

# G W LISK COMPANY INC.

## ENGINEERING PROCESS SPECIFICATION

### Burr Specification

EPS-805-STD  
Revision NC

#### Distribution

Intranet

	Signature	Date
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## 1.0 Purpose

1.1 This procedure establishes the Engineering, Manufacturing and Quality requirements and inspection criteria for de-burring of machined parts.

## 2.0 Scope

2.1 The intent of this specification is to define burr conditions, eliminate judgments and establish accept / reject criteria for parts and components whether manufactured or procured.

2.2 The intent is also to describe the difference between conventional de-burr (class 1) and what is referred to as "Micro De-burr (class 2 or 3)."

## 3.0 Conflict Statement

3.1 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:

3.1.1 Engineering Drawing

3.1.2 Purchase Order

3.1.3 Manufacturing Procedure

3.1.4 All Other Documents.

## 4.0 Engineering

4.1 Parts will conform to the requirements set forth in the part drawing and to this specification.

4.2 Will define the classification of the surface/edge condition on the engineering drawing. If no classification is noted on the drawing the default shall be class 1.

4.3 Parts will be deburred to conform to the requirements.

4.4 Parts will be dispositioned in accordance with the requirements set forth in this specification.

4.5 If particular inspection requirements are required, they will be specified as applicable on the Engineering drawing, work order, purchase order or work instruction.

## 5.0 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

5.3.1 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 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 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.

**ACCEPTABLE** except when altering hole dimensions or affecting surface to surface contact.



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.



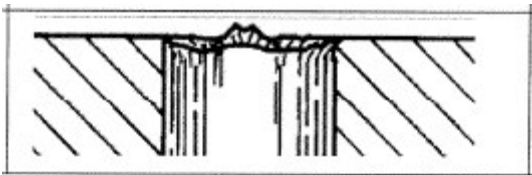
5.6.3 **Doughnut Burr** - UNACCEPTABLE since material tends to flatten and blend it into adjacent surfaces; burr must be removed.



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.

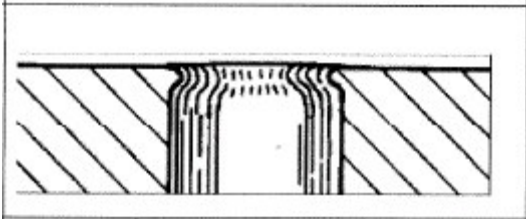


5.6.6 **Crowned Burr** - Loosely attached material typically formed around a hole that has been countersunk. UNACCEPTABLE regardless of degree; burr must be removed.

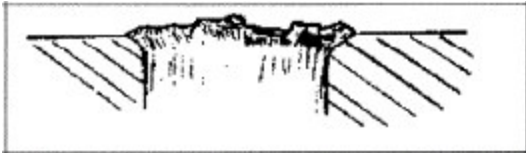


5.6.7 **Rolled Burr** - Similar to a hinged burr, this type of burr forms in holes and features that are located on surfaces that have been milled or turned.

**UNLESS OTHERWISE SPECIFIED ACCEPTABLE** *except* when installation hole or feature dimensions are altered, or when potentially hindering assembly of mating parts. Acceptability may often be defined by free passage of a given size pin.



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 will 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 may need removal depending upon its evaluation.

## 6.0 Inspection Requirements

### 6.1 Inspection Methods

6.1.1 **Class 1:** Conventional surface/edge - Inspect part with the naked eye.

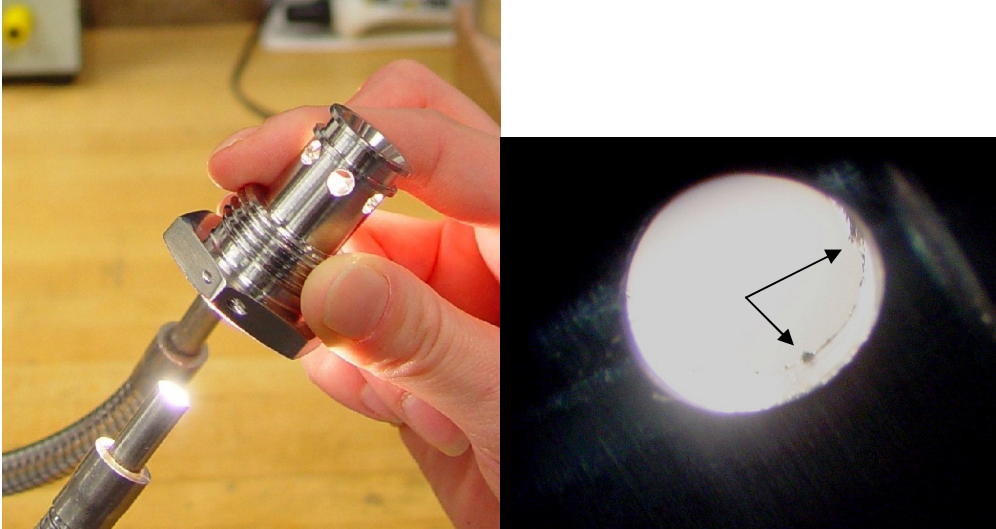
6.1.2 **Class 2:** Functional surface/edge - Inspect part using 10X magnification for detection and removal (micro de-burr) of burrs.

