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COMPLIANCE IS MANDATORY

John C. Stennis Space Center MACHINE SHOP TOLERANCES

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Document History Log

Change/ Revision	Change Date	Originator/ Phone	Description
Basic	02.24.2012	B. Farner/2967	Initial release, supersedes SSC 66-505.
A	04.05.2017	B. Farner/2967	Five-year update. Revised cover sheet to reflect approval by CO OMD, and concurrence by PMD. Updated references and acronyms. Administrative changes required. Added section 5.5-b. Section 6.1, revised Figure 2/Table 2. Section 13.5 was deleted, as it was a duplicate of information included in Section 6.1-b. Section 13.7, Welded Aluminum Corners, was deleted. Section 17.1, inserted the word "burrs". Section 20.6: Clarified that the Tolerance "Y" reference in Figure 52 is in inches.

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1.0 PURPOSE

This John C. Stennis Space Center (SSC) standard (SSTD) specifies the shop tolerances for the use of the designer or for shop use when no tolerances are specified on a drawing.

2.0 APPLICABILITY

- Tolerances specified on a drawing shall have precedence over tolerances in this SSTD.
- For unspecified tolerances, the shop supervisor shall be responsible for using tolerances in compliance with this SSTD.

3.0 REFERENCES

All references are assumed to be the latest version unless otherwise indicated.

ANSI B46.1, *Surface Texture (Surface Roughness, Waviness, and Lay)*

ANSI Y14.5, *Dimensioning and Tolerancing*

ASME B1.20.1, *Pipe Threads, General Purpose*

FED-STD-H-28/2, *Screw-Thread Standards for Federal Services Section 2 Unified Inch Screw Threads-UN and UNR Thread Forms*

SAE AS71051, *Pipe Threads, Taper, Aeronautical National Form, Symbol ANPT – Design and Inspection Standard*

SAE AS8879, *Screw Threads – UNJ Profile, Inch Controlled Radius Root with Increased Minor Diameter*

SPR 1440.1, *SSC Records Management Program Requirements*

SSTD-8070-0005-CONFIG, *SSC Preparation, Review, Approval, and Release of SSC Standards*

4.0 RESPONSIBILITIES

- Users of this SSTD shall comply with its requirements, ensure use of the correct version of this SSTD and the documents it references, and inform the appropriate organization of needed changes in accordance with SSTD-8070-0005-CONFIG.
- Responsibilities for the use and control of this SSTD and for the review and approval of revisions or cancellation of this SSTD shall be as specified in SSTD-8070-0005-CONFIG and the applicable documents referenced therein.

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5.0 GENERAL

5.1 Dimensioning and Tolerance

- Interpretation of dimensions and tolerances shall be in accordance with ANSI Y14.5 and as supplemented herein.
- Parts exceeding tolerance limits to any degree, regardless of magnitude, shall not be considered as meeting drawing requirements.
- When linear tolerances are not given, the following shall apply:

Table 1

DIMENSION	ALLOWABLE TOLERANCE
Fractional	$\pm 1/16''$
One decimal place	$\pm .030''$
Two decimal places	$\pm .020''$
Three decimal places	$\pm .010''$

5.2 Dimensions

5.2.1 Dimensions and Finishes

Measurement of dimensions and tolerances include applied metallic finishes such as electroplate, immersion plate, etc., and also include inorganic finishes such as anodic treatment, metal coloring, localizing, and chromate treatment. Measurements do not include applied organic finishes such as paints, varnishes, enamels, phosphates, etc.

5.2.2 Dimensions Reference

Dimensions marked "Reference" are not to be used for inspection purposes.

5.2.3 Dimension Reference Temperature

All dimensions are expressed in inches at the international standard reference temperature of 20°C (68°F). The manufacturer is responsible for making the necessary conversion for temperature variation.

5.2.4 Machine Setting Dimensions

Four- or five-place decimal dimensions without tolerance are used as machine setting dimensions for precise machining such as jig bore work, gear cutting, and

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for data dimensions such as gear Ditch center lines, screw Ditch diameters, and similar applications. Such dimensions are not for inspection purposes.

