



<b>Mountainhome Workmanship Standard</b>	
Author: Jacob Nichols	Issue Date: 01/27/2020 Effective Date: 08/15/2022

**1. Purpose / Scope**

- 1.1. The purpose of this document is to define the workmanship standard for Collins Aerospace Mountainhome (hereby referred to as “Mountainhome.”)
- 1.2. This is a general overview of the standard practices for all parts which are manufactured in this facility.
- 1.3. Part-specific workmanship standards shall also be adhered to when applicable. These will be referenced by the job traveler and/or applicable engineering documentation.

**2. Responsibility**

- 2.1. Top management owns this document and is responsible for maintaining and enforcing it.
- 2.2. It is the responsibility of all employees to abide by and adhere to this document.

**3. References**

- 3.1. COL-POL-0001- Collins Aerospace Quality Manual
- 3.2. MTH-QLT-PRO-0101- Collins Aerospace; Mountainhome, PA Quality Management System Manual
- 3.3. MTH-QLT-PRO-1101- Control of Foreign Objects or Debris

**4. Definitions**

- 4.1. Foreign Object (FO): A substance or article alien to the part that could cause damage or otherwise compromise the form, fit, or function of the part or any other related parts. Examples include but are not limited to the following:
  - 4.1.1. Liquids / liquid residue, including oil, coolant, and chemicals
    - 4.1.1.1. For some parts containing internal coolant paths, some oil residue may be allowable in the final product. When applicable, this will be defined in the part’s engineering documentation.
  - 4.1.2. Metal chips or shavings. This can occur from a number of places, including straightening, machining, and deburring.
  - 4.1.3. Salt and/or salt residue resulting from incomplete cleaning of dip braze salts.
  - 4.1.4. Dust, fuzz, and other similar types of debris.
- 4.2. Foreign Object Damage (FOD): Any damage attributed to a foreign object that can be expressed in physical or economic terms which may or may not degrade the product’s required safety and/or performance characteristics.
- 4.3. Workmanship: A set of criteria which Collins Aerospace Mountainhome evaluates production parts to which may not necessarily be defined by a dimension, drawing note, or other discrete definition. Workmanship captures criteria such as overall part appearance, paint / coating quality, quality of hardware installation, cleanliness of the part, attention to detail, etc.



## 5. Core Values and Goals

*Note: The following is meant to support this procedure and does not supersede the company's official Quality Policy.*

- 5.1. Performance is the most important objective as a means of ensuring customer satisfaction.
- 5.2. Mountainhome shall provide customers with quality, on-time product.
- 5.3. Mountainhome will continue to improve processes and personnel by focusing on 100% customer satisfaction through a "Zero Defects" process and culture.
- 5.4. Mountainhome will meet customer Regulatory/Statutory & Corporate specifications which relate to products.
- 5.5. Mountainhome will not sacrifice quality of parts due to time constraints.
- 5.6. Start with good parts; end with good parts.
- 5.7. All employees are responsible to verify the quality of both incoming and outgoing parts. Take pride in your work.
  - 5.7.1. Quality is **everybody's** responsibility. It takes teamwork from every organization and every employee to build a quality product.
  - 5.7.2. **IF YOU SEE SOMETHING, SAY SOMETHING.**
    - 5.7.2.1. Communication and teamwork is the key to success.
    - 5.7.2.2. Don't ever be afraid to admit a part has been damaged; early detection is the most important step here.
- 5.8. Containment of non-conforming product is key to protect the customer.
  - 5.8.1. If a part is found to be non-conforming, all parts that could be affected must also be evaluated and inspected to ensure containment of the issue.



## 6. Cleanliness Guidelines

- 6.1. Cleanliness is not just the responsibility of the custodial teams; all employees are responsible for keeping the facility up to the cleanliness standards.
- 6.2. Improper cleanliness can indirectly lead to workmanship issues. These issues can manifest primarily as FO contamination and dings and scratches.
- 6.3. Cleanliness standards can be found on document MTH-QLT-PRO-1101, which is the FOD document.

