Tiercon Mould Standard

Revision Level: 12
Revision Date: October 28, 2021

Tiercon Mould Standard

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0.1 Revision Log

Section No.	Description of Revision	Revision Level	Date
All	Revision 00 - New Release for New Tiercon, 1675386 Ontario Inc.	Revision 00	March 7, 2006
5.12	Hydraulic Connectors for All Facilities	Revision 01	July 4, 2006
5.9.13	Eyebolt Hole Requirements	Revision 02	Sept. 12, 2006
5.11.16	Lubrication Requirements	Revision 03	January 23, 2007
5.13.9	Limit Termination Box	Revision 03	January 23, 2007
5.12	Hydraulic Connectors for All Facilities	Revision 04	Jan 3, 2008
5.14.21	Staubli SVG Connection Part Number	Revision 05	December 16, 2008
5.0-5.14	Water/Hyd/Spotting	Revision 08	March 19 2019
5.7.7	Ejector pin Bar code	Revision 10	March 2 2021
2.0.4 and 5.1.1	Revised ISO9001:2000 to ISO9001:2015	Revision 11	July 12, 2021
Page 20	problem with the document layout for our mold standards, which made some diagrams not completely visible. This has been corrected.	Revision 12	October 28, 2021

1.0 Scope

Tiercon Mould Standard: Hereinafter may be called the "Specification"

The scope of this document is to provide general specifications for the design and fabrication of industrial equipment. Tiercon has implemented the "Tiercon Mould Standard" as a communication tool to ensure that equipment shall be built for maximum safety, performance and maintainability. This specification shall represent a baseline, which may assist Tiercon employees in policing the design, fabrication and purchase of industrial equipment. This specification is also intended for use by our Suppliers, to communicate clearly, Tiercon's expectations in quality for industrial equipment.

We do not wish to limit the creativity of our suppliers or their suggestions relating to new technology and improved methods of accomplishing our goals. We wish to instill an open line of communication with our suppliers and request that our employees are involved in decisions that may conflict with these specifications.

The "Tiercon Mould Standard" is intended to promote.

- Safety
- Environmental Awareness and Improvements
- Component Consolidation
- Minimum Purchase and Operational Costs
- Focused Supplier Support
- Conservation of Energy
- Implementation of New Technology
- Long Term Planning and Development
- Equipment Capability and Repeatability
- Supplier Responsibility
- Equipment Maintainability
- Quality of Equipment, Tooling and Fixtures supplied

2.0 General

2.01 All equipment proposals must include reference to the latest revision of the Specification.

2.02 The "Specification Acknowledgement Form" must be agreed upon and completed prior to acceptance of a purchase order or commencement of any work.

2.03 The acceptance of the purchase order whether written or verbal shall also deem acceptance of the Specification unless indicated by the supplier in writing on the "Specification Acknowledgement Form" and endorsed by the originator.

2.0.4 Suppliers of Tooling, Assembly Equipment and Fixtures must be registered to a minimum Quality Management System Requirements Standard ISO9001:2000

2.05 We wish to work with suppliers that operate in a manner that will help us to attain the Tiercon vision, "To be the preferred supplier of injection molded products".

2.06 We shall conduct business with preferred suppliers who believe in and demonstrate the following:

- Safety - following the "Occupational Health and Safety Act and Regulations for Industrial establishments", Ontario, Canada as well as rules and regulations under the "Ministry of Environment and Energy" (MOEE)
- Integrity
- Teamwork
- Speed
- Innovation
- Performance
- Open communication
- Lawful and ethical business practice following all laws of Ontario, Canada
- Quality

2.07 A penalty clause may be part of the contract for late delivery of equipment. A bonus clause may also be part of a contract for early delivery. Tiercon reserves the right to take action against poor quality tools and/or slippage in timing. This may take the form of a tool transfer and/or financial recourse against the supplier.

2.08 Tiercon requires equipment and tooling to meet all design and process criteria. In addition, set up, change over, maintenance and troubleshooting must be achieved safely and efficiently. All fixtures will be "quick change" with no or minimal parts which have to be exchanged during changeover. Changeovers are a design criteria when changeovers are inevitable.

2.09 The equipment shall be designed around a Total Productive Maintenance (TPM) program. Easy access to lubrication points, valves, sensors, gear boxes, motors, etc. must be considered prior to any fabrication and assembly of equipment.

2.10 The use of statistics by suppliers to control their own process is desirable. In addition, it is a requirement of every supplier of every piece of equipment to prove to Tiercon that the equipment and tooling is statistically capable and repeatable of meeting all specifications and requirements.

2.11 Equipment shall be delivered with documentation and training.

2.12 All electrical components shall be CSA and/or Ontario Hydro approved and conforms to OSHA standards.

2.13 This document may be used by itself in whole, or with additional documents in the form of, purchase orders, meeting minutes, Tiercon part design drawings, statistical specifications, plant layout, government documents, etc.

2.14 Failure to meet this specification without written approval by Tiercon may result in the supplier being financially responsible for all corrections.

2.15 It is the supplier's responsibility to identify additional improvements that may increase the performance of any piece of equipment. Tiercon may offer reward and recognition if the improvements prove positive.

2.16 Tool source to provide weekly timelines and pictorial documentation to the Tiercon Tooling Engineer.

3.0 Drawings, Confidentiality and Design Review

3.1 **Drawings**

3.1.1 All drawings (Def. drawings; math data, sketches, and/or files) supplied by Tiercon are confidential and property of Tiercon. Drawings are NOT to be copied unless approved by Tiercon. All drawings supplied must be returned to Tiercon at project completion or as requested by a Tiercon employee.

3.2 **Confidentiality**

3.2.1 The supplier shall be required to sign a Confidentiality Agreement prior to any drawings release by Tiercon. This document acts as a binding contract and legal agreement pertaining to all "Confidential Information".

3.2.2 It is standard operating procedure for Tiercon to enter into Confidentiality Agreements with its suppliers. The supplier must be prepared to sign this agreement if requested.

3.2.3 When Confidentiality Agreements are signed, all design proposals, and drawings, programs etc. become the property of Tiercon regardless of their physical location.

3.2.4 At the written request of Tiercon, equipment shall be designed and fabricated in camera. (Def. in camera; private, behind and enclosure, in secrecy)

3.3 Design Review

Definition of design approval: This approval is only an acknowledgement by Tiercon to the supplier that the general Equipment concept is within the purchase order requirements and that all sections of the Specification have been followed. This approval does not wave the responsibility of the supplier to make the equipment function as per the specification criteria established in this document and in additional documents such as the purchase order.

3.3.1 A design review by Tiercon shall be conducted at the detailed design stage. At this time, initial compliance to the Purchase Order, the project team will address the Specification, safety concerns and ergonomic issues. (Supplier and Tiercon representatives) At this point, Tiercon may provide approvals to continue.

3.3.2 Further reviews will be determined as needed by the Tiercon Project Manager. (Project/Process Engineer)

3.3.3 Supplier Responsibility: The supplier shall be responsible to ensure that the design is functional to all parameters documented in the Purchase Order, the Specification and any relative part drawings or layouts. If the supplier develops difficulties with any portion of the contract, it is the suppliers' responsibility to inform Tiercon, in writing, of this difficulty.

4.0 Equipment Proposal

4.0.1 All equipment proposals must conform to the latest revision of the "Tiercon Mould Standard".

4.0.2 Proposals must include a written breakdown of the following:

- Cycle time (seconds/cycle)
- Key mechanical components to be used-Bill of Materials
- Key electrical components to be used-Bill of Materials
- Key hydraulic components to be used-Bill of Materials
- Estimated overall dimensions
- Concept drawings
- Core Block Size, Cavity Block Size, Overall Mould Size and Weight
- Delivery time in weeks.

4.0.3 A delivery schedule in a Timeline form to be submitted at time of proposal. This schedule shall be revised at time of purchase order. The schedule will be the key tool for both parties to achieve specified milestones and avoid project pitfalls. Tiercon shall monitor this schedule for any delays to the project. This tool promotes open communication and project updates.

4.0.4 If for any reason a request for proposal is declined, Tiercon requires that the request for proposal package be returned immediately.

5.0 Mould Standard

5.1 Preliminary Mould Design

5.1.1 All Tool sources must be registered to a minimum of Quality Management Systems requirements Standard ISO9001:2000.

5.1.2 **Upon receipt of the drawings**, a complete review of the part design must take place by the tool source. All conditions, which will affect the final part and tool integrity, must be brought to Tiercon's attention within a reasonable amount of time. Such items are not limited to:

- Wall stock variations
- Ribs over 40% of nominal wall stock
- Draft conditions
- Die lock conditions
- Sections or sketches through lifters

5.1.3 The preliminary design is to be submitted to the Engineer for **written approval** prior to ordering of any steels or components. The preliminary approval will involve the following items:

- General lay-out
- Overall length, width, shut height, ejection and gating
- Machine tie bar locations relative to mould
- Mould material
- Mould weights (EST.), (Max. 60,000 lbs.) [Notify Tiercon in writing on mould weight exceeding 60,000 lbs.]
- Material to be moulded
- Mould designed shrinkage rate
- Mould designer
- Build timeline
- Lifter travel

5.2 Final Mould Designs

5.2.1 The final mould design drawings, which are approved by Engineering, are to be detailed.

5.2.2 The design and mould construction specifications are as follows:

- Drawing Standards:
- The mould drawings shall be complete and concise and contain as many views and sections needed to have a full understanding of the mould.
- There shall be at least one plan view of both the core and cavity halves and core and cavity centerline sections.
- Gates, runners, lands and vents will be fully dimensioned and shown in enlarged (4X)
- Centerlines of machines, mould and sprue shall be indicated.
- Cooling channel lay out and manifold system shall be shown.
- All lettering or labeling to be put on the mould shall be detailed.

5.3 Final Mould Design Dimensions

5.3.1 All dimensions shall be in decimal inches (part dimensions still in decimal millimeters).
5.3.2 Mould shut height shall be dimensioned and be at least ½" shorter than maximum shut height of specified press.

5.4 Mould build tolerances for part dimensions

- All two place decimals plus/minus .005"
- All three place decimals plus/minus .0005"
- Uniform wall thickness unless otherwise specified
- Wall thickness plus/minus .0035"
- Should multiple moulds be built, the shut height is to be maintained within .010" of each other.
- Multiple cavity tools to be balanced within 1% by weight of each other.
- Multiple cavity tools to be balanced for fill speed within 5%, i.e. 5-sec +/- 0.2 sec.

- Multiple cavity tools to be balanced within 1.0% by weight of each other for fully-packed parts.
- Multiple cavity tools to be balanced within 3.5% by weight of each other for short shot parts collected at 25% full, 75% full and injection transfer points.

5.5 Revisions

5.5.1 All revisions will be recorded in revision column shown on mould design.
5.5.2 A complete new set of drawings is required (reference Section 16.0) upon engineering changes.

5.6 Final Mould Designs

5.6.1 Part Identification (See Section 5.17 for Stamping Info.) must be in written format from The Tiercon Program Manager and include:

- Part Description
- Part number
- Cavity number with "RH" or "LH" if applicable
- OEM customers' company emblem/logo
- "Made in (Country of Origin)"
- Material code (as per SAE specification), (written verification from Tiercon)
- Date inserts/Grid: month/day/year stamped, (written verification from Tiercon) *DME or approved equivalent
- Customer specific safety symbols if required

5.6.2 Mould Identification must be stamped on a plate or directly on mould block

- All plaques must be permanently attached to outside of mold
- "Property of _____" (OEM Customers)
- "Top of Mould"
- Tool Source Name
- Tool Source Job #
- Tiercon Job #
- Mould Weight _____ lbs.
- Waterline "in" and "out"
- Electrical schematics (optional plate or engraved)
- Hydraulic schematics (optional plate or engraved)
- Water schematics (optional plate or engraved)
- Material shrink information
- Manifold schematics (plaque).

5.6.3 When a texture and/or specified gloss is used

- Texture source (original)
- Texture type (OEM spec i.e. "Montana BG")
- Gloss level (OEM spec)
- Optional plate or engraved

5.6.4 Painted on mould

- Tiercon Job # (3" high letters) White Paint. (Located at operator side, helper side (non-operator) and top of mould.)
- Operator Side and Non Operator Side, Black Paint
- Any important **safety** data in **Bright Red Box** (reference sections 5.13.10 and 5.13.11)
- " Top of Mould" Stenciled in large as possible white lettering.
- Tool to be Painted Tremclad Dark Blue.

5.7 Mould Components/Materials

5.7.1 Cavity and Core

- Standard application: High Hard P-20. (ref. GMN11049 section 4.3.2, GM approved source)
- A porosity check is to be performed after finish benching of cav. surface. Any porosity concerns must be reported to Tiercon and the steel supplier immediately. Corrective action must be taken before proceeding to continue working on the block. (ref. GMN11049 sec. 4.3.11)
- Moulding high abrasive: H-13 or S7 inserts with Rockwell "C" Scale of 46-48 or Treated
- Cavity and core blocks must be certified (available upon Tiercon request). (ref. GMN11049 sec. 4.3.3)
- Minimum 5" solid steel under lowest point in core and cavity unless approved by Tiercon in writing.

5.7.2 Lifter

- Identical to core material, same supplier. Must be Stress Relieved. (ref. GMN11049 sec. 4.15.1)
- Square one piece design Lifter Bars must be nitrided.
- Mould Max material with water. Must be approved by Program Manager.

5.7.3 Lifter T-nut

- Ampco 18 (Varies from GMN11049 for material and design, sec. 4.15 fig. 7)

5.7.4 Clamp Plates, Manifold Plate, Parallel, Retainer Plate, Ejector Plate and Safety Strap

- Cold rolled steel, boiler plate or equivalent, i.e.: 1020
- Must be identified on Tool Design.

5.7.5 Slide Material.

- Identical to core material, same supplier. (ref. GMN11049 sec. 4.14.1)

5.7.6 Pillar Support

- Cold rolled steel.

5.7.7 Ejector Pins, Stop Button, Return Pins, Bushings, etc.,

- Are to be purchased from DME whenever possible.

One ejector pin per cavity must have Tiercon authorized bar code added.

5.7.8 Plaques

- Aluminum, no plastic.

5.7.9 Cylinder Yokes

- P20 steel.

5.8 Mould Build Specifications

5.8.1 Stress Relieving

- Core and cavity must be stress relieved after rough machine. (ref. GMN11049 sec. 4.3.5)
- Vibration is not an acceptable method.
- Lifters must be stress relieved by the method discussed & approved by the Tiercon Program Manager. (ref. GMN11049 sec. 4.15.2)

5.8.2 Welding

- No welding to be done on any mould component without written Tiercon Tooling

Engineer approvals. Must be recorded and charted on a mould welding request form and signed. (ref. GMN11049 sec. 4.3.8, 4.3.9)

- Stress relieve after welding.
- Preheat for color matching on Class A surfaces.

5.8.3 Locating Ring

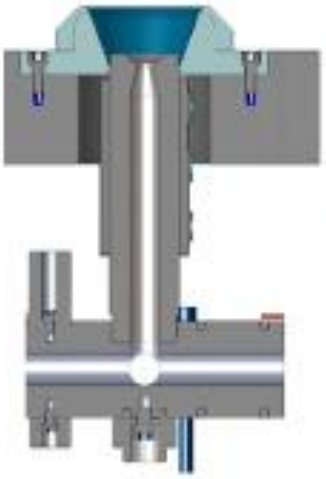
- All locating rings to be 4" up to 990-Ton, 5" when greater than 990-Ton unless otherwise specified in writing by Tiercon Program Manager.-
- Nozzle spherical radius .750 typical for all machines.
- Standard DME sprue bushing to be used wherever possible.
- All sprue bushings shall be keyed to keep from rotating.
- Sprue orifice diameter specified by Tiercon Program Manager in writing (Depending on mould flow results).
- The sprue bushing area must not have any undercuts between the back-plate and the sprue bushing. This area must be sealed and have at least 5 degrees draft per side. (Inherent on hot manifold tools.)