5.3 Tolerances, Material

When standard raw material cross-sections are specified without tolerances on the drawing, the tolerances referenced in the material specification shall apply.

5.4 Countersinks and Counterbores

Countersink or counterbore diameter shall be concentric within .005" to the hole diameter.

5.5 Threads

- a. Screw thread form shall meet the requirement of FED-STD H-28/2. All threads are right hand unless otherwise specified.
- b. SAE AS71051 applies for National Pipe Thread (NPT) type threads on fluid system tube fittings. ASME B1.20.1 applies to NPT type threads used for fluid system pipe and pipe fittings, and for structural connections. For straight thread on fluid system tube fittings, SAE AS8879 Class 3 applies unless the applicable drawing or specification states otherwise. Class 2 threads should be the standard for all straight (UN, UNR, UNJ, UNC type) thread connections that are not used on fluid system tube fittings, unless the applicable drawing or specification states otherwise.

5.6 Surface Roughness

- a. Interpretation of finish symbols such as 16/ and 63/ shall be in accordance with ANSI B46.1. The finish symbol indicates that material must be allowed for machining to the specified roughness.
- b. When a surface is produced by other methods such as casting, forging, and broaching, the finish is indicated with added notes such as follows:

 as cast

  as forged

5.7 Spot Face

A spot face is a round flat surface (usually around a clearance hole) machined on a finished or unfinished surface in a plane perpendicular to the axis of a hole through the "spot". The "spot" can be an accurate or an approximate diameter as specified.

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5.8 Welding

- All weld splatter shall be removed.
- High spots and irregularities shall be within the finish requirements specified for the weld.
- Contrasting surface appearance on the area adjacent to welds shall be acceptable.

5.9 Notes

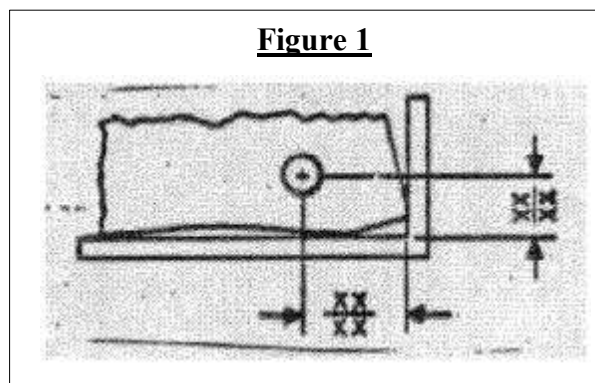
The figures in this document are used for illustration only, and may be over-detailed or incomplete.

6.0 MEASUREMENTS

6.1 Linear Dimensions

- Measurements

Linear dimensions locating features from an edge are measured from the extremity of the edge. (See Figure 1.)



- Irregularities Of Cut-offs

The cut-off on the edge of a part shall not vary from the plane shown on the drawing by more than the Tolerance “Y”. Tolerance “Y” must not cause overall dimension to exceed its tolerance. (See Figure 2.)

