

MCDESG-112 Tool Design

Assignment #2

112-02-001-XXX	FLANGE-CASTING
112-02-002-XXX	FLANGE-MACHINED

1. The FLANGE will be used with a mating part with Fixed Fasteners (1/2-13 UNC Studs). Using Ames website for Clearance Holes the minimum hole is .562 and the maximum hole is .572. Calculating the Position Tolerance:

Hole MMC	.562
<u>-Fastener MMC</u>	<u>-.500</u>
	.062

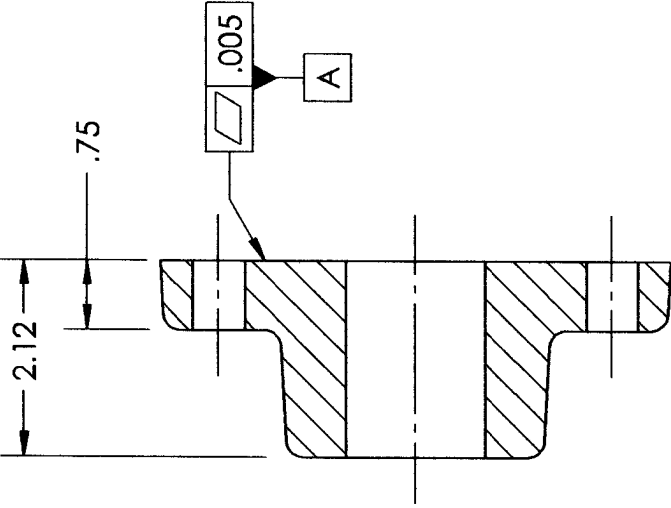
The clearance hole gets 40% of .062 = .0248

2. Create a part 112-02-002-XXX. (XXX are your initials)
3. Create configurations:
112-02-002-XXX FLANGE-MACHINED
112-02-001-XXX FLANGE-CASTING
4. The material for both will be Gray Cast Iron.
5. The machining operations include:
 - a. Removing .06 inches of material from the large flat face. This reduces the .81 and 2.18 dimensions to .75 and 2.12 respectively.
 - b. Enlarging the 1.38 DIA to 1.500 DIA.
 - c. Creating the four .563 DIA holes.
6. The machined surfaces should have a different color applied to the faces using a "Display State."
7. Create drawings similar to those attached. You can use the inch drawing border that you used from MCDESG-106, or one that is supplied on Blackboard. Tolerance Block dimensions should be:
 - a. 112-02-001-XXX TWO PLACE DECIMALS $\pm .06$
 - b. 112-02-002-XXX TWO PLACE DECIMALS $\pm .03$
8. Add a Revision Table to each drawing.

9. Add the Datums, basic dimensions, and Geometric Tolerances to the
112-02-002 FLANGE-MACHINED
10. Drilled Hole reference material is attached.

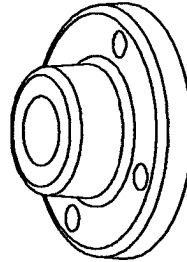
REVISIONS			
ZONE	REV.	DESCRIPTION	DATE
	A	RELEASED	1/28/2019
			JONES

B



B

A



VIEW SCALE 1:4

SECTION A-A

MATC

FLANGE-
MACHINED

NAME DATE
SMITH 01/28/19
TITLE:

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: 1/32
ANGULAR: MACH ± .5° BEND ± 1°
TWO PLACE DECIMAL ± .03
THREE PLACE DECIMAL ± .005
DRAWN CHECKED
ENG APPR MFG APPR
Q.A.
COMMENTS:
INTERPRET GEOMETRIC
TOLERANCING PER: ASME Y14.5-2009
MATERIAL
112-02-001-XXX
FINISH