## 7. FOD Control [See MTH-QLT-PRO-1101 for more information.]

- 7.1. FO/FOD identification and prevention is the responsibility of every employee.
- 7.2. Each employee needs to be aware of the FO/FOD level for the department they are working in.
- 7.3. Each employee is responsible for preventing and identifying FO/FOD.
- 7.4. If a FO/FOD risk is identified, the employee must notify their area supervisor immediately.
  - 7.4.1. Supervisors and management are responsible for taking actions to mitigate FO/FOD risks.

## 8. Part Handling and Transportation Guidelines

- 8.1. Direct Part-to-Part contact is unacceptable.
- 8.2. Always handle parts with the utmost care.
  - 8.2.1. Do not slide parts on surfaces.
  - 8.2.2. Avoid metal-to-metal contact.
  - 8.2.3. Do not stack parts without proper protection. See Section 8.3 for more information.
  - 8.2.4. Avoid contact with personal jewelry, watches, or other personal items. This includes rings, necklaces, lanyards, watches, bracelets, belt buckles, etc.
  - 8.2.5. Wear clean gloves with finished parts to avoid FO contamination. If your gloves are dirty, then discard them and replace with new prior to handling finished parts.
  - 8.2.6. **Handle all parts as if they are finished parts.**
    - 8.2.6.1. Do not assume that damages can just get fixed later if parts are early in the production process.
    - 8.2.6.2. Expect that all damages will be catastrophic, and take every step necessary to avoid these damages.



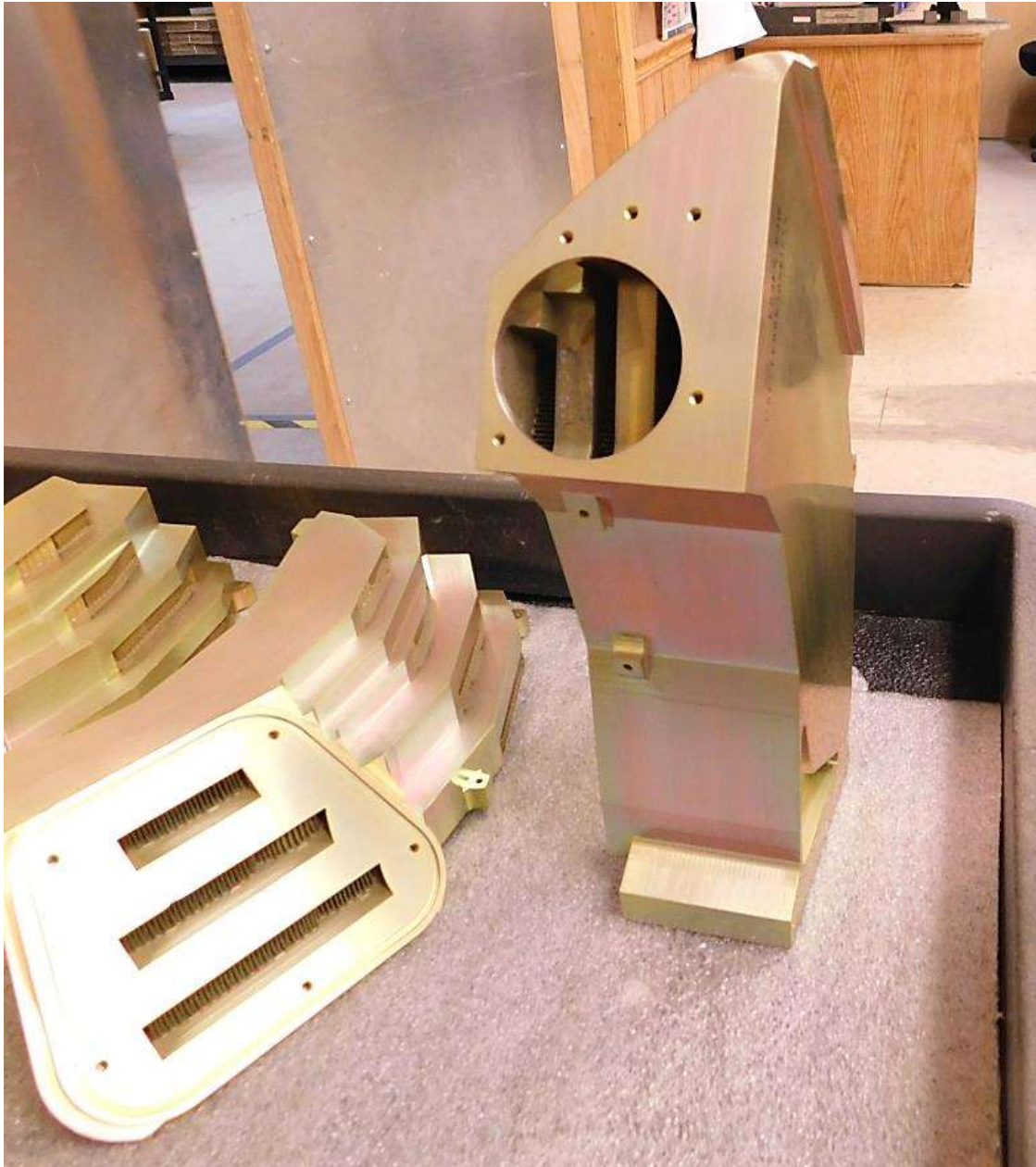
8.3. Properly loading parts onto carts and workstations:

8.3.1. Before loading, check that the surface is both properly padded and free of any FO.

8.3.1.1. Keep an eye out for metal shavings.

8.3.1.2. Clean carts/surfaces as needed. Cleaning of the surface is the operator's responsibility.

8.3.2. Never stand parts vertically:

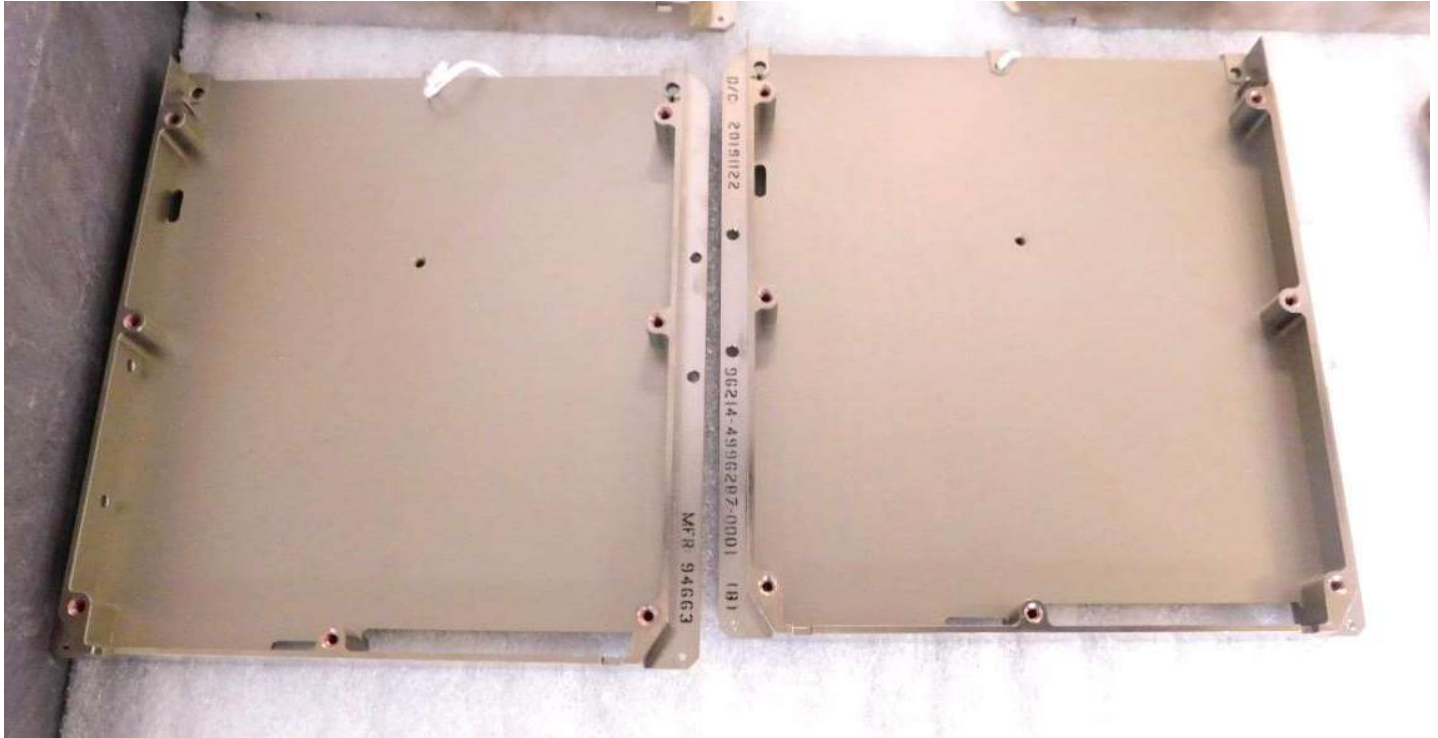


**Figure 1:** The part on the right (1) is standing improperly and has a high risk of falling over and becoming damaged. The part on the left (2) is lying safely and has minimal risk of falling over.



8.3.3. Always be sure to put a reasonable amount of space between parts.