5.8.4 Runner System

- All runners and size to be determined by the Tool source and approved by the Tiercon Program Manager in writing. (ref. GMN11049 sec. 4.6.1)
- All runner systems to be vented. (ref. GMN11049 sec. 4.6.4)
- Runners shall be constructed to a balanced layout.
- A cold slug "reservoir" will be incorporated at the sprue puller and at the end of each of the runners, i.e.: 1 1/2" x dia. (ref.

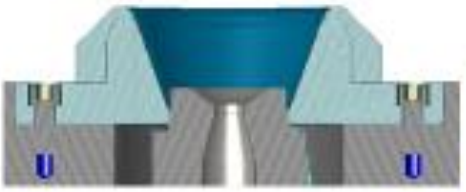
4" & 5" Locating Ring for Manifold

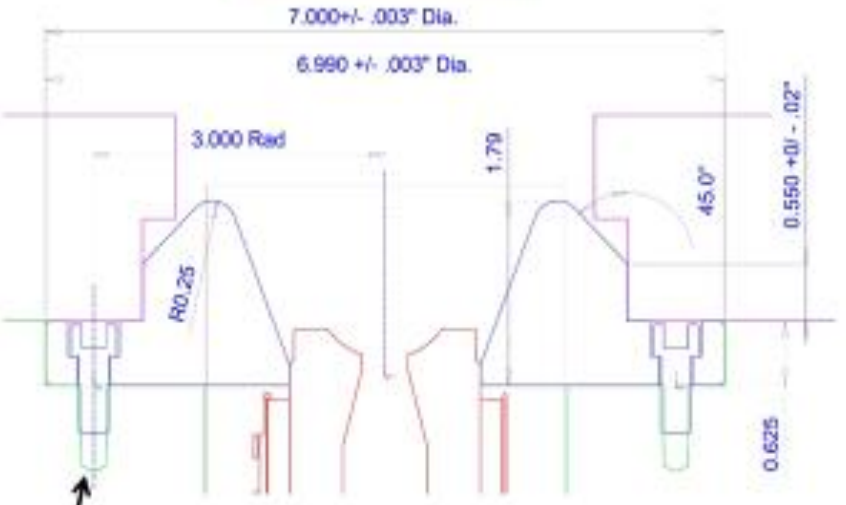
TIERCON



With this design the 4" & 5" Locating Ring is interchangeable between each other and from Manifold to Hot Drop

5" Locating Ring Shown

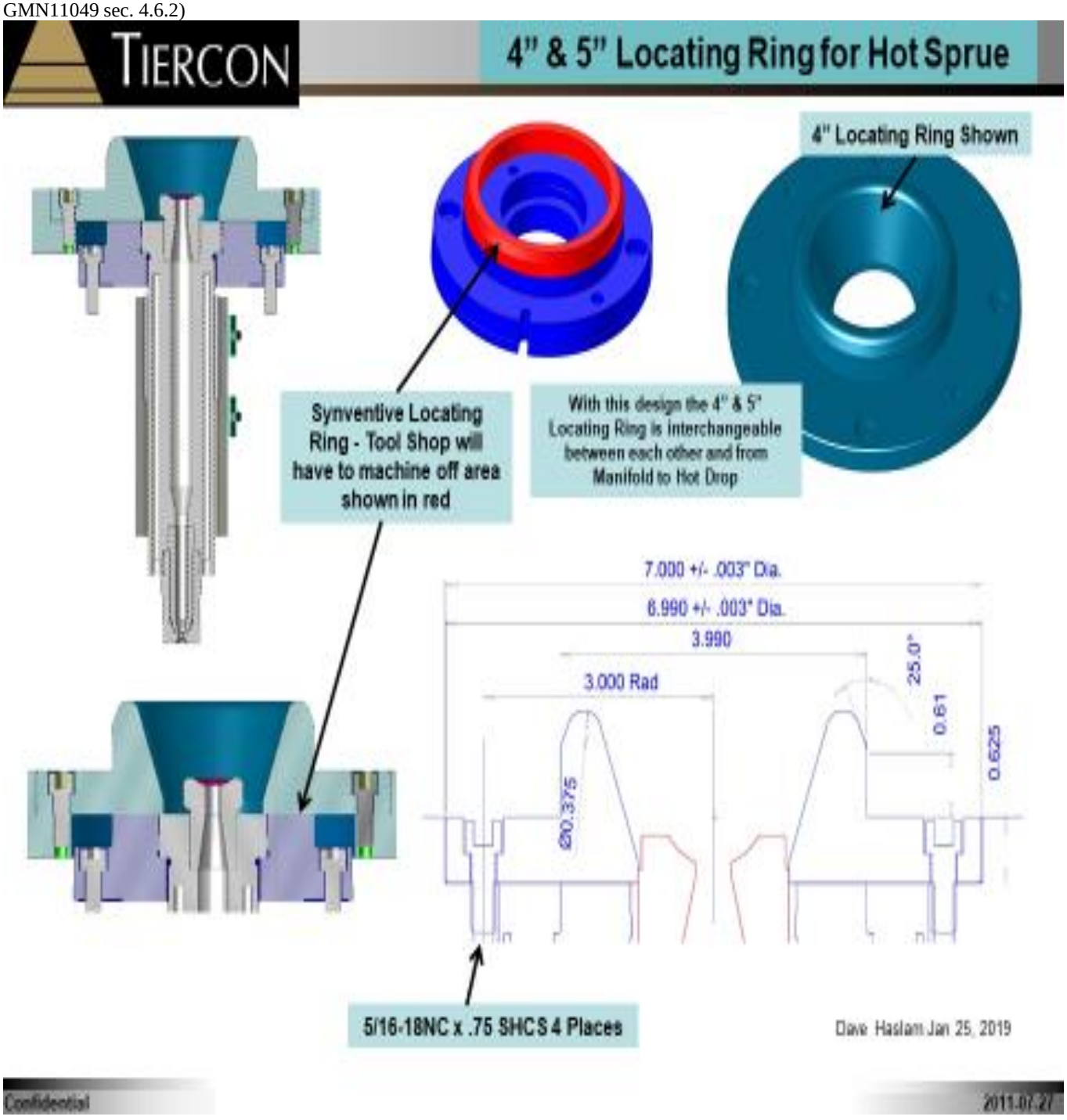




5/16-18NC x .75 SHCS

Dave Haslam Jan 25, 2019

GMN11049 sec. 4.6.2)



5.8.5 Runner Shut-Off Insert

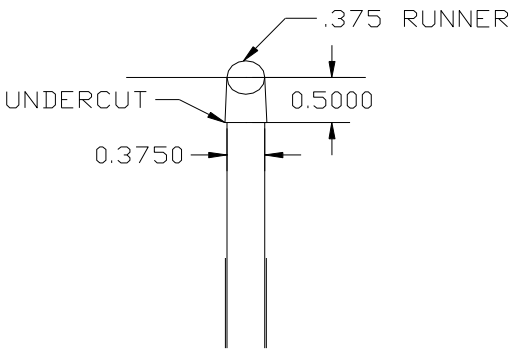
- **Standard on all moulds with multiple parts** unless SVG manifolds are used**.**
- P-20 material or steel equivalent. Include recessed storage pockets for inserts. Do not make the inserts reversible.
- Runner shutoffs with cap screws should have fasteners located at lest 2x dia. from runner edge.

5.8.6 Gates (Also see section 5.14)

- Tiercon Program Manager shall approve the type of gates to be used and their locations. (ref. GMN11049 sec. 4.6.1)
- Mould flow is required & must be part of the tool timing build
- Proper gating dimensions will be determined in conjunction with the material supplier. (Depending on raw Material). These must be in writing from the Tiercon Program Manager.

5.8.7 Sprue Pullers

- The sprue puller of choice is the tapered undercut Type. Dimensions below are in inches. (ref. GMN11049 sec. 4.8.1)



5.8.8 Vents

- <u>Mould try-outs will not be accepted without machined vents *opened*</u>
- All vents to be min. 0.0015" deep x 0.100" land x 0.500" wide and brought out to parting line clearance. May vary depending on material used. (ref. GMN11049 sec. 4.7.1)
- Vents to be spaced 2-2.5" apart max.
- All vents must be clear to atmosphere.
- Pockets, ribs and blind features must be vented.
- Lifters & Runners must be vented.
- Vent all Ejector Pins. (ref. GMN11049 sec. 4.7.2)

5.8.9 Parting Line Shut-Off

- Flat parting lines with no specific seal-off are not acceptable.
- In general, seal-off surface shall be 1.25-1.50 wide around entire periphery of cavity, runner system and guide pin areas. Spot-off shall be 85-100% on these surfaces. (ref. GMN11049 sec. 4.23.3)
- If vertical shut-off is required, draft angle on surfaces must be discussed with the Tiercon Program Manager.
- Pressure pads on Parting Line P-20 Nitrided (All tools, core and cavity) (Varies from GMN11049 sec. 4.23.4, using hardened pads)
- Preload to be determined after first tryout.

5.8.10 Locks

- Locks will be incorporated in tool to prevent side thrusts from deflecting mould sections, no inserts. (ref. GMN11049 sec. 4.23.7, **varies from GMN11049 sec. 4.23.8 **no Ampco inserted wear pads to be used.)
- A 15-degree min. angle design parting line lock will be utilized to prevent core/cavity motion during injection.
- Locks must not interfere with automatic part de-moulding, i.e. part dropping in auto.
- Any lock moving a slide or backing it up must have a wear-plate incorporated (material Ampco18).

5.8.11 Horn Pin

- Burn Hex at the end for easy removal. (A setscrew can be used in replace of burning a hex. Setscrew must sit below surface and be welded in place.) or Flats on horn pins need to be opposite of engagement to slides.
- Unified National Course thread to be used to secure horn pin in place.
- Threaded portion of the horn pin shall be bottomed out in the hole of the pin and permanent Loc-tite to be used.
- Consider a keeper style lock instead of threaded design. *See figure 1-1

5.8.12 Guide Pins

- Must be incorporated on side that will least restrict to automatic part de-Moulding.
- Guide pins are to be hardened and ground DME brand or equivalent. Shouldered are preferred. Must be tapered at the end, 1/3 of working length at 5 degrees. (ref. GMN11049 sec. 4.11.4)
- Guide bushings are to be bronze plated, grooved and shouldered. To be recessed. (ref. GMN11049 sec. 4.11.3)
- Guide Bar or Guide pin at "0" corner must be offset to prevent improper closing of tool. (ref. GMN11049 sec. 4.11.1)
- Square or Rectangular Guide blocks are to be used for large moulds.
- Must have chamfered clearance (45 deg. on rail edge) below for clear out. (ref. GMN11049 sec. 4.11.2, fig. 5)

5.8.13 Core Pins

- Sleeved pins are to be used whenever possible on ejector side.
- Core pins of standard hardness are acceptable, DME or equivalent.
- Core pins must be mounted so that replacement can be accomplished with minimum mould disassembly.

5.8.14 Ejector Pins

- It is the responsibility of the tool source to ensure a sufficient # of ejector pins to de-mould part per design intent.
- Location and size to be determined by Tiercon Program Manager and Tool Source.
- Ejector pins on parting line surface are not acceptable.
- Contoured pins must be positively locked. "D" lock preferred.
- Any pins less than 3/16" dia. must be approved in writing by Tiercon Program Manager.

5.8.15 Return Pins

- Return pins must not interfere with automatic part de-Moulding.
- Minimum diameter of pin to be ¾" unless otherwise specified.
- Standard, hardened and nitrided, DME or equivalent.
- A minimum of four (4) pins per mould is required. Moulds over 48" long must have 6.
- Stop buttons must be provided under each return pin.
- .060 preload is required (spring).

5.8.16 Ejector Guide Pins and Bushings

- Hardened pins shall guide ejector plates and Ampco 18 bushings, DME or same, i.e.: GEB – 100. (varies from GMN11049 sec. 4.10.1, no graphite impregnated bushings)
- Minimum of four (4) pins are required. Mould over 48" long may require 6 pins. (Size, location and quantity are the responsibility of the tool source.) (ref. GMN11049 sec. 4.10.2, 4.10.3)
- Must be counter bored into back of core shoe, no clearance.
- All ejection guides must have grease fittings on outside of the ejection plate and counter bored flush to ejection plate accessible in press position.

5.9 Ejector and Retainer Plate

5.9.1 Use the following chart as a guideline to determine ejector and retainer plate thickness.

Maximum Width	Maximum Length	Min. Thickness Retainer Plate	Min. Thickness Ejector Plate
6.00	8.00	0.50	0.75
7.50	24.00	0.50	1.00
8.50	24.00	0.50	1.00
20.00	36.00	0.75	1.50
30.00	54.00	1.00	2.00
35.00	63.00	1.25	2.00
40.00	72.00	1.25	2.50

5.9.2 Type of ejector advancement is to be discussed with Tiercon Program Manager. Hydraulic is required on 500-Ton and greater unless expressed in writing by The Tiercon Program Manager.

5.9.3 If hydraulic ejection system is utilized, provisions for a standard knockout pattern must be incorporated per machine specifications.

5.9.4 When hydraulic ejection and lifters are being used, a provision for threaded knockouts must be incorporated.

- Knock out thread size .750inch 500 ton or larger
- Knock out thread size .500inch 490 ton or smaller

5.9.5 Ejector Plate Return (Reference section 5.13.13 for important information.)

- Spring or Hydraulic return is preferred unless otherwise specified by the Tiercon Program Manager.
- The Program Manager shall specify the use of die springs. They shall be Medium-duty (blue) compression and located in counter-bored hole.
- Compression shall not exceed 35% of free length DME or equivalent. All springs should have ¼" pre-load (min). Withstanding a weight of 1 ½ times the plate weight.
- Gas shocks are an option to be considered for ejection return.

5.9.6 Pillar Supports

- To be used as close as possible to the area of maximum load (under cavities and runner system).
- Quantity, size and location are the responsibility of the tool source.
- 0.002 – 0.004 pre-load should be incorporated and noted on the drawings as well as stamped on the pillar support themselves. (loose shim for pre-load is unacceptable, (ref. GMN11049 sec. 4.12.2)

5.9.7 Parallels

- Located In-Board from edge of clamp plate.
- Chip or debris build dropout area must be incorporated.
- Hydraulic line channels may be drilled in these.

5.9.8 Stop Buttons

- To be located in bottom clamp plate directly in line with return pins and as required.
- Travel stops which limit ejector plate travel shall be placed near knockout hole locations or as close as possible.

