Manufactured Parts Specification

APPLICABLE TO ALL INTERNAL & EXTERNAL PROCURED MACHINED OR MOULDED PARTS/ASSEMBLIES

SECTION 1: GENERAL TOLERANCES

SECTION 2: BURR CONTROL

SECTION 3: CLEANLINESS CONTROL FOR FOREIGN OBJECT DEBRIS (FOd) MITIGATION

SECTION 4: HANDLING & PACKAGING CONTROL

SECTION 1 – GENERAL TOLERANCES

1. OBJECTIVE

To specify general tolerances applicable to components manufactured by Curtiss Wright and also by approved sub-contractors.

2. SCOPE

Unless otherwise defined on the component drawing, the following criteria shall be used when interpreting drawings, manufacturing and inspecting components.

3. GENERAL TOLERANCES

Unless otherwise stated all drawings will comply with the appropriate British Standard. All dimensions and tolerances will apply after finishing i.e.: anodising, chemical etching etc., unless specified otherwise on the drawing. Normally drawings will quote dimensions in metric units. Unless otherwise stated, the tolerances on these dimensions will be as quoted in the tolerance box at the bottom of the drawing. However, see section 4 for more specific machining tolerances and section 10 for casting tolerances.

4. GENERAL MACHINING TOLERANCES

4.1 HOLES

4.1.1 Drilled Holes

The tolerance on drilled holes shall be as follows:-

For metric sizes:-

Up to 6.00mm dia	-0.03mm	+0.05mm
Over 6.00mm to 10.0mm dia	-0.05mm	+0.08mm
Over 10.0mm to 13.0mm dia	-0.05mm	+0.10mm

For inch sizes:-

Up to 0.250” dia	-0.001”	+0.002”
Over 0.250” dia to 0.375” dia	-0.002”	+0.003”
Over 0.375” dia to 0.500” dia	-0.002”	+0.004”

4.1.2 Reamed Holes

For metric sizes the tolerances shall be as BS 4500 H7 which are -0.000mm and with the following + values in mm:-

HOLE SIZE	+ tolerance (mm)
Over 1.0 to 3.0mm	0.010
Over 3.0 to 6.0mm	0.012
Over 6.0 to 10.0mm	0.015
Over 10.00 to 18.0mm	0.018
Over 18.0 to 30.0mm	0.021
Over 30.0 to 50.0mm	0.025
Over 50.00 to 80.0mm	0.030

The tolerance on reamed holes in inch sizes shall be as size H7 in BS 1916 which is -0.000" and with the following + tolerances:-

HOLE SIZE	+ tolerance (Inches)
Over 0.04" to 0.12"	0.0004
Over 0.12" to 0.24"	0.0005
Over 0.24" to 0.40"	0.0006
Over 0.40" to 0.71"	0.0007
Over 0.71" to 1.19"	0.0008
Over 1.19" to 1.97"	0.0010
Over 1.97" to 3.15"	0.0012

4.1.3 Tapping Size Holes for Screw Threads

For internal threads, use the tapping size drill specified in BS 1157. It may be found necessary to increase the tapping drill dimension in soft materials and decrease the tapping drill dimension in harder materials to maintain the specified thread dimensions as stated in BS 1157.

The finish of threads is important and is specified in paragraph 9.1. of this standard together with the requirements for undercuts in paragraph 9.2.

4.1.4 Recommended Minimum Thread Depth

Minimum thread depth = diameter x 1.5 for holes in hard materials.

Minimum thread depth = diameter x 2.0 for holes in soft materials

(For greater detail refer to paragraph 9.3).

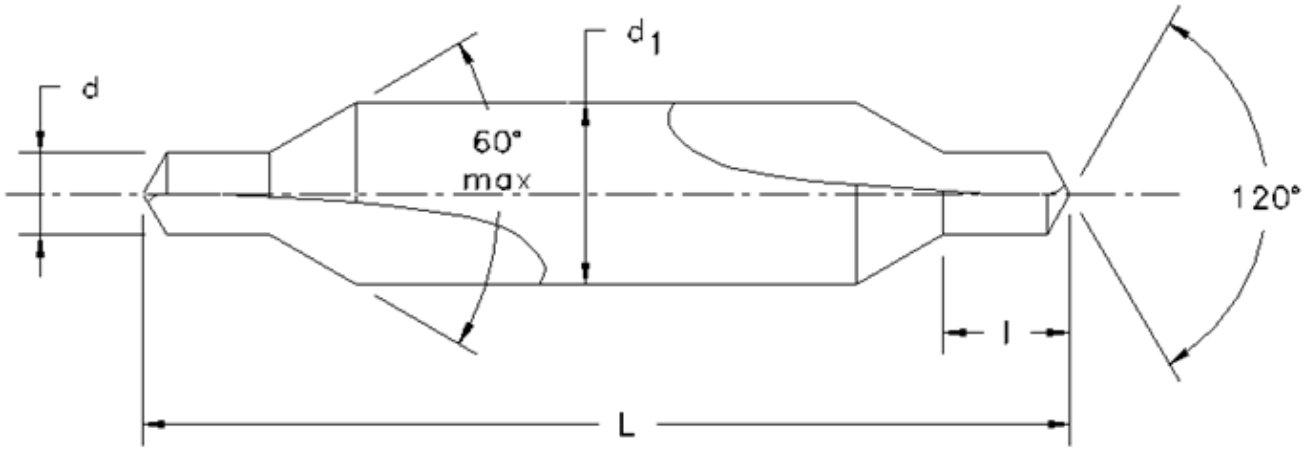
5. CENTRE DRILLS – DIMENSIONS OF COMBINED DRILLS AND COUNTERSINK – TYPE 'A':

