Consolidated MetCo

Die Cast Tooling Standards

Table of Contents

General Dictations

It is assumed that the following standards are more guidelines than resolute facts. It is the intention that the Designer / Engineer be free to make appropriate modifications in contrast to these "Standards" for the betterment of the tool. It is of the best interest for both Consolidated MetCo (ConMet) and the vendor to use all practical sense in tooling; be it design, material, or technique. ConMet strives for low cost tooling, but not at the expense of corrupting or endangering the life expectancy of, nor the quality or commitment each company has vested.

All modifications to the tooling in contrast to the standards must be duly noted and approved by a ConMet Tooling Engineer. It is assumed that these notifications be present upon final design review. Any changes after final approval (not initiated by ConMet) require express written consent from ConMet Tooling Engineer(s). With out consent, changes are sole responsibility, in all matters, of the vendor.

Shipping and Sampling

All tooling must be packaged with reasonable expense for safe and undamaged transport to a ConMet facility. Once the tooling arrives, it will be reviewed for any damages due to shipping. Expense of repairs of damage as a result of poor packaging will be the burden of the vendor. ConMet will "charge back" the net amount of repair costs. Repairs to tooling may require the return shipment to the originating vendor or a vendor of ConMet discretion. These charges will be included in the "charge back" amounts. Damage not deemed vendor fault will be dealt at ConMet's discretion.

Every die will be reviewed prior to sampling. It is the right and advised (though not always practical) for ConMet Tooling Engineer(s) be present at final assembly and prior to packaging. Upon arrival at the ConMet facility, the tooling is to be inspected for damage and quality and dimensional correctness. Once deemed approved, sampling activities will commence. The vendor will not be absconded from these activities, rather invited for a part or the duration. ConMet will strive to schedule the sample activities far enough in advance for the vendor to make appropriate arrangements. However due to production limitations, ConMet reserves the right to delay or cancel any sampling activities. During the sampling activities, ConMet Tooling Engineer(s), Process Engineer(s), and associated personnel **will try to find fault** in the tooling abilities to make high quality castings. If any are found due to design flaws or construction and modifications are deemed necessary; ConMet and the vendor will continue to work unabated to ensure both parties and the tooling receive equal compensation.

ConMet Quality Policy

Consolidated Metco will provide cost effective and reliable products and services at a level of quality that meets or exceeds our customer's expectation. Our goal driven teams strive for continuous improvement in quality, service technology, and product safety.

Tooling Quality Policy and Requirements

On delivery of all tooling (complete die, inserts, replacement cores, etc.) the following will be required.

- Steel certifications
- Heat treat certifications
- Documentation of final measurements
- Copies of check-off lists, sign-off sheets

All steel and mating components should be checked for accuracy and correct size. Measurement techniques may be in order to ensure these components are correct.
Heat Treat

Approved Suppliers

In order to provide our customers with the best quality castings, we must adhere to the use of the best quality components. Below is a listing of approved suppliers and materials. While this list is never complete, it is a starting point.

Unless otherwise directed, all heat treating is to be according to the NADCA 207-2003 spec. It is the vendor responsibility to source the heat treating to a facility that can accommodate this spec. It is also the vendor responsibility to ensure this spec is met.

Supplier	Type / Name	Purpose
SCHMOLZ + BICKENBACH USA Inc. 365 Village Drive Carol Stream, IL 60188 Phone: (630) 682-3900 Fax: (630) 690-0925 http://www.schmolz-bickenbach.us	Thyrotherm 2344 Magnum Thyrotherm 2344 EFS/Supra HOLDER BLOCK (AISI 4130) THYROPLAST 2312 P-20 Modified	Cavity steel Cavity steel Holder steel Holder steel Holder steel
Bohler-Uddeholm Corporation 2505 Millennium Drive Elgin, IL 60124 Phone: (800) 638-2520 Fax: (630) 883-3101 http://www.bucorp.com/index.htm	Dievar W403 VMR Orvar Supreme Orvar Superior Holder Premium P20 Modified	Cavity steel Cavity steel Cavity steel Cavity steel Holder steel Holder steel
Progressive Components 235 Industrial Drive Wauconda, IL 60084 Phone: (800) 269-6653 Fax: (800) 462-6653 http://www.procomps.com/		Ejector pins, core pins, and additional components
DME 29111 Stephenson Highway Madison Heights, MI 48071 Phone: (800) 626-6653 Fax: (888) 808-4363 http://www.dme.net/dme/index.html		Ejector pins, core pins, and additional components
PCS Company 34488 Doreka Dr. Fraser, MI 48026 Phone: (800) 521-0546 Fax: (800) 505-3299 http://www.pcs-company.com/		Odd sized ejector pins, core pins and additional components
Parker Hannifin Corp.	Water fittings	ST series BST series
Brennan Industries	Hot oil fittings	37° JIC Fittings

Cavity and Ejector Inserts

1. Material to be Premium or Superior Grade H13 from the approved supplier list. Stress relieve at 1200°, then heat treat per latest NADCA specifications to requirements listed in BOM or purchase order. Stress temper at 950° - 1000° before final assembly. Different heat treat specifications may be required depending on ConMet customer requirements.

2. Insert MPL to stand up .002" - .003" from holder block. 800T – 1000T presses, MPL to stand up .003" - .004" from holder block.

3. Minimum steel thickness under part to be 2.0" for 400T presses, 3.0" for 600T presses, 4.0" for 800T – 1000T presses. Stationary thicknesses may be less, contact ConMet Tooling Engineer for clarity.

4. Minimum steel between part edge (overflow) and outside of insert to be 2.5" for 400T presses, 3.0" for 600T presses, 4.0" for 800T – 1000T presses.

5. Insert corners to be no less than R.1.520".

6. Bottom to be chamfered according to press tonnage. For 400T presses, inserts to have a .20" x 45° chamfer. For 600T presses the chamfer to be .28" x 45°. For 800T – 1000T presses the chamfer to be .28" x 45°.

7. Relief on outside of insert to be .020" - .040" deep with minimum of 1.5" and a maximum of 3.0" of bearing on all sides. Exception: bearing should go below all slide pockets. There shall be no relief between multiple inserts and on the bottom of an insert.

8. Insert mounting screws to be dependant on machine tonnage. For 400T & 600T presses the minimum screw to be Ø5/8"-11 SHCS. For 800T presses the minimum screw to be Ø Ø3/4"-10 SHCS. Screws to be spaced approximately 6" apart to maximize the number of screws in each insert. Minimum screw locations are to be the four corners. See Appendix "A" for minimum screw depths.

9. Lift holes to be Ø5/8"-11 UNC. Lift holes to be located on top side at minimum, three sides if possible (bottom not required). Top lift hole to be placed at insert COG.

10. Engrave "CAV 1", "CAV 2", etc., on MPL in the lower operator corner when multiple sets of inserts are made. Engrave "CAV 2", "CAV 3", etc., when additional complete dies are made, not just replacement inserts for the original die. Multiple cavity dies to have cavity number engraved on MPL. Engraving to be made with a Ø.125" ball cutter, .010" deep, x .375" high.

11. Engrave on bottom of insert according to Appendix "C".

Shot Block

1. Material to be Premium H13 from the approved supplier list. Stress relieve at 1200°, then heat treat per NADCA specs to RC 46-48. Hardness may also be provided by ConMet Tooling Engineer. Stress temper at 950° - 1000° before final assembly. Different heat treat specifications may be required depending on ConMet customer requirements.

2. Shot block MPL to stand up .002" from holder block, flush to cavity insert.

3. Shot hole diameter to be .005" over nominal diameter, tolerance to be +.003" -.000", and chamfer to be .125" x 30°. Shutoff for riser, when required, to match runner block. Shot hole diameter to be given at time of job release.

4. Minimum steel between shot hole and outside of block to be 2.0" when no cooling lines exist. If cooling lines are required, the lines are to pass no less than .750" of the shot hole.

