

VI. SPECIFIC REQUIREMENTS: (continued)

D. Dimensional / Tolerances (continued)

11. For lofted drawings, the lofting tolerance (typically $\pm .030$) applies to the center of each line depicted. Therefore, the tolerance between two parallel lines is $\pm .060$. The tolerances *do not* accumulate between a series of parallel lines and the overall tolerance between any two specific features remains at $\pm .060$. As an example, a part drawn to be 20.000 inches long may vary from 19.940 to 20.060 inches long.
12. There are drawings with tolerances different from ± 0.03 . These tolerances are stated in the tolerance block of the drawing. Check for application of Engineering note "T1" which revises the tolerance block, from 1/64 inches to 1/32 inches.

T1 Note Clarification - Any part that is not directly on air passage and is below an air passage part will not be inspected as an air passage contour line part, and therefore shall have the $\pm 1/32$ inch tolerance applied by the T1 note. The part shown in Figure 2 is inspected to $\pm 1/32$ inch tolerance.

In cases where the use of the $\pm 1/32$ " tolerance contributes to an assembly non-conformance, and the use of the $\pm 1/64$ " tolerance on certain part features will eliminate that non-conformance, a Manufacturing Instructions (PCD) will be issued to the supplier which will identify those part features to be controlled to a $\pm 1/64$ " tolerance. This PCD will be issued as part of required corrective action for the aforementioned non-conformance.