Preferred centre drill sizes:-

All dimensions are in millimetres

d k12	d_1 h9	*l*		L	
		max.	min.	max.	min.
(0.5)	3.25	1.0	0.8	21	19
(0.63)		1.2	0.9		
(0.8)		1.5	1.1		
1.0		1.9	1.3	33.5	29.5
(1.25)		2.2	1.6		
1.6	4.0	2.8	2.0	37.5	33.5
2.0	5.0	3.3	2.5	42	38
2.5	6.3	4.1	3.1	47	43
3.25	8.0	4.9	3.9	52	48
4.0	10.0	6.2	5.0	59	53
(5.0)	12.5	7.5	6.3	66	60
6.3	16.0	9.2	8.0	74	68
(8.0)	20.0	11.5	10.1	83	77
10.0	25.0	14.2	12.8	103	97

(Note sizes in brackets should be avoided whenever possible).



6. ANGLES:

6.1 On tapers the tolerances shall be ±1°

6.2 On chamfers the tolerance shall be ±5°

6.3 For holes on P.C.D. or Radial pitches the tolerance shall be as follows:-

P.C.D. of hole mm (ins)	Angular Tolerances
Up to 12.5 (0.500”)	±1°
Over 12.5 (0.500”) to 25 (1.00”)	±½°
Over 25 (1.00”) to 50 (2.00”)	±¼°
Over 50 (2.00”) to 75 (3.00”)	±10’

7. GEOMETRIC TOLERANCES:

7.1 Roundness

Diameters to be round within 0.025mm (0.001”) T.I.R. (Total Indicator Reading).

7.2 Concentricity

Concentricity diameters to be concentric within 0.08mm (0.003”) T.I.R.

7.3 Parallelism

C/L’s of co-axial holes and diameters shall be parallel within 0.08mm (0.003”) per 25mm (1”) run and maintain tolerances at all points.

Parallel C/L’s of slots and holes to be parallel within 0.5mm (0.002”) per 25mm (1”) run and meet tolerances at all points.

Parallel surfaces (planes) to be parallel within 0.05mm (0.002”) per 25mm (1”) run and meet tolerances at all points.

7.4 Flatness

Machined surfaces to be flat planes within ±0.025mm (±0.001”) per 25mm (1”) run.

7.5 Straightness

Spindles, shafts and rods to be straight within ±0.025mm (±0.001”) per 25mm (1”) run.

7.6 Squareness (Right Angularity)

Surfaces or C/L’s shown at right angles to be at 90° ±½° for machine work and 90° ±1° for sheet metal and press work.

7.7 Shaft Slots

The C/L of a slot in the end of a shaft is to coincide with the C/L of the shaft axis within ±1°, ±0.13mm (±0.005”). When slots are shown at both ends of a shaft or where an identification mark is shown at right angles to a slot, they do not have to be aligned accurately, unless the drawing particularly specifies this.

7.8 Position

The general positional tolerance shall be ±0.13mm (±0.005”).

8. FINISH:

8.1 Surface Finish

Unless otherwise stated, the surface finish of all surfaces shall be specified as follows:-

0.8√	Milled or machined	= less than 0.8µm RA (32µins C.L.A)
0.8√	Turned	= less than 0.8µm RA (32µins C.L.A)
0.4√	Ground	= less than 0.4µm RA (16µins C.L.A)
0.15√	Honed	= less than 0.15µm RA (6µins C.L.A)

A sample of each of these finishes shall be held for comparison purposes.
Surfaces to be free from scratches, burrs, indentations or other random discontinuities.

8.2 Face Finish

“Pips” left after face turning to be less than 0.25mm (0.010”) dia x 0.10mm (0.004”) high.

8.3 Internal Radii

The radius on internal corners of adjoining surfaces is not to exceed 0.13mm (0.005”)

8.4 Chamfers

All chamfers must be turned to give a uniform appearance (see paragraph 6.2 for tolerance).

8.5 De-burring

See section 2 of this document for full Burr Definition.

The following methods are to enable the de-burring of a component to achieve a uniform appearance –

Nylon brush (abrasive filled)	-	Used for external corners and edges
Rubber bonded (abrasive filled)	-	Used for external corners and edges
Rotating barrel (Rumbler)	-	For various grades and shapes of media
Vapour matt machine	-	For very light and feather edges
Needle files	-	For very light and feather edges
Countersink tools	-	For tapped holes etc
Tweaker blade	-	Mainly for use on internal diameters
Hand de-burring tools	-	Mainly for use on internal diameters
Wet and dry + Scotch Bryte	-	On steel only

8.6 Finish of Metal Components

Because of subsequent finishing treatments to parts made from aluminium alloys, it is very important that the surface is not contaminated. Therefore in machining operations, only use manufacturer's recommended mineral and soluble cutting oils.

8.7 Sharp Edges

Were a drawing calls for a "SHARP EDGE" on an external corner a Max radius of 0.05mm is acceptable.

9. SCREW THREADS:

9.1 Finish

Threads shall be smooth, cleanly finished and without burrs or torn threads. On the external threads it is important that the first threads are not burred or deformed to prevent entry into the corresponding internal thread. On internal threads the first thread shall be removed using a drill point of diameter equal to the maximum diameter of thread +0.08mm, -0.00 mm (+0.003", - 0.000"). See also paragraph 2.3 on tapping size holes.

9.2 Under Cuts of Threads

METRIC	Undercuts should be as shown in BS1936 part 2.
IMPERIAL	Undercuts should be of form "A" as shown in BS 1936 Part 1.