5. If shot block telescopes into cavity insert, shot block must be the same thickness as the cavity insert.

6. Shot block corners to be R1.520".

7. Bottom to be chamfered according to press tonnage. For 400T presses, inserts to have a .20" x 45° chamfer. For 600T & 800T presses the chamfer to be .28" x 45°.

8. Relief on sides of shot block to be .020" deep with 1.50" of bearing. Exception: bearing should be with held from top and bottom of shot block.

9. Screws to be Ø5/8"-11 SHCS. Four screws to be located in the corners of shot block. See Appendix "A" for minimum screw depths.

10. Lift hole(s) to be placed in the shot block when possible. If shot block weighs over 40 lbs, lift hole is required. Lift hole to be Ø5/8"-11. See Appendix "B". Lift holes to avoid cooling lines.

11. Engrave "HOLDER 1", "HOLDER 2", etc., on MPL in the lower operator corner when multiple sets of complete dies are made. Engrave "HOLDER 2", "HOLDER 3", etc., when additional complete dies are made. Engraving to be made with a Ø.125" ball cutter, .010" deep, x .375" high.

12. Engrave on bottom of insert according to Appendix "C".

Runner Block

1. Material to be Premium H13 from the approved supplier list. Stress relieve at 1200°, then heat treat per NADCA specs to RC 46-48. Hardness may also be provided by ConMet Tooling Engineer. Stress temper at 950° - 1000° before final assembly. Different heat treat specifications may be required depending on ConMet customer requirements.

2. Runner block MPL to stand up .002" from holder block, same as ejector insert.

3. Riser, when required, to be made to the diameter of the shot hole plus 7° - 10° per side. Riser to have a R.300" in the bottom corner if 3.0" tall or less, and a R.550" in the bottom corner if over 3.0" tall. All riser design to have either spiral baffle or bubbler for cooling.

4. If the runner block telescopes into ejector insert, runner block must be the same thickness as the ejector insert.

5. Runner block corners to be R1.520".

6. Bottom to be chamfered according to press tonnage. For 400T presses, inserts to have a .20" x 45° chamfer. For 600T & 800T presses the chamfer to be .28" x 45°.

7. Relief on sides of runner block to be .020" deep with 1.50" of bearing. Exception: bearing should be with held from top and bottom of runner block.

8. Screws to be Ø5/8"-11 SHCS. Four screws to be located in the corners of shot block. See Appendix "A" for minimum screw depths.

9. Lift hole(s) to be placed in the runner block when possible. If runner block weighs over 40 lbs, lift hole is required. Lift hole to be Ø5/8"-11. See Appendix "B". Lift holes to avoid cooling lines and ejector pins.

10. Engrave "HOLDER 1", "HOLDER 2", etc., on MPL in the lower operator corner when multiple sets of complete dies are made. Engrave "HOLDER 2", "HOLDER 3", etc., when additional complete dies are made. Engraving to be made with a Ø.125" ball cutter, .010" deep, x .375" high.

11. Engrave on bottom of insert according to Appendix "C".

Cavity Holder Block

1. Material to be 4140, 300 BHN or higher and purchased from the approved supplier list.

2. Minimum steel thickness under insert to be 2.0” for 400T presses, 2.5” for 600T presses, and 3.0” for 800T presses. Shotwell nose length will dictate overall thickness.

3. Minimum steel between insert and outside of holder block to be 3.0” for 400T presses, 3.5” for 600T presses, and 4.0” for 800T presses.

4. All pockets in holder block to be .002” shallow for preload.

5. Bottom corner radius for the insert pockets to be R.19” for 450T presses, R.25” for 600T and 800T presses. On larger dies or deeper pockets, the bottom radius can be increased to R.31” or R.50”. This is to be reviewed on a die-to-die basis.

6. Insert pocket corners to be .015” - .020” smaller than insert. i.e. insert corner is R1.520”, holder block corner to be R1.500”. If vent covers insert radius, clear by .005”

7. Pockets for the insert and shot block to be cleared .0015” per side and top. On larger or multi-cavity dies, pockets can be cleared .002” per side and top. The bottom of the insert pocket is considered a datum. This side does not get cleared.

8. Shot hole clearance diameter to be .031” over nominal diameter with a .50” x 10° or 1.00” x 5° chamfer on back side of holder block.

9. Clamp slots to be on operator and helper sides of the cavity holder block. Size to be 1.00” from back x 1.00” x 1.00” with a .1875” root radius.

10. Pry bar slots to be on all four corners of the cavity holder block. Size to be approximately 1.00” wide x 1.5” long x .375” deep from MPL, with a R.125” in the bottom corner.

11. Knock-out holes are **not** required behind each insert and will be requested during design phase. Knock-out holes are to be modeled Ø1.070”. Larger dies to have Ø1”-8 UNC jack screws in place of knock-out holes. Thread depth to be 2” on pocket side, and cleared from back side Ø1.062”. Knock out holes are to be placed near the corners of the insert, shot blocks are not to be considered.

12. Air vents are required when leader pin bushings are on the cavity side. Air vents to be .50” wide x .060” deep min., and run from the bushing hole to the outside of the holder block.

13. Lift holes to be located on all four sides of the holder block, placed to balance the holder block. Size of lift holes is to be determined by weight of entire ejector half of die. See

Appendix “B”. Top lift hole(s) to be placed at COG of entire assembly. Additional lift holes may be added for manufacturability.

14. Engrave “HOLDER 1”, “HOLDER 2”, etc., on MPL in the lower operator corner when multiple sets of complete dies are made. Engrave “HOLDER 2”, “HOLDER 3”, etc., when additional complete dies are made. Engraving to be made with a Ø.125” ball cutter, .010” deep, x .625” high.

15. Engrave on operator side of holder block according to Appendix “C”

Ejector Holder Block

1. Material to be 4140, 300 BHN or higher and purchased from the approved supplier list.

2. Minimum steel thickness under insert to be 3.0” for 400T presses, 3.5” for 600T presses, 4.0” for 800T presses.

3. Minimum steel between insert and outside of holder block to be 3.0” for 400T presses, 3.5” for 600T presses, and 4.0” for 800T presses.

4. All pockets in holder block to be .002” shallow for preload.

5. Bottom corner radius for the insert pockets to be R.19” for 450T presses, R.25” for 600T and 800T presses. On larger dies or deeper pockets, the bottom radius can be increased to R.31” or R.50”. This is to be reviewed on a die-to-die basis.

6. Insert pocket corners to be .015” - .020” smaller than insert. i.e. insert corner is R1.520”, holder block corner to be R1.500”. If vent covers insert radius, clear by .005”.

7. Pockets for the insert and shot block to be cleared .0015” per side and top. On larger or multi-cavity dies, pockets can be cleared .002” per side and top. The bottom of the insert pocket is considered a datum. This side does not get cleared.

8. Knock-out holes are required behind each insert (usually 800T+), not the shot block, close to the four corners. Knock-out holes are to be modeled Ø1.070”. Larger dies to have Ø1”-8 UNC jack screws in place of knock-out holes. Thread depth to be 2” on pocket side, and cleared from back side Ø1.062”. This is an option for larger dies.

9. Lift holes to be located on all four sides of the holder block, placed to balance the holder block. A center of gravity lift hole for the entire ejector half to be located on the top side of the assembly for loading into the press. Sizes of lift holes to be determined by weight of entire ejector half of die. See Appendix “B”.

10. Engrave “HOLDER 1”, “HOLDER 2”, etc., on MPL in the lower operator corner when multiple sets of complete dies are made. Engrave “HOLDER 2”, “HOLDER 3”, etc., when additional complete dies are made. Engraving to be made with a Ø.125” ball cutter, .010” deep, x .625” high.

11. Engrave on operator side of holder block according to Appendix “C”

Bottom Clamp Plate

1. Bottom Plate to always be used unless otherwise specified.

2. Material to be 4140, 300 BHN or higher and purchased from the approved supplier list.

3. Thickness to be 2.00”. Clamp slots on operator and helper sides only.

4. Lift holes to be Ø5/8”-11 UNC. See Appendix “B”. Lift holes to be located on the top and bottom sides in the center of the plate. Rails and support pillars are screwed to the bottom clamp plate to form an ejector box; a lift hole is to be placed on top of Ejector Box Assembly at COG for the assembly onto the holder block.

