01/11

- \* Water line baffles are preferred over bubblers
- \* Cooling circuit is the preferred method .
- \* Baffles are not preferred and needs TE approval, In case of use max. 4 baffles/circuit are allowed.
- \* Diameter "B" should be at least ( 1 ) pipe thread size larger than Diameter "A".



( DME Standard sizes below, Refer to Supplier specifications , but must equivalent)

Plug Size	C Dimension	Plug Size	C Dimension
1/8	0.12	3.0mm	2.66mm
1/4	0.17	6.0mm	4.33mm
3/8	0.21	9.0mm	5.00mm
1/2	0.26	12.5mm	6.50mm
3/4	0.35	18.5mm	8.75mm
1	0.42	25.0mm	10.00mm

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **O - RINGS**

SECTION # **VI**

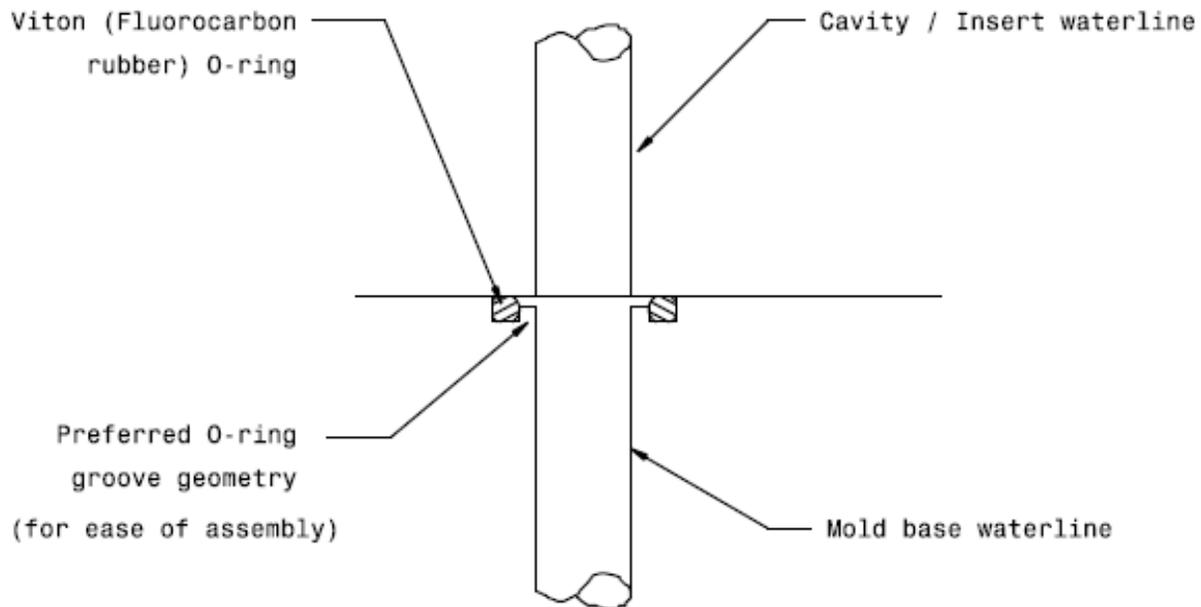
VIEW # **E**

FILE:

DATE: 12/01/11

The use of O - Rings must be approved by the JCI tooling Engineer and molding site.

O-Rings are not preferred, and alternative methods should be used whenever possible.  
O-Rings to be used on all interfaces which have water channels crossing through them as shown below.



° Groove dimensions must be to the vendors specs.

° O-rings directly in compression

(no possibility of shearing O-ring during assembly)

All O-rings must be replaced upon disassembly - do not re-use.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **WATER MANIFOLDS**

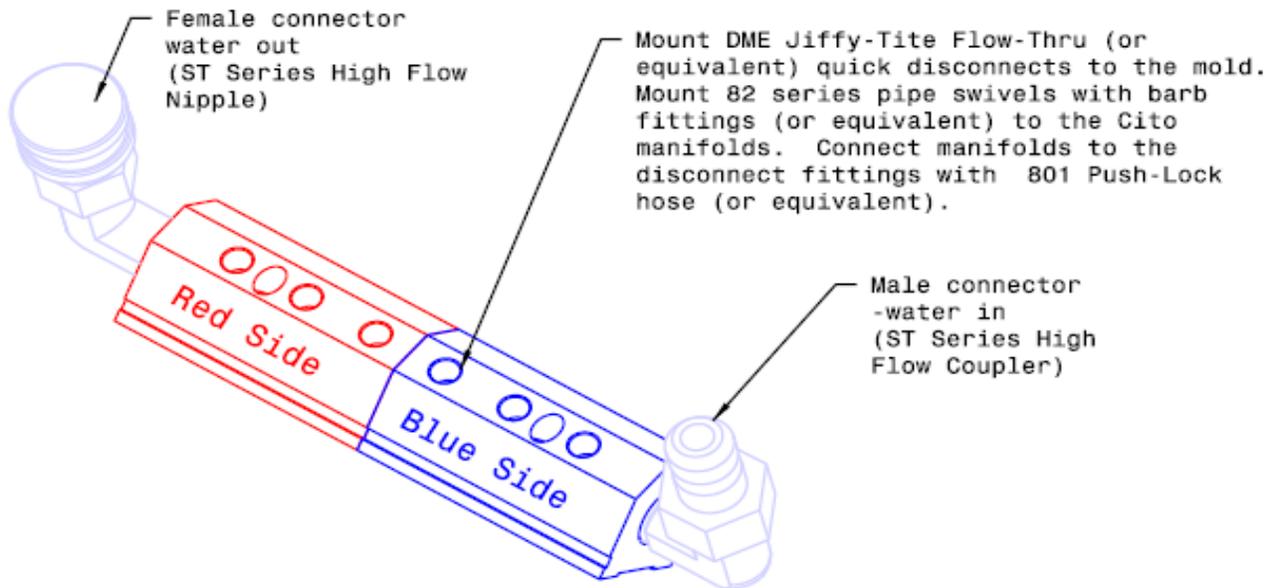
SECTION # **VI**

VIEW # **F**

FILE:

DATE: 12/01/11

- Water manifolds are required on all tools running in presses of 500 ton and above.
- Cito type divided manifolds are preferred.
- Manifolds mounted on the bottom of the tool should be piped to the non-operator side.
- Manifolds must be protected from incidental contact with the press or other objects.
- Manifolds may be required on smaller tools at the Tooling Engineer or molding sites request.
- Molding site to verify manifold sizes during tool design phase. needs Tool Engineer approval.
- \* The manifold must fulfill the requirements.



CITO TYPICAL MANIFOLD SIZES			
Press Size	Manifold Series	Conector - Out	Connector - In
Up to 1000	IM4	BST-8	BST-N8
1000 - 1500	IM6	BST-10	BST-N10
Above 1500	IM8	BST-12	BST-N12

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **VII SLIDES / LIFTERS**

SECTION # **VII**

VIEWS **A-F**

FILE:

DATE: 12/01/11

This section outlines the basic construction expectations of the **SLIDES** and **LIFTER** details and features.