9.3 Optimum Depths of Full Thread (Tapped Holes)

Giving satisfactory thread engagement for general use (e.g. studs and set bolts) are listed in the tables below:-

METRIC

METRIC THREAD	MM DEPTH IN HARD METALS (e.g. Steels)	MM DEPTH IN SOFT METALS (e.g. Light Alloys)
M1.6	4	5
M2	5	6
M2.5	5	7
M3	6	8
M4	8	10
M5	10	12
M6	12	14
M8	16	20
M10	18	25

METRIC THREAD	MM DEPTH IN HARD METALS (e.g. Steels)	MM DEPTH IN SOFT METALS (e.g. Light Alloys)
M12	22	28
M16	28	35
M20	35	45
M24	40	52
M30	48	65

IMPERIAL

INCH THREAD	INCH DEPTH IN HARD METALS (e.g. Steels)	INCH DEPTH IN SOFT METALS (e.g. Light Alloys)
0.112 & 6BA	0.250	0.300
0.138 & 4BA	0.300	0.350
0.164	0.300	0.400
0.190 & 2BA	0.350	0.450
¼	0.450	0.600
5/16	0.550	0.700
3/8	0.650	0.850
7/16	0.750	1.000
2	0.850	1.100
9/16	0.950	1.200
5/8	1.050	1.400
¾	1.250	1.600
7/8	1.400	1.900
1	1.600	2.100

9.4 Dimensions - B.A Thread.

External threads shall be made as specified for “Normal Class Bolts” in BS 93.
Internal threads shall be made as specified for “Nuts” in BS 93.

9.5 Dimensions - B.S.F. Thread.

External threads shall be made as specified for “Medium Class Bolts” in BS 84.
Internal threads shall be made as specified for “Medium Class Nuts” in BS 84.

9.6 Standard Whitworth & Threads of Whitworth Form

External threads shall be made as specified for “Medium Class Bolts” in BS 84.

9.7 Dimension - Unified Thread.

External thread shall be made as specified for “Class 2A External Threads” in BS 1580.
Internal threads shall be made as specified for “Class 2B Internal Threads” in BS 1580.

9.8 Dimensions - I.S.O. Metric Thread.

Quoted on drawing as ‘M’ size x pitch-fit, e.g. M6 x 0.75 - 6g to BS3643.

9.8.1 Coarse Grade

External threads shall be made as specified for “Medium Class External Threads” to fit 6G as specified in BS 3643
Internal threads shall be made as specified for “Medium Class Internal Threads” to fit 6H as specified in BS 3643.

10. INVESTMENT CASTING DIMENSIONAL TOLERANCES:

10.1 Linear Dimensional Tolerances

(Including tolerances between holes centres)

In general a tolerance of ±0.13mm/25mm will be achieved, on relatively small components, up to 13mm a tolerance of ±0.1mm is possible. On small dimensions of approximately 6mm a tolerance of ±0.08mm can be attained, however, it must be remembered that an increased level of dimensional accuracy may well call for specialised tooling and production process control techniques, with a proportionate increase in component cost.

10.2 Flatness and Straightness

The shape and section of the component concerned and the alloy being cast will have a large bearing on the flatness and straightness achieved in the as-cast product. As a general rule, a tolerance of ±0.13mm/25mm of casting length will apply.

10.3 Ovality

A tolerance of ±0.13mm will apply up to 25mm diameter and ±0.13mm/25mm of diameter thereafter.

10.4 Concentricity

Concentricity between outside and inside diameters in the as-cast product will be dependent upon component size and the relative sizes of the outside and inside diameter, for example:-

OD	ID	Eccentricity as Cast
25mm	12mm	±0.13mm
50mm	25mm	±0.25mm

10.5 Angles

A tolerance band of +0.5 to +1.0 degree will generally apply for cast angles. However, their accuracy will depend to a large extent on the mass and configuration of adjoining metal sections.

10.6 Radii

A normal tolerance for both internal and external radii would be ±0.4mm/25mm of radius.

SECTION 2 – BURR CONTROL

1. OBJECTIVE

This procedure establishes the Engineering, Manufacturing and Quality requirements and inspection criteria for de-burring of machined parts only. (Not applicable to Moulded Parts)

2. SCOPE

The intent of this standard is to define burr conditions, eliminate judgments and establish minimum accept / reject criteria for parts and components whether manufactured in house by Curtiss Wright or procured from a Sub-contractor and define the difference between conventional de-burr (class 1) and what is referred to as “Micro De-burr (class 2 or 3).”

3. PRECEDENCE

In the event of a conflict between the requirements of this specification and the requirements of other documents, the order of precedence is as follows:

1. Engineering Drawing
2. Purchase Order
3. Manufacturing Procedure
4. All Other Documents.

4. GENERAL

1. Parts will meet requirements set forth in the associated part drawing and this specification.
2. Define the classification of the surface/edge condition on the engineering drawing.
3. **If no classification is noted on the drawing the default shall be class 2.**
4. Parts will be deburred to conform to the requirements herein.
5. Parts will be dispositioned in accordance with the requirements set forth herein.
6. If particular inspection requirements are required, they will be specified as applicable on the Engineering drawing, work order, purchase order or work instruction.

5. DEFINITIONS

5.1 Burr

Non-functional material extending from the parent surface of a part.

5.1.1 Loose Burr

Not rigidly fastened or securely attached to the parent surface or having worked partly free from the parent surface.

5.1.2 Tight Burr

Strongly fixed or held to the parent surface with no slack or looseness.

5.2 De-burr

Removal of non-functional material shall be done with conventional tools for example; a file, grit blasting, thermal, electrochemical, tumbling, etc.

5.3 Surface/Edge Condition

The surface/edge condition is the result of a machining/manufacturing process which has the potential of creating a sharp edge or burr.