5. Clearance holes are required through the plate for bumper pins and for a hydraulic pullback, if used.

6. Screws to be Ø3/4"-10 SHCS and spaced approximately 6” to 8” apart. On very large dies (800T+), screws to be Ø1”-8 SHCS. See Appendix “A” for thread engagement into holder block. Maximum screw length to be 8”.

7. Clamp slots to be on operator and helper sides of the clamp plate. Size to be 1.00” from back x 1.00” x 1.00” with a .1875” root radius.

8. Engrave “HOLDER 1”, “HOLDER 2”, etc., on the back side in the lower operator corner when multiple sets of complete dies are made. Engrave “HOLDER 2”, “HOLDER 3”, etc., when additional complete dies are made. Engraving to be made with a Ø.125” ball cutter, .010” deep, x .625” high.

9. Engrave according to Appendix “C”

Rails

1. Material to be 4140, 300 BHN or higher and purchased from the approved supplier list.

2. Side rails to extend the entire height of the holder block. Top rail to start .25” from each side rail, bottom rail to start .25” from each side rail. If there are clean-out slots in the holder block for slides, bottom rail can be opened up to allow dirt from the clean-out slots to pass through. Bottom rail also to be flush to the bottom side of the holder block and mounted directly to holder block. If rail needs to be moved up from the bottom, then two - Ø2.0” feet need to be screwed on to the bottom of the rail, and flush to the bottom of the holder block. Bottom feet should be screwed on with one Ø1/2"-13 SHCS. Thread engagement per Appendix “A”.

3. Rails are to overlap insert pocket by .25” minimum and prefer .50”. This is to ensure pocket edges have adequate support. Bottom rail may be omitted.

4. Clamp slots to be on one side of each side rail. Size to be 1.00” from back x 1.00” x 1.00” with a .1875” root radius (only if Bottom Clamp Plate is omitted).

5. Clean-out slots in the rails are required when leader pin bushings are on the ejector side and the rails do not allow dirt to pass through. Clean-out slots also required behind angle pins. Slots to be ramped down and out to the side to prevent dirt from falling onto the pin plate.

6. Screws mounting rails to Bottom Clamp Plate to be Ø5/8”-11 SHCS and spaced approximately 6” to 8” apart. Thread engagement per Appendix “A”.

7. Lift holes to be Ø5/8”-11 UNC. See Appendix “B” for thread engagement. One lift hole to be located on the top side of each rail, as sitting in the press.

8. Engrave according to Appendix “C”

Pin Plates

1. Material to be 4140, 300 BHN or higher.

2. Pin plates to have minimum stroke to eject part.

3. Thickness of pin plate to be .75", and thickness of support plate to be 1.5". On larger dies (600T & 800T), pin plate to be 1.0", and support plate to be 2.0".

4. Pin plates to clear rails by .125" per side

5. Support pillar clearance to be .125" per side (.25" on the diameter) bigger than the support pillar.

6. Forward stops to be used as design dictates. Return stops to be used in conjunction with guided ejection.

7. Screws to be Ø1/2"-13 SHCS. Thread engagement of screw into pin plate to be thru. Pattern screw placements around a 5" - 6" grid paying special attention to return pins, guides and pull backs. Do not place screws in bumper pin locations.

8. Lift hole in pin plate and support plate to be Ø1/2"-13 UNC. See Appendix "B" for thread engagement. One lift hole to be located on the top side of each plate, as sitting in the press.

9. Engrave "HOLDER 1", "HOLDER 2", etc., on the back side of each plate in the lower operator corner when multiple sets of complete dies are made. Engrave "HOLDER 2", "HOLDER 3", etc., when additional complete dies are made. Engraving to be made with a Ø.125" ball cutter, .010" deep, x .625" high. (Ejector pin ID's to be stamped or engraved – vendor option. If stamped, letters or numbers must be clear and concise.)

10. Engrave plates according to Appendix "C".

Support Pillars

1. Material to be 4140, 300 BHN or higher.

2. Preload support pillars .002", for larger tonnage dies (800T+) preload to be .003".

3. One support pillar to be located close to centerline of shot hole. Other support pillars to be located under part areas and under slides. Spacing to be approximately 6" between support pillars. Do not place support pillars in bumper pin locations, over clean-out slots, or directly below clean-out slots.

4. Screws to be Ø5/8"-11, on center of each support pillar. See Appendix "A" for thread engagement. Support pillars are to be attached to the Bottom Clamp Plate.

Guide Posts and Stops

1. Material of guide posts to be 8620, carburized .06” deep and hardened to 60-62 Rc. Thomson rod may also be used.

2. Material of stops to be 4140, 300 BHN or higher.

3. No preload on guide posts and stops. Clearance should be included on ejection full return.

4. Typical nominal size of guide post to be Ø1.000”, Ø1.250”, Ø1.500” or Ø2.000”. The actual diameter of guide rod shall .007” less than nominal diameter, i.e. Ø.993”, Ø1.243”, Ø1.493”, and Ø1.993” respectively.

5. Guide post stop dimensions are designer option. A minimum contact (between stop and pin plate) of 1/8” per side is required.

6. Guide posts pocket depth to be 1/2 the nominal diameter of the post. Pocket diameter to be .003” less than nominal diameter.

7. Guided ejector bushings to be used with all guide posts. Bushing heel to be seated in the support plate. Bushings to be Progressive GEB100, GEB125, GEB150, GEB200 or equivalent.

8. Four guide posts to be located near the corners of the pin plate between the return pins and the bumper pins, if possible. If pin plate is much longer in one direction, one or two additional guide posts may be located in the middle of the pin plates. The number of guide posts typically to be the same as the number of return pins. Do not place guide posts in bumper pin locations, over clean-out slots, or directly below clean-out slots.

9. Screws to be Ø1/2"-13 SHCS unless screw length required larger diameter. Thread engagement of screw into holder block per Appendix “A”. One screw on center of each guide post, counter-bored into stop. Max screw length is 8.00”.

10. Guide post stops may be used as back stops as long as the stop is backed up by the rear clamp plate. Guide post stops are to “kiss” up to the bottom clamp plate. Do not leave clearance between guide post stop and bottom clamp plate. Meaning: total height of guide post and stop is equal to the rail height.

11. Minimum thickness for stop is .250”. In this case clear the rear clamp plate for the head of the screw. Add back stop to support plate or bottom clamp plate.

Hydraulic Pullback

1. Material to be 4140, 300 BHN or higher.

2. Hydraulic pullback to be used per design criteria. Hydraulic pullback also to be used if ejector pins are located under slides. Thread size per machine criteria. Will be noted on design reviews

3. Thickness of hydraulic pullback to be same as pin plate stops. If used with a bottom clamp plate, pullback to be flush with bottom of clamp plate.

4. Screws to be Ø5/8”-11 SHCS. Thread engagement of screw into back of support plate to be .875”. Four screws to be located in the corners of pullback.

5. Pull backs may also be screwed directly to support plate. If so, support plate must be 2.0” thick and Ø5/8”-11 SHCS must be used between support plate and pin plate.

Leader Pins and Bushings

1. Leader pins to be Progressive straight style, LP200L__, LP250L__, or LP300L__. Leader pins to be Ø2.000". On 800T dies, leader pins can be Ø2.500" or Ø3.000". A 10° x 1.00" tapered lead-in to be ground on tip if no lead-in present. Counter-bore diameter for head to be .100" over head size.

2. Leader pins are to be installed the half in which has the most standing steel or the most delicate steel to protect.

3. Leader pin to engage bushing before any other components contact each other. Length of leader pin above MPL to be 1/2" more than the amount of the standing steel on half which leader pin is present.

4. Bottom Opposite Operator side leader pin to be 2" above MPL to aid in part extraction

5. Bushings to be Progressive shoulder bushings, bronze plated with internal grease grooves. A spacer is required to back-up the bushing, flush to the back of the holder block. Spacer is to be a slight press into place. DO NOT weld spacer into place.

