



### **GENERAL INFORMATION**

All dies shall be designed with the operator's safety the major consideration. As a general rule, no die shall be designed where an operator must load or unload with any part of their body inside the die.

GRS&S Engineering must approve all tool and die designs before proceeding with the tool build. This required approval does not shift the responsibility for the design or the ability of the tooling to produce acceptable parts, run automatically under production conditions in GRS&S presses away from the tool source, but is an effort to promote the best communication between GRS&S and its tooling suppliers to eliminate errors that cost time and money. Die designs and drawings are the property of GRS&S.

It is required to participate in design review meeting(s) at GRS&S. This usually consists of a preliminary and final design review. The intent of these meetings are to inform, answer questions and gain consensus of all disciplines. Topics of discussion may include guarding, die protection, specific dimensions needing control, high wear issues (material choices, surface treatment), timing, informational needs, etc. This is intended to be a two-way communication.

Weekly tooling progress reports may be required and will be e-mailed no later than Friday at noon to the attention of the Project Engineer. The form can be supplied by GRS&S. Also, the progress of the tools will be visibly available at any time.

Specific customer standards may supersede GRS&S guidelines and will be discussed during design reviews.

### **PAYMENT**

- 1. All new tools and tool changes are released with payment terms indicated on the purchase order. Standard terms are net 45 days from when tool is accepted as production ready by GRS&S manufacturing.**
- 2. If progressive payments are given, initial payment is at complete die design, second payment is at approved die complete samples, and the final payment is upon receipt of complete updated CAD file, Production Readiness Form and GRS&S manufacturing approval.**
- 3. In the event different payment terms are issued, they will be specified on the purchase order.**
- 4. Complete payment will not be sent until CAD data for the tooling is received. This data must be in an accepted format and be organized in a suitable manner as described in this document.**



## **DIE PROTECTION**

- 1. At preliminary design stage, GRS&S will review design to determine types and location of die protection to be used. After concept has been established, die protection must be included in the die design and build.**
- 2. Sensor requirements and other components and sources are found in the Sensor Standards.**
- 3. Sensors will be prescribed by GRS&S, but will be purchased by the tool source.**

## **CAD**

- 1. A copy of the completed tool design, including all updates, is required for final payment. Copies of all simulations to the latest model must be included. This can be in the form of a CD or Internet download.**
- 2. CAD is preferred as IGES format.**
- 3. If the design is done in a 3-D or solids format the following would be required:**

**-A 2-D rendering of the Plan of Die and Plan of Punch, ballooned with the component's detail number.**

**-The Bill of Materials, preferably as An Excel file.**

**-All fabricated components (purchased components-punches, buttons, spools, etc. should be described in the bill of materials) stored as separate 3-D, IGES files and identified by their detail number. They should also be exported in "die position" and referenced to a world x, y, z zero. This will allow us to reassemble the components in our 3-D software and retain the correct design location. Lower trim steels should be drawn with the proper break included.**

**All information should reflect final part and die conditions.**

**If the design is in a 2-D format the following should be included:**

**-Plan of Die, Plan of Punch and Section views ballooned with the components detail number.**

**-The Bill of Materials, preferably as An Excel file.**

**-Detail prints, if any, are identified by their detail number.**

**-All wireburn information (trim steels and trim punches) updated to reflect latest part and die conditions and labeled as their detail number.**



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## CAD (continued)

-Any components requiring 3-D machining should be sent with surface or solid CAD data. The CAD should reflect the correct side of material and not require a machining offset to properly machine. The CAD should be labeled by the detail number of the component.

## CAM & SLIDES

1. Slide details shall be provided for lubrication with grease grooves with Zerk fittings.
2. Gibbs will be a minimum of 1" thick, this may go thinner with GRS&S approval.
3. Re-buildable cams and slides preferred.
4. Positive return cams are preferred. If cams are not positive return, the cam must be sensed to verify the cam has been retracted.
5. 4140 preferred for gibbs, while A2 is used for slides.