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Figure 2

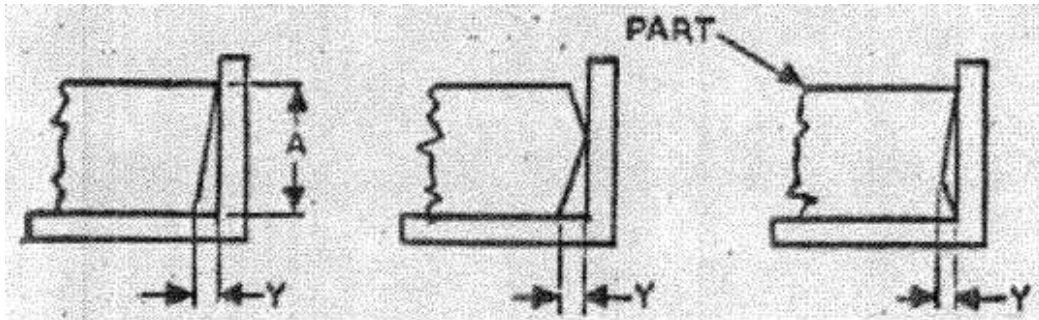


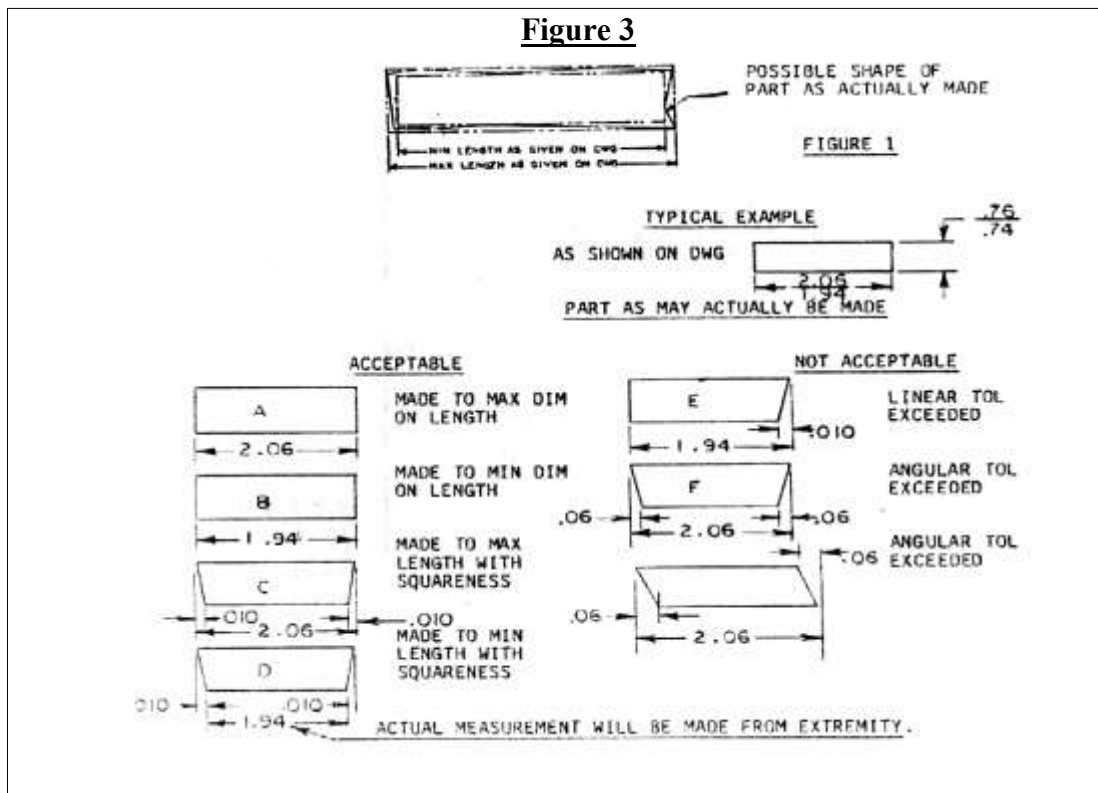
Table 2

Material Thickness Cut (Thickness is into page on Figure 2.)	Material Width Cut	
	Width Dimension A	Tolerance Y
Up to & including .125"	Up to & including 1"	.010"
	Over 1"	.010 in./in. of "A" but not to exceed .30"

6.2 Relation Of Linear Tolerance And Angularity Tolerance

Irregularities in the perimeter of the finished part will be permitted provided all points on its outer edges are within dimensional tolerances, except when restricted by the requirements of Section 6.1. (See Figure 3.)

Figure 3



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7.0 BORED HOLES, ALINGMENT, AND SQUARENESS

7.1 Tolerances

Table 3 gives the tolerances which apply to alignment, squareness, and out-of-round holes having a total diameter tolerance of .002" or less.