6. Four leader pins required in each die, near the four corners.

Return Pins

1. Return pins to be Ø1.000”. Return pins to be Progressive straight style ejector pin, EP1000L__.

2. Return pins to stand up above holder block .002” or flush with insert.

3. Return pins are preferred in the insert(s) however design may dictate they be placed in the holder block. Design according to Appendix “D”.

4. Bearing in insert to be Ø1.003” x 1.00” long, bearing in holder block to be Ø1.003” x 1.50” long.

5. Four return pins to be located near the corners of the pin plate. If pin plate is much longer in one direction, additional return pin(s) may be located in the middle of the pin plates. The number of return pins should be the same as the number of guide posts. One or two return pins to be offset to prevent pin plates from being installed wrong. Do not place return pins directly below clean-out slots.

6. ID return pins “1”, “2”, “3”, “4”, etc.

Ejector Pins

1. Ejector pins to be Progressive straight style, EP__L__.

2. Ejector pins to be flush in part. Ejector pins to be ±.010" in overflows. Ejector pins to be flush in runner and vacuum channels. If ejector pin is in ramped area of runner, contour and time pin.

3. Contoured pins to be keyed with flat on high side of pin (timed pin). Dowels or pins are NOT an acceptable method of timing pins.

4. Bearing lengths and relief diameters for ejector pins to be according to Appendix "D"

5. Do not locate ejector pins within shot sleeve inside diameter.

6. If pins are placed under slides, crash pins are required as well as pull backs.

7. ID ejector pins same as return pins but start after return pin count

Core Pins and Set Screws

1. Core pins to be Progressive high hardness core pin, CPH__L__ (CX pin).

2. Date pins to be Progressive standard hardness core pin, CPS__L__ (C pin).

3. Flash core pins .015” - .020”.

4. Bearing, relief lengths, and clearance for core pins to be according to Appendix “D”.

5. ID core pins in cavity insert “C1”, “C2”, “C3”, etc. ID core pins in ejector insert “E1”, “E2”, “E3”, etc. ID core pins in slides “S1”, “S2”, “S3”, etc.

6. For easy removal core pins, double set screws to be installed in holder blocks behind core pins in inserts. Set screws to be socket head, cup point, ground flat and parallel on both ends. Easy removal core pins will be noted during design review. Set screw sizes to be one of the following:

   Ø 1/2-13 UNC x 1/2”
   Ø 5/8-11 UNC x 3/4”
   Ø 3/4-10 UNC x 3/4”
   Ø 7/8-9 UNC x 1”
   Ø 1-8 UNC x 1”
   Ø 1 1/4-7 UNC x 1”
   Ø 1 1/2-6 UNC x 1 1/2”

7. Thread length to be equal to length of double set screws.

8. Clearance for set screws through Ø1-8 UNC to be .062” over set screw size. Clearance for Ø1 1/4”-7 UNC and Ø1 1/2”-6 UNC set screws to be .093” over set screw size. Clearance to be in holder block, pin plates, and bottom clamp plate where possible.

Cooling Lines

1. Cooling lines and oil lines to be located and sized to best cool or heat the insert. These will be reviewed and located upon design review

2. Minimum distance from cooling line to casting and non-casting surfaces to be .75” (less must have approval).

3. Cooling lines to be drilled with ball tip drill.

4. Cooling lines on angles or into corner radius of insert to be spot-faced.

5. Plug cooling lines with brass plugs. Identify plugged lines with plugs with “P” or “PLUG”.

6. Cascades and brass extension elbows to be Progressive cooling components.

7. Clearance diameters for pipes out the side of holder blocks to be Ø.75” for 1/8 and 1/4 pipes. Clearance diameters to be Ø.88 for 3/8 pipes, and Ø1.06 for 1/2 pipes.

8. Pipe to extend out 1.0” minimum from the holder block. Do **NOT** Lock-Tite pipes to the inserts or internal fittings - i.e. cascade heads, use only Teflon tape. Lock-Tite is to be used for external fittings only.

9. Route cooling lines to best cool the insert and part. Cooling lines may exit Helper, Top, and Operator sides. No cooling lines are to exit the bottom of the die. In general; “IN” lines are placed on the Operator side, “OUT” lines are placed on Helper side.

Slide Fronts and Slide Plates

1. Material to be Premium H13. Stress relieve at 1200°, then heat treat per NADCA specs to RC 46-48. Larger, more complicated slide fronts to be RC 44-46. Hardness may also be provided by ConMet Tooling Engineer. Stress temper at 950° - 1000° before final assembly. Different heat treat specifications may be required depending on ConMet customer requirements.

2. Slide fronts that go into insert to have 5° draft (2° minimum) above PL on all sides. Vertical corners to be R.75" if possible, minimum to be R.25". Top and bottom corner radii to be R.125". Minimum draft in line of pull to be 2° per side.

3. Slide plates that do not go into insert to have 5° draft above MPL on two sides. The face of the slide plate, from MPL up to the top, to extend into the insert (by the amount of draft to the top of the plate) and have 2° draft. The resulting edge over MPL to be cleared .005" on the slide plate. Top corner radii to be R.125".

4. Slides to have a .300" shank on the back to locate the slide to the carrier. Shank to be approximately .50" in from the outside of the slide. Shank pocket in carrier to be modeled with .001" per side clearance when slide front has a straight bottom and .002" per side clearance when slide front has a tapered bottom. Shank corners to be R.800" (R.750" in pocket) with a R.06" in the bottom corner and a .08" x 45° chamfer around bottom.

5. Trash slot may be required in bottom corner of face of slide. Slot to be 1/4" x 1/4" with a R.125". Slide plates can be shortened .250" to allow for this.

6. Screws to be Ø1/2"-13 SHCS. On larger slides, screws to be Ø5/8"-11 or Ø3/4"-10 SHCS. Thread engagement per Appendix "A".

7. Engrave slide number "1", "2", etc. on top of slide by the upper left corner, to be read in the line of pull, when multiple slides are required. Engraving to be made with a Ø.125" ball cutter, .010 deep, and .375" high.

Carriers

1. Material to be 4140, 300 BHN or higher (8620 also acceptable).

2. Carriers to have a .300” shank pocket on the front to locate the slide to the carrier. Shank to be approximately .50” in from the outside of the slide. Shank pocket in carrier to be modeled with .001” per side clearance when slide front has a straight bottom and .002” per side clearance when slide front has a tapered bottom. Shank pocket corners to be R.750” (R.800” on shank) with a R.06” in the bottom corner and a .08” x 45° chamfer around top.

3. Trash slot may be required in bottom corner of the face of carrier if slide front does not go to bottom of carrier. Slot to be 1/4” x 1/4” with a R.125”.

4. Clean-out slots are required in the holder block for all carriers. Slots to be a minimum of .75” wide, with full radius on ends. Slots to be as wide as the pocket for the heels, and go from the bottom of the heel out to the back of the holder block.

5. Carriers to have 5° draft above MPL on two sides (draft must match slide front). Top corner radii to be R.125” (radii must match slide front). Lock angle to be 15° for cylinder pull, and 18 degrees for angle pin pull (lock angle to be 3° more than angle of angle pin). Top corner radius over lock angle to be R.125”. Bottom corner radius for lock angle to be R.300”. Radii over sides of lock angle to be R.030”, blended to R.001” around the R.300” at bottom. Note: Location of lock angle to project force to bottom corner of front of slide.

6. Heels to be .375” wide for carriers up to 10” wide, and .500” wide for carriers 10” and wider, x 1.500” high or 1.250” high if space does not allow. Slot in holder block to be .44” wide or .56” wide. Clearance on top of heels to be .005” for carriers up to 10” wide, and .008” for carriers 10” and wider (slot in holder block to be nominal size). Radius in corner of heel to be R.06”, with a .03” x 45° chamfer on top side and a .06” x 45° chamfer on bottom side (all the way around carrier). Chamfer on front side of heels to be .37” x 45° or .50” x 45° (entire width of heel), and chamfer on back side of heels to be .12” x 45°.