5.4 Classification of Surface/Edge Condition

5.4.1 Class 1

This classification of the surface/edge condition is generally detectable by the naked eye. The removal of a burr is performed using conventional machine shop practices and does not require the aid of magnification for detection and disposition.

5.4.2 Class 2

This classification of the surface/edge condition is a consideration for micro de-burring. The condition of the edge/surface is detected and dispositioned with the aid of **x4** magnification. The presence of a burr could cause functional issues within the assembly.

5.4.3 Class 3

This classification of the surface/edge is generally used where the edge must be sharp and free of flaws such as nicks and scratches. This classification is generally used for valve seat edges. The removal of a burr or creating an intended sharp edge is generally performed during the machining process. When identified, this surface/edge condition will require the aid of **x10** magnification. In addition, a detailed secondary document may be referenced which defines the acceptance criteria. Hand de-burring is not allowed for this classification unless specified in a secondary document.

5.5 Micro de-burr

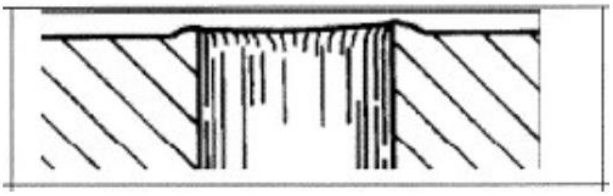
Removal of non-functional material with special tools such as media, hand grinders and the aid of magnification.

5.6 Types of burrs

The following illustrations depict the most common types of burrs.

5.6.1 Extended/Extruded Burr

Readily seen raised material generally caused by the drilling of a malleable material. This type of burr does not exhibit evidence of material that can break away.



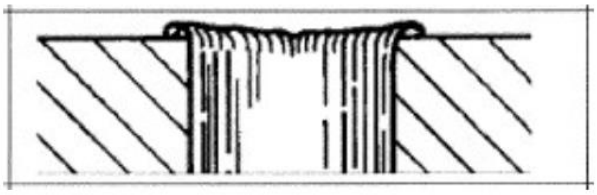
UNACCEPTABLE regardless of degree; burr must be removed.

5.6.2 Feathered Burr

Loose burr generally found on an edge where two dissimilar surface finishes meet.

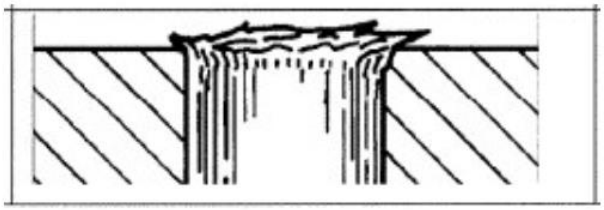
UNACCEPTABLE regardless of degree; burr must be removed.

5.6.3 Doughnut Burr



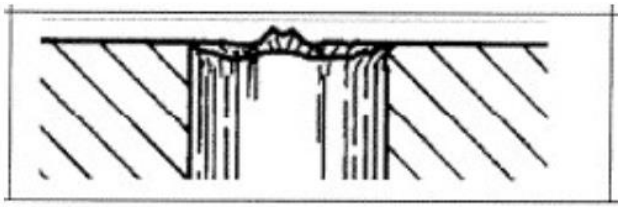
UNACCEPTABLE since material tends to flatten and blend it into adjacent surfaces; burr must be removed.

5.6.4 Loose/Sliver Burr



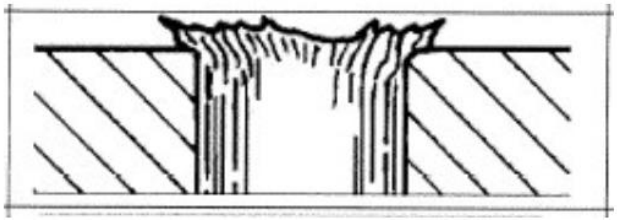
UNACCEPTABLE regardless of degree; burr must be removed. Loose burrs may contaminate system or damage mating parts. Loose sliver of material attached to the edge of a feature. This type of burr generally forms on edges adjacent to a milled or turned surface.

5.6.5 Hinged Burr



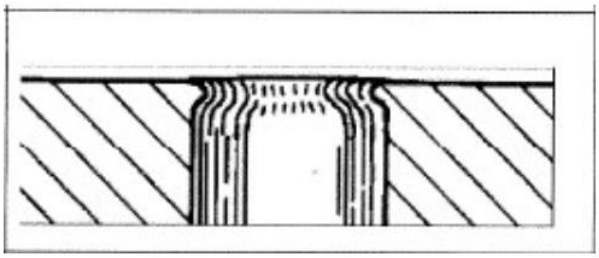
Loose material typically formed in holes and features located on surfaces that have been milled.
UNACCEPTABLE regardless of degree; burr must be removed.

5.6.6 Crowned Burr



Loosely attached material typically formed around a hole that has been countersunk.
UNACCEPTABLE regardless of degree; burr must be removed.

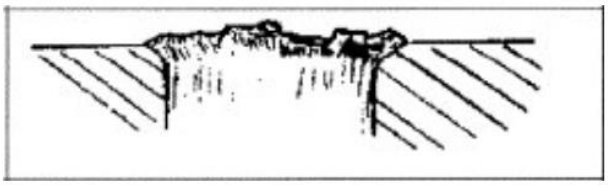
5.6.7 Rolled Burr



Similar to a hinged burr, this type of burr forms in holes and features that are located on surfaces that have been milled or turned.

UNACCEPTABLE regardless of degree; burr must be removed.

5.6.8 Rough/Broken Burr



UNACCEPTABLE regardless of degree; burr must be removed.

5.6.9 Secondary Burr

Often after a primary deburring operation such as countersinking or chamfering, a small burr may be generated at the intersection of the countersink or chamfer surfaces and the original part surfaces. These burrs are known as secondary burrs. This type of burr could appear as any of the aforementioned burr types and must be removed.