7.2 Total Indicator Run-out (TIR)

The total indicator run-out (TIR) of precision holes delineated in line with other precision holes, and the squareness of these holes in relation to other precision holes or machined surfaces shall be within the values shown in Table 3. (See Figure 4.)

7.3 Out Of Roundness

The out of roundness of precision holes shall not exceed the tolerance of the hole diameter. (See Figure 4.)

7.4 Alignment

The alignment of precision holes delineated in line with other precision holes shall be measured in terms of TIR.

Figure 4

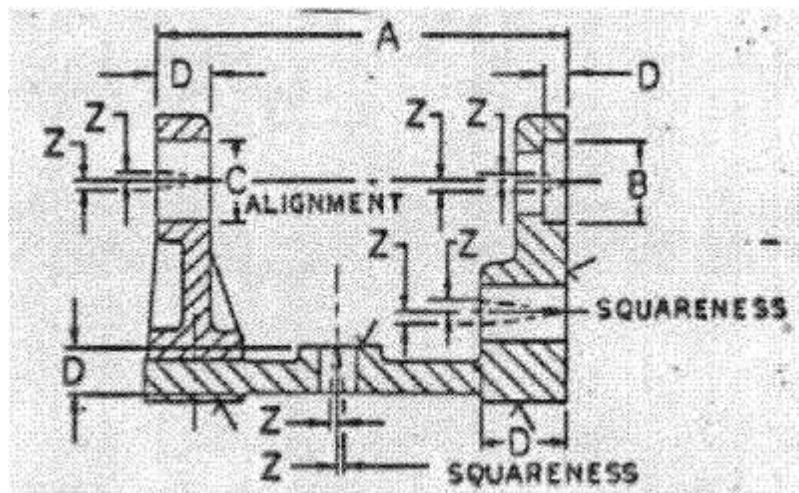


Table 3

Distance A	Between (TIR) Bores B & C	Squareness Tolerance Z for Precision Bored Holes
Up to & including 12"	.001"	For D = 1" or less For Z = .0005"
Over 12" including 18"	.002"	For D = over 1"
Over 18"	.003"	For Z = .0005" per inch of D

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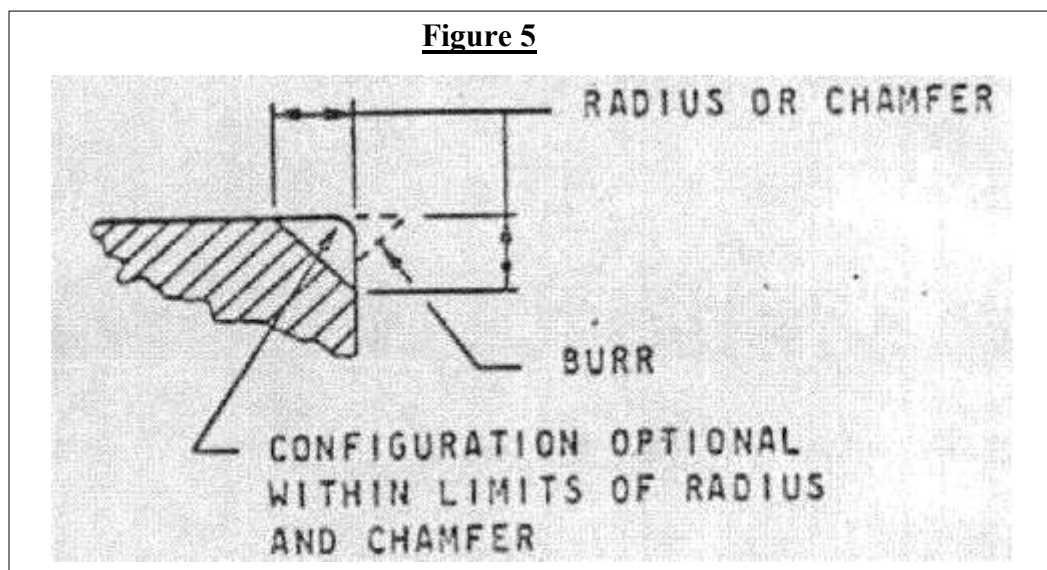
8.0 BURRS AND SHARP EDGES

8.1 Burrs

- A burr is defined as that material extending beyond either of two intersecting surfaces.
- Any burr which can be dislodged by vibration or handling, and/or is sharp, and/or exceeds the drawing limits for the final assembly part configuration, shall be removed.