7. Clearance in holder block to sides of carriers to be .002” total clearance per inch of carrier for slides up to 4” wide. Slides over 4” to have .003” total clearance per inch of carrier. This clearance also to be on draft above MPL. Split clearance equal on both sides when carrier is on the top or bottom of die, or when a center gib is used. When carrier is on the side of the die and no center gib is used, put .002” clearance on bottom side and the rest of the clearance on the top side (clearance in cavity holder block to always be split equal on both sides).

8. Grease grooves to be machined on bottom and two sides of carrier, between heel and MPL. Grease grooves to be .Ø1875" ball x .025" deep, spaced 1" to 1 1/4" square. Grooves to stop approximately .25" from outside of carrier and MPL.

9. Lift holes, when required, to be Ø1/2"-13 UNC. See Appendix "B". Lift holes to be located on the top side of each carrier as sitting in the press (and symmetrically on opposite side), in the center of gravity of the carrier and slide front, to be used to load and unload the carrier while die is in the press.

10. Engrave slide number "1", "2", etc. on top of carrier by the upper left corner, to be read in the line of pull, when multiple slides are required. Engraving to be made with a Ø.125" ball cutter, .010" deep, and .375" high.

Center Gib(s)

1. Material to be S7, heat treated to RC 54-56.

2. Center gib(s) to be used on slide pulls from the side of the die, and when slide pull is critical to be pulled straight. One center gib to be used per slide, located on or near the centerline of the carrier.

3. Size of center gib to be a minimum of 1.000” wide x 1.000” deep, split equal in holder block and carrier. Sizes can be decreased if space does not allow. Radius in bottom of slot in carrier to be R.060”. Radius in bottom of slot in holder block to be R.060”, if slot is .625” deep or more radius on bottom to be R.125”.

4. Clearance in holder block to side of gib to be .0005” per side. Clearance in carrier to side of gib to be .002” per side. Clearance in carrier to top of gib to be .005”. Clearance in slide plate to sides and top of gib to be .005” per side. Note: Gib should not go through slide front and cover trash slot, carrier must be made bigger.

5. Screws to be Ø3/8”-16 SHCS. Thread engagement per Appendix “A”. Gib(s) to be screwed in from bottom of die to keep dirt out of screw heads and counter-bores.

6. Grease grooves to be machined on top and both sides of gib. Grease grooves to be .Ø1875” ball x .025” deep, spaced 1” to 1 1/4” square.

Wear Plates

1. Wear plates may be used when extremely high volumes of parts are expected, or where high wear surfaces are expected. This will be noted on the design review or initial design phase.

2. Material to be S7, heat treated to RC 56-58.

3. Size of wear plate to be .750” thick minimum.

4. Wear plate to be pocketed in holder block on all four sides. Pocket to be approximately .50” in from clean-out slot and outside of holder block. Corner radii of wear plate to be R.750”, and bottom corner in pocket to be R.125”.

5. Clearance in holder block to wear plate to be .001” per side. Carrier pocket in holder block to be dropped .003” from top of plate to ensure that carrier rides on wear plate.

6. Screws to be Ø1/2”-13 SHCS. Thread engagement of screw to be only .50”. Wear plates to be screwed in from bottom of die to keep dirt out of screw heads and counter-bores. Screw holes in wear plates not to break through top side, and threads to be bottom tapped.

Locks

1. Material to be S7, heat treated to RC 54-56.

2. Lock angle to be 15° for cylinder pull, and 18° for angle pin pull (lock angle to be 3° more than angle of angle pin). Top corner radius over lock angle to be R.320" (R.300" in carrier). Note: Location of lock angle to project force to bottom corner of front of slide.

3. Lock to have 5° draft on two sides (draft must match carrier). Bottom corner to be chamfered .15" x 45° when radius in bottom of pocket is R.125". When radius in bottom of pocket is larger than R.125", bottom corner of lock to have a radius .020" bigger than radius in pocket.

4. Lock to be cleared .005" per side to slide pocket, which is cleared to match carrier pocket. Radii in corners of pocket to be R.750".

5. Screws to be Ø1/2"-13 SHCS. Thread engagement per Appendix "A". Locks to be screwed in from bottom (2-3 screws) and side of die (1-2 screws), depending on length of lock.

6. When using angle pins, lock must be removable while angle pins are installed. Location of lock may have to be moved toward outside of base to clear angle pins.

7. Extremely large carriers with deep lock pockets require the lock to be a flat plate with the pocket in the holder block machined on the locking angle. Plate to be 1.500" thick with R.550" corner radii in the pocket. Six screws to be used from side of die, square to lock.

8. Lock to have 0.002" to 0.003" preload to carrier.

Cylinder Plates, Cylinders, and Cylinder Nuts

1. Cylinder plate and rail material to be 4140, 300 BHN or higher.

2. Thickness of cylinder plate to be 2.00". Thickness for larger bore cylinders can be 2.50" or 3.00". Thickness of cylinder plate rails to be 1.50" minimum. Increase the size for larger bore cylinders.

3. Cylinder plate and rails to be 3-piece design when the majority of the carrier pulls out of the holder block. Rails to have same clearance (put on each side of rail to keep screws centered on rail) to the side of the carrier as the holder block wall (rails may be different thicknesses depending on how much clearance is on each wall in the holder block). Cylinder plate to be slotted and not counter-bored for cylinder gland. Heel slots to have .001" per side clearance from nominal size if carrier needs to be closely aligned, and .005" per side clearance from nominal size if carrier does not need to be closely aligned.

4. Rails to be doweled to cylinder plate with two Ø.50" x 1.0" dowel pins, and screwed to cylinder plate with one Ø5/8"-11 SHCS. Dowel pin engagement into rail to be .312", and thread engagement per Appendix "A". Larger cylinder rails can use Ø.750" x 2.0" dowel pins, and Ø3/4"-10 SHCS. Dowel pin engagement into rail to be .375", and thread engagement per Appendix "A".

5. Rails to be doweled to holder block with two Ø.50" x 1.0" dowel pins. Dowel pin engagement into holder block to be .312". Larger cylinder rails can use Ø.750" x 2.0" dowel pins, dowel pin engagement into rail to be .375"

6. Cylinder plates and rails with cylinder bore sizes through Ø4.999" to be screwed to holder block with four - Ø3/4"-10 SHCS. When cylinder bore size is Ø5.0"+ screws to be Ø1"-8 SHCS. Thread engagement of screws per Appendix "A".

7. Plates and rails standing above MPL to be cleared at edge of holder block with a 45° chamfer, starting .125" below MPL and extending up to top of plate or rail. If chamfer is too large for the plate or rail, a .125" deep slot starting .125" below MPL and extending up to top of plate or rail to be used.

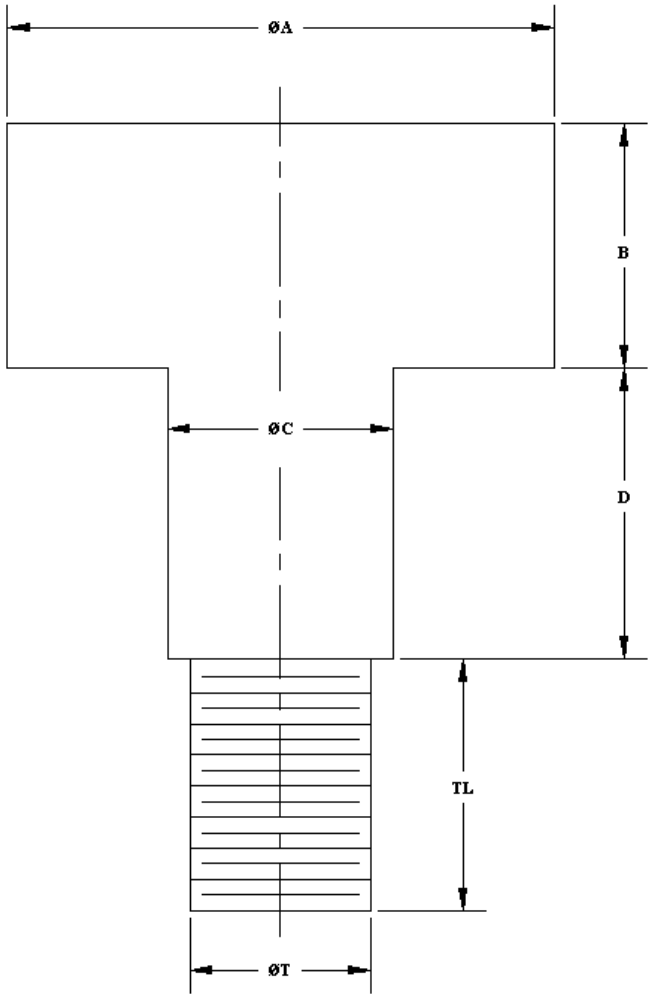
8. Slide to pull back 4"- 6" to allow cleaning while in press. Retracted carrier to stop approximately 1.0" away from cylinder plate (when possible) to avoid hand from being caught between carrier and cylinder plate.