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 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.



**6.2.3 Proper Lighting** – Similar to the direction of viewing workpieces, lighting should also be at an angle of 30 to 60 degrees to the surface being inspected. Intensity, type, color and angle of lighting used, shall be mainly dictated by size, shape, material and detail of the workpiece.

**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 and 3 is based on 10X magnification, unless otherwise specified. The recommended lighting used is from a bifurcated light source as shown below.



6.2.5 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.

## 7.0 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.

### **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.

### **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.

### **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

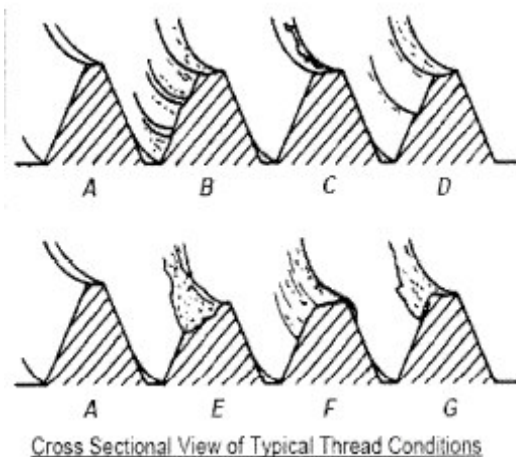
C - Rolled over material on crest - UNACCEPTABLE

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



## 8.0 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 Micro Deburr, para 5.2 and 6.1.2).

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.

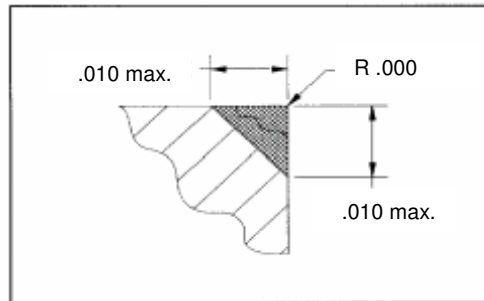
8.1.6 The appropriate deburring tools shall be used. The tools must be capable of removing burrs without damaging adjacent surfaces or removing the surrounding material.

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.

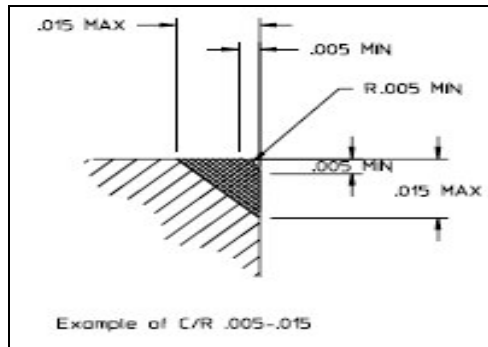
#### 8.1.7.1 C/R (Chamfer / Radius)

Any combination of angles or radii that fall inside an area formed by the largest chamfer 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).



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



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.