## DIE SETS

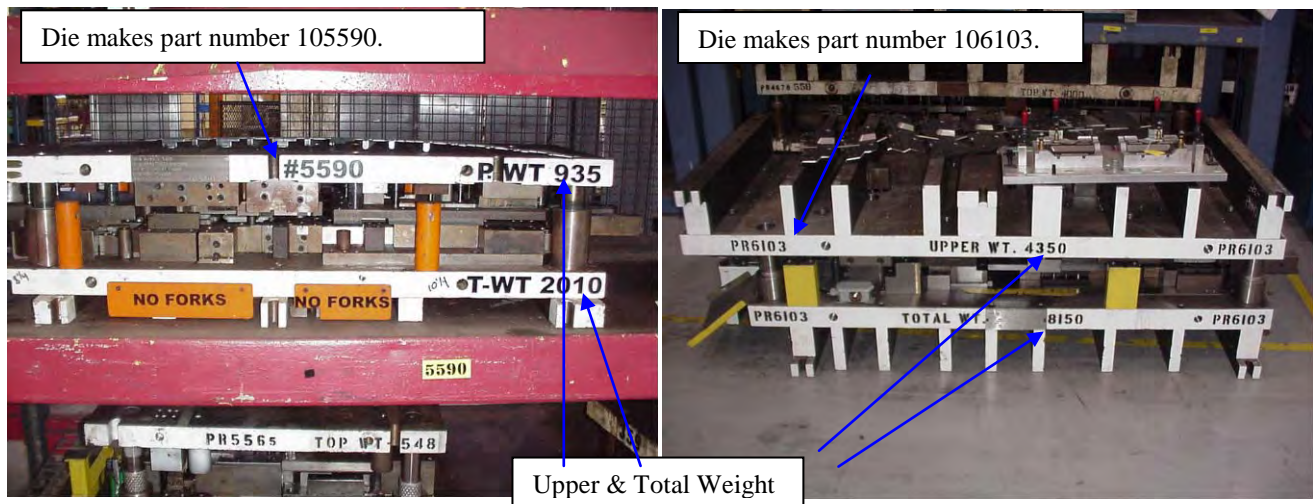
1. Ball-bearing sets are required. Sleeves to be "rotator style".
2. All progressive dies will be minimum of four pin sets.
3. Die sets shall not be symmetrical. One pin must be offset 1/4" and marked.
4. Large tools may be required as split die sets. This will be determined at design meetings with the guidelines falling about 120 inch long and/or 15,000#.

## HANDLING

1. Four suitable tapped holes (1" or 1-1/4") must be put in the top and bottom shoes for handling purposes. The die size will determine the location for balance.
2. Two openings suitable for hi-lo forks must be available under the die shoe, for all dies with 1-1/2" or greater spacing under die. These will be spaced no more than 48" apart and will allow even lifting by a hi-lo. For the GR facility, 4" minimum openings are needed for dies under 5,000# and 6" minimum for dies over 5,000#. For the KY facility, 4-1/4" minimum openings are necessary for dies under 6,000 and 7-1/4" for dies over 6,000#.
3. If fork openings aren't a reasonable option or if no parallels are used under die, an alternative bracket will be needed. This method must be agreed to by GRS&S at the tool design review.
4. For "No Fork" openings under dies, a plate must be put over the opening, front and back, painted yellow or orange and stenciled with "No Forks".

## IDENTIFICATION

1. All removable components are to be stamped properly with tool number.
2. All die sets are to be painted WHITE except the dies for the Mexico facility, which will be YELLOW.
3. Die number will be painted on all four sides of the punch holder on the right side, a minimum of 1-1/2" tall, 2" preferred. Dies will have black lettering. Die number will be the last 4 digits of the GRSS item number preceded by "PR", if run in GR facility, "KY" if run in Richmond facility and "MX" if run in Chihuahua facility. For dies that produce LH and RH parts at the same time, the die number will be the lower of the 2 item numbers. If the die produces a part that is part of an assembly, the die number shall include the "dash" number. Examples: Die produces item number 106402, die number shall be PR6402; die produces item numbers 106352 and 106353, die number shall be PR6352; die produces item number 106382-2, die number shall be PR6382-2. Any die that utilizes changeover tooling to produce more than one part number should be stenciled with lower part number as the die number. Any questions about die numbering should be referred to the GRS&S project engineer.