6. INSPECTION REQUIREMENTS

6.1 Inspection Methods

6.1.1 Class 1

Conventional surface/edge - Inspect part with the naked eye.

6.1.2 Class 2

Functional surface/edge - Inspect part using 4X magnification for detection and removal (micro de-burr) of burrs.

6.1.3 Class 3

Critical surface/edge – Edge must be free of flaws such as nicks, scratches, chips, etc. Inspect part in areas noted on drawing using 10X magnification and as specified by a secondary document.

6.2 Aids for detecting the presence of burrs

6.2.1 Cleanliness of Parts

Cleanliness of parts is an important and yet frequently overlooked aspect when inspecting for burrs. Contamination on machined parts makes inspection difficult. Burrs can easily be overlooked and confused with dirt or other contaminates. Proper cleaning of components I.A.W. section 3 of this document is imperative prior to inspecting components for burrs.

6.2.2 Direction of Viewing

Easily detectable burrs may be overlooked when viewing a part from a single direction. It is good practice to view components from varying directions and angles when inspecting for burrs. In general, parts should not be viewed looking straight down but should be viewed with the line of sight between 30 and 60 degrees to the edge of the surface being inspected.

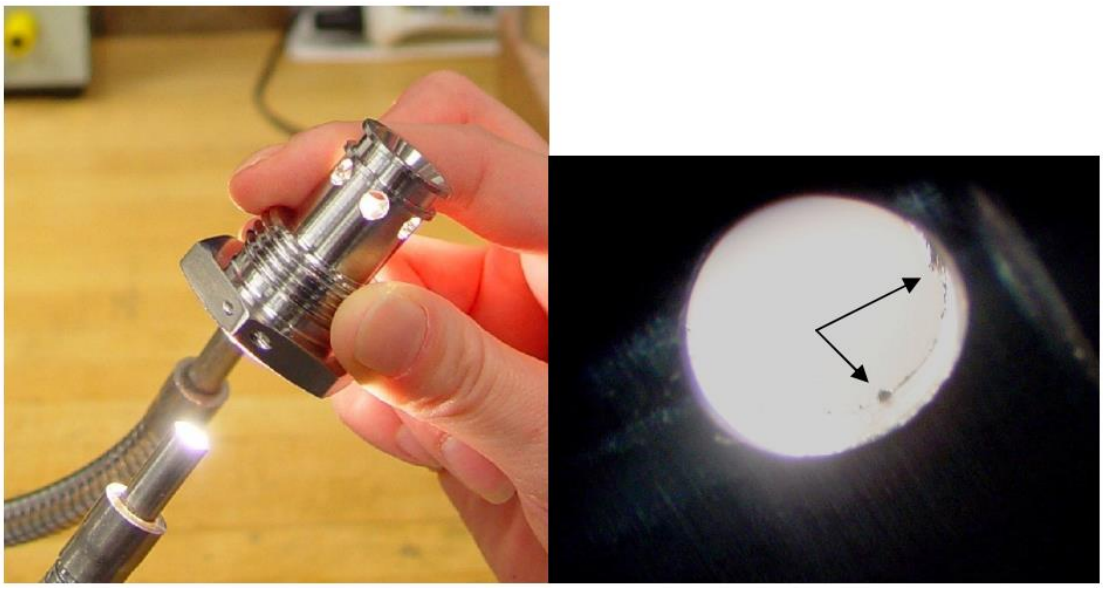


Figure 1 - Direction of Viewing

6.2.3 Proper Lighting

Similar to the direction of viewing work pieces, lighting should also be at an angle of 30 to 60 degrees to the surface being inspected. Intensity, type, colour and angle of lighting used, shall be mainly dictated by size, shape, material and detail of the work piece.

6.2.4 Proper Equipment

An Optical microscope or equivalent may be used for detection and evaluation of many burr types. In some cases, higher magnification may be required to detect a burr, however acceptance for classes 2 is based on 4X magnification and 3 is based on 10X magnification, unless otherwise specified. The recommended lighting used is from a bifurcated light source as shown below.

Figure 2 - Magnification equipment

Inspect part using optical comparator. This is typically a secondary method of inspection. A burr may be observed while performing dimensional inspection. Verification of the burr should be performed using a microscope.

7. THREADS

Both internal and external threads present a challenge in the area of deburring. Of the two, internal threads are the most difficult. Roots and side-walls, particularly on small diameter, blind threaded holes, remain from view. These areas should not, however, be overlooked or forgotten. Burrs and other contaminants dislodged from these areas may enter the system and clog small diameter fluid passages or scratch sealing surfaces.

7.1 Bent First Thread

Frequently, the first thread of both internal and external threads taper to a thin sliver type burr. This burr can easily be pressed into the root of the thread and may tear loose when matched with a mating threaded component; therefore it must be removed.

7.2 Extruded Burrs (not applicable to rolled threads)

Extruded burrs are raised portions of metal located along the outer edge(s) of a threaded hole. Extruded burrs prevent proper surface-to-surface contact of mating parts. These raised metal burrs are not acceptable and must be removed when associated with threads.