5.9.9 Mould Inserts

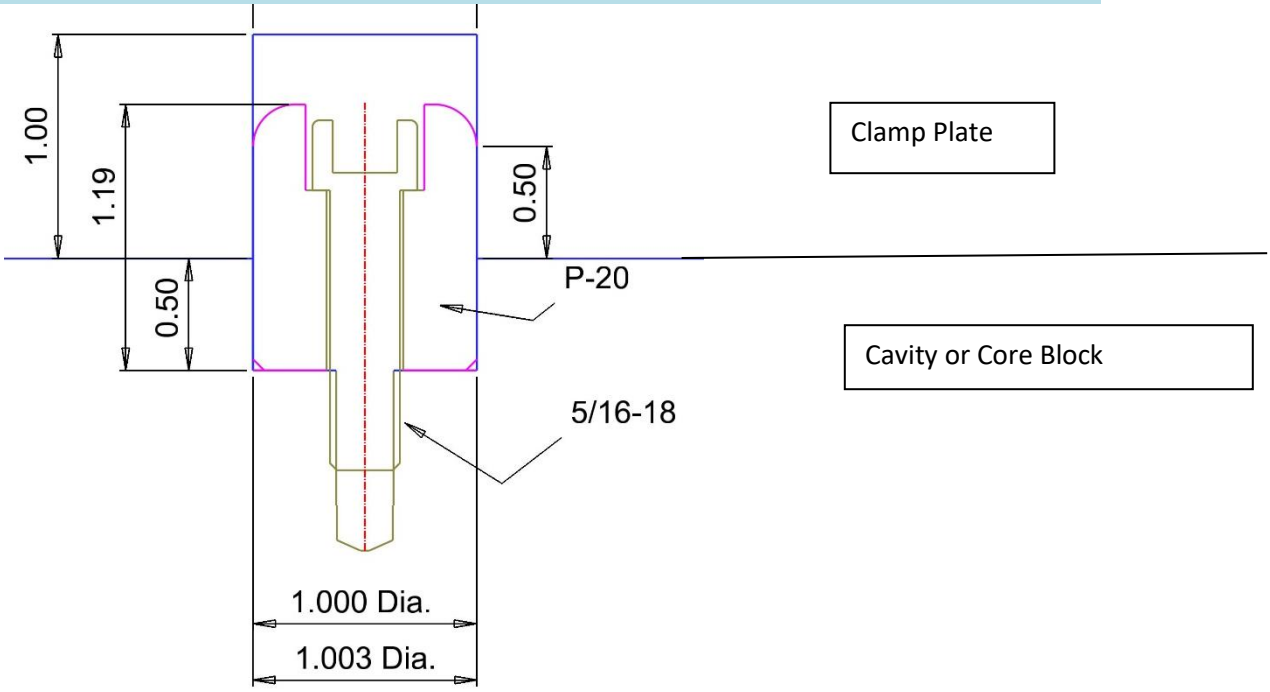
- Mould inserts should be accessible from clearance holes in the back-plate, wherever possible.
- Stamped information on jackscrew size should be present at that location on back-plate. (i.e.: ¼ - 20 Jackscrew)
- Provide two (2) knockout holes for each insert, perpendicular to insert rear surface, threaded jack-out holes should be incorporated.
- Each individual insert block should have it's own separate pocket in mould base for storage.
- The backside of the insert must have the Tiercon Job # stamped on it.

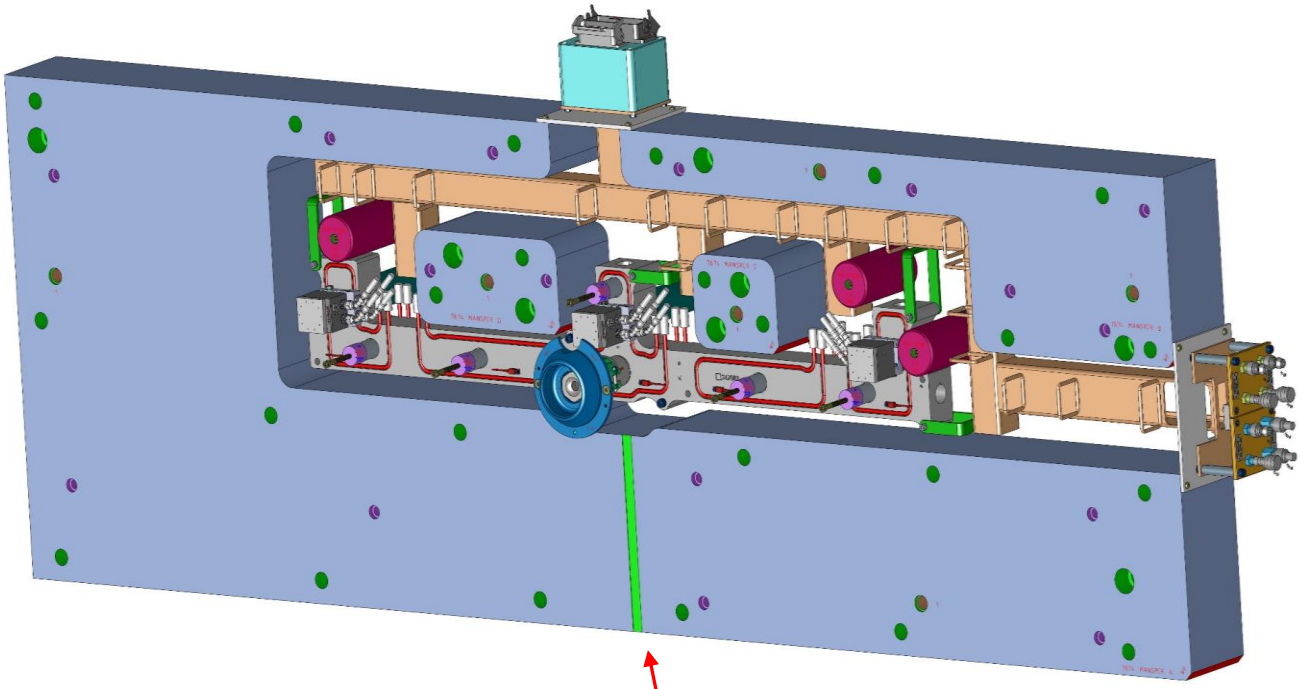
5.9.10 Clamp Plates

- QMC plates should be quoted on all tools 1500-Ton and above as an option.
- QMC plates should be discussed prior to tool design with The Tiercon Program Manager.

Clamp Plate locating.

Top Plate MUST be located to Cavity Block
Bottom Plate MUST be located to Core Block
Dowels are not allowed
Use Locating Puck Shown
Tool Shop can modify sizes shown
Concept NEEDS to be the same





Low Point in Manifold pocket MUST have a slot vented to the bottom of mold.
Note: If low areas are not tied in to each other, each one will need a slot

5.9.10.1 All clamp plates should be designed with the following items:

- Less than tie bar horizontal spacing.
- Clamp holes must be incorporated. 3/8" oversize to maximum machine size specifications of clamp bolt thread diameter. Depending on press size, more than one size hole may be required. (ref. GMN11049 sec. 3.7.2)
- Design must allow clearance for impact gun accessibility to clamp bolts. i.e.: holes too close to core or cavity block, water manifold clearance, etc.
- Clearance holes must be incorporated in both core/cavity clamp plates at std. ANSI pattern for machine knockouts as well as lifter removal/access.
- Clamp Plates to extend beyond core and cavity blocks, will act as stand-offs to protect components. Incorporate additional stand-offs so core and cavity blocks can free stand on their own. (ref. GMN11049 sec. 3.7.2)

5.9.11 Lifting Devise

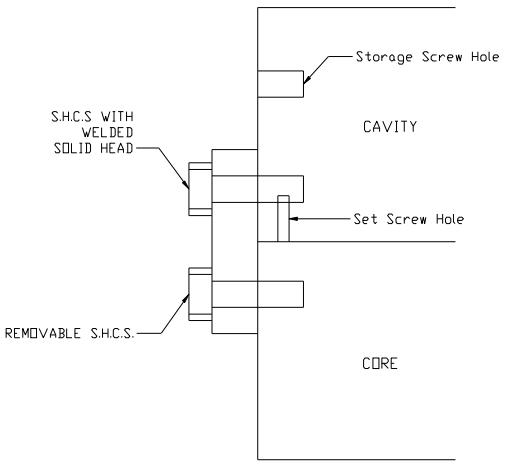
- On approval swivel lift rings are to be used; however, mold must be balanced 100%. No Square or sharp edges on interior lifting area, damages hooks on crane/chains.
- Lifting device must be have approved location to lock into place during production ie standing pin.

5.9.11.1 Shot Counter

- All moulds to have a shot counter- must be on operator's side of mold Must be Progressive with all final data, CMM Data, 2D prints,3D prints as well as BOM populated into the shot counter.

5.9.12 Safety Straps

- Should be located where visible when mould is in the press, i.e.: operator and non-operator sides.
- Two- (2) safety straps per mould, one (1) per side and opposite end to each other. (Varies from GMN11049 sec. 4.19.1)
- Four (4) ¾ diameter Bolts to be used on moulds over 12,000 lbs.
- Safety straps should be painted RED. (ref. GMN11049 sec. 4.19.1)
- Safety strap to have permanent swivel point and lock with storage hole. (ref. GMN11049 sec. 4.19.4)
- Nominal distance of 3" between centers on all shipping strap boltholes.



5.9.13 Eye Bolt Holes

- Each mould will have eyebolt holes on all faces of the mould on both core and cavity halves. Placed where the lift hooks will not interfere with mould components. (I.e. hoses connectors, etc.)
- The size of the eye bolt holes will be specified based on mould weight as follows:

Recommended Max. Mould Wt.	Thread Size	Tap Depth	Preferred Clearance
50 – 4,000 lbs.	¾ - 10 N.C.	1 ½ inch	6 inch dia.
4,000 – 10,000 lbs.	1 – 8 N.C.	1 ¾ inch	6 inch dia.
10,000 – 18,000 lbs.	1 ½ – 6 N.C.	3 inch	9 inch dia.
18,000 – 30,000 lbs.	2 N.C.	4 ¼ inch	14 inch dia.

- Provisions for eyebolt holes on the cavity back-plate within a 3-ft. diameter of the sprue bushing must be incorporated for lifting purposes from a truck.

- Additional holes must be within 6" of the edge of the Core and Cavity back-plates on all sides. This is for rotating the mould for disassembly.
- Lift rings should be discussed with The Tiercon Program Manager prior to build of the tool.

5.9.14 Slides

- Mechanically actuated slides properly heeled are preferred over hydraulically actuated slides and should be employed wherever possible. If hydraulically driven, limit switches are required. (ref. GMN11049 sec. 4.14.2)
- Slide material to be the same core material.
- Slides should travel entire distance in both directions prior to actuation.
- All sliding surfaces must be greased using approved grease *see Lubrication Requirements Section 5.11.16.
- Incorporate grease grooves in slides, wear plates, and Gibbs where feasible. Grooves should be 0.025" deep.
- Wear plates and Gibbs are to be constructed of Ampco 18 materials. (ref. GMN11049 sec. 4.14.9.1 varies from ref. GMN11049 sec. 4.14.10, graphite impregnated gibbs)
- Wear plates to have a consistent thickness of 0.250" for all slides.
- All Gibbs should maintain nominal height and width of 1.000", length will be to suit. A nominal distance between hole centers will be 2", using 3/8-UNC S.H.C.S.
- Slides that open to the outside of mould must have positive stop blocks to prevent accidental drop-out from the mould.
- A positive system to keep slides in the proper orientation when the mould is open must also be incorporated, i.e.: external or internal spring. (ref. GMN11049 sec. 4.14.5) Gas Shocks to be used on large slides.
  Note: A ball-plunger type of retention for this purpose is not acceptable.
- All slides over 10 lbs. must have handling holes (drilled and tapped) for removal and installation. (ref. GMN11049 sec. 4.14.12)
- All wear-plates for slides must have outboard grease nipples on large tools.
- All slides require integral Heel Locks. Heel locks in slides to be inserted with Ampco18 material. (ref. GMN11049 sec. 4.14.8.1)
- Slide retainers DME with sensors (DME smart lock).
- Clamp down holes for slides and well spotted locking angles shall be incorporated in cavity half of mould for ease of matching.

5.9.15 Lifters

- Maximum angle of lifter rods is to be 15 degrees. Any condition requiring greater must be discussed with Tiercon Program Manager. (ref. GMN11049 sec. 4.15.3)
- Maximum stroke of machine ejection system is to be used to minimize lifter angle.
- Minimum length bearing bushing of 3-½ inch is to be used for all angular lifter slides. Bushings should include grease grooves, DME preferred. Top and bottom bushing is required.
- All lifters are to be fastened to lifter bars via spring steel rolled pins. (No Thread)
- Pin sizes are as follows: (Ream Fit)

Lifter Bar Diameter	Roll Pin Diameter
1.00	0.250
1.25	0.375
1.50	0.375
1.75	0.500
3.00	0.500

- All angular lifters are to be fastened to the lifter slide using self-locking screw, i.e.: Nylock or same. National course screw is required.
- Lifters across parting lines **are not to be used** without approval from The Tiercon Program Manager.
- All lifters are to be consecutively numbered with lifter shaft length stamped on all shafts. (ref. GMN11049 sec. 4.15.4)
- All lifters over 10 lbs. are to have handling holes (drilled and tapped) for removal and installation. (ref. GMN11049 sec. 4.15.7)
- All lifters must be vented.
- Lifter travel must advance a min. of 0.100" from die lock conditions. This travel must be shown on final design drawings.
- Lifters should be guided if room allows via additional shafts or blind pins.
- Water in lifters is essential. See mould cooling requirements section 5.10.
- *See Lubrication Requirement Section 5.11.16.

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- Lifter T-nuts made from Ampco 18 will be designed to function between ejector and retainer plates. (Varies from ref. GMN11049 for design and components sec. 4.15 fig. 7) Consider a design with no ears, solid rectangular block for lifter foot
- T-nut Housings, which are mounted to ejector plate, will be used for accelerated and de-accelerated lifter designs.
- All lifter bolts to include lock washers.
- 90% min. surface contact after spotting. (ref. GMN11049 sec. 4.15.8)
- Bushings are to be secured in the core block with a snap ring; however, if an anti-rotation lock is requested this will replace the snap ring.

5.10 Mould Cooling Requirements

5.10.1 Water lines must be present in all inserts, lifters and slides. Deviations are to be approved by Tiercon.

5.10.2 Water flow patterns in tool will be discussed with Program Manager with recommendations from tool shop. Tool shop will take ownership for improper cooling.

5.10.3 Water lines must be ¾ from the part surface and no more than 2 times their diameter between each other. This may vary from

Tool to Tool.

5.10.4 Water lines must be no closer than ¼ inch to ejector pins, core pins, seal-off, etc.

5.10.5 Use bubblers only in areas requiring spot cooling or thermal pins. Do not use Beryllium inserts.

5.10.6 Bubbler plug should be marked to identify baffle position. Use brass for the baffle and the plug. (DME Style). (ref. GMN11049 sec. 4.9.14)

5.10.7 To create optimum cooling, thermal pin shall be connected to a water line.

5.10.8 Inlet and outlet clearances must be provided around machine tie-bars.

5.10.9 All lines to be no less than ½" NPT in diameter utilizing Jiffytite quick disconnects (DME). Larger moulds should be ¾" NPT diameter specifically 500-Ton and up. To be approved by The Tiercon Program Manager.

5.10.10 All water line disconnects are to be recessed in the mould and flush with the outer surface.

5.10.11 All water lines are to be identified and stamped with 1/2-inch high letters as "IN" and "OUT". Numbered on core. Lettered on the cavity. Paint rings around jiffy connectors Blue-IN, Red-OUT (ref. GMN11049 sec. 4.9.8.1, 4.9.8.2)

5.10.12 1-¼ inch NPT quick connectors. Part number: Parker BST-10 Female – 1¼ and Parker BST-N10 Male – 1¼. MAIN IN-Male, MAIN OUT-Female for manifold type designs.