## Appendix A

### Images of Burrs

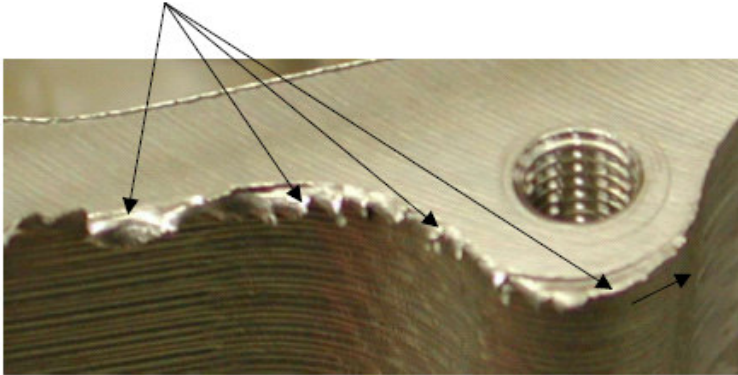


Figure 1 – Hinged Burr

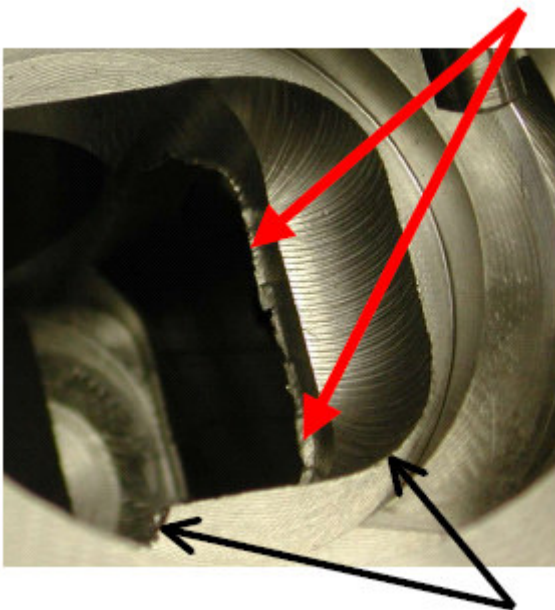


Figure 2 – Hinged Burr

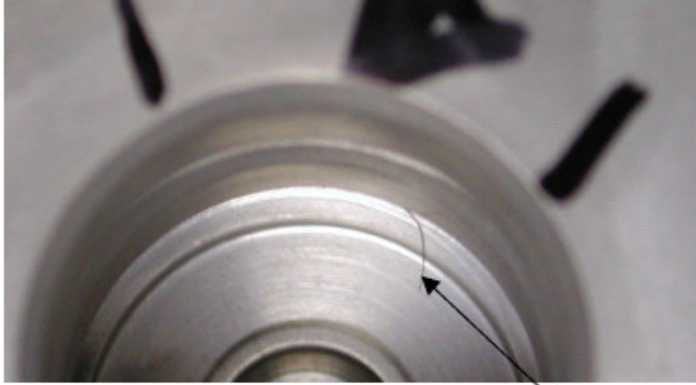


Figure 3 – Sliver Burr

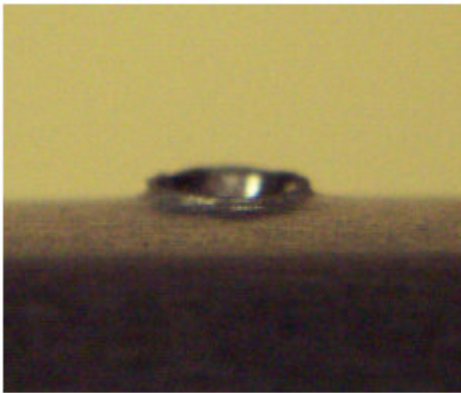


Figure 4 – Doughnut Burr



Figure 5 – Rough/Broken Burr

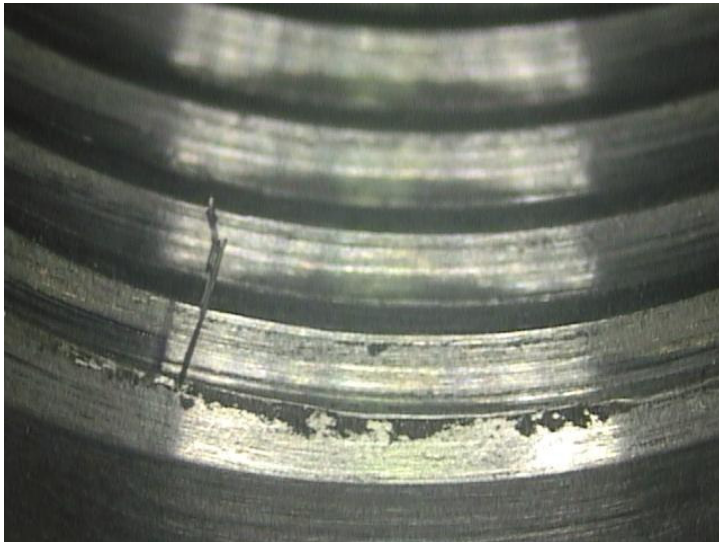


Figure 6 – Sliver Burr

## Revisions

REVISION	CHANGE	DATE	APPROVAL
N/C	Original Release		