9. Lift holes to be Ø1/2"-13 UNC. See Appendix "B". One lift hole to be located on each side of the cylinder plate, when centered, to be used to load and unload the cylinder box while die is in the press. Hoist rings to be appropriately cleared around cylinder plates and rails.

10. In most cases, cylinders to be Parker J-2H or JJ-2H, non-cushioned, with Buna-N seals. Piston rod to be standard diameter and length with rod end style #9, small female threads. Cylinder ports to be NPT fittings and placed so hydraulic lines are parallel or away from MPL. When in doubt ask.

11. Cylinder nut material to be 4140, 300 BHN. Cylinder nut sizes to be as follows (all dimensions in Inches):

Cylinder Bore Ø	ØA	B	ØC	D	ØT	TL
Ø2.50	Ø1.50	.75	Ø1.00	.75	Verify w/ MFG	Verify w/ MFG
Ø3.25	Ø2.00	1.25	Ø1.375	1.25	Verify w/ MFG	Verify w/ MFG
Ø4.00	Ø2.50	1.25	Ø1.75	1.25	Verify w/ MFG	Verify w/ MFG
Ø5.00	Ø2.75	1.50	Ø2.00	1.50	Verify w/ MFG	Verify w/ MFG
Ø6.00	Ø3.25	1.75	Ø2.50	1.75	Verify w/ MFG	Verify w/ MFG
Ø7.00	Ø3.75	1.75	Ø3.00	1.75	Verify w/ MFG	Verify w/ MFG



NOTE: Length of small diameter (D) to be adjusted to fit piston rod into carrier with approximately 1” of steel between large diameter (ØA) and back of carrier.

12. Cylinder nut to have solid male threads on end of small diameter. Cylinder nut to have two wrench flats on the small diameter (ØC) that match the flats on the end of the piston rod.

13. Cylinder nut slot in carrier to have .030” per side clearance to cylinder nut diameters. Slot to have .040” per side clearance to front and back of cylinder nut when cylinder travels the full amount of cylinder stroke, and .010” clearance to back side only of cylinder nut when cylinder does not travel the full amount of stroke. Radius in corners to be R.03”, with a .08” x 45° chamfer between diameters.

14. Cylinder nut length to be determined by cylinder stroke. Size cylinder to stroke out before slide is “home”. The lock will pull slide remaining amount, hence clearance behind cylinder nut and carrier slot.

Limit Switches and Switch Brackets

1. Limit switches are required for all cylinder pull slides. Limit switches are not required for angle pin pull slides.

2. External limit switches to be Allen-Bradley 802T-NPTP. Internal cylinder limit switches to be CLS-4.

3. Limit switch roller to be triggered by an adjustable locating button, mounted to a switch bracket. Adjustable locating button to be Carr Lane CL-LB-3, with a Ø3/8”-24 UNF thread. A Ø3/8”-24 UNF jam nut to be used to lock the locating button in place.

4. Switch bracket to be made from Cold Roll steel, size to be 1.00” wide. Switch bracket to be pocketed into bottom of carrier .125” and screwed in with two Ø5/16”-18 SHCS. Thread engagement of screw into carrier per Appendix “A”. Two Ø3/8”-24 UNF threaded holes to be put into bracket for the locating buttons to trigger the limit switches, one in the forward position, and one in the retracted position.

5. Switch bracket pocket in carrier to be 1.00” wide (same as bracket) x .125” deep, with sharp bottom corner. Pocket to be 1.875” from back of carrier and run out to back of carrier. Pocket corners to be cleared out with a Ø.250”, past back wall .125”, to allow sharp corner on switch bracket.

6. Switch bracket clearance in holder block to be 1.300” wide (.125” per side wider than bracket) with full radius centered at end of switch bracket, .25” deeper than bracket, and have a R.25” in bottom of pocket.

Angle Pins, Springs, and Stops

1. Angle pins to be Progressive or equivalent straight style leader pin; LP__L-_.

2. Angle pin to be sized appropriately for expected load of slide pull. Angle pin to have full ball on end engaging into carrier, opposite end to be machined flush to back of holder block.

3. Angle pin to be on 15° (can be adjusted anywhere up to 20° for longer travel). Clearance hole in carrier to be .040" per side larger than angle pin, and have a R.125" over top and bottom.

4. Clearance slots are required in the ejector holder block behind all angle pins. Clean-out slots behind the angle pins are required in the rails when the rails do not allow dirt to pass through. Slots to be ramped down and out to the side to prevent dirt from falling onto the pin plate, if possible.

5. Springs to be used for slides on top and sides of holder block, not on bottom side. The number of springs per slide to depends on weight of slide and location. Springs to hold 2X weight of slide and carrier. Springs to be Danly medium load (green) # 9-16__-11 (1" OD), # 9-20__-11 (1 1/4" OD) or Danly medium-heavy load (blue) # 9-16__-21 (1" OD), # 9-20__-21 (1 1/4" OD) rectangular wire construction.

6. Stops to be used with all angle pin pull slides. Material to be Cold Roll. Stop to be mounted to outside of holder block when slide pulls back close to or just past edge of holder block. Stop to be mounted to bottom of slide pocket when room exists. Screws for stop to be Ø1/2"-13 SHCS, two required, thread engagement per Appendix "A".

General Die Construction

1. Part area to be EDM'd only if cutting is not possible. After EDM work, all EDM marks to be polished out and piece to be stress tempered at 950° - 1000°. This can be in conjunction with final stress temper.

2. All molding components to be polished to a 220 finish. Components to be draw polished in the line of pull.

3. All components to be engraved per Appendix "C". Additional engraving or stamping pads may be added to include Heat #, Vendor Job #, or other vendor related items provided they do not interfere with construction or normal function of the die. Components too small for a stamping pad may be engraved or stamped with a minimum of ConMet CK #.

4. Thermocouples to be used by request only. Thermocouple to be DME TC-8000. Bayonet adapter to be DME BA-1007 (Ø1/8"-27 NPT x 7/8") or BA-1013 (Ø1/8"-27 NPT x 1 3/8"). Hole in insert to be Ø.281" with full ball at tip. Hole in holder block to be Ø.344", tapped from back side Ø1/8"-27 NPT, and drilled Ø.75" x 1 1/2" deep from back to clear bayonet fitting. Slot holder block 1" deep x 1" wide x 2 1/2" long on center of thermocouple to attach bayonet fitting. Hole or slot may be used for cable to run out through side of holder block. Ensure cable is held in place by the use of tabs or other such items.

Engraving

All die components (except purchased) are to have some form of identification. Most components will be engraved with a material pad as specified in Appendix "C"

File Naming Guidelines

Every product produced by ConMet has an associated ConMet Part Number (CMI #) and a CK number (for all new designs). This CK # is to be used on all correspondence concerning that program. It is also the base of the file naming structure.

ConMet has developed a numbering and naming system that is used on all die cast dies designed internally. As a reference, below are the following segments and the numbers associated to each segment.