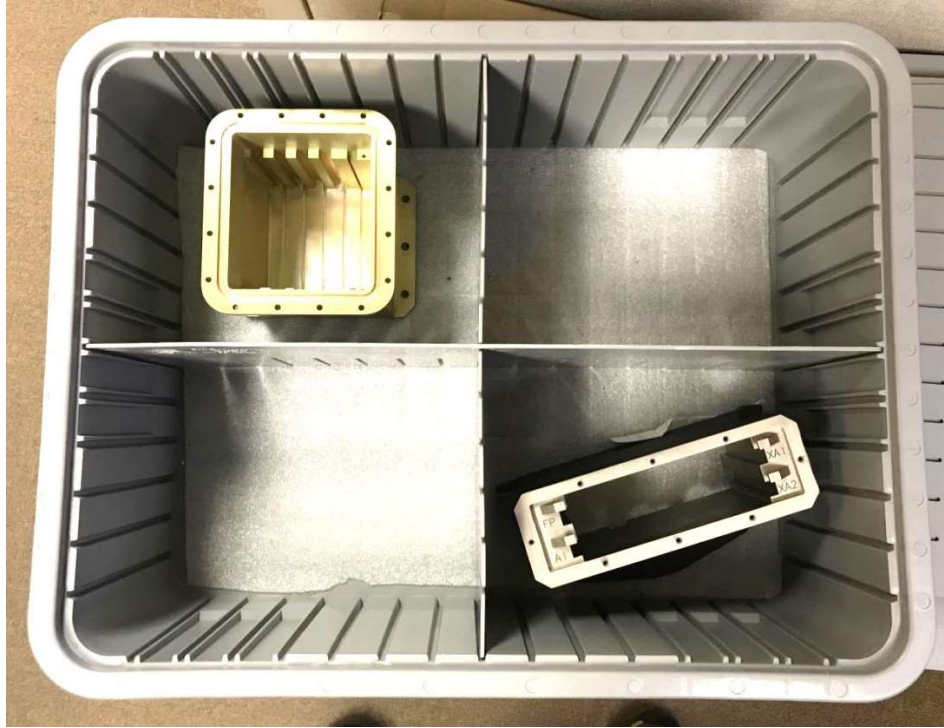
8.3.3.1. Two inches is the minimum spacing requirement, unless proper padding is utilized.



**Figure 2:** These parts are too close together and have a high risk of impacting each other. For these parts, a bin with dividers is highly recommended. See Section 8.3.4 for more information.



8.3.4. Use bins with dividers when possible. If there are not enough sufficient bins and dividers available when they are needed, then notify your supervisor:



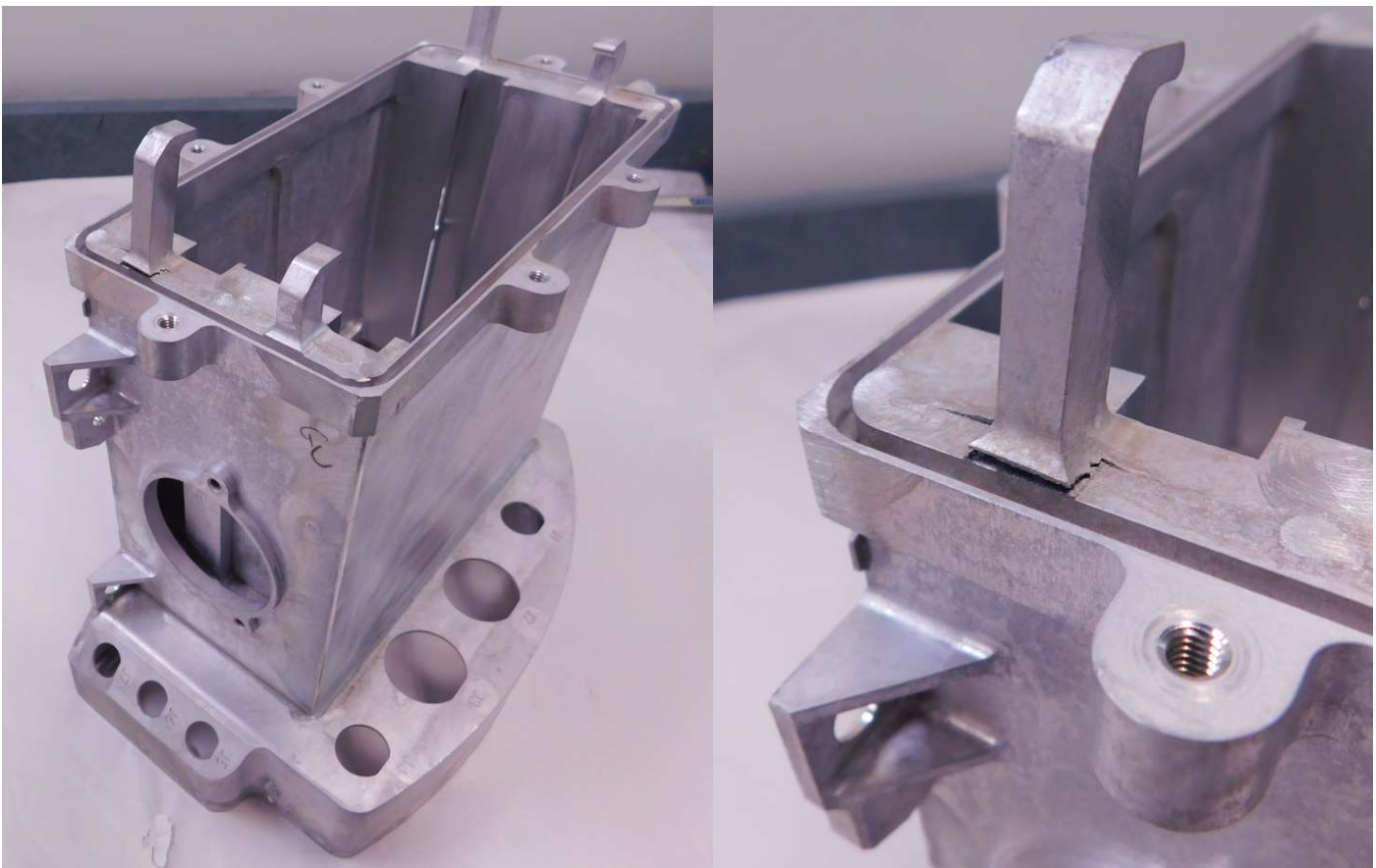
**Figure 3:** The above image shows a bin being properly used with dividers. This optimizes space and ensures protection during travels.



8.3.5. Keep parts away from edges where it may be possible to inadvertently knock them off of a cart/table/etc.

8.3.5.1. Eliminate overhang whenever possible to reduce the risk of contacting the part when somebody is walking by (some parts may be too large to totally eliminate overhang).