Specific views shown on the following pages are:

**A-1) TYPICAL CAM SLIDE NOTES**

**A-2) TYPICAL CAM SLIDE DESIGN REFERENCE**

**B) CAM SLIDE WITH INSERTED HEEL BLOCK**

**C) PURCHASED LIFTERS**

**D-1) TYPICAL LIFTER & ROD NOTES**

**D-2) TYPICAL LIFTER ROD DESIGN REFERENCE**

**E) ANGLED LIFTER RETAINER**

**F) LIFTER WATER LINES**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TYPICAL CAM SLIDE NOTES**

SECTION # **VII**

VIEW # **A -1**

FILE:

DATE: 12/1/2011

- \* Slides must be removable from the tool without complete disassembly of the tool.
- \* Slides are to have a medium duty spring ( max 36% compression) and a detent to retain the slide in the open position regardless of tool orientation (internal springs are preferred) , - Cage style or a guide pin to support the spring are optional . Note: Spring preload force to be greater than 2x slide weight. ( Must be approved by a Tool Engineer)
- \* Vent slides ( and Lifters) whenever possible.
- \* Leader pins must engage into the tool 1.0" / 25.0 mm prior to the horn pin engaging into the slide.
- \* Water is required in the slide whenever possible.
- \* No ejection under the slide (suicide slide) without a JCI Tool Engineer approval.
- \* If ejection must be placed under the slide. "Positive Ejection Returns" are required. With limit switches.
- \* Nose tips/ insert of the slide are to be replaceable - keyed or doweled is preferred. Slide detail should be inserted for replace-ability on molds with annual production volumes above 100,000 - or the slide face contains fragile details - or ejection exists under the slide face - or- damage is expected to the slide face.
- \* All components / Pocket must be " ID" with "Tool # " and " Location"
- \* ID slide for, Location, material type & hardness and weight over 50lbs / 23 kgs.
- \* Dowel all gibs - ( Optional )
- \* 10Rc difference between the slide shutoff and the cavity base are required. ( Not when using hardened steels).
- \* HEEL /PLATE NOTES: - angle is required to be 5" ( degrees) greater than the horn pin, - preloaded for crush, - plate will be recessed 90% into the slide to absorb slide and slider forces , the wear plate must have a different hardness and composition than the slider / tool. -Lamina wear plates (Ampco-18 or equivalent) will be used.
- \* Self lube gibs and plates will be used for guiding the slide.
- \* Grease groves are required in the bottom of the slide
- \* Wear plates are to be .250" / 6.0 mm Thickness minimum.
- \* Positive stops locks are required ( Superior brand are preferred or equivalent)
- \* Spherical radius required at the end of the horn pin ( No angles)
- \* Notes for deceleration - Reference with design on ( Sec VII, View A-2)
  - Angle "A " ( deceleration) Max = 10 degrees.
  - Angle "B " ( horn pin) Max = 22 degrees
  - The combination of "A" and "B" is not to exceed 22 degrees. ( "A" + "B" = 22 degrees)
- \* **All deviations must be approved by the JCI Tool Engineer.**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

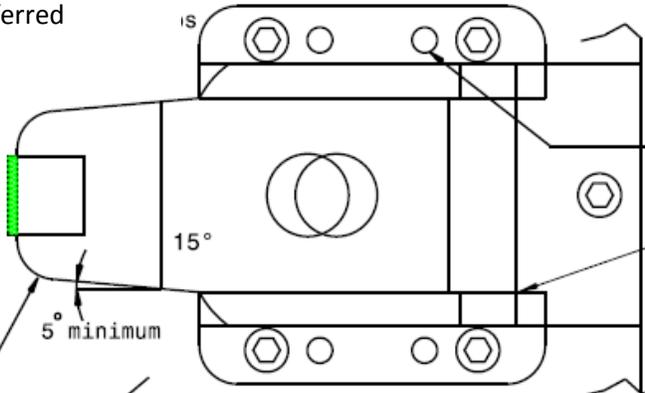
TITLE: **TYPICAL CAM SLIDE DESIGN REFERENCE**

SECTION # **VII** VIEW # **A-2** FILE: DATE: 12/1/2011

**\* Design reference and notes.**

Replaceable nose tips , keyed or doweled preferred

\*Number and ID each component , pocket  
\* ID slides for material type and hardness



Doweled gibs (optional)

ANSI RC2 fit clearance when possible, must account for large thermal expansion when

Use DME angle pins or equivalent when horn pins mounted from the rear.

Heel plate angle to be 5' greater than horn pin. Preload for crush.

10 Rc difference between, slide shutoff and cavity / base.

Self lube gibs and plates will be used for guiding slide

5° minimum

Lamina wear plate (Ampco-18 or equiv)

$L/D > 1.0$

Spring cage or Guide pin

Stop Blocks

Minimum wear thickness 0.25" / 6.0mm

Spherical Radius - No angle

Superior brand slide lock preferred ( Not as shown)

0.03" to 0.06" / .76 to 1.5 mm Clearance per side

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **CAM SLIDE WITH INSETED HEEL BLOCK**

SECTION # **VII**

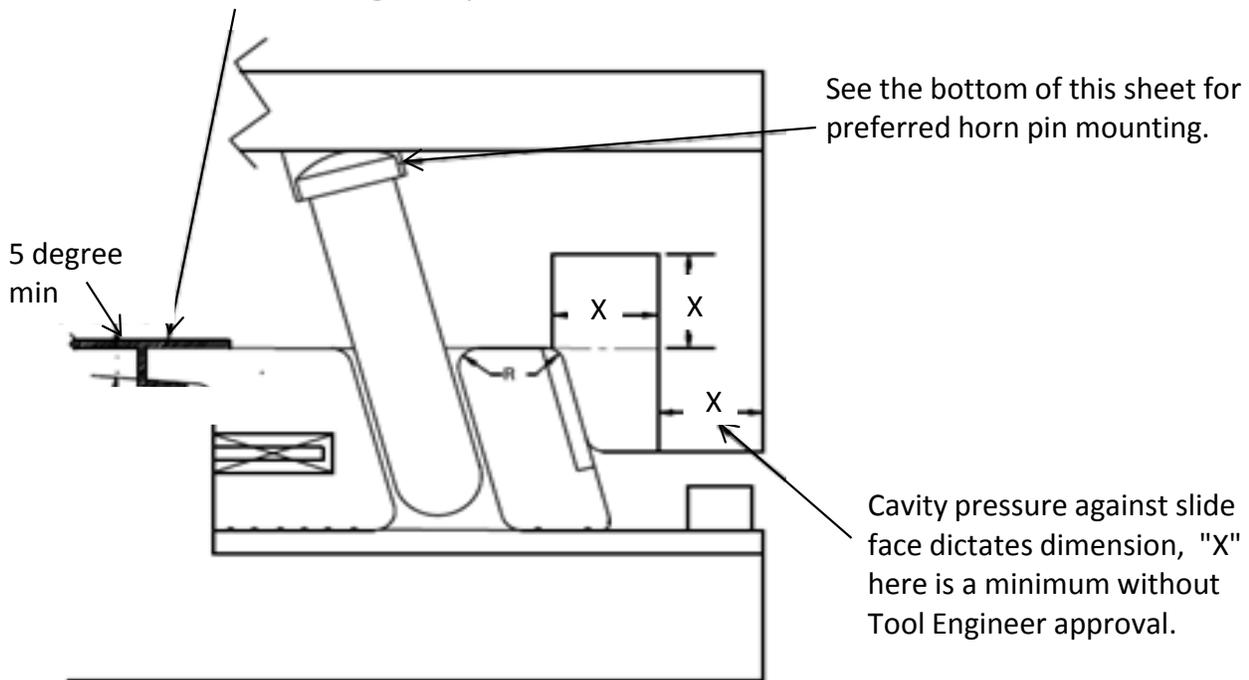
VIEW # **B**

FILE:

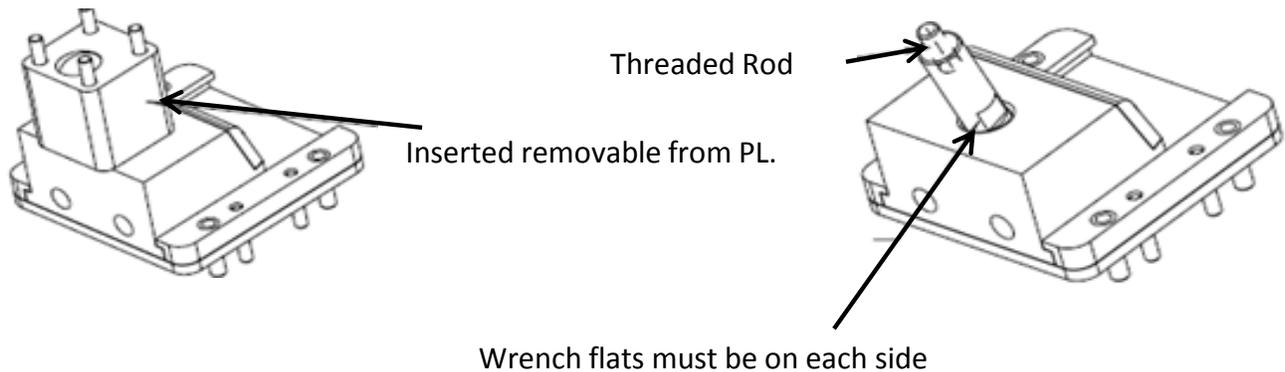
DATE: 12/1/2011

\*\* PLEASE referee to Sec VII, View A-1 & A-2, for additional requirements pertaining to slides.  
 \* All information contained in view, applies to this page except where superseded by information displayed below.

Nose tips/ insert of the slide are to be replaceable - keyed or doweled is preferred. Slide detail should be inserted for replace-ability on molds with annual production volumes above 100,000 - or the slide face contains fragile details - or ejection exists under the slide face - or- damage is expected to the slide face.



## PREFERRED HORN PIN MOUNTING STYLES



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **PURCHASED LIFTERS**

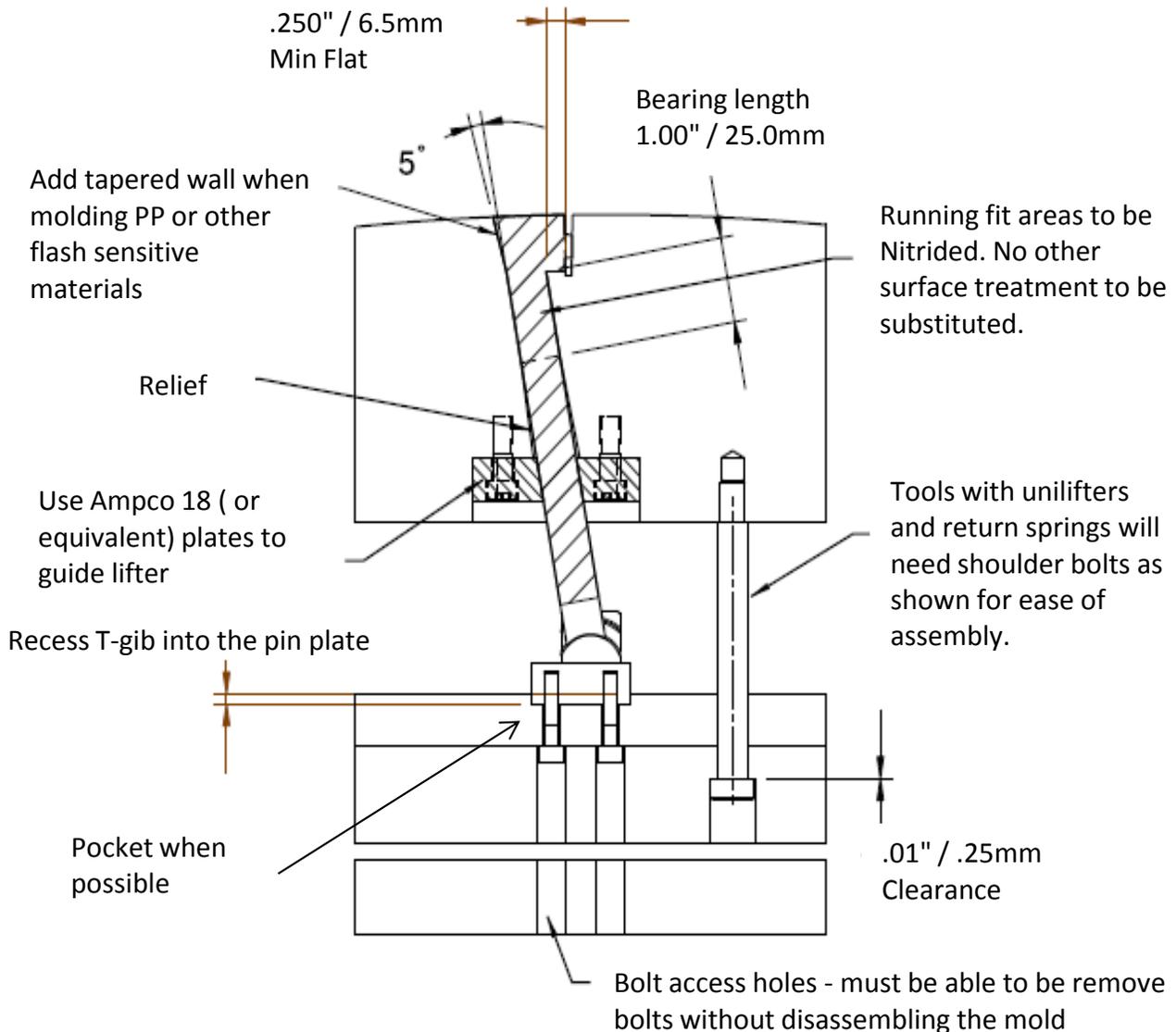
SECTION # **VII**

VIEW # **C**

FILE: 12/1/2011

DATE: 12/1/2011

- \* Progressive Unilifters ( or equivalent) must be a standard component.
- \* All components / Pocket must be " ID" with "Tool # " and " Location"
- \* ID slide / lifter for, Location, material type & hardness and weight over 50lbs / 23 kgs.
- \* Reference the recommended specification when installing these components.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TYPICAL LIFTER & ROD NOTES**

