

Trident Workmanship Standard

These drawing standards apply only when and if our customer's do not denote or specify their own standard or another nationally recognized standard. In these cases where such direction is not specifically provided Trident will default to ASME Y14.5M-1994.

For general workmanship guidelines and definitions for standard terminology, the following document has been created to aid and direction to manufacturing and quality operations of Trident.

Chapter 1: Definitions

ABRASION - A mark or series of marks on a surface, which interrupts the perceived continuity of the surface. These marks are usually observed as changes in shades or gloss of the material surface.

BURRS - Thin ridges of base material at the juncture of the material face and the cut edge.

CRACKS - A line or group of lines resulting in material separation. For example, in an area of a part that has been stretched beyond its elastic limit.

GALLING - A single line or series of lines of gouging or dragging on the surface of the part.

PREFINISHED MATERIAL - Any raw stock, part, or assembly with an organic application: such as painting, an inorganic application: such as plating, a brushed application: such as a decorative stainless steel, or a polished application: such as a polished stainless-steel finish has been completed.

SLIVERS - Small quantities of shaving scrap which may be connected to or imbedded in the surface of the part.

SLUG MARKS - Marks that result from loose pieces of material being embedded in the surface of the part.

STRETCHER STRAINS - Marks that appear on the surface of the part during the early stages of stretching.

TEARS - A line, hole or flaw resulting in material separation.

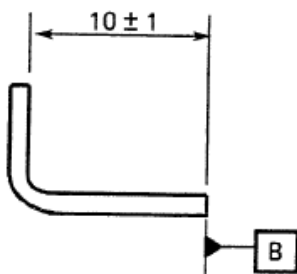
Chapter 2: Implied Linear Dimensions / Stock Thickness / Bends

Verification of Dimensions:

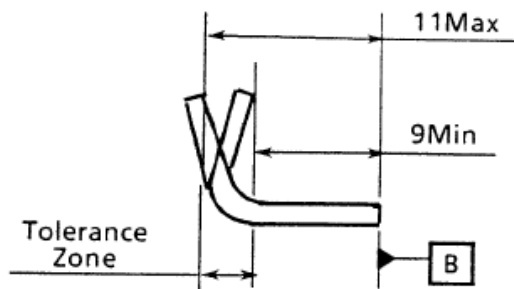
Linear Dimensions:

All linear dimensions are considered "local" unless they originate from a specified datum. Linear dimensions originating from a specified datum are taken in a 90 relationship to the specified datum.

This on Drawing:



Means this:



Material Thickness:

All stock thickness is considered "local" even when originating from a specified datum. A flag note in the drawing notes column may specify stock thickness.

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Angle Bends:

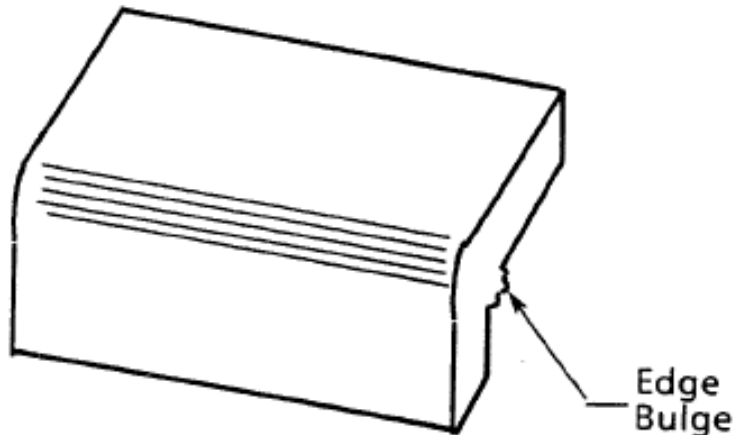
All non-tolerance bends shall be $\pm 2^\circ$ in the unrestrained condition. This requirement shall apply to the inside or outside of the part as specified by linear dimensions locating the bend.

