DELPHI

TOOL DESIGN – MANUFACTURURING DESIGN SPECIFICATIONS FOR TOOLING AND EQUIPMENT

SECTION B - DESIGN/DRAFTING STANDARDS

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SECTION B - DESIGN/DRAFTING STANDARDS

B.1 GENERAL

This section pertains to both **Delphi** Tool Designers and Contract Design Vendors. Delphi code numbers must be listed in the B/M only if supplied by **Delphi** Designers or the **Delphi** purchasing representative. All tool and machine designs shall be CAD designed using solid models drawn to scale.

1.1 Detail sheets should accommodate a maximum number of details, but must not appear crowded. **DO NOT** use "E" size paper solely for the purpose of showing as many details as possible on one sheet.

1.2 Each set of drawings must include a complete Bill of Material that contains a listing of all necessary parts for the construction of the tool.

1.2.1 Every detail of a design, including pneumatics, hydraulics, electrical, etc. must be assigned a "detail number" and appear in the B/M. Only special or non-stock fasteners shall be listed. Common screws, nuts, etc., are not listed or ballooned.

1.2.2 Descriptions of purchased items must be complete. All information required including manufactures name and manufactures part number shall be listed to assure that a purchased item is received as required.

1.2.3 When a casting is required, the pattern number, material, and estimated weight are to appear in the B/M. Also, pattern numbers should appear on the detail drawing.

1.2.4 Use "ANSI" numbers when specifying drill bushings in the B/M.

1.2.5 *Use standard material sizes where practical.* The material size stated in the B/M should allow 1/8 inch extra material (for machining) at "saw cuts". If the "sawed" dimension is judged adequate for build, do not specify any extra material.

1.2.6 When an item that can be identified by a Delphi buy code number is to be used as a detail of a design, a description and/or a separate drawing number of the item must also appear in the B/M.

1.2.7 Any added special process required on standard materials (ie: Chrome Plating, Rubber Coating, etc.) must be noted in the B/M and noted next to the balloon on the detail sheet.

1.2.8 When multiple fixtures or weldments are required, the B/M must reflect the material required for one fixture. The fixture or weldment shall be noted with the quantity required as follows:

DET	QTY	MAT'L	DESCRIPTION
1	3		WELDMENT
1A	1	1018	½ x 3 x 3 ¼
1B	1	1018	½ x 3 x 6 1/8
1C	1	1018	¼ x 2 x 2

1.3 The layout of views is to be consistent with good design practices. A sufficient number of views must be provided to convey all necessary information regarding the size and shape of the part.

1.3.1 Allow sufficient space between views for all necessary dimensions and notes.

1.4 Avoid drawing in the area directly to the left of the "Revision Block".

1.5 All fabricated and machined details must be drawn and dimensioned on sheets separate from the plan views. A standard or purchased item which requires an alteration must be detailed sufficiently to show the machining detail.

1.6 If a detail is identical to a detail on another tool, it must be "detailed-out" completely *unless the detail can be identified by it's own tool number and/or Delphi Code Number.*

1.7 When a detail is "opposite hand" to a detail which has already been drawn, the new detail shall also be drawn. However, only the 0,0 datum shall be shown. No dimensions are required. A note must accompany this detail which states that it is "Opposite Hand to Detail _____".

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1.8 All CAD files are to be drawn FULL scale. Section Views may be other than full scale if needed to show information that is difficult to see at full scale or to clarify that area.

1.9 All tool drawings are to be dimensioned in inches for U.S. operations unless specifically stated otherwise and in that case dual dimensions are required.

1.10 All dimensions are to be stated in decimals except for fractional thread sizes and reference to dowel sizes.

1.11 Angular dimensions are to be expressed as decimals.

1.12 It is not necessary to show, in detail, all screws and dowels on assembly drawings. However, enough should be shown to convey design intent. All necessary centerlines should be shown to indicate the screw and the dowel locations.

1.13 When required, torch cut templates must be drawn full size and provide "kerf" allowance as required.

1.14 When selecting the weight and uniformity of lines, the outline of the tool should be the most striking part of the drawing and should be drawn in sharp, dense, **black** lines.

1.15 Divide machine drawings of various stations or units into subassemblies with separate tool number's.

1.16 Provide any useful information on assembly drawings relative to the tool, equipment, etc. Include tool number's of other associated tooling, tool layouts, machine layouts, and reference tools if considered important to the job.

1.17 Show adjacent mechanisms (in phantom lines) on tool drawings as a check for interference's.

1.18 To provide for uniformity in the case of multiple or repeat build, all items such as pipe, tubing, hose, conduit, fittings, manifolds, junction boxes, etc. which will be mounted on and become part of the tool itself, should be shown in the design.

1.19 All tool details, ie: chuck jaw inserts, locating pads, die sections, clamp fingers, welding electrodes, etc. must have clearly defined dimensions for interchangeability so that spare details can be made in advance of need to minimize downtime.

1.20 Detail "Balloons" are to be drawn **.56 dia**

1.20.1 The balloon is connected to the detail it identifies on an assembly sheet by means of a line and arrow head.

1.20.2 If the detail is to be "detailed out" on a separate sheet, divide the balloon in half with a horizontal line and place the detail number in the upper half and the sheet number on which it is detailed in the lower half.

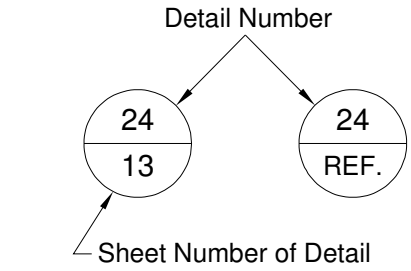
1.20.3 If a detail is not to be "detailed out", do not split the balloon.