SECTION # **VII**

VIEW # **D-1**

FILE:

DATE: 12/1/2011

## TYPICAL LIFTER CONSTRUCTION TECHNIQUE FOR CUSTOM LIFTERS

- \* Note: Spring steel lifters are not an option, unless approved by the JCI Tool Engineer and manufacturing site.
- \* Vent lifters whenever possible.
- \* Large lifters should have (2) rods for stabilization.
- \* Medium (blue) loctite required on all lifter bolts.
- \* Do Not include return springs on tools with pocketed lifters. Use gas springs or positive returns. ( Sec V, View E).
- \* Purchased cars / carriers for lifters , or they can be manufactured by the tool supplier. Use a standard component /options that meet the requirements for manufacturing.
- \* All Steel angle / straight lifter heads need to be cooled, otherwise AMPCO heads need to be used.
- \* Cooling channels must be drilled near by the lifter.
- \* Bearing surface of a lifter head - 25% engagement with water in the lifter head , - 75% engagement without water in the lifter head. - Lifter head Is to be relieved .02"-.04" / .5 mm - 1.0mm dp after engagement .
- \* All angle lifter heads must have the possibility to be disassembled at the ejector plates and ejection position. ( Clearance access hole through the clamp plate)
- \* All access holes my need cover plates for Mag platens - Review with the manufacturing site and Tool Engineer to supply press specifications.
- \* All bushing are to be bronze - No steel bushings. The bushing is to be with in 1.0" / 25.0mm of the lifter head pocket and as long as possible. Secured in with a S.H.C.S (socket head cap screw)
- \* All rods are made from Thompson shaft ( or equivalent)
- \* Rod / shaft 1.0" / 25.0mm diameter is the minimum. Smaller must be approved the JCI Tool Engineer.
- \* Rod & car/carrier fit -  
-Tight fit - with one side keyed with 0.15" / 3.8mm flat on the shaft. Buried 0.25" / 6.5mm into the car / carrier body at 0 to 90 degrees to the dowel.
- \* All lifter heads are to be doweled with a solid pin.
- \* Minimum shut off requirement - flat shutoffs is .250" / 6.5mm
- \* Lifter / pockets are to be 1-5 degrees more than the lifter angle, (preferred is 5 degrees).

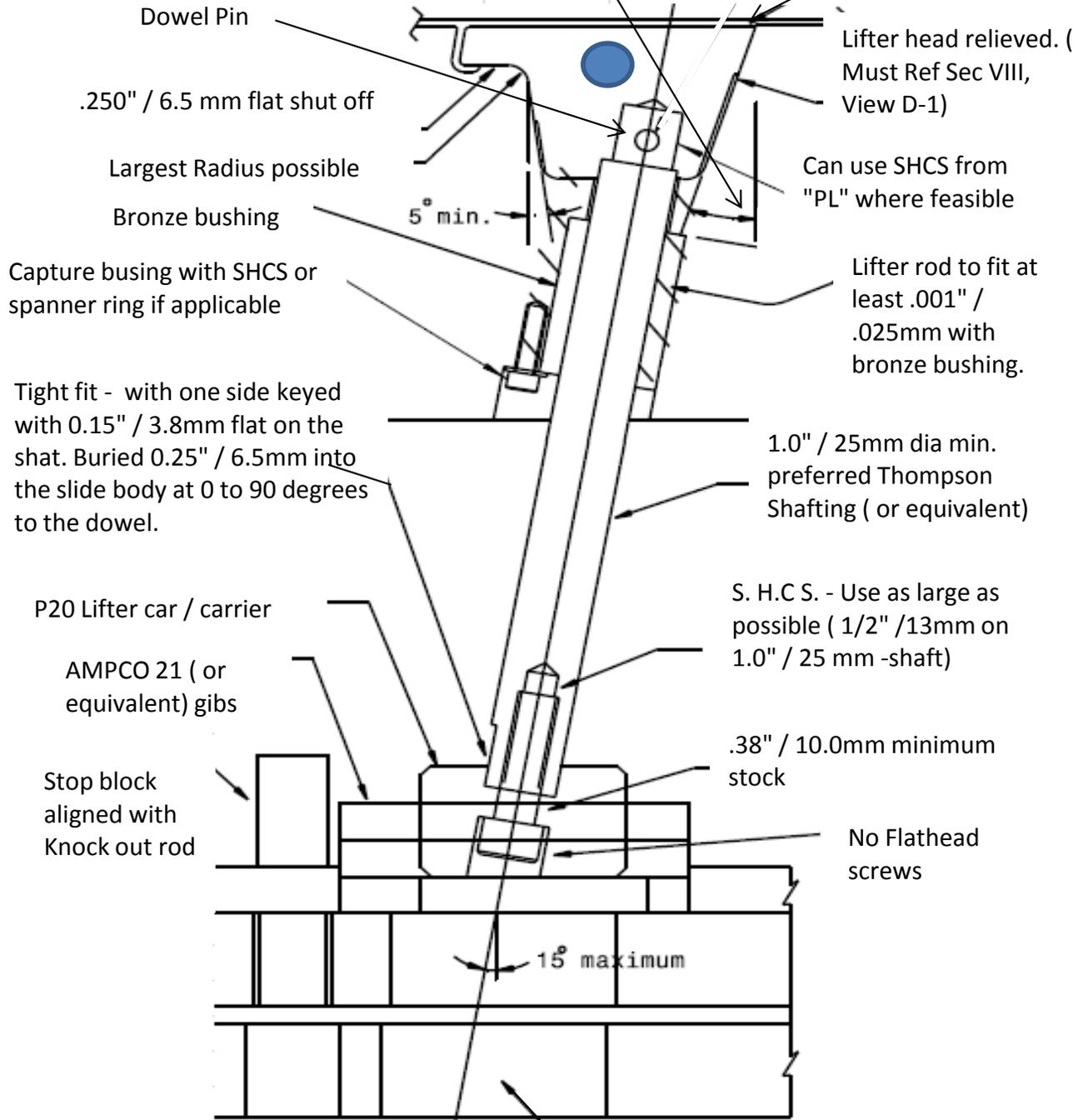
# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **TYPICAL LIFTER ROD DESIGN REFERENCE**

SECTION # **VII** VIEW # **D-2** FILE: DATE: 12/1/2011

Lifter / pockets are to be 1-5 degrees more than the lifter angle, (preferred is 5 degrees).

Lifter face relieved .001" - .003" / .025mm (below wall stock .07mm)



Lifter head relieved. ( Must Ref Sec VIII, View D-1)

Can use SHCS from "PL" where feasible

Lifter rod to fit at least .001" / .025mm with bronze bushing.