SIZE DWG. NO. REV
A 112-02-002-XXX A

SCALE: 1:2 WEIGHT: SHEET 1 OF 1

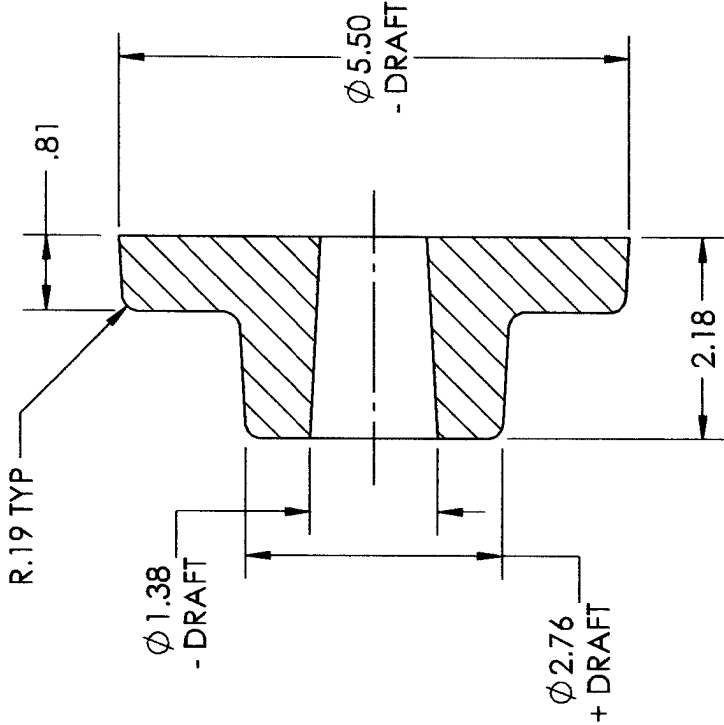
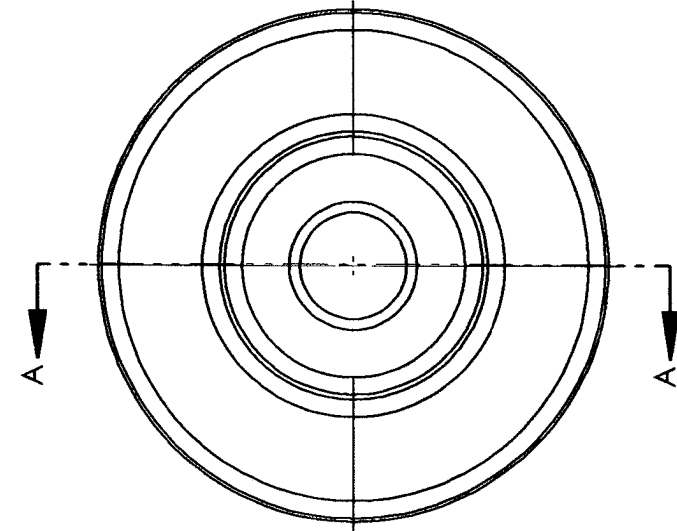
DO NOT SCALE DRAWING

REVISIONS

ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	RELEASED	1/28/2019	JONES

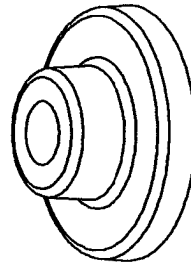
- NOTES:
1. UNLESS OTHERWISE SPECIFIED, DRAFT IS 3°.
 2. UNLESS OTHERWISE SPECIFIED, RADII TO BE R.19.

B



B

A



VIEW SCALE 1:4

SECTION A-A

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN INCHES

TOLERANCES:

FRACTIONAL: 1/32

ANGULAR: MACH ± .5° BEND ± 1°

TWO PLACE DECIMAL ± .06

THREE PLACE DECIMAL ± .005

INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5-2009

MATERIAL: Gray Cast Iron

FINISH

Q.A.

COMMENTS:

NAME: SMITH

DATE: 01/28/19

MATC

TITLE:

FLANGE-CASTING

SIZE DWG. NO. REV

A 112-02-001-XXX A

SCALE: 1:2 WEIGHT: SHEET 1 OF 1

DO NOT SCALE DRAWING

PLEASE PRINT NOTE This drawing was approved by joint action of the Ordnance and Navy Departments as it meets the standard for this product. The drawing for this product is the standard drawing for the same product design, not later than six months after the latest date of approval of the drawing. It may be put into effect at an earlier date after promulgation.

STANDARD DRILLED HOLE TOLERANCES:

FOR HOLES DRILLED WITH A DRILLING MACHINE USING SUITABLE JIGS AND FIXTURES, THE HOLE TOLERANCES DEPEND UPON THE DIAMETER OF THE HOLE AND INCREASE AS THE HOLE DIAMETER INCREASES. THE FOLLOWING ARE STANDARD TOLERANCES FOR GENERAL MACHINE WORK AND APPLY IN ALL CASES EXCEPT WHERE GREATER OR LESSER ACCURACY IS REQUIRED BY THE DESIGN:

HOLE DIA	TOLERANCES
.0135 THRU .125	+ .004 - .001 (4)
.126 THRU .250	+ .005 - .001
.251 THRU .500	+ .006 - .001
.501 THRU .750	+ .008 - .001
.751 THRU 1.000	+ .010 - .001
1.001 THRU 2.000	+ .012 - .001

THIS DRAWING FORMS A PART OF THE AIR FORCE-NAVY AERONAUTICAL STANDARD DRAFTING ROOM MANUAL.