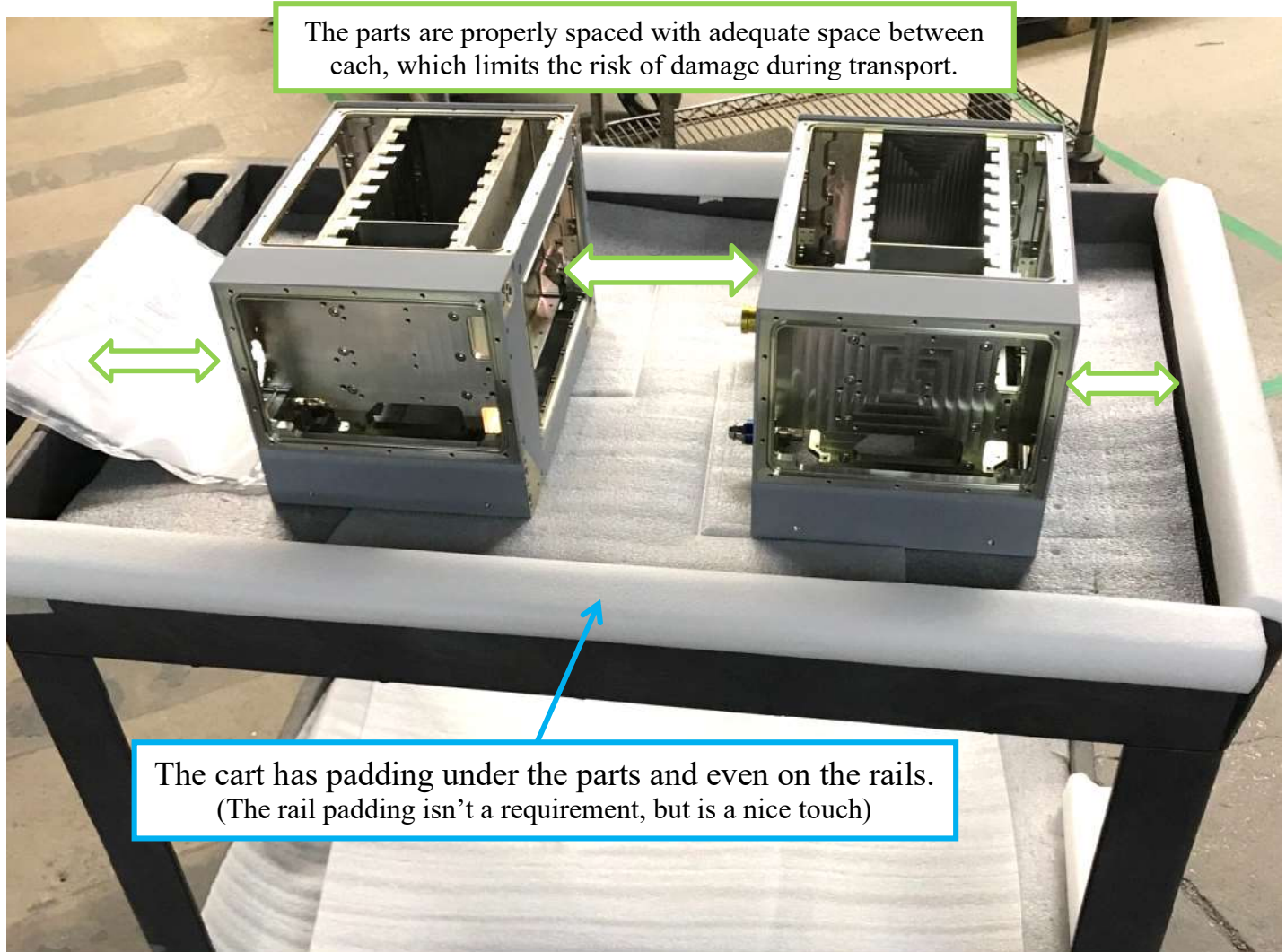
8.3.5.2. Consider all moving objects at or around your cart or workstation. Make sure parts can't be knocked over or slid around by things like elbows, sleeves, air hoses, or power chords.



**Figure 4:** This part fell off of a table and was rendered scrap. It was left too close to the edge of a table AND it was stored in a very unstable position, balancing on the smaller top flange with the fingers through the holes in a downdraft table.



8.3.6. Properly loaded carts:



**Figure 5:** The above image shows a properly spaced and padded cart.





8.4. Part storage

8.4.1. For parts that need to be stored for extended periods of time, it is good practice to cover the parts to reduce risk of FO/FOD exposure and part damage.