Chapter 3: Bending / Perforation Bulges

3.1 Process Acceptance Criteria

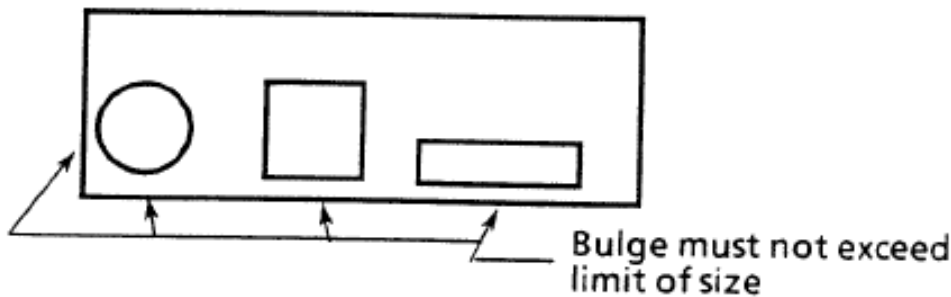
3.1.1 *Bulges Due to Bending:*

Bulges produced at the ends of bends are acceptable and need not be within size limits. Datum feature contact must not be made in the area of the bulge.



3.1.2 *Bulges Due to Perforations:*

Bulges due to the closeness of the perforations near the edge of a part shall be cause for rejection if the dimensional limits of that part, measured over the bulges, are exceeded



Implied / Specified Burr Requirements

3.2 Burr Limits, Burr, and Deburr Requirements

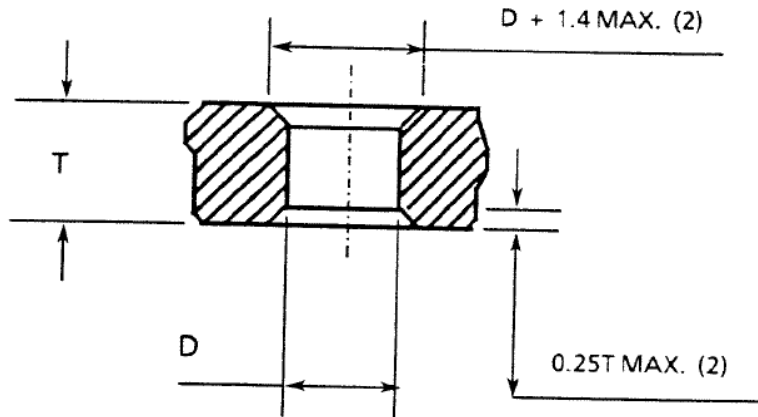
3.2.1 *Implied Burr Limits:*

- Burr height shall not exceed the dimensional limits of the feature; and
- Burr height shall not exceed 15% of the stock thickness up to 1.2 mm stock thickness inclusive; and 10% of stock thickness above 1.2 mm.

3.2.2 *Holes:*

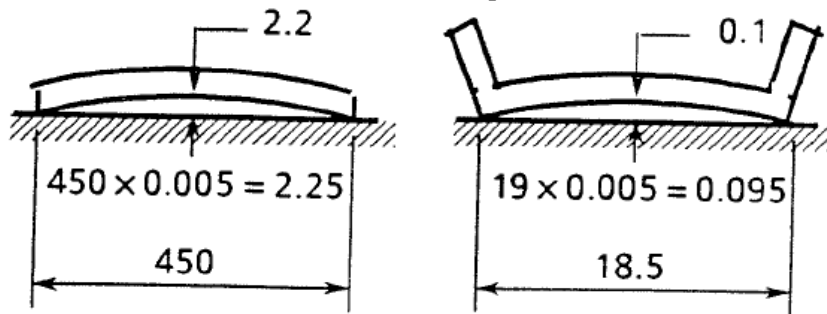
Deburring by countersinking shall be limited to a diameter not exceeding the diameter plus 1.4 mm, nor shall the countersink depth exceed 25 percent of the material thickness on either side.