Segment	Range	Range Description
Segment 1	001 thru 099	General assembly files
Segment 2	100 thru 299	Stationary half files
Segment 2.1	CKXXXX-100	Stationary Holder Block
Segment 2.2	CKXXXX-101	Stationary Shot Block
Segment 2.3	CKXXXX-200	Stationary Insert – OP side
Segment 2.4	CKXXXX-201	Stationary Insert – Off OP side
Segment 3	300 thru 499	Ejector half files
Segment 3.1	CKXXXX-300	Ejector Holder Block
Segment 3.2	CKXXXX-301	Ejector Shot Block
Segment 3.3	CKXXXX-400	Ejector Insert – OP side
Segment 3.4	CKXXXX-401	Ejector Insert – Off OP side
Segment 4	500 thru 549	Slide 1 construction files
Segment 5	550 thru 599	Slide 2 construction files
Segment 6	600 thru 649	Slide 3 construction files
Segment 7	650 thru 699	Slide 4 construction files
Segment 8	700 thru 899	Miscellaneous. parts
Segment 9	900 thru 950	Pro-Engineer Split Files
Segment 10	990	Runner/Overflow file
	991	Cast result file

Prints

1. Before starting a new job, ConMet to send the latest part model to ensure that vendor has the latest, updated model to build from. Sheet layout is dependent on design and complexity of tool. However, a general guideline is as follows:
    - Sheet 1 – Main Page
        - Isometric view of Stationary half (PL view)
        - Isometric view of Ejector half (PL view)
        - Approval note
    - Sheet 2 – Stationary Half Assembly
        - Views showing basic and critical features; include a section view
        - Include dimensions of overall size
    - Sheet 3 – Ejector half Assembly [holder block and insert(s) only]
        - Views showing basic and critical features; include a section view
        - Include dimensions of overall size
    - Sheet 4 – Cover Insert(s)
        - Views showing basic and critical features; include a section view
        - Include dimensions of insert to MPL, and overall height
    - Sheet 5 – Ejector Insert(s)
        - Views showing basic and critical features; include a section view
        - Include dimensions of insert to MPL, and overall height
    - Sheet 6 – Back view of complete die
        - Mark or note location of ejector bars holes
    - Sheet 7 – Vertical section(s) of complete tool
        - Include dimensions of stack height, ejection stroke
    - Sheet 8 – Horizontal section(s) of complete tool
    - Sheet 9 – Pin plate assembly

2. Items to be confirmed on preliminary prints:
    - press size
    - stack-up height is within min/max for press
    - shot hole diameter and length
    - shot position
    - shrinkage for part

3. When die is finished, the following to be shipped with in a booklet
    - steel certification
    - heat treat certification
    - core pin details
    - ejector pin list
    - cooling line schematic
    - computer files of die design (to be sent via e-mail or ftp site)
        - .stp files of 3-D die model (or native Pro-E files if available)
    - .igs, .dwg, or .dxf files of 2-D prints

Appendix A

The chart below dictates the minimum amount of thread engagement not the tap depth. It is the responsibility of the designer to ensure taps are of appropriate depth.

Screw Thread Engagement	
Screw Size (Tap Size)	Minimum Engagement
Ø10-32	.32”
Ø1/4” – 20	.38”
Ø5/16” – 18	.44”
Ø3/8” – 16	.50”
Ø1/2” – 13	.75”
Ø5/8” – 11	.88”
Ø3/4” – 10	1.00”
Ø1” – 8	1.38”
For screws larger than Ø1” use: Diameter of thread + .375” as length of engagement.	

Dowel Pin Engagement	
Dowel Pin Size	Minimum Engagement
Ø3/8” x 1”	.250”
Ø1/2” x 1”	.312”
Ø5/8” x 1.250”	.375”
Ø3/4” x 2”	.375”
Ø1” x 2”	.375”

Appendix B

Lift Hole Selection Chart

This chart is for use with shoulder style eye bolts. ConMet does not allow the use of non-shoulder eye bolts. Dies will not be received nor sent out with such hardware. ConMet has also issued a policy in which all new tooling must come equipped with hoist rings in lieu of eye bolts to pick up the assembled die halves. Below are the tables for both hoist rings and eye bolts for reference. Hoist rings are purchased from DME or any equivalent supplier. Steps must be taken to ensure clearance of hoist ring and externally mounted components.

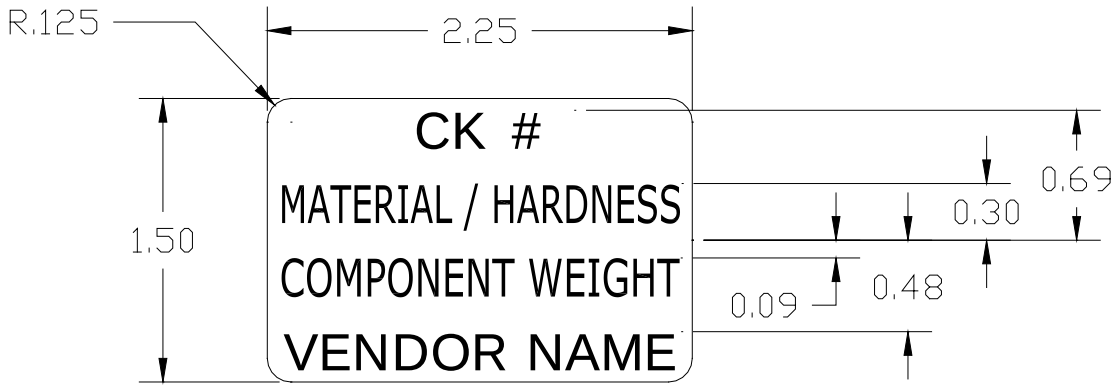
Hoist Rings				
Catalog Number	Rated Load (lbs)	Thread Size	Min Tap Depth	Torque (ft/lbs)
SHR0001	800	Ø5/16”-18	.75”	7
SHR0002	1000	Ø3/8”-16	.75”	12
SHR0003	2500	Ø1/2”-13	1.00”	28
SHR0004	4000	Ø5/8”-11	1.25”	60
SHR0005	5000	Ø3/4”-10	1.25”	100
SHR0006	10000	Ø1”-8	1.75”	230
SHR0007	15000	Ø1 1/4”-7	2.25”	470

Eye Bolts				
Thread Size	Thread Depth	Swing of Eyebolt	Side Pull Safe Load (lbs)	Straight Pull Safe Load (lbs)
Ø1/2”-13	1.00”	2.125”	630	2,600
Ø5/8”-11	1.25”	2.750”	1,000	4,000
Ø3/4”-10	1.50”	2.875”	1,500	6,000
Ø1”-8	2.00”	3.625”	2,760	8,000
Ø1 1/4”-7	2.50”	4.500”	4,450	15,000

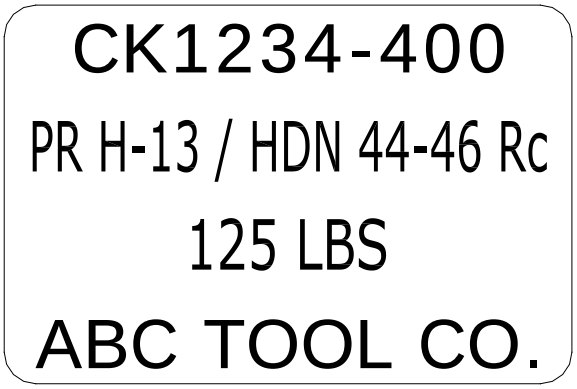
Appendix C

Engraving

All components to be engraved using the drawing below; depth of pad to be .02". Engraving pad can be modified to allow for more information, including the vendors job number or detail dumber. The pad may also be modified in size to accommodate smaller objects.