5.10.13 External plumbing when used must be flush with mould surface.
Water fittings must be sealed with Teflon Tape and Thread Sealant (Loc-tite 592). Use Parker Push-Loc abrasion resistant hose, yellow rings must be installed and not able to turn by hand. NO GEAR CLAMPS.

5.10.14 Lifters and slides must be piped using a combination of water line pipes and hoses. When applicable use DME extended brass Jiffy pipe; otherwise, black nipple pipe with brazed connector is acceptable.

5.10.15 Water system plaques will be attached to the side of the mould opposite the operator. It will be an aluminum plaque or engraved.

5.10.16 Water main connections are to be plumbed to non-operator side of tool. To outer edge of Tool.

5.10.17 Water channels shall be machined on Top of Mould side, connecting water ins and outs to ensure water and oil runoff is diverted away from moulding surfaces.

5.10.18 Hard piping must be approved by Tiercon and if used must be supported properly.

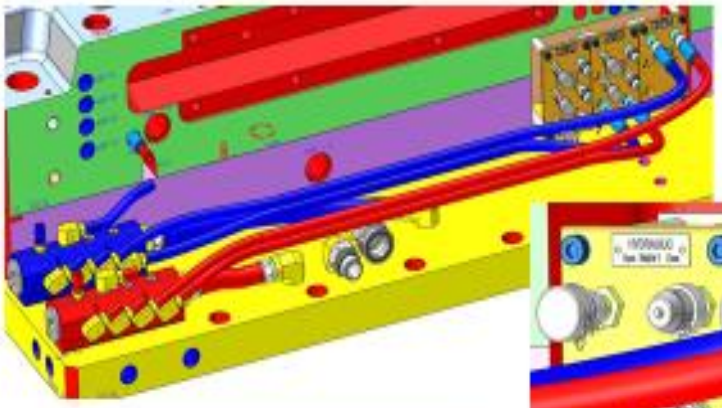
5.10.19 Lifter and slide water must be separate from core or cavity water blocks. This will require additional manifolds and main hook-ups.

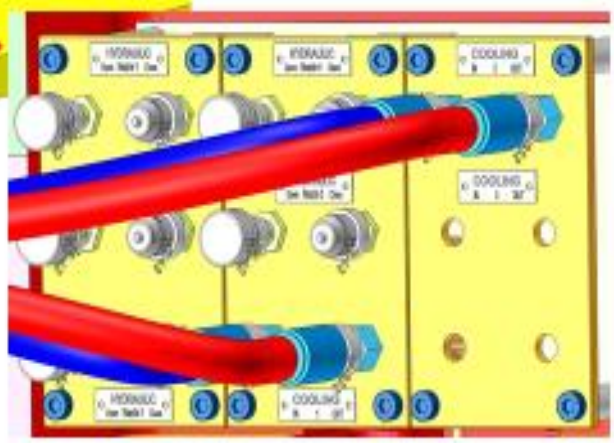
5.10.20 Use of "O" rings must be approved from Tiercon. (ref. GMN11049 sec. 4.9.4)

5.10.21 The mold must be tested for continuous flow and pressure at 550 kPa (80 psi) at build source. (ref. GMN11049 sec. 4.9.10)

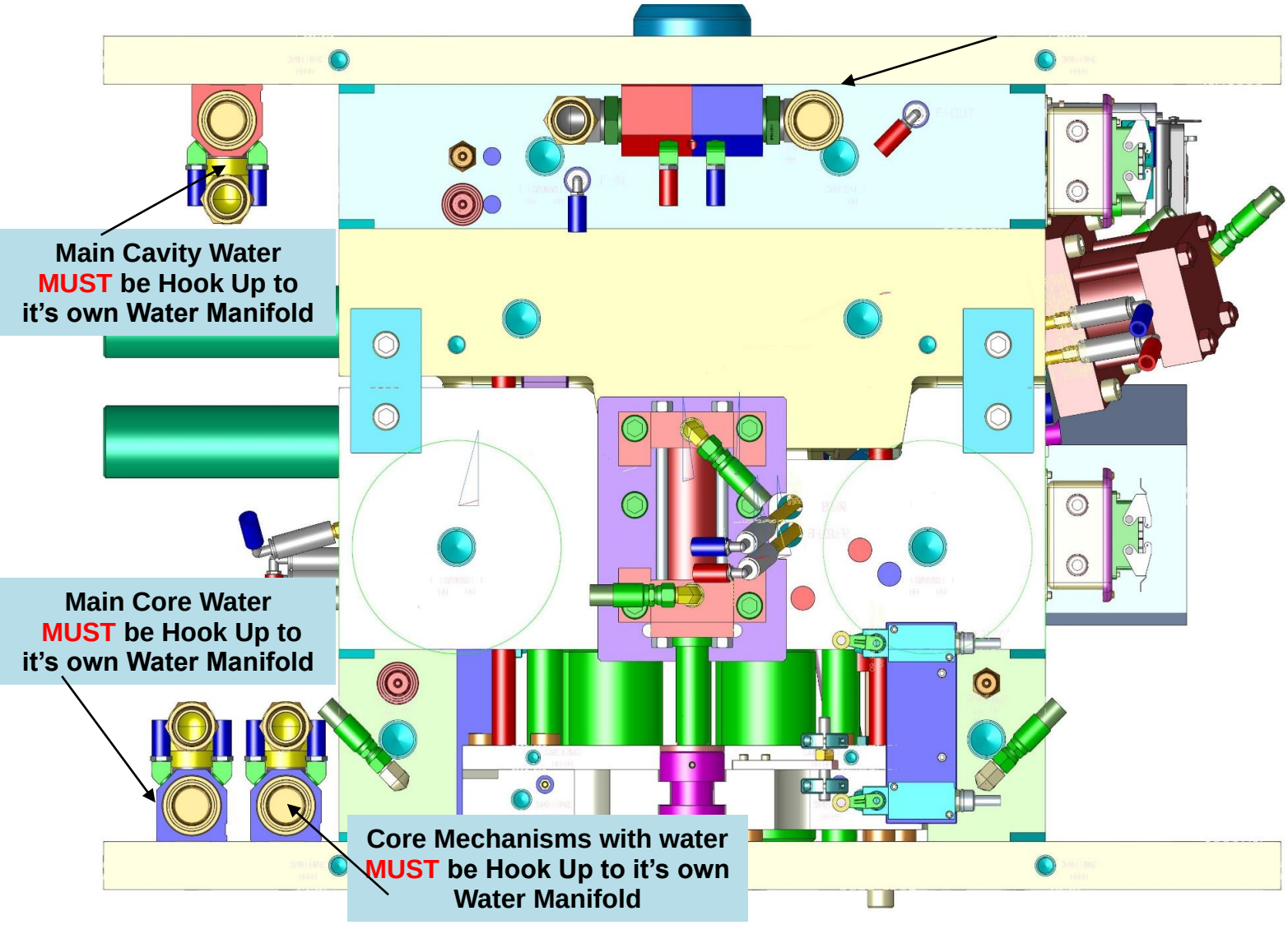
Valve Gate Water – Each Circuit Needs to be plumbed separately into the Main Water Manifold

Stoney Creek - Co-Plas - Oshawa





If mold water temperature is set higher than 140 degree a separate Water Manifold for the SVG Hydraulic unit will be needed



Note: ALL water hook-ups needs to be away from Tie-Bars

Cavity Mechanisms with water MUST be Hook Up to it's own Water Manifold

5.11 Finish Requirements

Seal Off and Load Bearing Surfaces

In order to prevent flash, premature tool wear and the need to use excessive clamp tonnage the clamp force must be properly distributed over multiple load bearing surfaces.
The following guidelines must be followed. Any deviations must be approved in advance and in writing by the Tiercon Tooling Engineer:

- The parting line seal off must not exceed 50% of the total load bearing surface area for the mold. This means that 50% of the clamp force bearing surface area must be made up of pressure pads and/or other bearing surfaces like the areas surrounding the guide pins.
- The parting line bearing surface (seal off) must be a minimum of 1.5" wide around the entire periphery of the molded part(s) and runner system. The seal off must not be minimized to achieve the 50% - 50% ratio but rather pressure pads must be added.
- All seal off areas are to be flat stoned to a minimum 240 finish. No cutter marks.
- Seal offs around parting lines must be perpendicular to clamp force whenever possible.
- Seal off angles must be approved by the Tooling Engineer.
- Non load bearing areas beyond the 1.5" parting line bearing surface must relieved a minimum 0.060" and be finished to a 180 disk. Cutter marks are not acceptable.

Spotting

In order to prevent flash, premature tool wear and the need for excessive use of clamp tonnage proper spotting is considered to be of paramount importance. The following guidelines must be followed. Any deviations must be approved in advance and in writing by the Tiercon Tooling Engineer:

- All molds must be reviewed by Tiercon for proper spotting.
- The Tool Shop must make arrangements to demonstrate to the Tiercon Tooling Engineer (or designate) that proper spotting of the mold has been accomplished.
- The Tooling engineer to verify the mold spotting prior to first shots.
- Tiercon expects the Tiercon Tooling Engineer to be present to buy off on the final spotting review process especially the initial application of the spotting blue to a clean mold.
- Tiercon's in-house moldmakers will also conduct a spotting validation in the home line molding machine as part of the mold buy off procedure. The Tool Shop is welcome to be present for this procedure.
- The entire seal off, all load bearing surfaces, pressure pads and return pins must be blued during the spotting buy off.
- Tiercon expects even contact (even blue transfer) and no hard hitting areas (heavy blue transfer).
- Spotting validation to be completed at less than 50% of the molding plant's intended tonnage (not Mold Flow predicted tonnage)
- Tiercon may choose to use Mold-Align Pressure Sensitive Mold Aligning Paper (or comparable paper of film) to validate proper spotting.

5.11.0 Final spotting of tool must be verified by a Tiercon tooling engineer in the spotting press with pictorial verification while the tool is in the final spotting press.

Final Spotting Cont.

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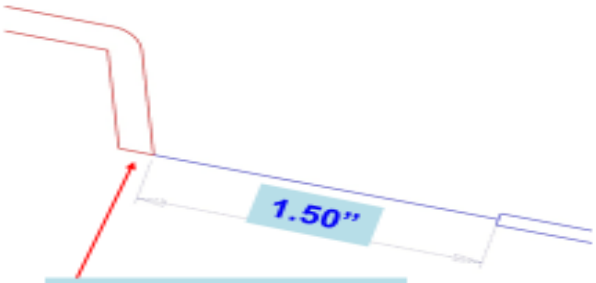
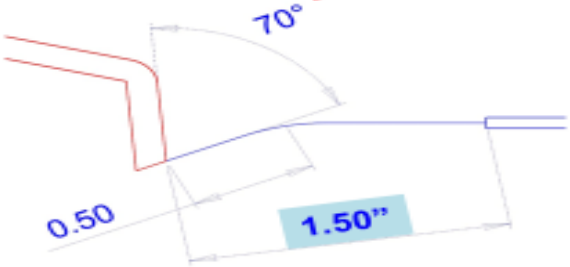
Slide 1

1000 Ton and Up 1.5" Seal-Off
Below 1000 Ton 1.25" Seal-Off



Parting Line Skirt **MUST** run off normal to the adjacent surface – If not needs to be signed-off by Tiercon Tooling Engineer

If Cavity Edge is less than 70 Degree between the Parting Line & Cavity Surface needs to be signed-off by Tiercon Tooling Engineer



If Seal-Off skirt angle gets too steep run off normal to the adjacent surface .5" and Transition as shown

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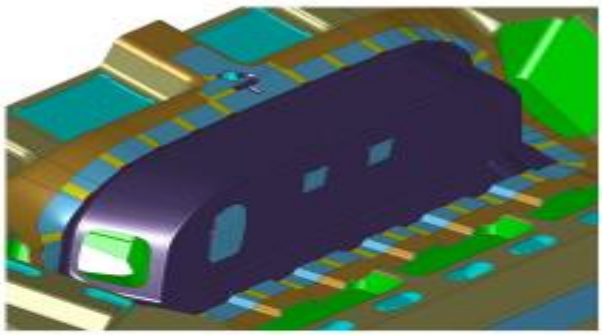
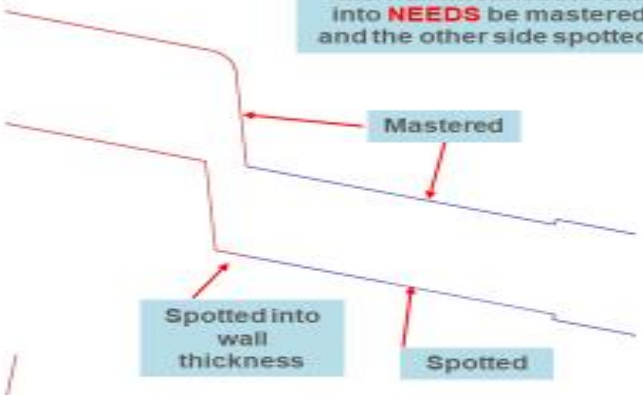
Slide 2



Any Molds that have Core Bead (match or mismatch) the Cavity MUST be Mastered

On **all** Molds – Where ever the wall thickness is cut into **NEEDS** be mastered and the other side spotted.



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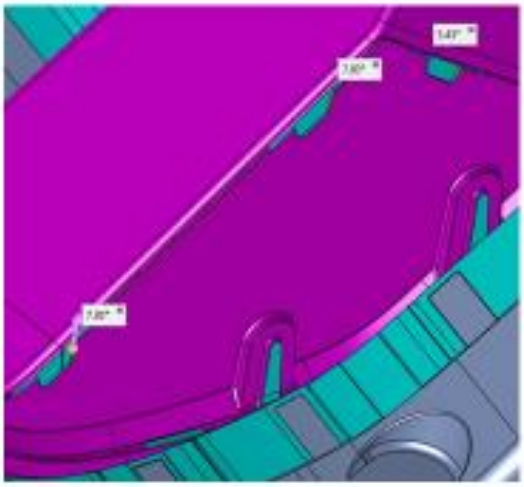
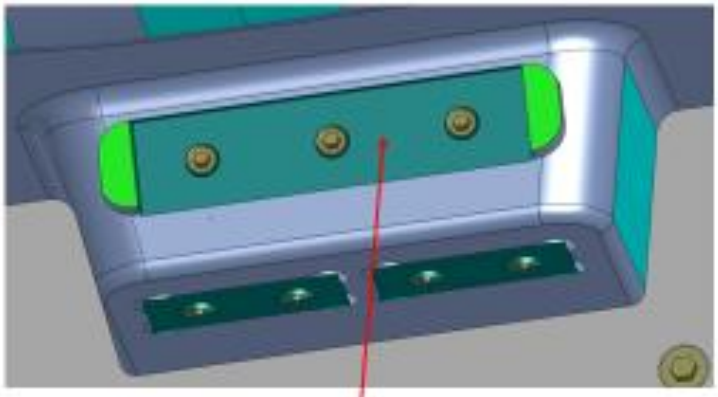
500 Ton and Up **MUST** have Die-Liners if any Parting Line Seal-Off is less than the Main Parting Line Locks