7.3 Burrs on Crests of Threads

Both internal and external threads are subject to burrs on thread crests

A – Reference as designated thread
B - Tool marks or ribbed sidewall - **ACCEPTABLE**
C - Rolled over material on crest - **UNACCEPTABLE**
D - Stepped sidewall and crest - **ACCEPTABLE**
E - Torn sidewall and crest - **UNACCEPTABLE** UNLESS SHARP EDGES ARE BLENDED
F - Burr turned down loosely on sidewall - **UNACCEPTABLE**
G – Same condition as in F shown in the exposed view – **UNACCEPTABLE**

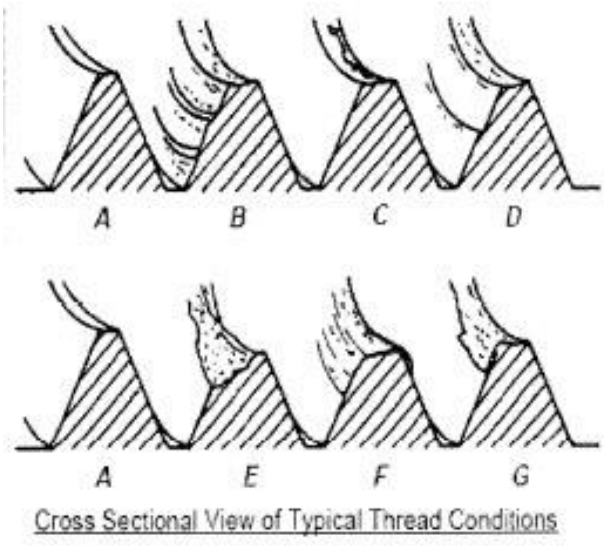


Figure 3 - Thread Crest Burrs

8. DEBURRING REQUIREMENTS

8.1 General

8.1.1 Deburring is performed by trained operators.

8.1.2 Deburring of the part may require the use of magnification aids (see section 2 para 6.1.4).

8.1.3 Deburr shall be adequate to allow accurate measurements of the feature.

8.1.4 If a secondary finishing operation is mandated, deburr shall be adequate so that the plating, anodizing or heat-treating doesn't cover the burrs.

8.1.5 No burrs shall be allowed that would cause a safety concern for handling of the part.

8.1.6 The appropriate deburring tools shall be used. The tools must be capable of removing burrs without damaging adjacent surfaces or removing the surrounding material.

8.1.7 Burrs including feathered, doughnut, sliver, hinged, and crowned burrs shall be removed to a C/R .of .010" max. unless otherwise specified on the engineering drawing.

8.1.7.1 C/R (Chamfer / Radius)

Any combination of angles or radii that fall inside an area formed by the largest chamber and the smallest radius as allowed by the stated tolerance.

Example 1: C/R .010 MAX - Any combination of angles or radii that fall within the shaded area shown. (Note that a sharp edge is permitted).

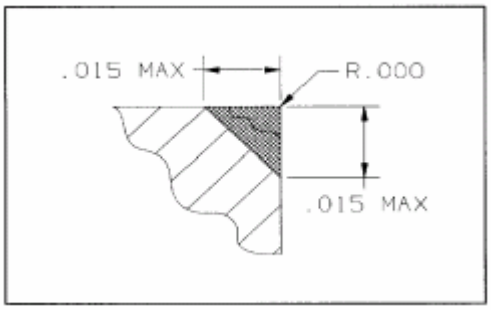


Figure 4 - C/R (Chamfer / Radius) Example 1

Example 2: C/R .010 ±. 005 - Any combination of angles or radii that fall within the shaded area shown.

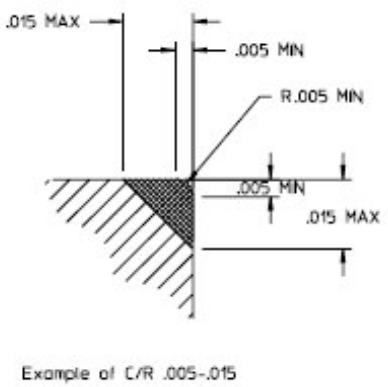


Figure 5 - C/R (Chamfer / Radius) Example 2

8.1.8 Extended/Extruded and rolled burrs are acceptable as long as the print tolerances are not violated. (i.e. radii, flatness, parallelism, size, etc.)