VI. SPECIFIC REQUIREMENTS: (continued)
D. Dimensional / Tolerances (continued)

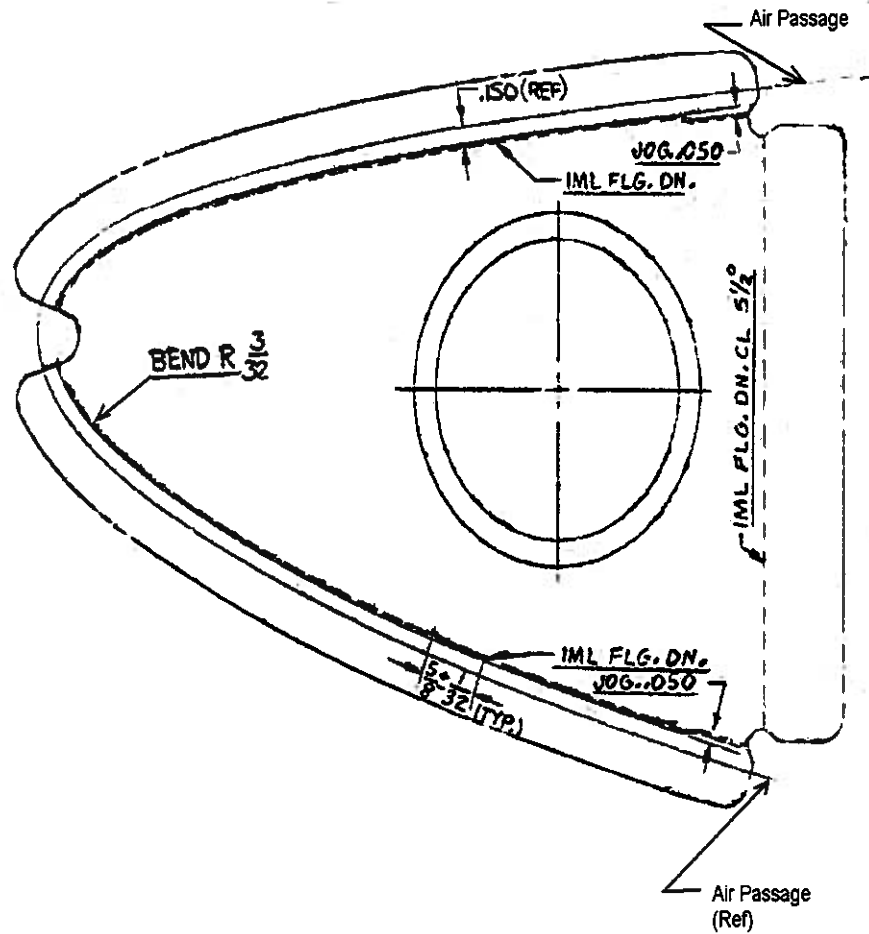


Figure 2

VI. SPECIFIC REQUIREMENTS: (continued)

E. Production Holes

1. Hole location and tolerance of location are defined on the engineering drawing.
2. Hole size/quantity must be per the Tooling, the Engineering Drawing, or the Manufacturing Instructions as applicable.
3. If the hole quantities specified on the engineering drawing do not coincide with holes in the detail part and/or the associated tooling (there are a greater number or lesser number of holes on the engineering drawing), check the Manufacturing Instructions to assure the holes conform on the next higher assembly (NHA) or the if the holes are part of the "as manufactured" configuration. If the Manufacturing Instructions have no reference, then initiate an RC/I form requesting evaluation of the next higher assembly for hole requirements. If acceptable, Northrop Grumman Manufacturing Engineering will revise the Manufacturing Instructions.
4. Hole locations shall be inspected to the Engineering Drawings, not the MTX plots or equivalent tooling. The exception would be parts that contain holes from the NHA, which are not on the detail part drawing and are noted on the Manufacturing Instructions. For these parts, the supplier's MTX plot or equivalent tooling shall be used to verify hole quantity, location and size of the NHA holes only.
5. Pilot hole locations, for formed parts, where the flat pattern and hole pattern are shown, shall be verified as follows (ref. Figure 3).

Note: For flat patterns differing from Figure 3, Contact your Commodity Engineering Representative, or issue an RC/I.

VI. SPECIFIC REQUIREMENTS: (continued)

E. Production Holes (continued)

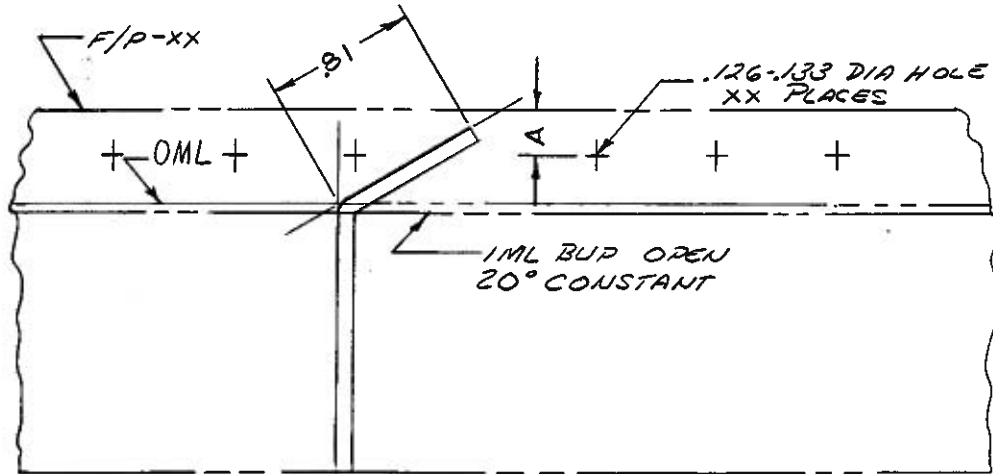


Figure 3

- a. Determine the 'should be' nominal dimension for edge distance by scaling dimension 'A' on the lofted drawing. Calculate the outer mold line (OML) distance to the hole center (ex. 0.81 - dim. A = hole center to OML). Measure the hole distance from the OML of the detail part and compare to the calculated dimension. The measured dimension must be within +/- 0.030 inches of the calculated dimension.
6. **Production pilot holes** shall be verified to assure that they are the correct "size" (i.e. #30 or #40 holes). This verification may require the measurement of a representative hole. The remaining holes may be visually evaluated. If holes are visually elongated, the holes shall be rejected, and the supplier has the option of submitting the parts to Northrop Grumman for MRB Engineering review (reference section M of this document).
7. Routed holes, or cutouts without specific dimensions and/or tolerances shall be inspected by applying the drawing linear tolerance for lofted dimensions, normally +/- 0.030 inches.
8. For the J Stars Program (E-8C) holes are not to be drilled at fastener locations. Only holes with a specific hole diameter callout are to be included. Any deviations from this would be annotated in manufacturing information.