1.0" / 25mm dia min. preferred Thompson Shafting ( or equivalent)

S. H. C S. - Use as large as possible ( 1/2" / 13mm on 1.0" / 25 mm -shaft)

.38" / 10.0mm minimum stock

No Flathead screws

Tight fit - with one side keyed with 0.15" / 3.8mm flat on the shat. Buried 0.25" / 6.5mm into the slide body at 0 to 90 degrees to the dowel.

Capture busing with SHCS or spanner ring if applicable

Largest Radius possible

Bronze bushing

.250" / 6.5 mm flat shut off

Dowel Pin

P20 Lifter car / carrier

AMPCO 21 ( or equivalent) gibs

Stop block aligned with Knock out rod

SHCS access hole, must have enough clearance to remove the SHCS without disassembly of the tool.

\* All access holes my need cover plates for Mag platens - Review with the manufacturing site and Tool Engineer to supply press specifications.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **ANGLED LIFTER RETAINER**

SECTION # **VII**

VIEW # **E**

FILE:

DATE: 12/1/2011

- \* Angle "A" Maximum = 10 degrees
- \* Angle "B" Maximum = 15 degrees
- Total lifter angle combination Angle "A" + Angle "B" = 15 degrees.
- \* If the total angle exceeds the 15 degree, special mechanics must be used.
- \* DME Vector form systems are to be used whenever feasible.
- \* Use standard components that can be applied to these applications.
- \* In case a bigger angle is required, the use of double forced guiding is required.  
(Standard parts only)

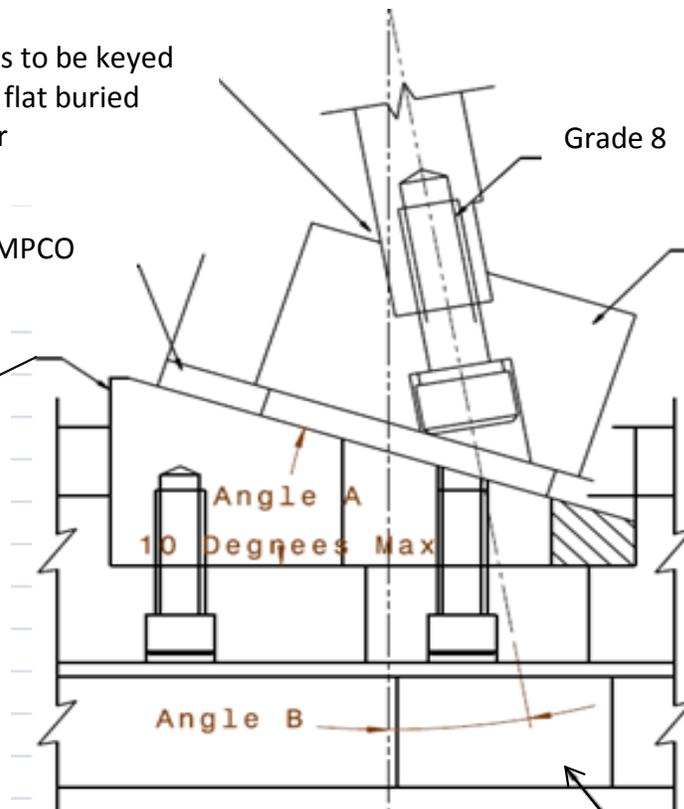
Tight fit - the shaft is to be keyed with .15" / 4.0mm flat buried into the car / carrier

.375" / 8.0 mm AMPCO 21 - (Preferred)

HRS angle block

Grade 8 S.H.C.S.

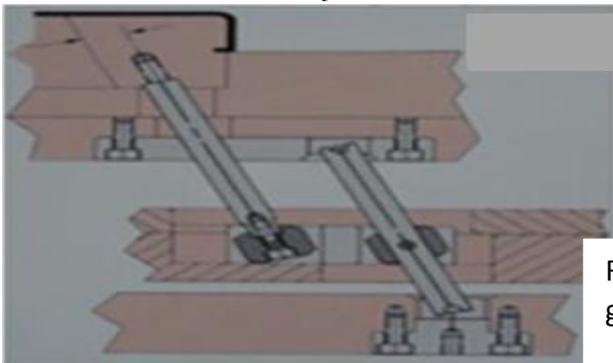
4140 Puck- Entire puck can be made of AMPCO 21 or equivalent rather than using a ear



Angle A  
10 Degrees Max

Angle B

SHCS access hole, must have enough clearance to remove the SHCS without disassembly of the tool.