8.1.9 All print tolerances, finishes and requirements must be maintained after deburring is completed.

9. BURR EXAMPLES

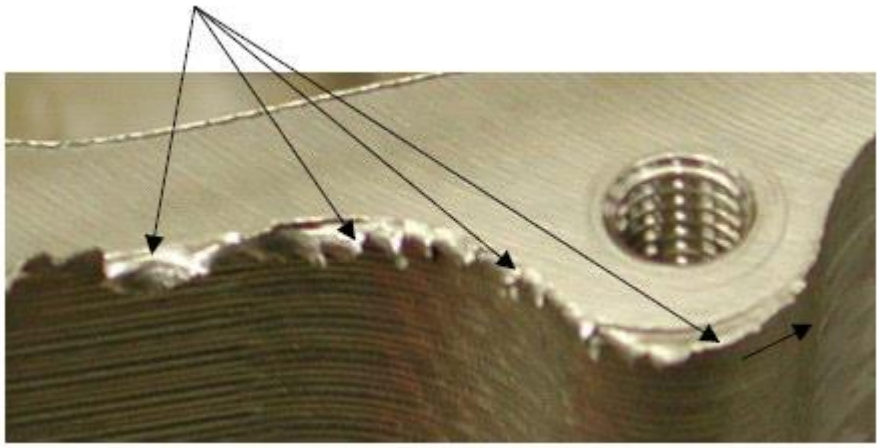


Figure 6 - Hinged Burr

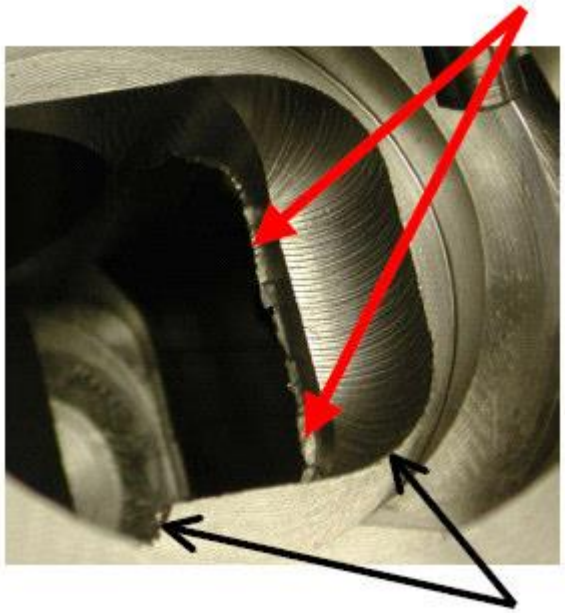


Figure 7 - Hinged Burr

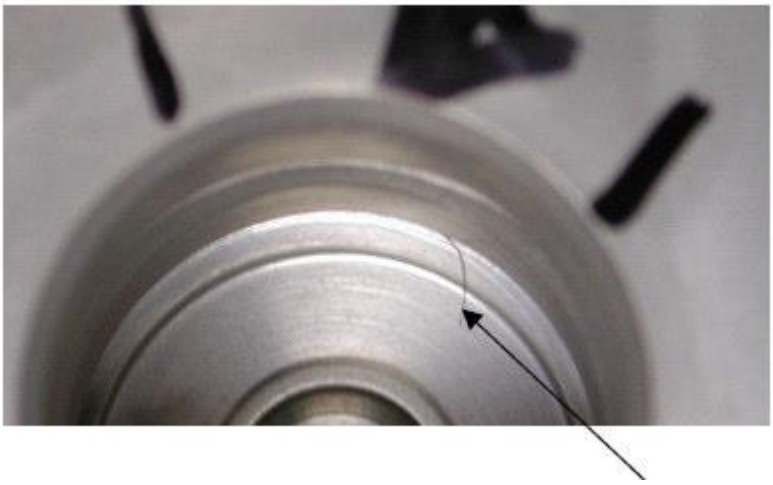


Figure 8 - Sliver Burr

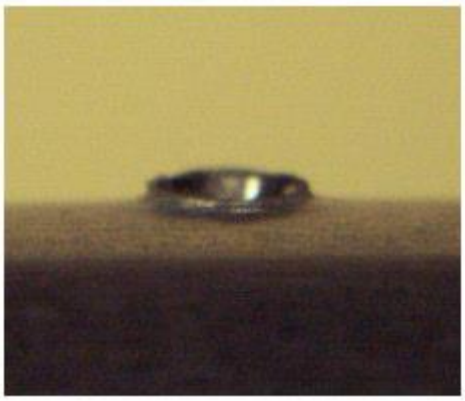


Figure 9 - Doughnut Burr

Figure 10 - Rough/Broken Burr

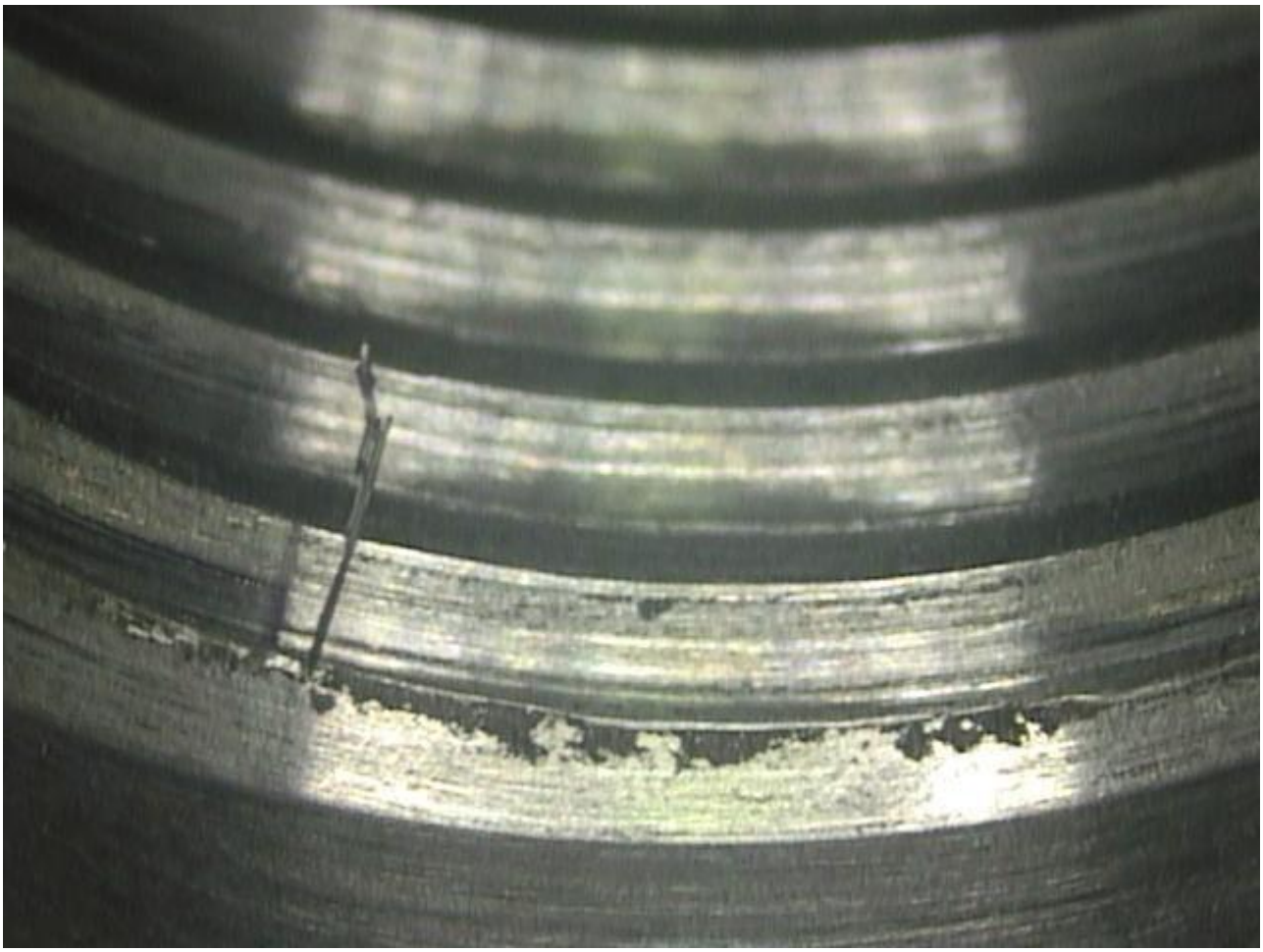


Figure 11 – Sliver Burr

SECTION 3 – CLEANLINESS CONTROL FOR FOREIGN OBJECT DEBRIS (Fod) MITIGATION

1. OBJECTIVE

This procedure establishes the cleanliness criteria for machined parts only (this does not cover moulded parts), to mitigate incoming part level Foreign Object Debris and its potential for migration into Curtiss Wright assemblies.

2. SCOPE

The intent of this standard is to define cleanliness, eliminate judgments, and establish minimum accept / reject criteria for parts and components whether manufactured in house by Curtiss Wright or procured from a Sub-contractor.

3. PRECEDENCE

In the event of a conflict between the requirements of this specification and the requirements of other documents, the order of precedence is as follows:

1. Engineering Drawing
2. Purchase Order
3. Manufacturing Procedure
4. All Other Documents.

4. CLEANING PRACTICES

The cleaning practices used to ensure foreign object debris removal I.A.W. this specification are at the machine shop/vendors discretion to achieve the most efficient process however consideration must be given to the part being made and the requirements of the associated drawing, with regard to tolerances and any subsequent defined surface finishes, and/or coatings.

5. MINIMUM CLEANLINESS LEVEL

Unless otherwise stated on the associated drawing as a minimum all machined parts must;

1. Be free from swarf
2. Be free from cutting fluid (oil based or aqueous)
3. Be free from dust or dirt
4. Be free from non-organic fibres transferred from cleaning towel and or cloth.
5. Be free from organic fibres transferred from operator.

6. SWARF EXAMPLE

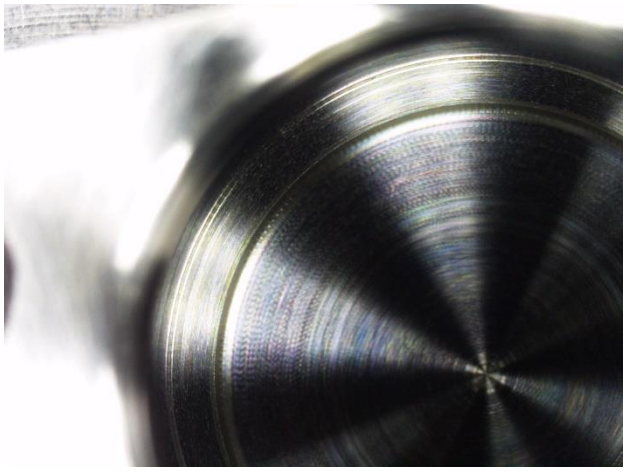
Swarf, also known as chips or by other process-specific names (such as turnings, filings, or shavings), are pieces of metal, wood, or plastic that are the debris or waste resulting from machining, woodworking, or similar subtractive (material-removing) manufacturing processes.