Die-Liner Angle needs to be 2 degree less than lowest Seal-Off angel

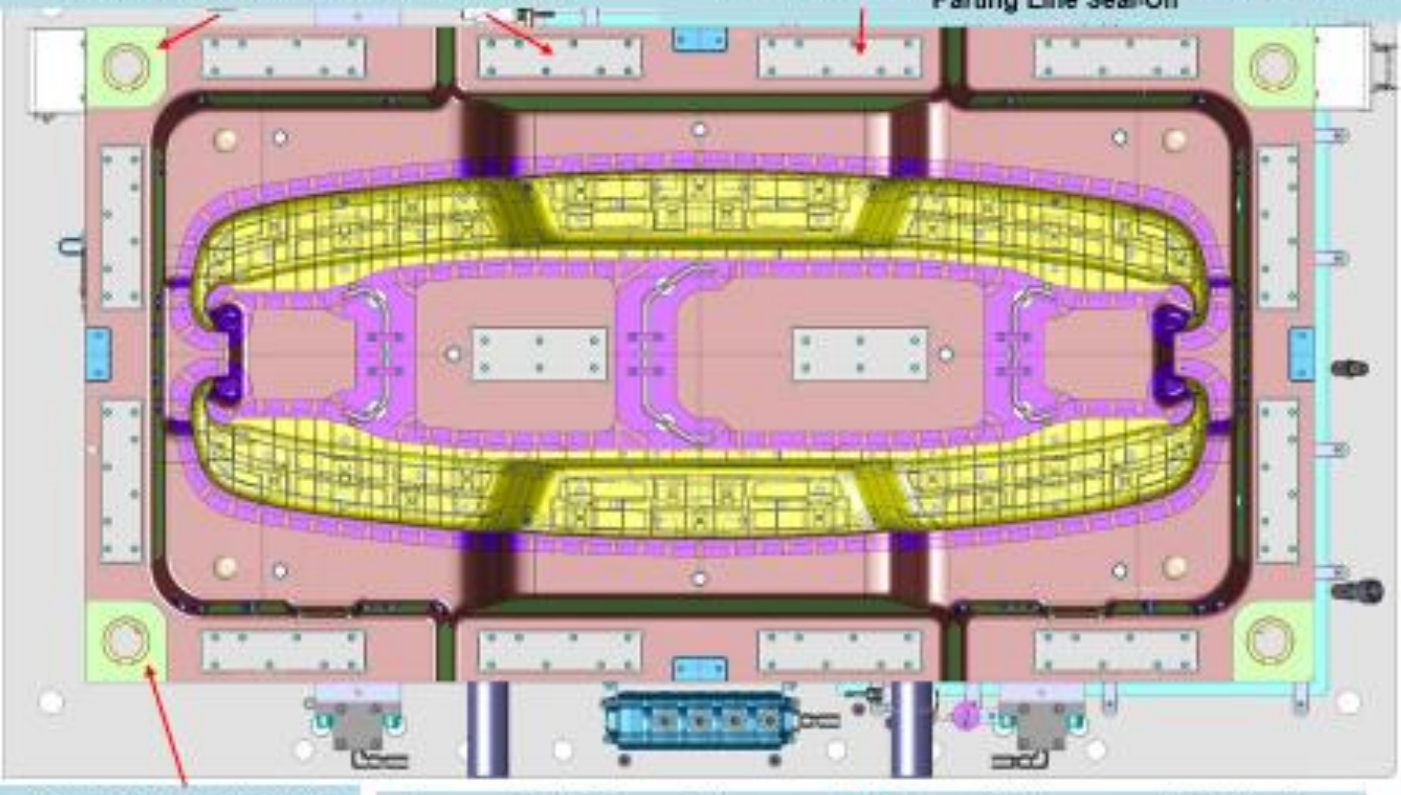


Die-Liner **MUST** be recessed into a pocket holding in top & bottom max. of .005" per side clearance

Below 500 Ton **MUST** have Top Locks if any Parting Line Seal-Off is less than the Main Parting Line Locks

ALL Parting Line Pressure Pads & Corner Pads NEED to be .001/.0015" clear Seal-off

Parting Line Pads need to be placed around mold as shown to balance the load from Injection Press Tonnage to maintain Parting Line Seal-Off



4 Corner Pads Need to have the Same Hit as the Parting Line Pads

Pressure Pads & Corner Pads sq. area MUST be at a Minimum equal to Parting Line seal-off sq. area

50% Parting Line / 50% Padded area or higher - Typically on a single cavity mold the Parting Line Pads is 2x Parting Line just for proper support around the mold

Final Spotting Approval must be done at plant in home line or back up press. If plant deems the spot unsatisfactory the tool shop will pick up the tool respot the tool at their expense

Blue must be transferred across enter parting line seal off as shown

All parting line pressure pads as well as corner pads to be cleared .001-.0015 from parting line seal off.

5.11.1 Opaque Parts – Class A Visible Surfaces

5.11.2 Moulded in color surfaces, unless luster requirements varies from standard, in which case, sample plaques will be provided – 1200 grit, # 15 micron range diamond (SPI-SPE #2).

5.11.3 Painted surfaces must be a minimum of a 400 Emery finish.

5.11.4 Ribs, bosses, baffles, etc. must be a minimum of 600 Emery in direction of draw.

5.11.5 Core pins must be a minimum of 600 Emery in direction of draw.

5.11.6 Non-significant surfaces must be a minimum of a 320-disc finish. Core surfaces can be left as cut if approved by Tiercon. (ref. GMN11049 sec. 4.18.3)

5.11.7 Runners and gates must be a minimum of a 400 Emery finish.

5.11.8 Mould face surfaces that are cleared from each other must be a minimum of 280 emery finish (SPC-SPE #4), some machining marks permissible.

5.11.9 Underside of opaque parts must be a minimum of a 320-emery finish.

5.11.10 Mould shut-off surfaces as finished in final spotting.

5.11.11 Sliding units (slides, guide pins, guiders, gibs, etc.) must be standard ground finish (20 micron).

5.11.12 All sharp corners on mould bases are to be broken.

5.11.13 Other mould finishes (texture, plating) will be given by Program Manager and should be noted on mould design.

5.11.14 Vapor Hone (if required)

- Vapor Hone finish is to be a 240 dry blast, 5 inch distance from surface, at 100 PSI gauge pressure. This may vary depending on customer requirement.

5.11.15 Welding

- No welding permissible on part surfaces without prior authorization from Tooling Eng. (ref. GMN11049 sec. 4.3.7)
- Weld Map must be provided for all Cavity welded areas. (ref. GMN11049 sec.4.3.9)

5.11.16 Lubrication Requirements

5.11.16.1 All moving components must be lubed with a white lithium or equivalent grease. **MUST NOT CONTAIN ANY SILICONE**

5.11.16.2 Any component requiring grease grooves, are to have grooves at least 0.025” deep

5.11.16.3 Bushings are to contain grease grooves. DME preferred.

5.11.16.4 All slide components to contain grease groves, this includes all gibbs and wear pads or the slide body’s themselves

5.11.16.5 If guide bar design is used as oppose to guide pins; then, grease grooves must be machined into wear pads

5.11.16.6 Grease zerks must be present in as many applications as possible. Ejector guides, slides, lifter rods etc.

5.12 Hydraulic Requirements

5.12.1 Hydraulic ejection is **mandatory** on any mould requiring completely **returned ejection prior to mould closing**.

5.12.2 Tied-in knockout bars are not acceptable. However, this provision must be accounted for with threaded knockouts in the tool design.

5.12.3 Hydraulic ejection must be used on all moulds, unless approved by Tiercon Program Manager.

5.12.4 Springs or gas shocks to return ejection would be considered on open and shut tools.

5.12.5 Flow dividers of choice are from Delta. (eg. P23-59 for 4 port flow divider.)

5.12.6 Standard size cylinders shall be designed if possible to utilize existing parts and reduce inventory.

5.12.7 Flow divider has to be installed when two (2) or more cylinders are moving one (1) plate simultaneously.

5.12.8 Hydraulic system to be tested at 3,000 PSI; system must operate at 2,000 PSI-leak free.

5.12.9 Hard pipe to be used between cylinders and manifold only when space is limited; **otherwise, hydraulic flex line is required.** All hydraulic flex line to be ½" diameter with crimped fittings and 37° flare.

5.12.10 All hoses shall be designed to be easily accessible. Hoses must be located in areas that do not interfere with any other mould components (water connections).

5.12.11 Hydraulic cylinders, manifolds, etc, shall be designed so they are located at the bottom of the mould. Moulds over 4 ft. long should have 4 cylinders for hydraulic ejection. All moulds with cylinders shall have "legs" installed to prevent cylinders, etc. from being damaged. (ref. GMN11049 sec. 4.16.5)

5.12.12 The location of the main hydraulic connection will be on the non-operators side, middle to lower part of the mould. **This position must not lie in a location that interferes with mould loading or quick coupler connection due to tie bar interference**

Standard part – Quick Disconnects:

PARKER H4-62 Female and H4-63 Male STONEY CREEK, SHREVEPORT

IT EP6-31 3/4 NPT-100 Male and IT EC6-31 3/4 NPT-F00 Female OSHAWA

Female: Forward or Pull Male: Set or Return

See Attached plant specific requirement

5.12.13 All Hydraulic cylinders, whether driving cores or ejection, must have limit switches to monitor both forward and retract positions. Moulds must have two switches to monitor return and one switch (min.) to monitor forward positions. *see attached sketch Figure 3-3

5.12.14 All core pulls to be monitored by limit switches, forward and return. (Same connection as 5.12.12 if needed)

5.12.15 Ejector cylinder yokes are to be secured to the hydraulic cylinders with a socket head cap screw (S.H.C.S). The yoke must be locked to the S.H.C.S. with a setscrew. *see attached sketch Figure 2-2

5.12.16 Yokes must have access holes through the back plate for the S.H.C.S.

5.12.17 Yokes must be timed to act as stop buttons where applicable.

5.12.18 S.V.G. Hydraulic Operating Pressure must be called out on Manifold Plaque.

Hydraulic Ejection/Core Action Main Fittings

Stoney Creek Injection Presses
All Co-Plas Injection Presses
Oshawa Injection Presses for Hydraulic Ejection & Core 1 Action

Parker # H4-62
Female FORWARD/PULL

Ejection Stamp Core Action Stamp

Parker # H4-63
Male RETURN/SET

Ejection Stamp Core Action Stamp

Hydraulic Core 2 Action Main Fittings

Oshawa Only

Parker # H6-62
Female PULL

Core Action Stamp

Parker # H6-63
Male SET

Core Action Stamp

5.13 Electric Requirements

TIERCON — Tooling Standards – Ejection & Core Switches — Slide 14

Ejection & Core Limit Switch Schematic & Hydraulic Fittings Required					
		Hydraulic Fittings Must be From Parker			
Pin #	Description	Stoney Creek	Oshawa	CoPlas	
1	Common				
2	Core 1 Pulled	H4-62	H4-62	H4-62	Female Fitting
3	Core 1 Set	H4-63	H4-63	H4-63	Male Fitting
4	Ejector Retracted (Return)	H4-63	H4-63	H4-63	Male Fitting
5	Ejector Advanced (Forward)	H4-62	H4-62	H4-62	Female Fitting
6	Core 2 Pulled	Separate Plug	Separate Plug	H4-62	Female Fitting
7	Core 2 Set	Separate Plug	Separate Plug	H4-63	Male Fitting

Thomas & Betts Part # MS 210B

Thomas & Betts 2 Lever Part # PB110E

Double Lever Locking Panel needs to be used on all molds

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TIERCON — Tooling Standards – Oshawa & Stoney Creek Core 2 Switch — Slide 15

		Oshawa	Stoney Creek	
Pin #	Descripiton	Parker Fitting	Parker Fitting	
1	Common			
2	Core 2 Pulled	H6-62	H4-62	Female Fitting
3	Core 2 Set	H6-63	H4-63	Male Fitting

Thomas & Betts Part # MS 206B

Thomas & Betts Single Lever Part # PB306

Single Lever Locking Panel only used for this application

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5.13.1 Hydraulics must be electrically monitored by limit switches that are wired to a central location on the mould. Wiring is to be contained with in wire channels and covered with plates.

5.13.2 One (1) limit switch indicating forward position and two (2) switches indicating return position must monitor all hydraulics for ejection.

5.13.3 All wiring must be clearly Labeled and wiring schematic must be supplied

5.13.4 Two (2) limit switches indicating set and pull will monitor all core and ejector cylinders. Limit switches to be mechanical type. *see attached sketch Figure 3-3

5.13.5 Limit switches will be wired normally open.

5.13.6 Core pull and ejector position limit switch wiring to be terminated in Thomas and Betts "Pos-E-Kon" male socket connector #MS210. (Reference section 22.0)

Pin 1	Common
Pin 2	Core Pulled
Pin 3	Core Set
Pin 4	Ejector Retracted
Pin 5	Ejector Advanced

5.13.7 All wiring is to be in accordance with Ontario Hydro Safety Code.

5.13.8 Electrical circuit layout must be provided on final mould design.

5.13.9 All switches to terminate into "Hammond" electrical box, approx. size of 4" x 6" x 6". Typical location of box will be the top of mould, non-operator side. Box rating is NEMA 12 or CSA 5. Any moulds exceeding 3 ejector limit switches plus 4 core driver limit switches must terminate to a terminal strip and be wired neatly to main connector. **All wiring must be labeled clearly.**

5.13.10 Core and ejection quick couplers must be clearly stamped on the mould for Forward/Pull and Set/Return.
Female: Forward or Pull Male: Set or Return.

5.13.11 Any mould requiring core pull, must have the following stamped on the operator's side of the mould with a **RED BOX** around it:
"ENSURE CORES ARE FULLY RETRACTED PRIOR TO DISCONNECTING MOULD"

5.13.12 Any mould which contains a SVG manifold system must include an open/close mould limit switch. Switch will be mounted on the cavity and on operator side. *See Section 5.14.21

5.13.13 **Fasteners**

5.13.14 Fasteners that would be removed, loosened or adjusted during a changeover should be a consistent size to facilitate the changeover and maintenance.

5.13.15 All screw products to be imperial size threads when possible.

5.13.16 All screw products should meet ANSI B18.3. DIN and BS standards. The lot should be traceable even without the shipping container.

5.13.17 All hex head screw products should be Grade 5 or better. (Unbrake or H.K only)

5.13.18 All socket head screw products should conform to Grade 9 standards.

5.13.19 All threaded rod (Ready Rod) should be Grade 5 or better.

5.13.20 All dowel pins shall conform to ANSI standards for Hardened Ground Machine Dowel Pins. All dowel pins shall be a pull type. The effective length must not be less than 75% of the overall length of the pin.

- General rule: use dowel pins of the same size (diameter) as the screws used in fastening the work.
- General rule: the length of the dowel pin should be about one and one half to two times the diameter in each part to be doweled.

5.14 Hot Manifold Requirements

5.14.1 All moulds requiring a manifold system must have "mould flow" completed, unless otherwise directed by Tiercon Program Manager. Mould flow must incorporate wall stock changes, i.e.: non-cored tape flanges, etc.

5.14.2 The designer and builder of the manifold must complete mould flow. The Tiercon Program Manager must approve a totally completed proposal for the design, build and functions of the manifold.

5.14.3 Current approved source for hot runner manifold is Synventive. Any manifold built without an approved source or without a mould flow completion must be signed off by Tiercon Program Manager prior to build.

5.14.4 If feasible Nozzle Drops are to be threaded to manifold body not seated.

5.14.5 Manifold power should not exceed 3,600 watts total per zone. Power is 240 volts and each zone should not exceed 15 amps unless Tiercon Program Manager has approved an alternate.

5.14.6 Separate manifold drawings are required by the tool source showing all relevant wiring, power and manifold details.