⑥ STANDARD REACTIVATED 16 SEP 1974

AND 10387

DRILL SIZES AND DRILLED HOLE TOLERANCES-TWIST

NOT A PART NUMBER

RECEIVED 26 JUN 11. 11. 26 MAY 15 22 JAN 47 '3 15 SEP 52 4 25 MAY 53 5 9 OCT 73 6 16 SEP 74

**ENGINEERS
EDGE****Ultimate - GD&T Wall Chart**ASME Y14.5-2009 Standard
Laminated, 24" x 36" - Awesome!**Machinist Drilled Hole Tolerance Capabilities Chart per. AND10387**[Manufacturing Knowledge Menu](#) | [Tolerance Charts Menu](#)**Machinist Drilling Mechanical Tolerance Capabilities Chart - ANSI Size Drills, ISO Metric Drill Sizes**

Drilled hole locations and size variations are cumulative of several manufacturing variables. Tool sharpness, accuracy, tool and machine rigidity, machine spindle bearings wear, general quality of machine, use of drill fixtures, material thermal expansion, and material density variations are some of the reasons hole features will never be manufactured perfect.

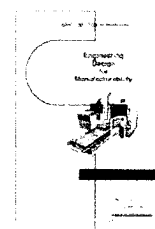
Most commercial twist drills have a diameter slightly smaller than the stated nominal size, however the actual hole feature will likely be manufactured larger than the nominal size of the drill tool. Compensating for manufacturing tool and process variability is a significant challenge for tight toleranced holes.

For Drill size chart for both Metric and ANSI sizes see:

[Machinist Drill Sizes - ANSI Size Drills, ISO Metric Drill Sizes](#)

[Engineering Design for Manufacturability](#)

Comprehensive guide for proper design of geometry, process capabilities & proper mechanical tolerance specifications.

**HOLE DIAMETER TOLERANCE-STANDARD DRILLED HOLE TOLERANCES**Per. [AND10387](#)

Airforce Navy Aeronautical Design Stanard

These size and tolerance are for holes drilled with a drilling machine using suitable jigs and fixtures. The hole tolerances depend upon the diameter of the hole and increase as the hole size increases. The following are standard tolerances for general machine work and apply in all cases except where greater or lesser accuracy is required by the design.

Drilled Hole Size	Tolerance
.0135 THRU .125	+.004/ -.001
.1260 THRU .250	+.005/ -.001
.2510 THRU .500	+.006/ -.001
.5010 THRU .750	+.008/ -.001
.7510 THRU 1.000	+.010/ -.001
1 .001 THRU 2.000	+.012/ -.001

Mechanical location tolerance capabilities Chart

Minimum Recommended Position Tolerances for Location of Hole Features in (mm) Less than 1" (25.4mm) in Diameter *		
Method	Normal Tolerance inches (mm)	Tight Tolerance inches (mm)
Manual location techniques (center punch and drill)	.080 (2)	.020 (0.5)
Drill fixture using bushing	.025 (0.635)	.008 (0.2)
Precision milling or CNC machine with fixture	.016 (0.41)	.008 (0.2)
Precision milling or CNC machine with optical or precision orientation	.005 (0.13)	.003 (0.076)
Jig boring with optical or precision orientation	.002 (0.025)	.0005 (0.013)

* # .xxx is roughly equal to [xxx = Positional Tolerance x .356]

Related Resources:

- [Preferred Tolerance Limits Fits ANSI B4.1](#)
- [Preferred Tolerances Limits Fits Calculator RC - LTs](#)
- [International Tolerances Grades](#)
- [Table of Hole Bore Tolerances per. ISO 286 Calculator](#)
- [Class I Fits & Limits Tolerances](#)
- [Class II Fits & Limits Tolerances](#)
- [Class III Fits & Limits Tolerances](#)
- [Class IV Fits & Limits Tolerances](#)
- [Class V Fits & Limits Tolerances](#)

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