8.2 Sharp Edges

- All sharp edges must be dulled or broken by any suitable process which will produce a radius or chamfer as specified below. Edges of a definite radius, when required, will be specified on the drawing. (See Figure 5.)



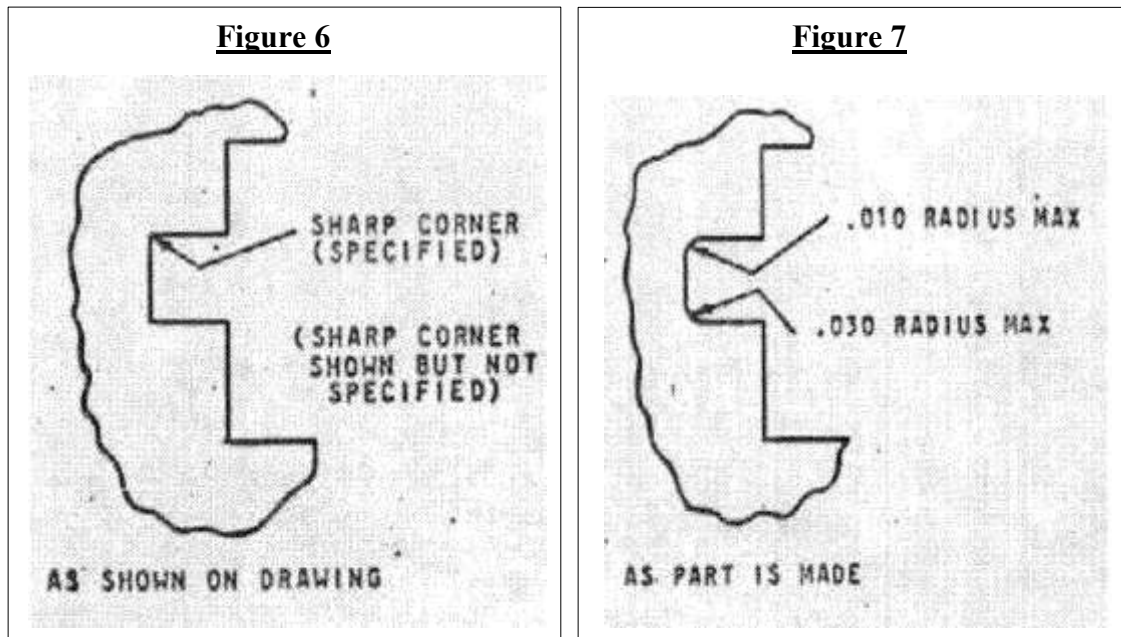
- When sharp corner is specified on the drawing, the radius or chamfer shall not exceed .010" max.
- When not specified 0 on the drawing but delineated sharp, the radius or chamfer shall not exceed .030" max.

9.0 CORNERS, INTERNAL AND EXTERNAL

9.1 Internal Corners

- When internal corners are shown on a drawing but no dimension is specified (see Figure 6), the part shall be made as shown in Figure 7.

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- b. When sharp corner is specified on the drawing, the radius shall be .010" max., with undercut not permitted.
- c. When sharp corner is shown on the delineation, but not specified, the radius shall be .030" max., with undercut not permitted.

9.2 Notches And Cutouts

- a. When a sharp corner is shown but not specified on a drawing, the radius shall be .06" maximum. (See Figure 8.)
- b. When a sharp corner is specified by note or a drawing, the radius shall be .01" maximum. (See Figure 8.)