5.14.7 When manifolds are used or hot drops directly into the part, low vestige tips are to be incorporated. In these cases, it should be discussed with The Tiercon Program Manager to locally revise the part to create an indented condition allowing the final moulded tip to be flush with normal part surface. **This condition must be approved by the OEM customer in writing and is the responsibility of Tiercon.**

5.14.8 When using a manifold drop onto parting line surface an expansion disk and cold slug area should be incorporated. The expansion disk should be a round bore the same size as the drop tip cut directly opposite the drop tip, approx. 0.04" to 0.05" deep.

5.14.9 Thru harden pins and nozzle tips must be used when using abrasive (glass, mineral filled) material. Specify material at start of program.

5.14.10 All hot manifolds "drops and zones", location and number to be specified by The Tiercon Program Manager.

5.14.11 Standard DME Cable Connectors and Pin Outlets are to be used:
MTC – 12 – G
PIC – 12 – G

5.14.12 All hot sprue bushings are to be specified by the Tool source and approved by the Program Manager.

5.14.13 Hot sprue bushing to be used when sprue is of excessive length or instructed by The Tiercon Program Manager.

5.14.14 Hot sprue bushing is to be made from P – 20 Hardened Steel. Standard DME bushing to be used whenever possible.

5.14.15 Bushing should contain two (2) Jack holes to provide easy removal from mould.

5.14.16 The manifold should be wired in the safest way possible. All wiring must be contained and properly stored. Use of Wire Guard to encase wiring on the manifold body is expected.

5.14.17 It is <u>important</u> that manifold and wiring are contained in the best possible manner to avoid any water from either broken or leaky lines entering manifold or electrical boxes.

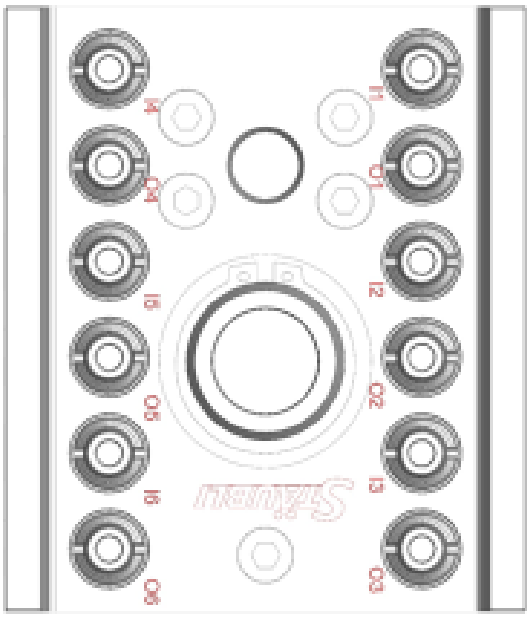
5.14.18 For any manifold system using spares for heaters and thermocouples, all wires for these should be routed to the electrical box, tagged, and not hooked up. All spares should be included in the electrical diagram location for the tool.

5.14.19 The main box location should be <u>top of mould</u>, operator side, This means either in the mould block or on the clamp plate. Connections should be in vertical position toward the top of the mould. Must be securely mounted using support plate if necessary.

5.14.20 Preferred mounting is as stated above except <u>below flush mounted into block</u>.

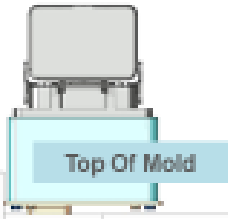
5.14.21 Spare parts list to be supplied in Mould booklet prior to shipment.

Staubli SVG Hydraulic Connector
Incorporated into Synventive Unitized System
Part Number
SPC205.12.7314/JV

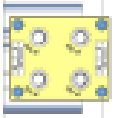


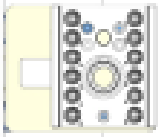
If more than 6 drops next connector will start I7 where I1 on picture above

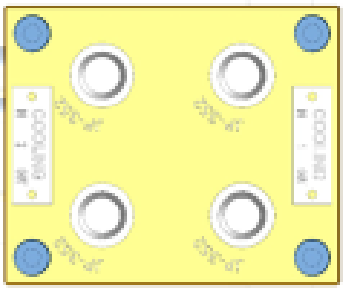
Stoney Creek
1000 Ton & Up



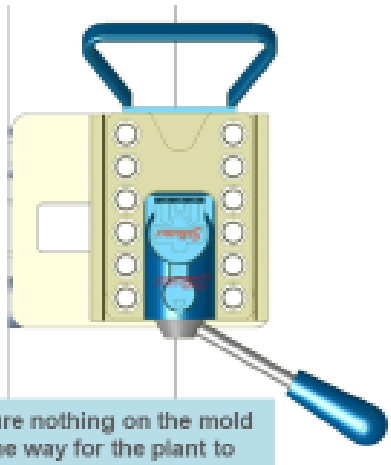
Non-Operator Side







Plumb Water individual into Cavity water Manifold – NO looping



Make sure nothing on the mold is in the way for the plant to Hook UP the press SVG Staubli

5.14.22 Connectors are to be DME standard series “G” for manifold power and thermocouple.

Required # of Zones	Thermocouple Connector	Power Plug	Mounting Box (if required)
1 – 12	MTC – 12 – G	PIC – 12 – G	Mold Mount
13 – 24	2 [MTC – 12 – G]	2 [PIC – 12 – G]	Mold Mount

5.14.21 V**alve Gate System (SVG)**

A. Approved staubli connector model SPC203.12.7309JV c/w (12) 3/8”, 24 SAE J1926 circuits. Approved by Tiercon Program Manager.
B. Quick Disconnects needed for each valve gate. H2-62, H2-63 OPEN-FEMALE, CLOSED-MALE
C. Hydraulic P.S.I. is to be identified on Manifold plaque, on exterior of mould.
D. If more than one coupler is required a second one must be installed.
E. A plunger type limit switch needs to be pocketed and mounted on operation side, center of Tool. Type XCMD.251OL1, Make: Schneider Canada.
Plug: Make Hubel model HBL7465V

5.15 Mould Try-Out/Production Run-Off

5.15.1 The mould try-out of the completed mould will be in the presence of Tool Manufacturer and Tiercon Representative as a minimum requirement.

5.15.2 Moulding machine at try-out will be similar in tonnage and barrel size as that of the Tiercon Production Injection Moulding Machine intended by design.

5.15.3 Resin material supplied by Tiercon.

5.15.4 If part requires texturing, a try-out will be necessary to verify dimensional stability, surface finish and mould function. To be included in your quote.

The "First Tryout" will include the following processing studies:

- Gate Seal Study.
- Cavity Balance Analysis.
  Multiple cavity tools to be balanced within 1.0% by weight of each other for fully-packed parts.
  Multiple cavity tools to be balanced within 3.5% by weight of each other for short shot parts collected at 25% full, 75% full and injection transfer points.
- Pressure Drop Analysis.
- Mould Surface Temperature Analysis.

Any major changes to cavity gating, runners, mould cooling or engineering changes may require that these tests are repeated.

5.15.5 If parts do not meet print dimensions or characteristics and/or do not fit on production fixture, the Vendor must take appropriate action to correct the issues.

5.15.6 After texturing, the mould will be tried out again for surface finish approval.

5.15.7 Any additional try-outs resulting from actions needed to correct flash, mismatch, mechanical problems, etc., are the sole responsibility of the vendor.

The Tiercon Program Manager will agree on satisfactory quality of part from tool. In such case, 75 shots will be done per cavity to verify quality level.

The mould must still be proved out on-site at Tiercon. The tryout will be a minimum of 300 shots. The tool must show complete

capability if meeting all the quality requirements. Tool must be capable of running fully automatic.

It is the responsibility of the tool source to deliver the mould to Tiercon upon request of first production run.

5.16.1 Supplier Warranty

5.16.1-a The supplier shall provide a basic warranty equal to or better than the following:

5.16.1-b All components and/or materials designed, manufactured or specified by the supplier shall be warranted to be free of defects and premature wear for a period of one year based on projected SORP.

5.16.1-c Upon written request by Tiercon, the supplier shall provide materials and labour to repair or replace components and/or materials designed, manufactured or specified by the supplier. Expenses incurred by the supplier, through a warranty claim period, shall be the sole responsibility of the supplier.

5.16.1-d Warranty Claims shall be corrected by the supplier, at the Tiercon facility. If repair or replacement is not physically possible at the Tiercon facility, the return of the equipment to the supplier shall be conducted at the suppliers' expense.

5.16.1-e A written response outlining the intended corrective action must be submitted to Tiercon within 24 hours of receiving the written Warranty Claim.

5.16.1-f Purchased components (off the shelf components) shall be warranted by the supplier based on manufacturer's warranty, provided, that the component(s) are not undersized, improperly installed or modified by the supplier. If components are undersized, improperly installed or modified by the supplier, a Warranty Claim shall be submitted to the supplier.

5.16.1-g Components modified or poorly maintained by Tiercon, shall result in a void in the warranty, to those specific components.

5.17 PRIOR TO TRYOUT

1. Steel check on CMM must be supplied with all moulds, core and cavity, **at time of first tryout**. An example can be made available for your reference (to ensure that there is no question as to what is acceptable). If you require further information, contact the appropriate tool engineer.
   Note: All CMM checks must be done in metric.

2. Specifications book depicting water, hydraulic, electrical and air lines, a Stock List, isometric view of part, and all diagrams are to be supplied with all moulds for first tryout. An example is included for your reference (to ensure that there is no question as to what is acceptable). If you require further information, contact the appropriate tool engineer. The booklet shall also contain a complete set of drawings ½ scale this includes all mould components, a complete detailed set of manifold and nozzle drawings including a complete material list, a drawing of the core and cavity showing the part and mechanisms with water lines only, also include any other plates with water lines. There must be 2 complete booklets supplied one for the plant and one for the Program Manager.

3. Generating 3/16" (4.5 mm) high and 0.025" (0.65 mm) deep markings the following information is to be present on the backside of all parts (typically core side of Mould). Can be stamped or machined;

- Part number (OEM and Tier One if applicable)
- Cavity number with "RH" or "LH" if applicable
- OEM customers' company emblem/logo
- "Made in (Country of Origin)"
- Material code, (written verification from Tiercon) as per SAE specification
- Calendar Grid: month and year (5 years, 12 months (max. length - 3" max. height – 2"))
- Customer specific safety symbols if required
- All runners to be stamped with material, cavity number and nozzle number

4. Mould to be verified by **CHECK LIST** before tryout. **The check List is to be signed and Dated. Please note that if a mould is shipped into plant without being checked or the mould does not run you may be charged for any machine time lost.** The Tool shop is responsible for any unnecessary tryouts.

5. The Tool Shop will be responsible for the following Try-outs: a) First Shots b) Pre-Grain c) Post Grain

6. Steel Certification sheets must be provided.

7. Wall thickness check with map must be provided

   Note: Tiercon will be responsible for material at the above tryouts (3 only). Tool shop will be responsible for material requirements and the tryout if more trials required to meet both Pre-Grain and Post-Grain approvals.

5.17.1 PRIOR TO FINAL DELIVERY

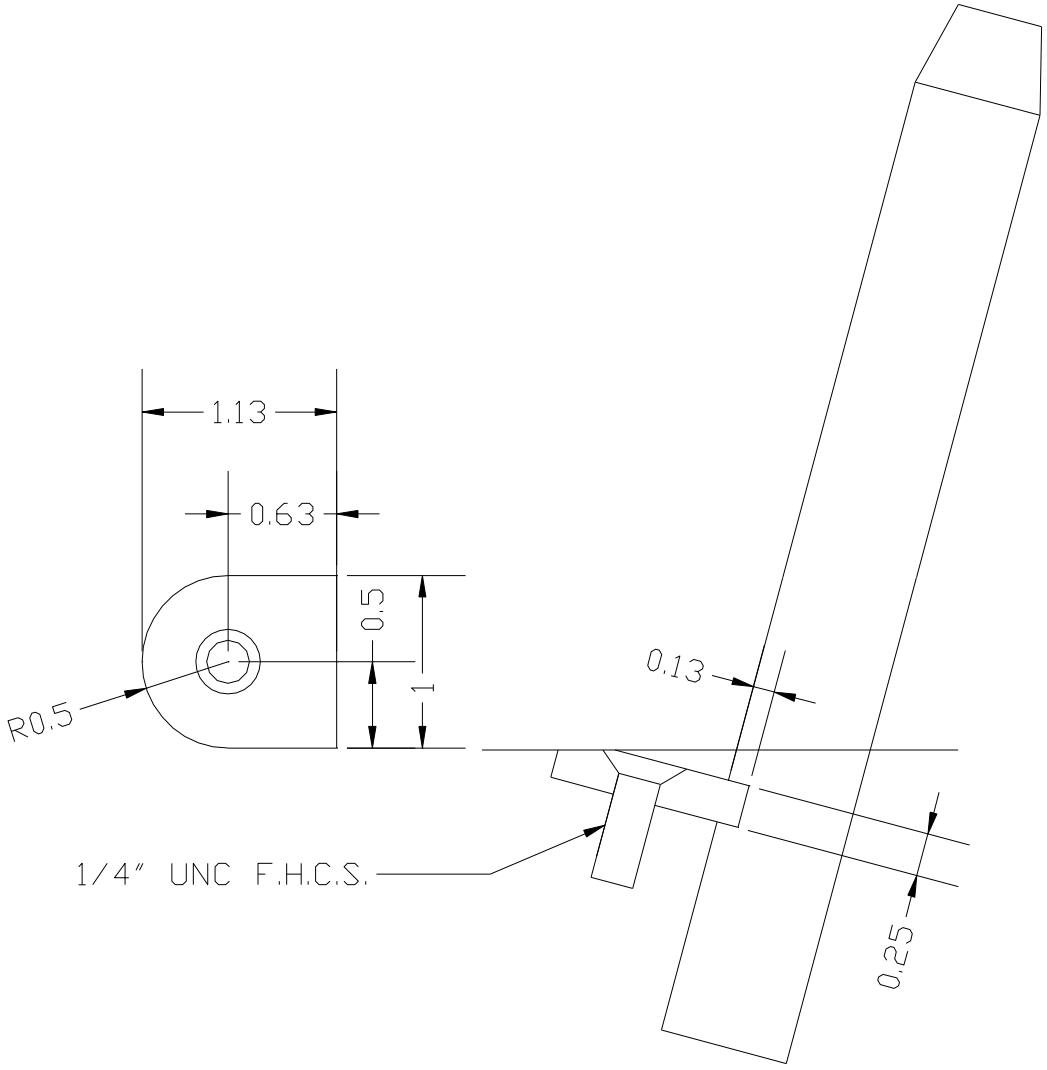
1. Paint mould with specified (OEM) customers' colour using Rust-Olem Paint. Tiercon Program Manager to Supply Information.
2. The following to be Stenciled in at least 1" letters (depending on Mould Size):
   - Top of Mould, Non-Operator Side, Operator Side – White Paint (Stamp in ½" Letters as well)
   - Total Weight, Cav. Weight, Core Weight – White Paint (Stamp in ½" Letters as well)
   - Yr. Of Production Start, Program Name, Customer, Tool #, OEM Part #/Name, and Duplicate Tool Designation if applicable – Black Paint (Operator and Top of Mould Sides)
   - Any Safety Information (KO's, Mould Sequence) – Red Paint or Plaques
3. **The tool shop is responsible for supplying a reference booklet (as noted in section 1), providing all pertinent information. Your tool engineer upon request will provide a sample reference booklet, which can be used as a guide.**
4. A completed checklist will be required with mould delivery and tryout. No exceptions (See Section 5.17.4)

5.17.2 PLANT TRYOUTS

1. When the mould is shipped to the plant for a tryout we require full support from the tool shop. This means if a handman is required at the plant the tool shop shall send one at **no charge** to the program, as the mould must be capable to run automatic.
   Note: Attendance of the Tool shop personnel is required until Tiercon personnel have completed the production part approval process (PPAP) with the customer.