Reference Only for double force guiding system

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **LIFTER WATER LINES**

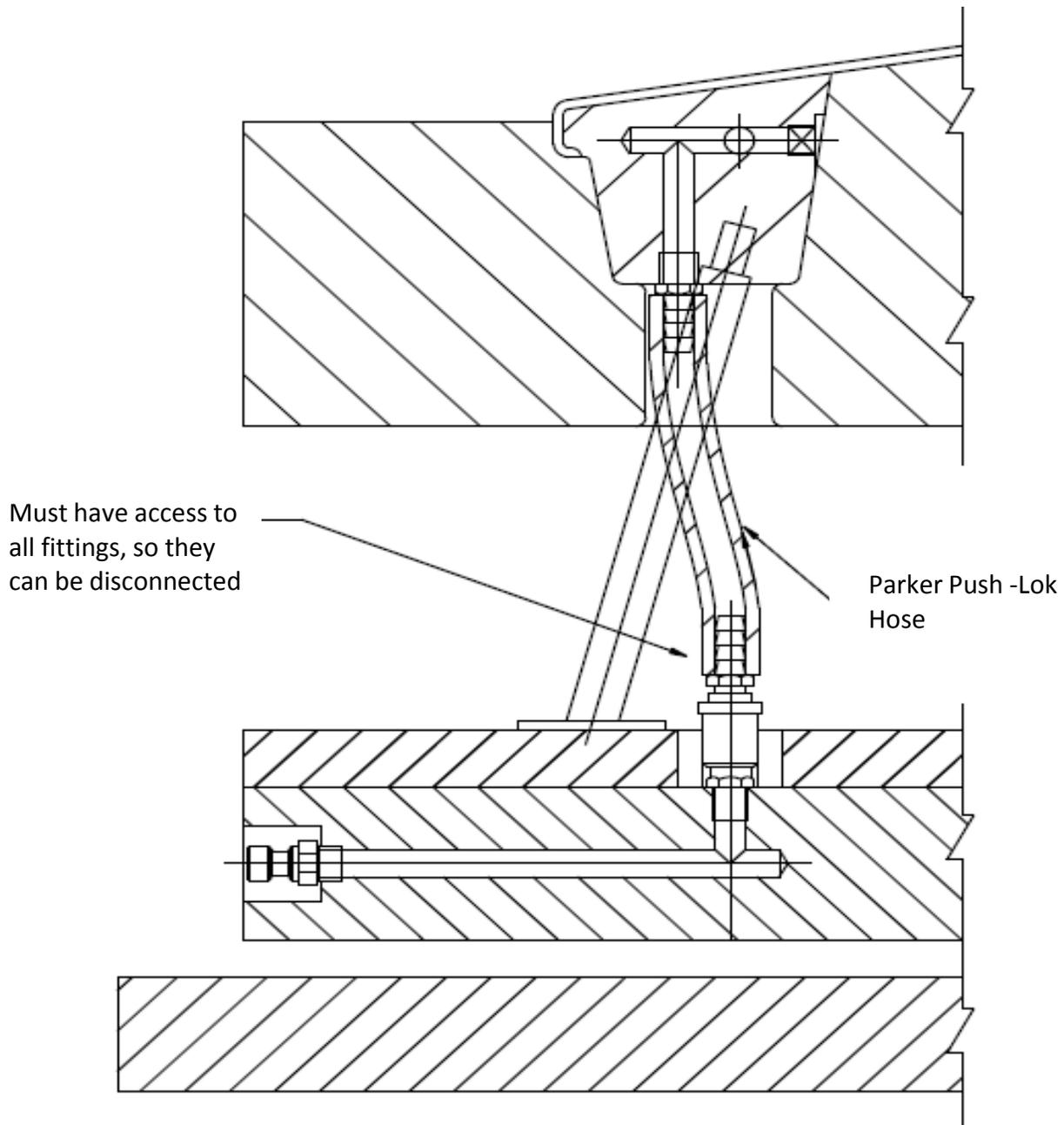
SECTION # **VII**

VIEW # **F**

FILE:

DATE: 12/1/2011

- \* Water must be in all lifters whenever possible ( and slides) ( Sec VII, View D-1)
- \* Must have access to all fittings, so they can be disconnected by hand- without complete tool disassembly.
- \* Parker Push -Lok hose
- \* Hose clamps are with temps above 60' C / 140' F.
- \* Optional plumping using the ejector plate.



# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **VIII CORE PULLS AND HYDRAULICS**

SECTION # **VIII**

VIEWS **A-D**

FILE:

DATE: 12/01/11

This section outlines the basic construction expectations of any **HYDRAULICALLY** activated **CORE PULL**.

Specific views shown on the following pages are:

**A) HYDRAULIC SLIDE**

**B) LIMIT SWITCH ASSEMBLY**

**C) MOLD SEQUENCE PLAQUE**

**D) LIMIT SWITCH CONNECTOR WIRING**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **HYDRAULIC SLIDES**

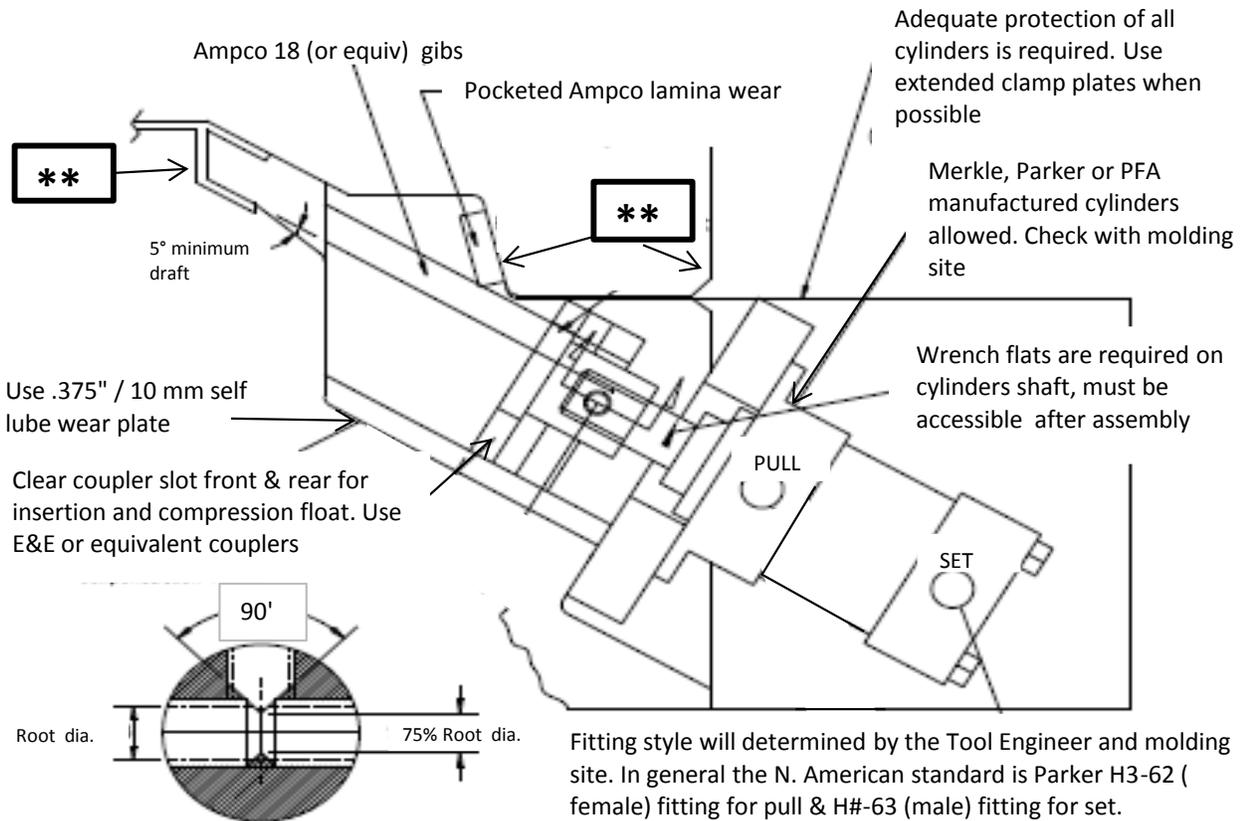
SECTION # **VIII**

VIEW # **A**

FILE:

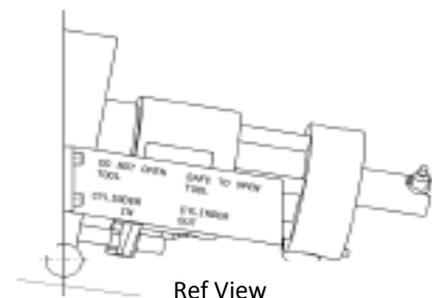
DATE: 12/01/11

- Deviations from this standard requires Tool Engineer and molding site approval.
- Main SET and PULL quick fittings to be located on the non-operator side
- Hydraulic lines to be incorporated in to mold base or plates when possible.
- Hydraulic lines cannot be in proximity to waterlines.
- Use quick connect fittings wherever possible to facilitate assembly.
- Use 3/8" (9.50mm) steel braided hoses. ( depending volume requirements / cylinder size)
- All fittings to be straight hydraulic threads (no "O" rings or pipe threads).



Cylinder locking detail, use cone point set screw. No sharp corner at bottom of the "V" groove. Optional construction is drilled through the roll pin. Roll pin diameter is not to exceed 25% of the root diameter.

Internal slides must have an external indicator to show the



All cylinders and components must be rated for a minimum of 3,000 psi (200 bar) constant load.

- Assume available machine hydraulic pressure is 1,700psi (115 bar).