4. Material thickness, coil width, progression, shut height, part number and upper weight is to be stamped or etched on the front or working surface of the die set.
5. Openings under the die needing scrap trays should be marked for the tray width.



Scribe # at openings

### **IDENTIFICATION** (cont'd)

6. Strip start point must be identified.
7. Total die weight must be painted on. Punch holder weight will be stenciled on front of die set.

### **KEEPERS**

1. Keepers can be made of 4140 or other suitable steel.
2. Keepers must be heat treat.
3. Provisions for lubrication are required.

### **LOCATORS**

1. Die locators will be included in every die. Type and location will be determined at design stage in accordance with die size and the press the die will run in.
2. Any scrap that could land on a locator must have the scrap ramped to avoid this condition.

### **PADS (ALSO SEE STRIPPERS)**

1. All guided pads or strippers to have balancers. If material is over 0.060" thick, pad balancers (stand-offs) are required.
2. Draw pads and draw rings have to be hardened.
3. Stripper pads over 50 pounds need handling holes.

### **PARALLELS**

1. Parallels should accommodate efficient removal of scrap from die.
2. Parallels which have scrap exiting between them shall have at least 3 ¼" between the parallels to allow for shaker trays to fit. Gaps between parallels should be sized to be in 1" increments over 3 ¼".
3. All dies to have parallels or top plates determined by press through GRS&S (for standardized feed and shut heights). See Press Specifications.



## **PARALLELS (cont'd)**

4. Feed height is defined as the top of lower die steels. In some cases, GRS&S may move feed height based on amount of lift in the tool. This will be determined at Die Design Meetings.
5. All parallels used to hold the die in the press will have 2" tall feet, extending a minimum of 2" from the edge of the die set. They will also have a 1-1/8" wide slot for accommodating a 1" bolt. See Press Specifications.
6. Any parallel that has scrap coming through it and exiting onto a shaker tray shall have the scrap come out of the parallel at least 1 1/2" above bolster height.

## **PUNCHES, BUTTONS & PILOTS**

1. Slugs and pilot holes are to be cleared through shoe and parallels.
2. Slugless buttons must be used.
3. All punches and buttons must be designed to standard manufacturers. The heavy-duty Bal-lok design is preferable.
4. Punches and buttons should be purchased from Dayton Progress or Moeller.
5. Consideration should always be made for quick changeability.
6. For all purchased punches and die buttons, one extra set is required for all holes in the part when annual volume is over 50,000.
7. Whenever possible for mis-matches/parting lines, scallops should be utilized. Typically GRS&S prefers 0.010"-0.015" deep with a R0.125". The size and practicality of these should be determined at the die review meeting.
8. Part number/identification stamp retainers to be Industrial Marking Products M.R. series that hold IMP180 or IMP094 stamps.

## **PUNCH SECTIONS (PUNCH HOLDER)**

1. All top sections are to be bolted from the inside of the die, for removal of sections in the press.
2. Lower thickness materials may require backing plates depending on punch size. This will be determined at design review. For all stock of 0.100" or thicker, hardened backing plates may be required, and will be determined at die design meetings.

## **SCREWS & DOWELS**

1. Chicago screws are not acceptable.
2. Blind dowels are not acceptable.
3. Standard dowels are required.



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## **SCREWS & DOWELS** (continued)

4. All holes in die sections shall be located at proper distance from edges to avoid weak areas in the section. The above is to be considered for heat treat conditions.
5. All blank punches and form steels shall be heeled where possible.
6. Screws and dowels must be positioned so blocks can't be assembled incorrectly.