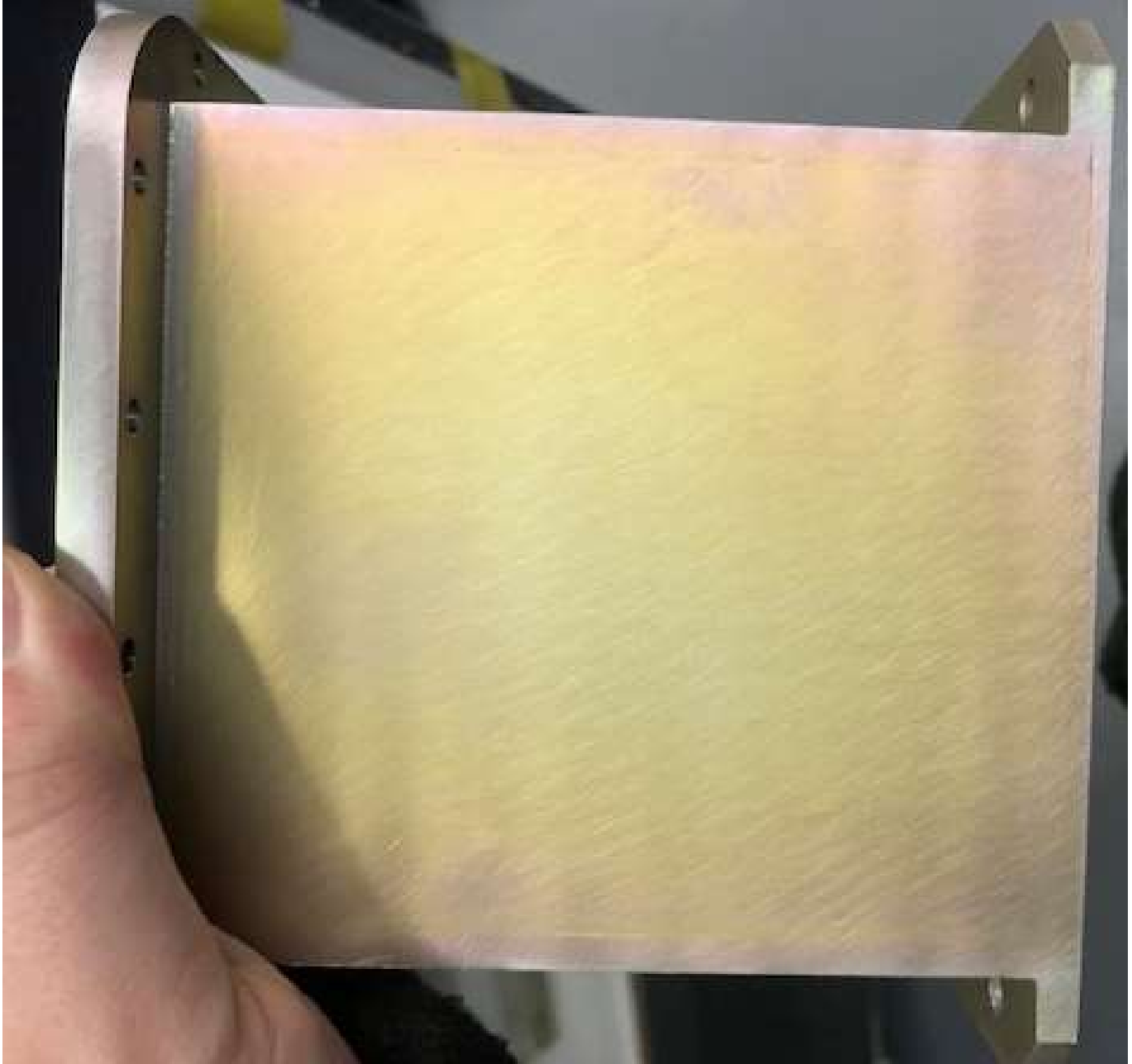
**Figure 6:** These parts are awaiting source inspection and have been properly covered to protect from FO/FOD contamination and damages.



**9. Chemical Conversion Coating (AKA “Chem Film”) Coverage and Staining**

9.1. Each employee should be able to identify proper and poorly chemical conversion coated surfaces.

9.2. Proper Chemical conversion coating coverage:



**Figure 7:** This is an example of acceptable chemical conversion coating coverage. Note the uniformity of color in the chemical conversion coating and the lack of staining.