**\*\*** Assume plastic pressure is 7000 psi (480 bar). - Pressure on the part surface of the action - MUST have adequate support / heel to prevent action blow back.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

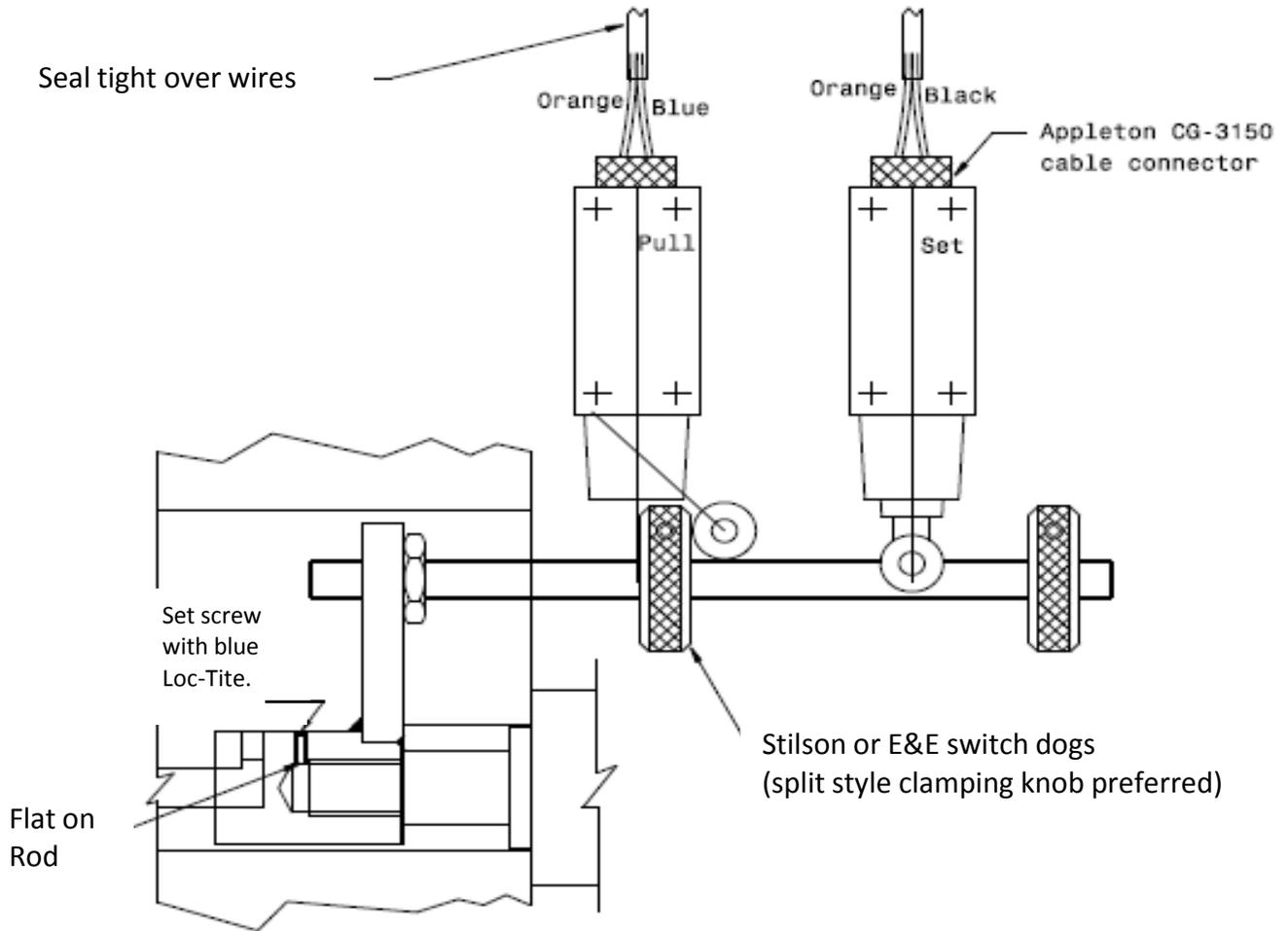
TITLE: **LIMIT SWITCH ASSEMBLY**

SECTION # **VIII**

VIEW # **B**

FILE:

DATE: 12/01/11



- Inside or buried slides must have an LED detection sensor.
- The tool supplier is required for wiring and final adjustment of the limit switch actuations.
- Two Balluf or Allen Bradley 802T ALP limit switches are required for each core pull or hydraulic cylinder.
- Honeywell or Telemacanique #XCM A102 plunger micro switches are acceptable with Tooling Engineer and molding site approval. Add anti-vibration material under the micro switch .

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **MOLD SEQUENCE PLAQUE**

SECTION # **VIII**

VIEW # **C**

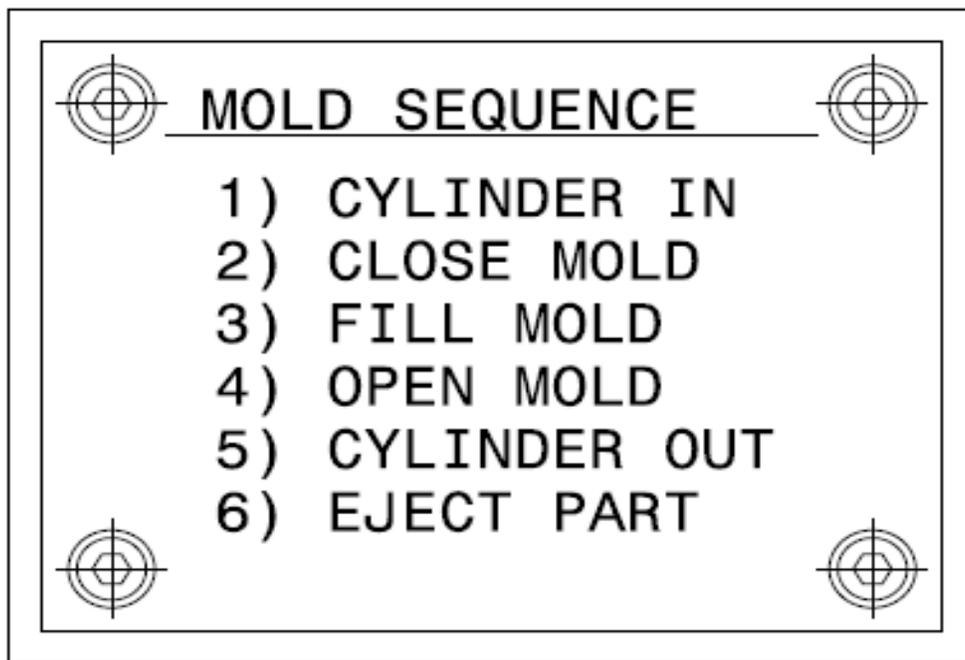
FILE:

DATE: 12/01/11

REFERENCE VIEW OF A SAMPLE ALUMINUM PLAQUE  
(to be recessed & staked or screwed on operator side of mold)

- Note that the specific sequence for events will be unique to each mold and should be established by Mold Designer and Tool Engr.

Native languages on plaque for country the the tool is going to run in.