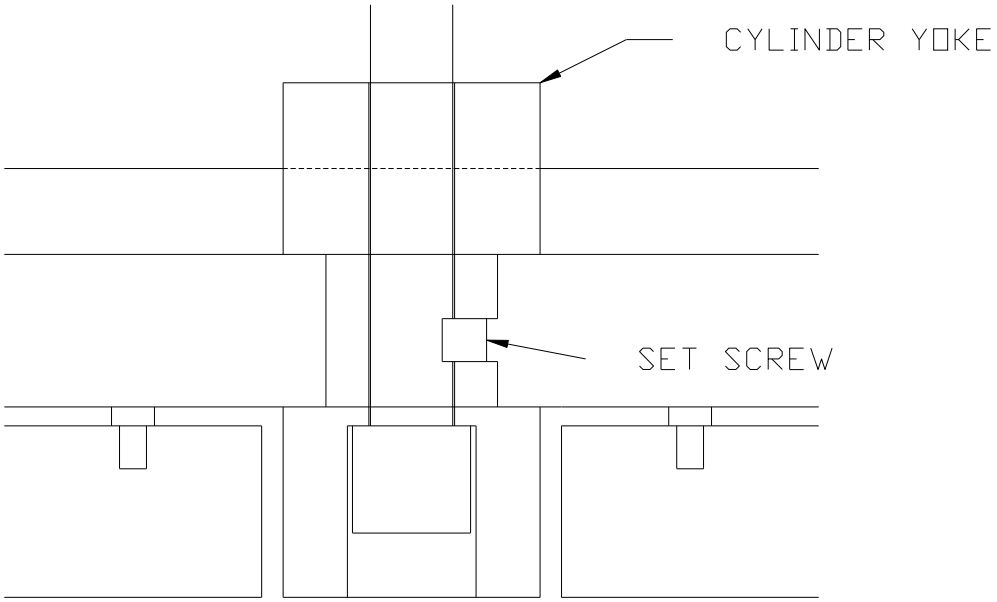
Supplemental Sketch to Slide Section 5.9.14

Figure 1-1



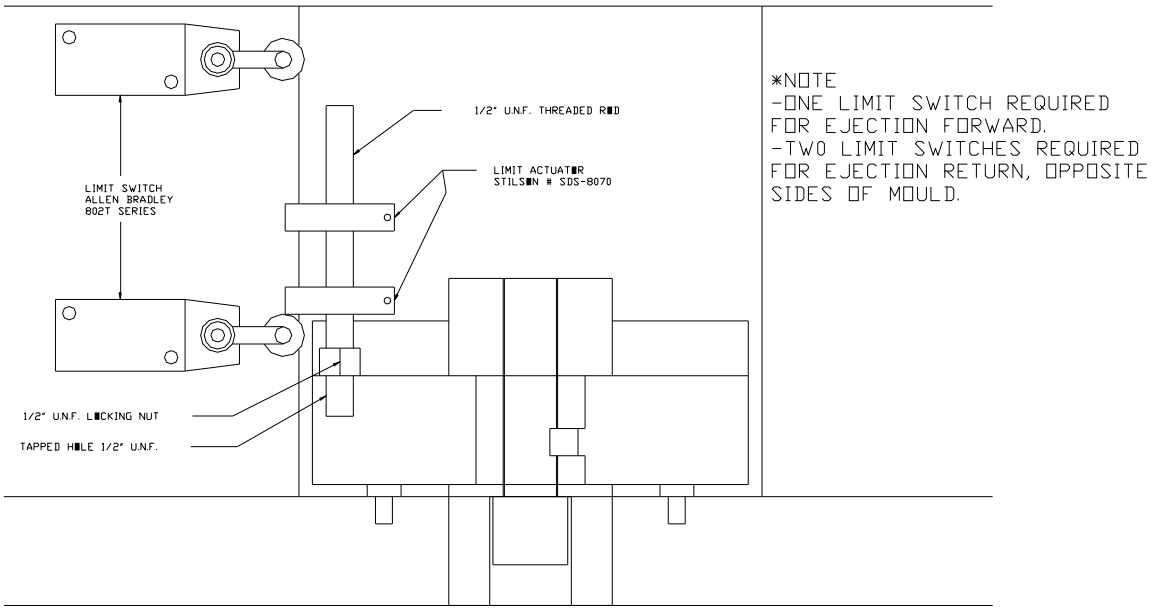
Supplemental Sketch Hydraulic Requirements Section 5.12.16

Figure 2-2



Supplemental Sketch Electric Requirements Section 5.13.4

Figure3-3



5.17.4 **CHECKLIST**

(Before tryout and mould delivery)

Mould Shop:_____ Date:_____

Part Name:_____ Mould Number:_____

Production Ready:

			OK	Comments
1	Jiffy Connectors	C/B 1/16 below 45x1/4 chamfer stamped in/out and numbered		
2	Water Lines	Water flow and all lines to be checked		
3	Water schematic plaques	Mounted on operator side of mould core & cavity		
4	Mould no. outside	Painted and stenciled also two I.D. plaques in a 1/8 pocket		
5	Mould Weight	Stamped on I.D. plaque and stenciled core cavity and total weight		
6	Clamp slots or holes	Min. 1"x1"x1" or extended plates with holes		
7	Eyebolt holes	Depth to be 21/2 the dia./4 on top and bottom max:46" between C.L.		
8	Mould Balance	Is mould balanced for loading into the press?		
9	Safety strap	Min 2 per mould with storage hole		
10	Mould size	Mould must be capable of top loading in press or drop in and rotate		
11	K'outs	Must have tapped hole and flush with back plate. Are ALBA connectors req'd.		
12	Locating ring	Must be the right size for the press-See Tiercon Standards		
13	Sprue brushing	Must be held in and have a ¾ spherical.		
14	Hot runner system	Test with heat controller must have epic plugs as per spec		
15	Valve gates	Must have separate ins and outs hooked to hydraulic manifolds		
16	Nozzles and gate pins	Must be heated up for 1 hour at operating temp. Then flushed if needed		
17	Hot runner schematic	Mounted on operator side of mould and top of mould down to the face of the mould		
18	Sub or cashew gate	Free of rings, high polish and proper size (balanced)		
19	Sucker pins	To be cut ½" below extension of gate and undercut		
20	Runners and gates stamped	Polish rads on corners of runner cold well sprue etc, chisel gates		
21	Nozzles	To be identified on P.L. left to right looking into the cavity		
22	Cavity finish	Per quoted request		
23	Core finish	Per quoted request or standard binder		
24	Part mat'l I.D. & cav# calendar	As per part print. First or second surface? Latest change I.D. See Tiercon Standards		
25	P.L. chamfers	Core and cavity must have adequate chamfers on all plates free from burrs		
26	Air Vents	Cut on parting line, lifters and slides as per the standards every 2"		
27	Ejector pins	All pins and lifter must be flush to the part or parting line		
28	Draft, drags & EDM	All ribs must have draft, be polished, no EDM or undercuts		
29	Wall stock	Verify wall in spotting press ask for lead samples		
30	Core to cavity matching	Any transitions should be matched after tryout		
31	Cylinders	Activate using air or oil use minimum pressure		
32	Cylinders	Caution Yes No		
33	Cylinder protection	Make sure stills or rails are installed to protect the cylinder		
34	Limit switches	Must be set and wired into epic plug as per specs		
35	Ejection free	Turn core in moulding position and test		
36	Slides preload safety	Make sure they will stay in open position		
37	Tapered guide pins	Minimum 2"x5" deg. And garbage shoot 45 deg. On bottom of guide bushing		
38	Stand off	Core and Cavity must stand alone		
39	Spec book	Must be complete at first tryout		

5.17.5

TOOL DESIGN REVIEW - WORK SHEET

Date:

Tool Description:			Tiercon Tool Number:		
Part Number:			Program Mgr:		
Tool Source:			Contact:		
Tool Shop Number:				**YES**	**NO**
1	Does tool fit in quoted press size				
2	Does ejector stroke clear part and runner from tool				
3	Do ejector guides meet Tiercon standards				
4	Do return pins meet Tiercon standards				
5	Do knock out patterns suit press				
6	Are there sufficient pillar supports				
7	Do hydraulic knock-out cylinders bottom out on back plate				
8	Does tool require center lift link				
9	Does gating meet Tiercon approval				
10	Are hydraulic components organized correctly on tool				
11	Do manifold wires come out top to tool opposite operator side				
12	Does tool require limit switches/Are they shown?				
13	Are eyebolts spaced to allow flipping tool without damaging any components on sides of tool? Tool to hang square and level				
14	Is there sufficient water	Cavity			
		Core			
		Lifters			
15	Wear plated for slides (Ampco 18)				
16	Grease Zerks on ejector guides				
17	Do slides have a retainer to hold slide in pulled location springs have device to prevent deflection	Do			
18	Are lifter rod bolts accessible from back of tool (Bolts NC)				
19	Does tool require runner shut offs				
20	Is manifold accessible from top to tool				
21	Do limit switches have adjustable dogs				
22	Does tool require any changeable inserts				
23	Are inserts changeable in press				
24	Are standoffs required				
25	Do we have the sufficient venting				
26	Is the spherical radius to Tiercon standards (.750)				

REVIEW WORKSHEET:			**SECTION**	
			REVISED	
			Revision#:	
			Intermediate	
TIERCON	**Date Issued:**		**Preliminary**	
	Approved By:		**Finals**	

5.18 Tiercon

CONTENTS OF BOOKLET

SKETCH OF PART
JOB NUMBER
PART NAME INCLUDING VEHICLE AND VEHICLE NUMBER
PART NUMBER
MOLD WEIGHT
MOLD SIZE
MOLD COMPONENTS MATERIAL LIST
COMPLETE MOLD DESIGN SHOWING ALL COMPONENTS ½ SCALE
MANIFOLD AND NOZZLE DESIGN SHOWING ALL ZONES
MANIFOLD AND NOZZLE MATERIAL LIST
CYLINDER AND LIMIT SWITCH SPECIFICATIONS
COMPLETE SPARE PARTS LIST
SEQUENCE PLAQUE

PRINTS SHOWING WATERLINES AND PART ONLY FOR CORE AND CAVITY. SHOW LIFTERS, SLIDES AND RETRACTORS INSTALLED IN MOLD AND SEPARATE. PRINTS ARE TO BE ½ SCALE

WATER SCHEMATIC FOR ALL PLATES

PLEASE NOTE: THERE ARE TO BE 2 SPEC BOOKS SUPPLIED ONE FOR THE PLANT AND ONE FOR THE PROGRAM MANAGER

Tiercon

JOB NUMBER DATE

PART NAME

PART NUMBER

INTERNAL PART NUMBER

TOOL SHOP

TOOLSHOP NUMBER

MANIFOLD SUPPLIER & NO.

SKETCH OF PART WITH SIZE DIMENSIONS

Tiercon

DATE

SKETCH OF MOLD

SHOW LENGTH WIDTH HEIGHT AND DIAGONAL

ITEM	DESCRIPTION	SIZE
1	TOP CLAMP PLATE	
2	MANIFOLD PLATE	
3	CAVITY	
4	RETAINER PLATE	
5	CORE	
6	RETAINER PLATE	
7	PARALLELS	
8	EJECTOR PLATES	
9	BOTTOM CLAMP PLATES	

CORE	**MOLD WEIGHT CAVITY**	**TOTAL**

JOB NUMBER

TOOLSHOP NAME AND NUMBER

MOLD LENGTH

MOLD WIDTH

MOLD HEIGHT

MOLD DIAGONAL

CAVITY FINISH

CORE FINISH

TYPE OF TEXTURE

GLOSS REQUIRED

TEXTURE SOURCE

Tiercon

CAVITY WATER SCHEMATIC **DATE**

SKETCH OF CAVITY SHOE WITH PART AND WATERLINES ONLY

SHOW TOP AND OPERATORS SIDE

JOB NUMBER
TOOL SHOP NAME AND NUMBER
TYPE OF JIFFY CONNECTION
TYPE OF MAIN WATER CONNECTION
MANUFACTURE AND SERIAL NUMBERS

Tiercon

CORE WATER SCHEMATIC **DATE**

SKETCH OF CORE SHOE WITH PART AND WATERLINES ONLY

SHOW TOP AND OPERATORS SIDE

SLIDES LIFTERS AND RETRACTORS TO BE SHOWN

JOB NUMBER
TOOL SHOP NAME AND NUMBER
TYPE OF JIFFY CONNECTION
TYPE OF MAIN WATER CONNECTION **STAUBLI** **CITO**
MANUFACTURE AND SERIAL NUMBERS

Tiercon

MANIFOLD SCHEMATIC **DATE**

SKETCH OF MANIFOLD AND NOZZLE SHOWING ALL ZONES

SHOW TOP OF MOLD AND OPERATORS SIDE

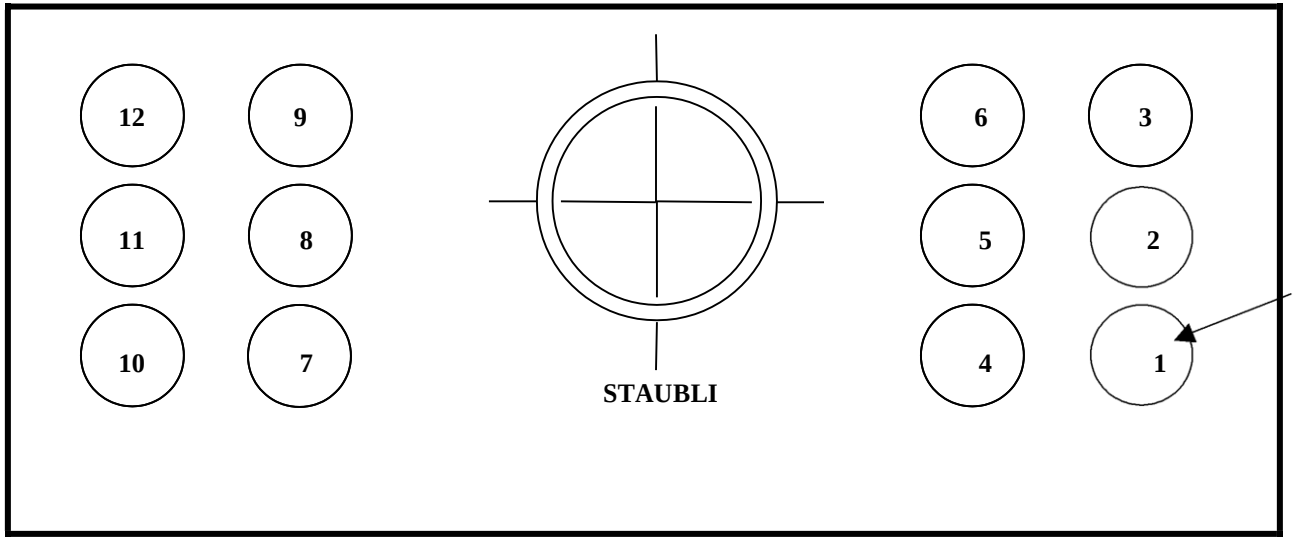
SHOW ALL SPARE THERMOCOUPLES

IINCLUDE S.V.G. HYDRAULIC PRESSURE IF REQUIRED

JOB NUMBER
TOOL SHOP NAME AND NUMBER
MANUFACTURER
NUMBER OF ZONES IN MANIFOLD
NUMBER OF ZONES IN NOZZLES
TOTAL NUMBER OF ZONES