## **SHIMS**

1. Shim packs required for intricate die steels or inserts.

## **SPRINGS**

1. Spring deflection shall not exceed the manufacturer recommendation.
2. Springs mounted horizontally shall be covered.
3. Square wire carbon springs are not acceptable.
4. Spring cages are required on lower form pads, pads that bottom and enclosed conditions.
5. Springs protruding from punch holder shall be covered with a top plate.
6. Springs should be retained on punch holder and are preferred to not be bolted from the back side.
7. When nitrogen springs are used, Dadco, Standfast or Hyson brands are preferred. If sizes aren't available, other brands may be used if approved by GRS&S.

## **STOCK GUIDES AND LIFTERS**

1. Stock guides will be made of hardened steel.
2. Stock lifters to be removable from die while in the press.
3. Bar type lifters preferred. No Kenville type lifters allowed.
4. Entry guides to be at least 6" long before pitch notch.
5. On progressive die, entry guides will have stock gauging with one side positive and one side adjustable. Whenever practical, the adjustable stock guide should be keyed so that the stock is adjusted square to the strip. This is mandatory on any tool which uses stock thickness of more than 1.5mm.
6. For thickness 0.100" or higher, or, widths of 12" or greater, the lead stock rail must be doweled and inserted.
7. Stock guide plate must overhang 1" beyond stock guides.

## **STOP BLOCKS**

1. All dies must have stop blocks with a 0.050" groove on top.



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## **STOP BLOCKS** (continued)

2. Stop blocks size must be commensurate with tonnage.
3. Dies up to 12" long require 1 stop block front and back (2 total).
4. Dies over 12" long require 2 stop blocks front and back (4 total).
5. When there is high snap through values (reverse tonnage), Neoprene bushings are required to help absorb this. They should be 1/2" taller than the stop blocks. This will be determined at GRS&S design review.

## **STRIPPERS**

1. Steel strippers are to be used on all pierce punches.
2. Rubber and urethane is not acceptable on permanent tooling.
3. Stripper shoulder bolts are not permissible, spools are required.
4. Windows to allow removal of punches in the press when Bal-lok punches are used.
5. Strippers to remain soft (4140 preferred).

## **TOOL STEEL & HEAT TREAT**

1. D-2 or approved substitute by GRS&S for cutting steels. Alternate material may be called out, depending on the application. For annual volumes of 50,000 or less, A-2 may be used with GRS&S approval.
2. Wherever possible, cutting steels shall have mechanical slug ejector.
3. D-2 or approved substitute by GRS&S for forming (surface treatment should be considered for high wear or heavy forming). Alternate material may be called out, depending on the application.
4. 4140 retainers or approved substitute by GRS&S.
5. No cast iron or extruded malleable iron is to be used without written approval.
6. There is no exception - all tool steels are to be identified in an area that will not be machined.
7. Heat treat - GRS&S requires quality heat treatment of all tool steels. Cracked details must be replaced.
8. Tool coating shall be discussed at tool design meeting(s) to determine which, if any, form steels should be coated. Coating type to be Ion-Bond TiC-5 unless approval for an alternate coating is given by GRS&S.

## **WEAR - PLATES**

1. Tool steel wear plates will be hardened with grease grooves



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## **WEAR – PLATES** (continued)

2. When Ampco or its equivalent is used - the Grade #21 Ampco or better is to be used. Lamina plates are acceptable.

## **WELDING**

1. Welding die sections will be accepted only upon approval by GRS&S. The integrity and strength of welded sections will remain the responsibility of the tool supplier.

## **SUBMISSION OF PART**

1. GRS&S Engineering will determine the amount of samples to be furnished off each set of tools prior to running samples.
2. The tool shop's sample run, under power preferred, of a predetermined number of pieces or sets of parts (usually 300pcs minimum) is not to determine production worthiness rather only to determine dimensional stability.
3. A first piece layout (3pcs minimum) is to be supplied with samples to GRS&S.
4. Dies must produce parts to print specifications, unless previously approved by our customer and/or GRS&S Engineering.
5. There will be a mini-qualification run of approx. 2,000 - 10,000 pcs, off the tool in a GRS&S press under production conditions. A toolmaker from the tooling supplier is to be present and may set up the tool with GRS&S associates. Final worthiness and acceptance of the tool will be determined by GRS&S and is required for payment.

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