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3.2.3 *Flatness:*

Flatness of unrestrained surfaces shall not exceed 0.005 times the MAXIMUM specified length in millimeters, rounded to the next tenth of a millimeter, with part at rest on a horizontal surface.



Process Acceptance Criteria

3.3 Surface Quality

3.3.1 *Acceptable Conditions:*

- DIE PRESSURE MARKS**- When striking of a part at a corner is required to “set” a required angle, die pressure marks, parallel to the axis of the bend and indented into the surface, may appear. These marks are acceptable unless otherwise specified.
- GALLING**-This condition is acceptable unless otherwise specified.
- ROUGH AREAS**- Parts, which display areas that are visually rougher than the surrounding surfaces, can be accepted unless otherwise specified.
- SCRATCHES**- Scratches are acceptable unless otherwise specified.
- STRETCHER STRAINS**- This condition is acceptable unless otherwise specified.

3.3.2 *Unacceptable Conditions:*

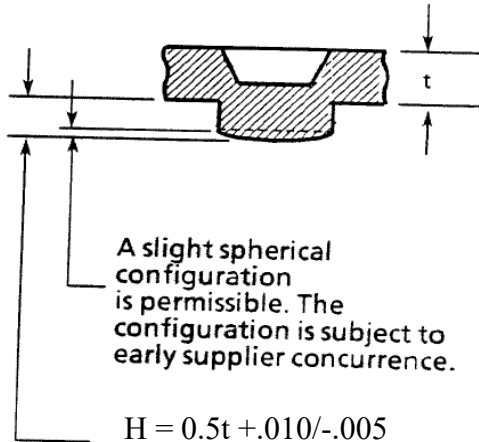
- DIRT**- The presence of accumulated foreign material on part surfaces is not acceptable. Any cleaning process performed on parts which could corrode must be followed by the addition of a surface treatment that will prevent rust formation.
- SLIVERS**- Any appearance of slivers connected to or embedded in the part is not acceptable.
- SLUG MARKS**- Any evidence of slug marks or of scrap being embedded in a part is not acceptable.

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- d. ***FOD (Foreign Object Debris)** – evidence of extraneous matter not related to the actual product i.e. not substrate or applied coating as directed by print specifications or related specifications can be considered FOD; such matter can be but is not limited to: dirt, deburring materials, processing fluids, entrapped fluids from plating process, disengaged tangs, etc.

Chapter 4: Semi-Perforations Data

4.0 Implied Control of Semi- Perforations:



$$H = 0.5t + .010 / -.005$$

Semi-perf diameter (\emptyset) tolerance is $\pm .001$.

Optional Configuration

Hole accepting semi-perf (hole in part) diameter (\emptyset) tolerance is $+.002 / -.001$.

Slot accepting semi-perf (slot in part) diameter (\emptyset) tolerance is $+.002 / -.001$.

Chapter 5: General Tolerance Block

The General Tolerance Block to be applied by Trident in the case where no general block has been provided by said customer or where the customer has approved Trident's General Tolerance Block when construction of the part is to the manufacturer's discretion. This tolerance block will be identified as follows:

Tolerances and Workmanship Guidelines per TWS-100:

Sheet Metal Part Tolerance -

Hole-to-Hole $\pm .008$

Edge to Edge < 12" $\pm .010$

Bend to Bend $\pm .020$

Hole to Edge $\pm .008$

Edge to Edge > 12" $\pm .020$

Hole/Feature Sizes $\pm .005$

Hole/Feature to Bend $\pm .015$

Edge to Bend $\pm .015$

Radius/Chamfers $\pm .020$

Angularity $\pm 2^\circ$

Surface Finish 125 or better

Machined Part Tolerance -

.XX = $\pm .010$

Radius/Chamfer $\pm .01$

Surface Finish 63 or better

.XXX = $\pm .005$

Angularity $\pm .5^\circ$

Chapter 6: Witness Marks and Tolerance

When a customer has not defined all aspects of a witness mark/engraving line (i.e. depth, width, length) Trident will proceed by first contacting the customer for guidance to what they require that has not been defined on their drawing; if they have no standards or a specified dimension Trident will utilize the following standards in applying said feature:

Depth = $.015 \pm .003$ due to processing operation such as time save that can alter the witness mark

Width = $.012 + .004$ (unilateral only) due to processing operation such as time save that alter the witness mark)

Length = $.394 \pm .005$

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***Chapter 7: Workmanship for Paints, Powders, and Coatings**

When a Trident customer has not defined all aspects of a cosmetics, visual inspection and acceptance of the finish application, Trident will proceed by first contacting the customer for guidance to what if anything they require; if they have no standards or specifications or direction, Trident will utilize the following standards in reviewing the finish(s) applied to the parts/product by either Trident's finishing facility or a Trident vendor.

Visual Inspection of plated and coated parts

Plated and coated parts shall be uniform, smooth, fine grained, adherent, and free from powdery areas, blisters, pits, nodules, voids, and other defects which could be detrimental to their utilization. Size and number of contact marks shall be minimum and follow in good practice within our industry. Final inspection of the finish shall be performed at a normal viewing distance of 24 – 36 inches with an unaided eye.

Chemical conversion coating can have color that ranges from clear to iridescent yellow to brown. The uniformity of the color may vary dependent upon the alloy to alloy on aluminum welds, castings, etc. Touch-up of this process shall follow the specification denoted by the drawing, in lieu of no specification Trident will follow the guidance of MIL-DTL-5541 for touch-up of this coating.

Variation in color, hue, or tint of the chemical conversion coating due to differences in the part surface finish, welds, brazing &/or machining features is acceptable.

Parts should not have uncoated areas, breaks, scratches, or defects that leave the base metal exposed post the application of this coating. This does not include contact marks as addressed above. Examples of possible failures:

- Chips
- Pits
- Corrosion
- Loss of adhesions
- Incorrect plating
- Missing plating in required areas
- Plating in areas not to be plated

Visual Inspection of painted or powder coated parts

Samples of painted parts shall be inspected for color, proper masking, and workmanship at normal viewing distances (36 inches). Light source used for inspection shall be the standard lighting within the Quality labs of Trident and/or the viewing areas within our assembly area. The painted surfaces are a smooth, continuous, adherent film, and uniform in appearance when viewed at 36 inches with an un-aided eye.

Incomplete cure, evidenced by a soft, tacky, or liquid condition is unacceptable.

Appearance of painted surfaces (X = Unacceptable surface condition)

Condition	Acceptability
Orange Peel	X
Runs or Sags	X
Wrinkling	X
Crazing, Cracking	1 X
Blistering	X
Peeling, Flaking, and Chipping	1 X
Pin Holes	X
Scratches, Gouges	1 X
Scuff Marks	1 X
Embedded FOD	2

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- 1) Any of these conditions that expose base material is not acceptable for any class of paint surfaces.
- 2) **Embedded Foreign Object Debris:** Any embedded FOD shall not adversely affect the appearance of the unit under normal lighting and shall not show non-conformances such as unattached bubbles, or delamination that may later separate from the product causing potential Foreign Object (FO) damage. Embedded FOD shall not be larger than an approximate diameter of 0.050 inches maximum within one square inch. No more than 10 pieces of 0.050 inches maximum diameter foreign objects within one square inch is acceptable. More than one fiber, greater than one inch long and thicker than 0.010, within one square inch is rejectable. Any combination of the above that exceeds one square inch in a localized area is a rejectable condition. Suspect foreign objects embedded in the finish that are smaller than approximately 0.030 in diameter are acceptable if they do not exceed 5% maximum surface area.