Tiercon

STAUBLI VALVE GATE SCHEMATIC **DATE**



SPECIFY WHICH VALVE GATE IS CONTROLLED ON LENS MOLD SPECIFY CAVITY HAND AND MATERIAL COLOUR

JOB NUMBER
TOOL SHOP NAME AND NUMBER

MANUFACTURER NUMBER AND COMPONENT NUMBERS
NUMBER OF GATES

Tiercon

SKETCH SHOWING POWER AND THERMOCOUPLE PLUGS

SPECIFY EACH PIN

SHOW ZONE AND SPECIFY WATTS AMPS, OHMS AND PIN NUMBER

JOB NUMBER
TOOL SHOP NAME AND NUMBER

DATE

Tiercon

CAVITY ASSEMBLY SHOWING CYLINDERS AND LIMIT SWITCHES **DATE**

SKETCH SHOWING CYLINDERS LINES AND CONNECTORS

JOB NUMBER
TOOL SHOP NAME AND NUMBER

CYLINDER MANUFACTURER	SERIAL#	BORE	STROKE
TYPE OF MALE AND FEMALE CONNECTORS	SERIAL#		
LIMIT SWITCH MANUFACTURER	SERIAL#		

CORE PULL SEQUENCE

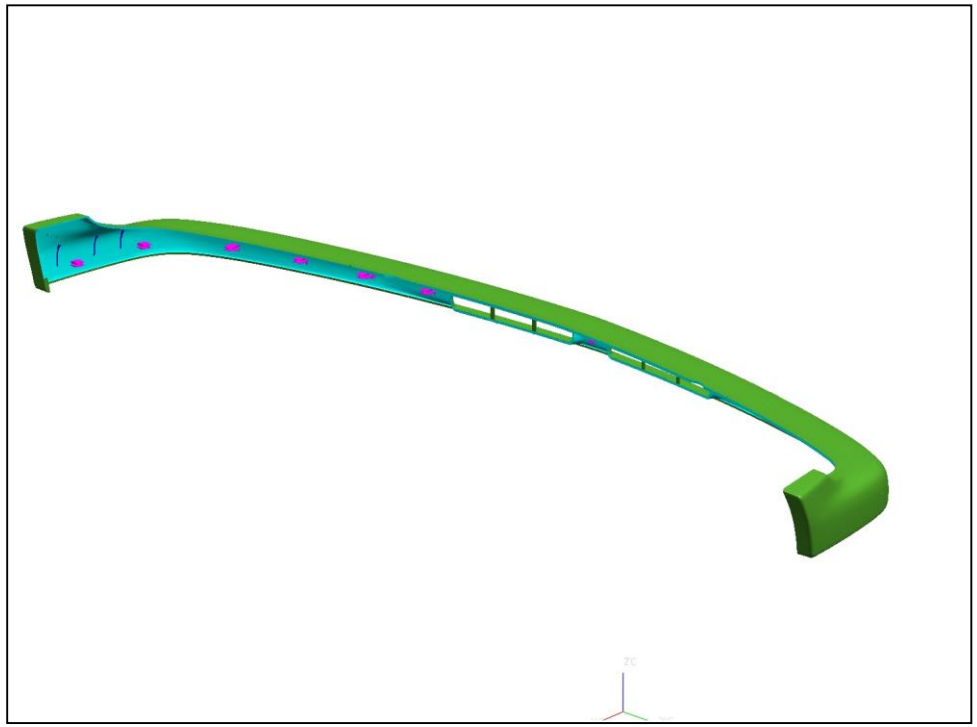
Tiercon

CORE ASSEMBLY SHOWING CYLINDERS AND LIMIT SWITCHES **DATE**

SKETCH SHOWING CYLINDERS LINES AND CONNECTORS

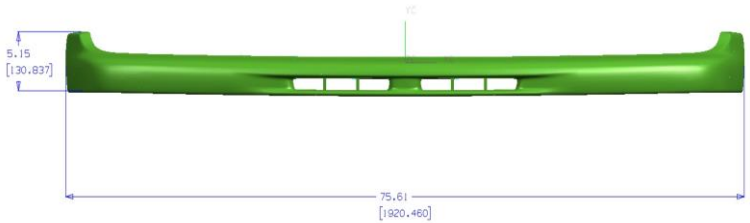
JOB NUMBER
TOOL SHOP NAME AND NUMBER
CYLINDER MANUFACTURER SERIAL# BORE STROKE
TYPE OF MALE AND FEMALE CONNECTORS SERIAL#
LIMIT SWITCH MANUFACTURER SERIAL#
CORE PULL SEQUENCE

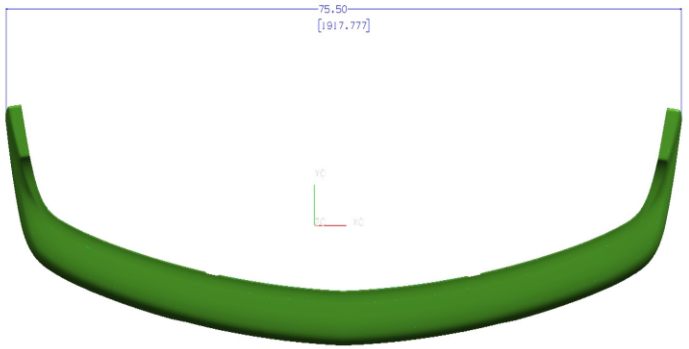
Tiercon
JOB NUMBER:
TOOL SHOP:
TOOL SHOP JOB NUMBER:



Tiercon

PART SKETCH





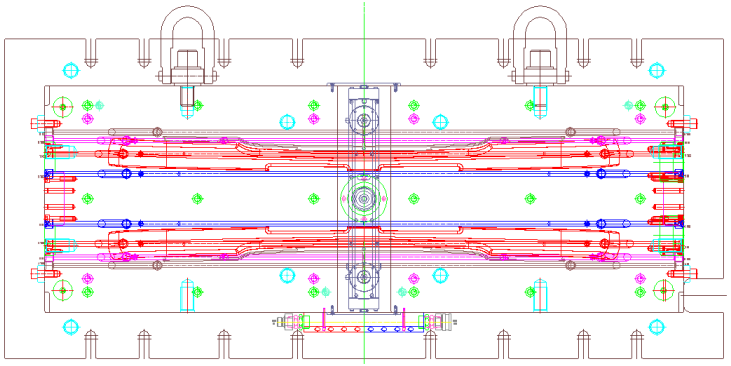
JOB NUMBER:
PART NAME:
PART NUMBER:

INTERNAL PART NUMBER:
TOOL SHOP:
TOOL SHOP JOB #:

Tiercon

CAVITY WATER SCHEMATIC JUN-02

CORE WATER SCHEMATIC
TOP OF MOLD



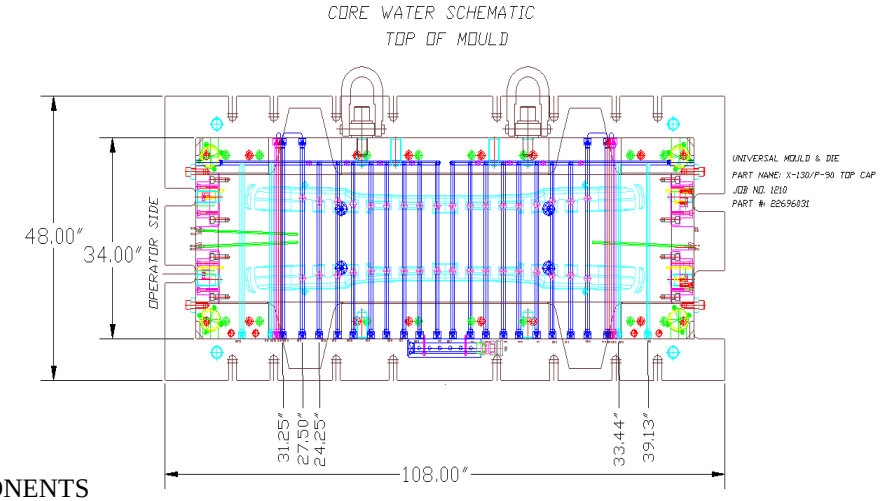
CAVITY WATER FITTINGS & COMPONENTS

COMPONENT	MANUFACTURER	CATALOGUE NUMBER:
JIFFY TITE SOCKETS	DME	JS-318
JIFFY CONNECTORS	DME	JPF-0352
WATER MANIFOLDS	CITO	IM6-6-BCD-6- ½ -N-(4 RED, 4 BLUE)
MAIN WATER COUPLER (SOCKET)	HANSEN	10-S41
MAIN WATER COUPLER (PLUG)	HANSEN	B10-T41
MALE PIPE NIPPLE	PARKER	1 ¼ FF
PIPE THRED REDUCER	PARKER	1 ½ -1 ¼ PTR

JOB NUMBER:
TOOL SHOP:
TOOL SHOP JOB NO.:

Tiercon

CORE WATER SCHEMATIC JUN-02



CORE WATER FITTINGS & COMPONENTS

COMPONENT	MANUFACTURER	CATALOGUE NUMBER:
JIFFY TITE SOCKETS	**DME**	**JS-318**
JIFFY CONNECTORS	**DME**	**JPF-0352**
WATER MANIFOLDS	**CITO**	**IM6-6-BCD-6- ½ -N-(4 RED, 4 BLUE)**
MAIN WATER COUPLER (SOCKET)	**HANSEN**	**10-S41**
MAIN WATER COUPLER (PLUG)	**HANSEN**	**B10-T41**
MALE PIPE NIPPLE	**PARKER**	**1 ¼ FF**
PIPE THRED REDUCER	**PARKER**	**1 ½ -1 ¼ PTR**

JOB NUMBER:
TOOL SHOP:
TOOL SHOP JOB NO.:

TIERCON WIRING SCHEMATIC

HEATER ZONE	HEATER LABEL	WATTS/ HEATER	WATTS/ ZONE	VOLTS/ ZONE	AMPS/ ZONE	OHMS/ ZONE
NOZZLE ZONE #1	NZ1A NZ1B	700 700	1400	230	6.0	38.3
NOZZLE ZONE #2	NZ2A NZ28	620 620	1240	230	5.4	43.3
NOZZLE ZONE #3	NZ3A NZ3B	950 950	1900	230	8.2	28.0
NOZZLE ZONE #4	NZ4A NZ4B	700 700	1400	230	6.0	38.3
NOZZLE ZONE #5	NZ5A NZ5B	620 620	1240	230	5.4	43.3
NOZZLE ZONE #6	NZ6A NZ6B	950 950	1900	230	8.2	28.0

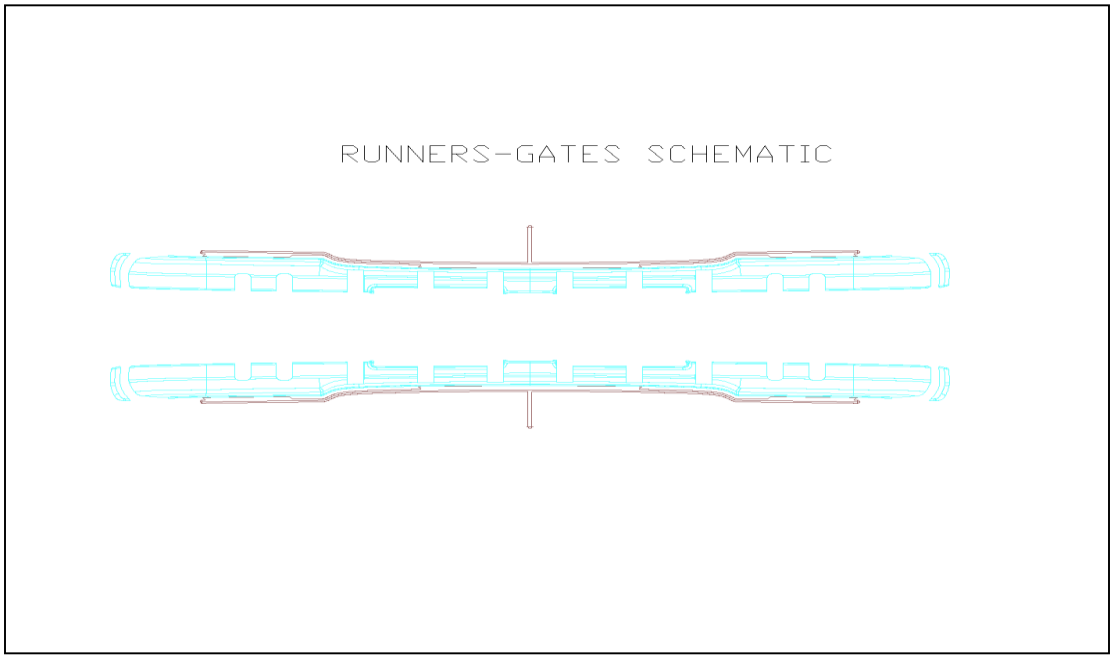
NOZZLE HEATERS

ELECTRICAL INFORMATION
TIERCON JOB#
PART NAME:
PAP JOB NO.
PART#:

HEATER ZONE	HEATER LABEL	WATTS/ HEATER	WATTS/ ZONE	VOLTS/ ZONE	AMPS/ ZONE	OHMS/ ZONE
MANIFOLD ZONE #7	MZ7A MZ7B	600 600	1800	230	5.2	44.2
MANIFOLD ZONE #8	MZ8A MZ8B	1000 1000	2000	230	8.6	26.7
MANIFOLD ZONE #9	MZ9A MZ9B	1000 1000	2000	230	8.6	26.7
MANIFOLD ZONE #10	MZ10A MZ10B	1200 1200	2400	230	10.4	22.1
MANIFOLD ZONE #11	MZ11A MZ11B	1600 1600	3200	230	14.0	16.4
MANIFOLD ZONE #12	MZ12A MZ12B	1800 1800	3600	230	15.6	14.7
MANIFOLD ZONE #13	MZ13A MZ13B	1800 1800	3600	230	15.5	14.7
MANIFOLD ZONE #14	MZ14A MZ14B	1600 1600	3200	230	14.0	16.4
MANIFOLD ZONE #15	MZ15A MZ15B	1200 1200	2400	230	10.4	22.1
MANIFOLD ZONE #16	MZ16A MZ16B	1000 1000	2000	230	8.6	26.7
MANIFOLD ZONE #17	MZ17A MZ17B	1000 1000	2000	230	8.5	26.7
MANIFOLD ZONE #18	MZ18A MZ18B	600 600	1200	230	5.2	44.2
MANIFOLD ZONE #19	MZ19A MZ19B	2000 2000	4000	230	17.4	13.2
MANIFOLD ZONE #20	MZ20A MZ20B	600 600	1200	230	5.2	44.2
MANIFOLD ZONE #21	MZ21A MZ21B	600 600	1200	230	5.2	44.2
MANIFOLD ZONE #22	MZ22A MZ22B	2000 2000	4000	230	17.4	13.2
MANIFOLD ZONE #23	MZ23A MZ23B	225	225	230	2.0	115.0

MANIFOLD HEATERS

MANIFOLD SCHEMATIC



(6) NOZZLE ZONES
(17) MANIFOLD ZONES
(23) TOTAL ZONES

MANIFOLD WAS MANUFACTURED BY A.S.

JOB NUMBER:
TOOL SHOP:
TOOL SHOP JOB NO.:

Tiercon

LIMIT WIRING SCHEMATIC