

**TOOL DESIGN - MANUFACTURING DESIGN SPECIFICATIONS FOR TOOLING AND EQUIPMENT**

**SECTION G – FIXTURE DESIGN**

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## TOOL DESIGN - MANUFACTURING DESIGN SPECIFICATIONS FOR TOOLING AND EQUIPMENT

### SECTION G – FIXTURE DESIGN

#### G.1 General

Delphi Thermal Systems products present great variety in their construction. It is difficult to recommend specific standards that apply to all areas. The list of standards shown is generalized as much as possible to be useful in the design of most fixtures.

**1.1** Design cost effective fixtures. Consider the tolerance requirements, volume of product parts, fixture environment, etc.

**1.2** Keep the design as simple as possible for the application. Minimize or eliminate adjustments and/or “fine tuning”.

**1.3** Be sure the fixture is sturdy enough for the operation being performed and the plant area in which it is used.

**1.4** Use standard purchased components and standard material sizes.

**1.5** Use structural shapes and aluminum, where rigidity and loading permit, for lighter fixtures.

**1.6** Use castings or molded parts for high usage or large quantities of fixtures.

**1.7** Use hardened blocks and/or lamina bronze or similar materials in wear areas.

**1.8** Attach loose details to the main fixture with cable or chain.

**1.9** All fixtures must be fully detailed including screw & dowel locations.

**1.10** Show the product part in red in two main views.

**1.11** If the fixture is used with other equipment, show the appropriate portion of the equipment in phantom and indicate the tool/equipment number.

**1.12** The product part must be loaded and unloaded conveniently.

**1.13** Do not allow product parts to be loaded incorrectly.

**1.14** The fixture must provide adequate support for the operation being performed.

**1.15** When product parts are placed in the fixture, they must be located on datum surfaces. The same surfaces must be used in fixtures for further operations.

**1.16** The product part must not be damaged or distorted by the fixture.

**1.17** Fixtures and support tables must be designed to ergonomic standards.

**1.18** The fixtures must be safe to use. If there is a question, request approval from the Safety Department.

**1.19** When appropriate, place a note on the drawing to have the first fixture approved before completing the order.

**1.20** Provide a note, “fit to approved product part” if the shape of the product part is questionable. Continue to dimension the fixture completely, but identify these dimensions.

**1.21** Product parts must be mounted in reliability/durability test fixtures in the same position they are used in the car.

**1.22** When building multiples of the same tool, each should be serially numbered starting with 001 and engraved on the tool after the tool number. (Ex: 7001234.001 001, 7001234.001 002). Details not permanently attached to main fixture must also bear a serial number matching the fixtures’ number.

**1.22.1** Part fastening location numbers are to be tagged or machine etched on fixtures.

**1.23** Dimensions requiring inspection must be identified with triangles and numbered consecutively. Wherever possible these dimensions should reflect dimensions from the piece/part drawing.

**1.23.1** An index of the triangles and their sheet location must appear on the first assembly sheet.

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1.23.2 The triangles must be equilateral, with sides of .25 minimum to .50 maximum.

1.23.2 Example: First Assembly Sheet Index.



Example: Suggested Triangle Locations