Figure 12 - Various examples of swarf, including a block of compressed swarf

The following example provide visual guidance of acceptable vs. non-acceptable levels of Foreign Object Debris.

Unacceptable (≥)

Acceptable (≤)



COMMON SENSE MUST BE APPLIED WHEN DECIDING THE LEVEL OF ACCEPTABLE SWARF.

SECTION 4 – HANDLING AND PACKAGING CONTROL

1. OBJECTIVE

This procedure establishes the Handling and Packaging criteria for machined parts only (this does not cover moulded parts), to mitigate incoming part level Foreign Object Debris and its potential for migration into Curtiss Wright assemblies.

2. SCOPE

The intent of this standard is to define handling and packaging during manufacture and shipment to Curtiss Wright, eliminate judgments, and establish minimum accept / reject criteria for parts and components whether manufactured in house by Curtiss Wright or procured from a Sub-contractor.

3. PRECEDENCE

In the event of a conflict between the requirements of this specification and the requirements of other documents, the order of precedence is as follows:

1. Engineering Drawing
2. Purchase Order
3. Manufacturing Procedure
4. All Other Documents.

4. 'IN' MANUFACTURE HANDLING AND PACKAGING

During the manufacture of machined parts (between machining and/or cleaning processes) packaging selection must;

- Ensure that no damage occur to the work piece.
- Not transfer itself in any quantity to the work piece.
- Provide separation of individual parts to prevent collision due to shocks and vibration during transportation.

5. POST MANUFACTURE HANDLING AND PACKAGING (SHIPPING TO CURTISS WRIGHT)

Post manufacture of machined parts (shipping to Curtiss Wright) packaging selection must unless otherwise stated on the associated drawing;

- Ensure that no damage occur to the finished part.
- Not transfer itself in any quantity to the finished part.
- Provide separation of individual finished parts to prevent collision and subsequent damage due to shocks and vibration during transportation.

Note: If environmental protection to the part is required, such as 'vacuum sealed bag' or 'oiled and bag' the associated drawing will specify.