- Sequence plate required on all tools with cylinders and non-standard action sequences.
- .250" (6.00mm) high letters are preferred (plate size can vary but plaque must be legible).

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

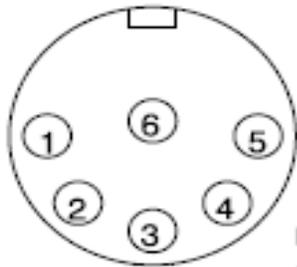
TITLE: **LIMIT SWITCH CONNECTOR WIRING**

SECTION # **VIII**

VIEW # **D**

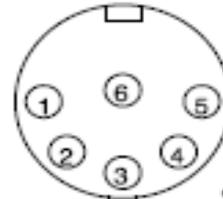
FILE:

DATE: 12/01/11



Large Plug  
Cores #1&2

(diagram shows male plug)



Small Plug  
Cores #3&4

PIN NUMBER	FUNCTION	
1	POWER FROM PRESS	
2	#1 PULL	┌───┐ └───┘
3	#1 SET	
4	#2 PULL	┌───┐ └───┘
5	#2 SET	
6	GROUND	

For standard core pull #1 connection

For standard core pull #2 connection

PIN NUMBER	FUNCTION	
1	#4 SET	┌───┐ └───┘
2	#4 PULL	
3	GROUND	
4	POWER FROM PRESS	
5	#3 SET	┌───┐ └───┘
6	#3 PULL	

For core pull #4 - special machine option required

For core pull #3 - special machine option required

- For 2 core pulls or less, the ground will always be pin 6.
  - Before designing more than core pulls. Verify that the molding site molding machine is capable of handling the additional plugs.
  - Always wire multiple limit switches in series.
  - Use 14 or 16 gauge, oil resistant wiring for limit switches.
- \* Always wire to plant / press specifications. Review with manufacturing site & Tool Engineer.

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **IX ENHANCED - REVISION REQUEST FORM**

SECTION # **IX**

VIEWS **A**

FILE:

DATE: 12/01/11

This section outlines the basic construction expectations of a **REVISION REQUEST** to the standards, for the tooling standards

Specific views shown on the following pages are:

## **A) REQUEST FORM**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **ENHANCED / REVISION REQUEST FORM**

SECTION # **FILL IN**

VIEW # **FILL IN**

FILE:

DATE: **YOUR DATE**

All of the requests for updates, enhancements, or revisions to the JCI / JCIM tooling standards should be submitted on this form. Photocopy or attach your request below, or provide a sketch of the requested change in the space provided. Submit your request to Mike Sneller (michael.d.sneller@jci.com). Your request will be logged, and a copy returned to you with a tracking number. If you do not receive the return copy within 5 business days you should consider your request lost, and are encouraged to resubmit. All submitted requests will be reviewed at the next scheduled tooling standards meeting. If the request is approved, it will be included in the subsequent release of that document. All requests must be submitted electronically, and all appropriate documentation and illustrations must be provided before a request will be logged, and a tracking number issued.

Requested By: **YOUR NAME and / or Supplier**

Tracking Number: **FOR MIKE SNELLER ONLY**

**Important Note: All request need to be in by November 1st, and reviewed with the Advance Manufacturing Engineers from EU, Asia and NA for approval. ( As to any changes will be affected globally).**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: **X TOOL DRAWINGS**

SECTION # **X**

VIEWS **A-B**

FILE:

DATE: 12/01/11

This section outlines the basic construction expectations of the **TOOL DRAWINGS**.

Specific views shown on the following pages are:

**A) TOOL DRAWING NOTES**

**B) TOOL DRAWING TITLE BLOCK**

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: JCI TOOL DRAWING

SECTION # X

VIEW # A

FILE:

DATE: 12/1/2011

The cad model tool design must be retained by the tool shop for a minimum of 5 years. The files may be deleted after 5 years with written approval from JCI.

*All JCI drawing sets are to include:*

## 1) Complete parts list

- Full bill of materials including:

a) Listing of all mold detail numbers and descriptions

b) Complete list of all purchased components with catalog numbers.

## 2) Full Cover & Ejector plan views and section views

- Balloons to identify all details (with title block stock list)

- Adequate section views to show parting line steps and all details.

- Tooling datum hole and features dimensioned to the centerline of mold.

- Show tie bars for targeted machine size.

- Show knock out pattern for targeted machine size.

- Plate - thicknesses and dimensioned

- Ejection travel dimensioned

- Mold height, length & width dimensioned

- Dimension high points of Cover & Ejector from back plates

- Dimension Sprue offset ( if any)

- Identify "0" (zero) corner.

- All cooling lines Cover & Ejector

- Components labeled in Ejector plan view: - Support pillar, - guide pins, -stop buttons, -ejector pins, - return pins, - knock-out holes, -forward stops, - etc.

## 3) Detail drawings

- Inserted details to be shown, dimensioned to be shown in separate view.

- Gate detail to be shown in a 4X scale view

- Any welded areas to be identified on drawings.

## 4) Full size drawing of all schematics to be included

- Hydraulics, - Pneumatics, -Electrical, -Water lines ( Cover, Eject, Slide , Lifter, ), -Counter air, - Gas assist.

## 5) Provide (2) CD-ROM's for each mold design. Each CD must contain the following:

- Complete Mold Design in 3 D step format, -Part data in STP & IGES formats, -All mold drawings, and part drawings, in DXF and PDF / TIFF formats, -All manifold designs and schematics from the manifold supplier ( Any special requirements)

**6) Each CD-ROM supplied must be labeled with the following information as a minimum, - JCI Tool number, -JCI Part number, - Part Name & Platform.**

## GENERAL:

\* Steel hardness , finish, coatings, and any weld to be shown on appropriate views

\* All dimensions in

- INCHES, English for North America.

- METRIC, native language for Europe & Asia.

\* Original drawing and tulip dimension certification to be supplied to the Tooling Secretary at or

# PLASTIC PART SUPPLIER INJECTION MOLD TOOLING STANDARDS

TITLE: JCI TOOL TITLE BLOCK

SECTION # X

VIEW # B

FILE:

DATE: 12/1/2011

\* Title block required to be completely filled out and shown on the lower right corner of each sheet in drawing package

DESIGN DOES NOT REFLECT REVISIONS MADE AFTER THE INITIAL TOOL BUILD							
					JCI GLOBAL INJECTION TOOLING		
TOOL NAME XXX							
BUILT BY JCI INTERIORS			DATE XX/XX/99		DESIGNED BY XXX		CHECKED BY XXX
Stack Height		Stack Height including locating ring		W X L (Include all Components)		Diagonal Dimension	
PROJECT NO. XXXXX		DESIGNED FOR MACHINE CINN.		TONNAGE XXX TON		APPROXIMATE WEIGHT XXX LBS.	
DESIGNED FOR PART NO. VAXXXX		REVISION X	ORIGINAL BUILD WORK ORDER NUMBER XXXXXX			TOOL NO. 8XXXXXX	
MATERIAL XXX		DRAWE .0XX	SCALE 1/1	SHEET 1 OF X			