1.20.4 If a detail is "ballooned" more than once, only one balloon should state the sheet number. The other balloons should say "REF" in the lower half.

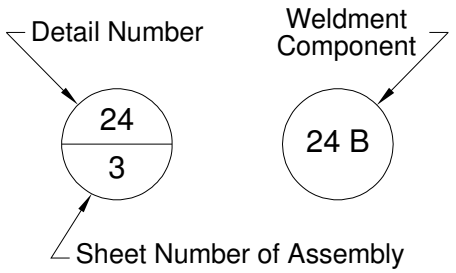
1.20.5 When more than (1) assembly sheet is used, divided balloons must be used on the detail sheets with the detail number in the upper half and the assembly sheet on which it appears in the lower half.

1.20.6 Balloons with "letters", lines, and arrow heads must appear on detail sheets to identify component parts of weldments.

Examples:
Assembly Drawing



Detail Drawing



1.21 On weldments, use the American Standard Graphical Symbols only in critical joints. Otherwise, show beads, fillets, etc. only.

1.22 Indicate surfaces that required machining with the finish symbol located on the extension line used to dimension the surface. This is a "machining" symbol only, and is not intended to indicate a surface finish quality.

1.22.1 "Micro-Finish" symbols are to be used only when a micro finish must be machined.

1.23 In the event that an entire sheet has become obsolete or is recorded as a revision no longer used, removed it from the Drawing Directory. The drawing shall be marked obsolete and returned to **Delphi** to be archived.

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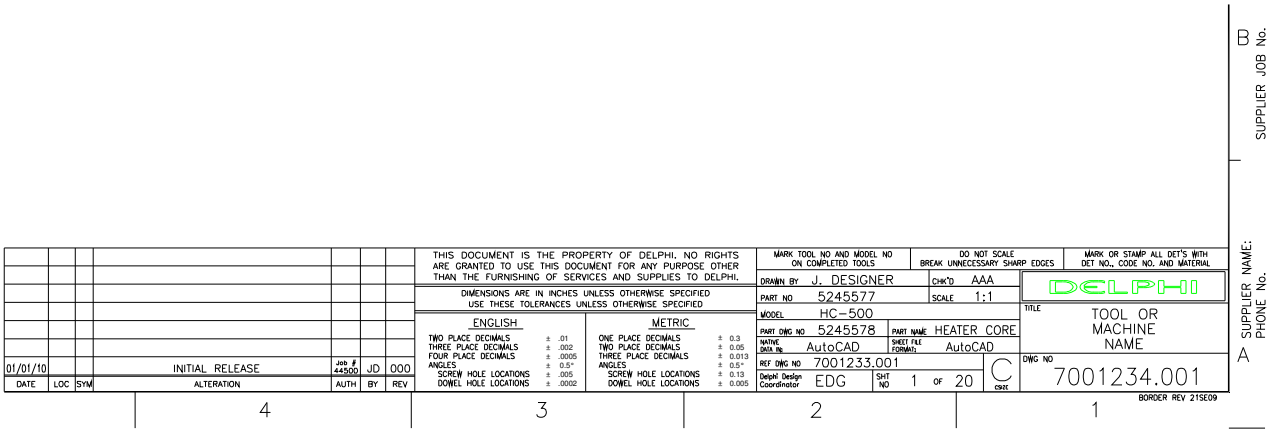
B.2 TITLE BLOCK INSTRUCTIONS



1. TITLE: The name of the Tool or Equipment.

2. DWG NO: The drawing number assigned to this tool. (7001234.001, or 4001234.005, etc.)

3. REF DWG NO: The drawing number of an existing design that has been used as a reference to create this new design.

4. DRAWN BY: The draftsman's name or initials.

5. INITIAL RELEASE DATE: The date on which the design was started and will be the same on all multiple sheet drawings. This date is shown in the Alteration Block as rev 000.
NOTE: This date should never change.

6. CHK'D: The checkers name or initials.

7. SCALE: The predominate scale to which the design is setup for plotting on this sheet.
ie: 1:1, FULL, ¼ size, ½ size, 2 x size, 2:1, 10 x size, etc.

8. PART NO: **PRODUCT No.** The Delphi number of the piece/part for which this tool is required. Add a chart if more than one piece/part assigned to the drawing. (required on sheet 1 only)

9. MODEL: The Delphi designation of the assembly or sub-assembly which contains the product refered to in item 8. (required on sheet 1 only)

10. PART NO DWG: The number of Delphi Product Engineering Drawing on which the piece/part in item 8 appears. (required on sheet 1 only)

11. PART NAME: The name of the piece/part in item 8 above. (required on sheet 1 only)

12. SHT NO: The number assigned to this sheet.

13. OF: The total number of sheets included in the design. This box needs to be filled in on the first sheet only.

14. M.D.C.: "Manufacturing Design Coordinator or Engineer" . . . The name or initials of the Delphi Manufacturing Designer or Engineer to whom this job was assigned. This box must be filled in on all sheets.

The following (15-18) pertains to the Bill of Material template which is above title block and is on a layer that is hidden. This can be used for one or two detail designs

NOTE: The B/M for multiple item drawings is to be in Microsoft EXCEL. The template file is supplied by Delphi.

15. DET NO: The detail number used to identify a particular detail or entity in the over-all design. A weldment is identified by a detail number and a sequence of letters is used to further identify its component parts.

16. AMT: The number (amount) of pieces of the detail required to build this detail.

17. MATL: The material of which this detail is made.

18. DESCRIPTION: The dimensions (expressed in fractions) of the piece of material required; all the required information if the detail is to be purchased.