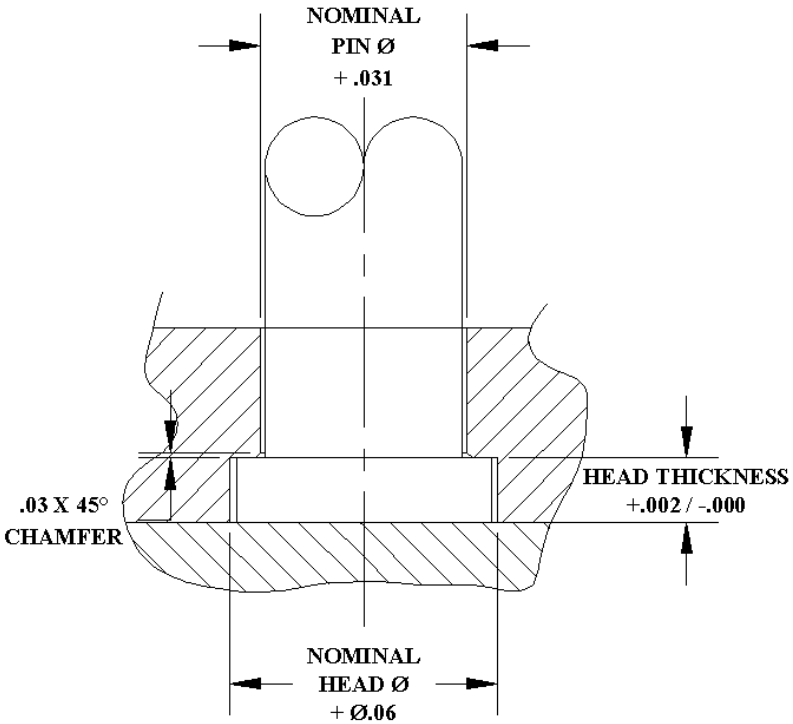


Example

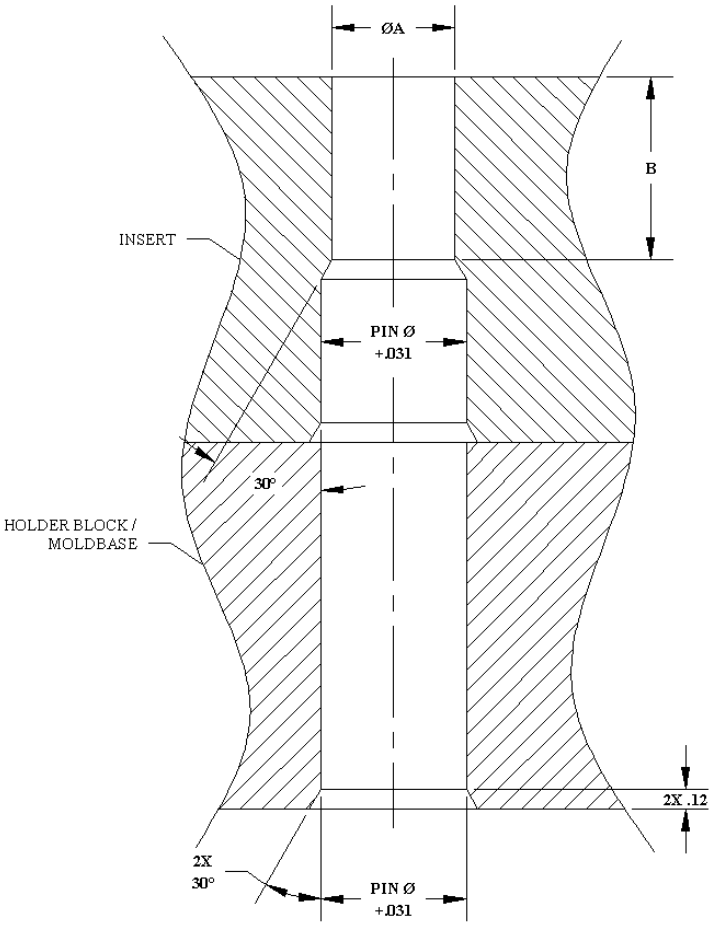


Appendix D

Ejector Pin Head Fit

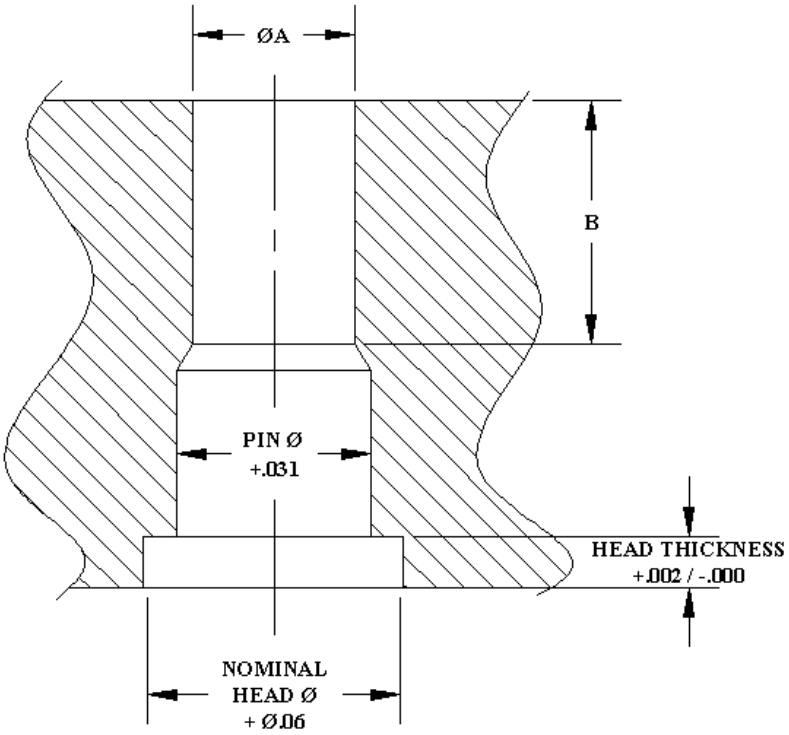


Ejector Pin Fit



PIN Ø	ØA	B
3/16 - 19/64	.001 - .002	1.00
5/16 - 31/64	.002 - .003	1.25
1/2 - 7/8	.003 - .004	1.50
1.00	.004 - .006	2.00

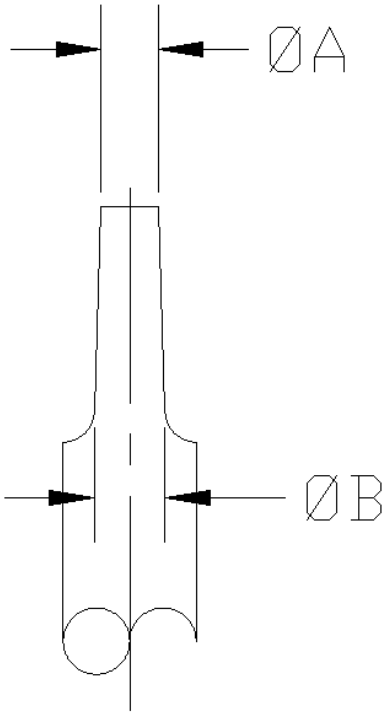
Core Pin Fit



PIN Ø	ØA	B
3/32 - 7/32	.0005 - .0015	0.50
1/4 - 15/32		0.75
1/2 - 3/4	.0015 - .002	1.00
1.000 +	.002 - .003	1.5 X PIN Ø

Appendix E

Core Pin diameters for Roll Formed Threads



Thread Size / Type	Dimension **A**	Dimension **B**
M6 Roll Form		
M8 Roll Form	Ø.291 / .292	Ø.294 / .295
M10 Roll Form		

Dimensions shown are regardless of casted pin height.

Revision History

Owning Dept.:	Date of Publication	Number of Pages
ENGINEERING	07/20/07	45

Chronology of Revisions to This Document

Date of Change	Revision No.	Description of Change
07/20/07	A	Initial Release.
07/21/08	B	Modified print specs
9/24/08	C	Added file naming guidelines
02/11/09	D	Updated entire standard
04/06/09	E	Guide post stops, cooling line requirements, Core pins,
09/26/11	F	Updated standards for 1000T press and general clean-up, Added Appendix E
08/30/12	G	Updated guide post requirements