VI. SPECIFIC REQUIREMENTS: (continued)

F. Tooling Holes

1. Tooling holes are classified into the following three categories.
 - a. Holes not identified on the engineering drawing and located in a neutral area of the part, as described in GS31AB section D11-7. These holes apply only to detail parts designed prior to 1990.
 - b. Holes identified with a "T" on the engineering drawing.
 - c. Production holes used as tooling holes.
 - d. Holes identified as "TF" (Tooling hole for Fab) and "TA" (Tooling hole for assembly)
2. Holes which have been identified as categories a or b above, and are suspected of having been deformed/elongated during forming, shall be inspected using the following criteria.
 - a. When tooling holes show evidence of having been deformed, appear elliptical, and are free from cracks and raised edges when examined with a 10X magnifying glass, the elongated diameter shall not exceed the hole size by more than 10%.
3. Production holes used as tooling holes (category 1.c above) must satisfy the required pilot hole tolerance.
4. Holes which exist in the part but are not called out on any applicable engineering drawing(s) (detail part, NHA drawings, etc.) shall be verified as tooling holes or identified as extraneous holes. If the holes cannot be identified to tools or engineering drawings, an RC/I shall be initiated. Parts confirmed to have extraneous holes shall be rejected.

G. Trim / Periphery

1. Periphery (flat pattern) of part and location of cutouts are defined on the engineering drawing.
2. Oversized trim is acceptable when defined on the Manufacturing Instructions.

VI. SPECIFIC REQUIREMENTS: (continued)

G. Trim / Periphery (continued)

3. Irregular trim shall not be accepted via the Manufacturing Instructions. Use the GS31AB section D15 guidelines for acceptability, or submit to Northrop Grumman for MRB Engineering review (reference section M of this document).
4. Unless noted on the Manufacturing Instructions, all tooling ears must be removed from the detail part, **except those designated for removal on assembly (reference SD20.276). Figures 4a and 4b below depict tooling ears that are removed on assembly.**

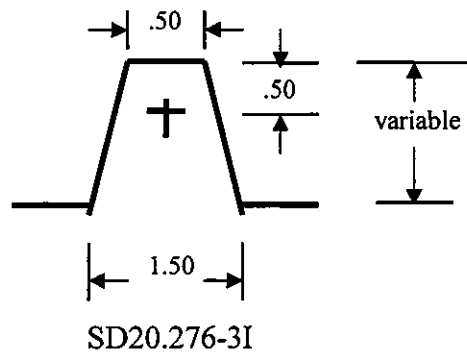


Figure 4a

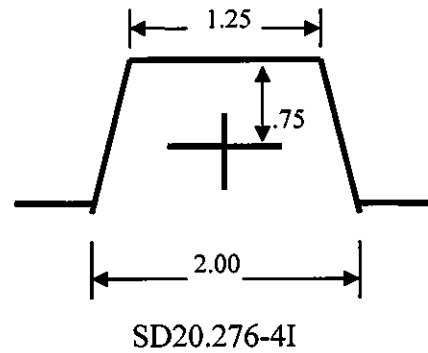


Figure 4b

H. Flange Inspection

1. The flange angle, along the entire flange length, shall not vary from its nominal value by more than the tolerance specified on the applicable drawing, or GS31AB (section D15-3). Angular tolerances for “free flanges” shall be applied in accordance with GS31AB Section D15-3 and the definition of free flanges given in Section V of this document.

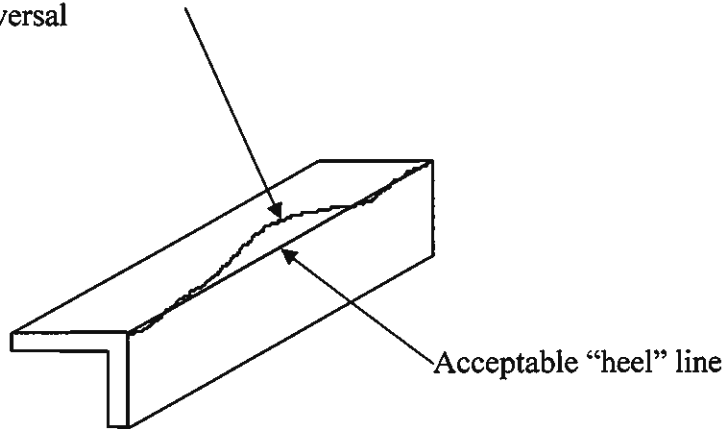
VI. SPECIFIC REQUIREMENTS: (continued)

H. Flange Inspection (continued)

The flange "heel" along the entire flange length, shall not vary from its nominal value by more than the allowable tolerance, with no reversals (reference figures 5 and 6).

The "toe" of the flange shall have smooth transitions and be free of wrinkles, folds, and creases. Waves are permissible within the drawing angular tolerance.

Unacceptable "heel" line
due to a reversal



Dotted line represents nominal flange "heel" line, and solid line represents discrepant "heel" line with reversals.

Figure 5



Figure 6