9.3. Chemical conversion coating problem identification:

9.3.1. If any of the following examples of chemical conversion coating issues are identified, then contact your area supervisor. Immediately non-conform the part. **IF YOU SEE SOMETHING SAY SOMETHING.**

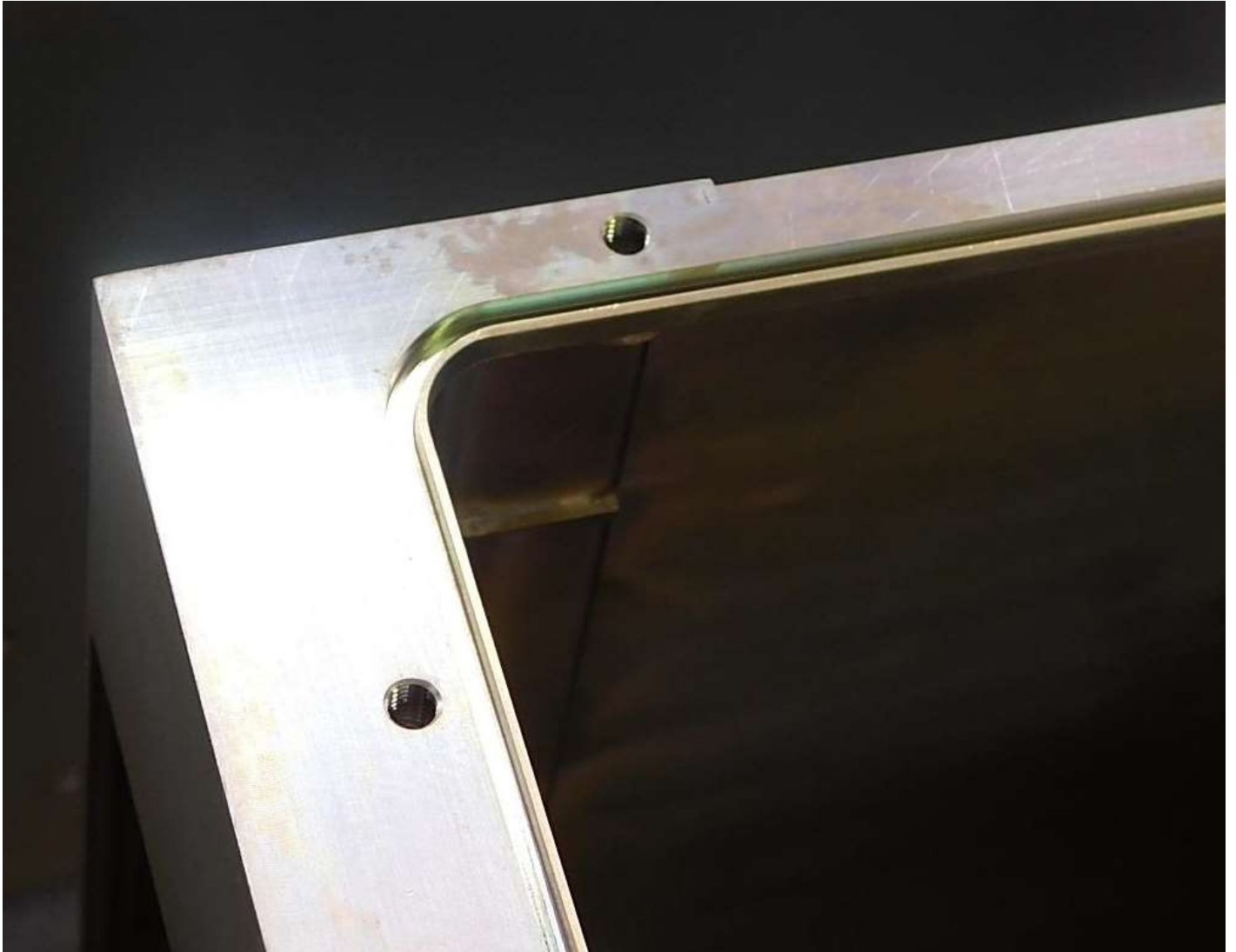
9.3.2. Poor Coverage:



**Figure 8:** Notice the non-uniform color identified above. This is an example of poor coverage.



9.3.3. Staining:



**Figure 9:** This is one example of chemical conversion coating staining.



**Figure 10:** Another example of chemical conversion coating staining.



9.3.4. Other Problems:



**Figure 11:** This is representative of either chemical conversion coating or deoxidizer splatter and is common around holes.



**Figure 12:** The white film on the braze seam is brazing salt residue. This improperly cleaned part had chemical conversion coating applied over top of the residue.

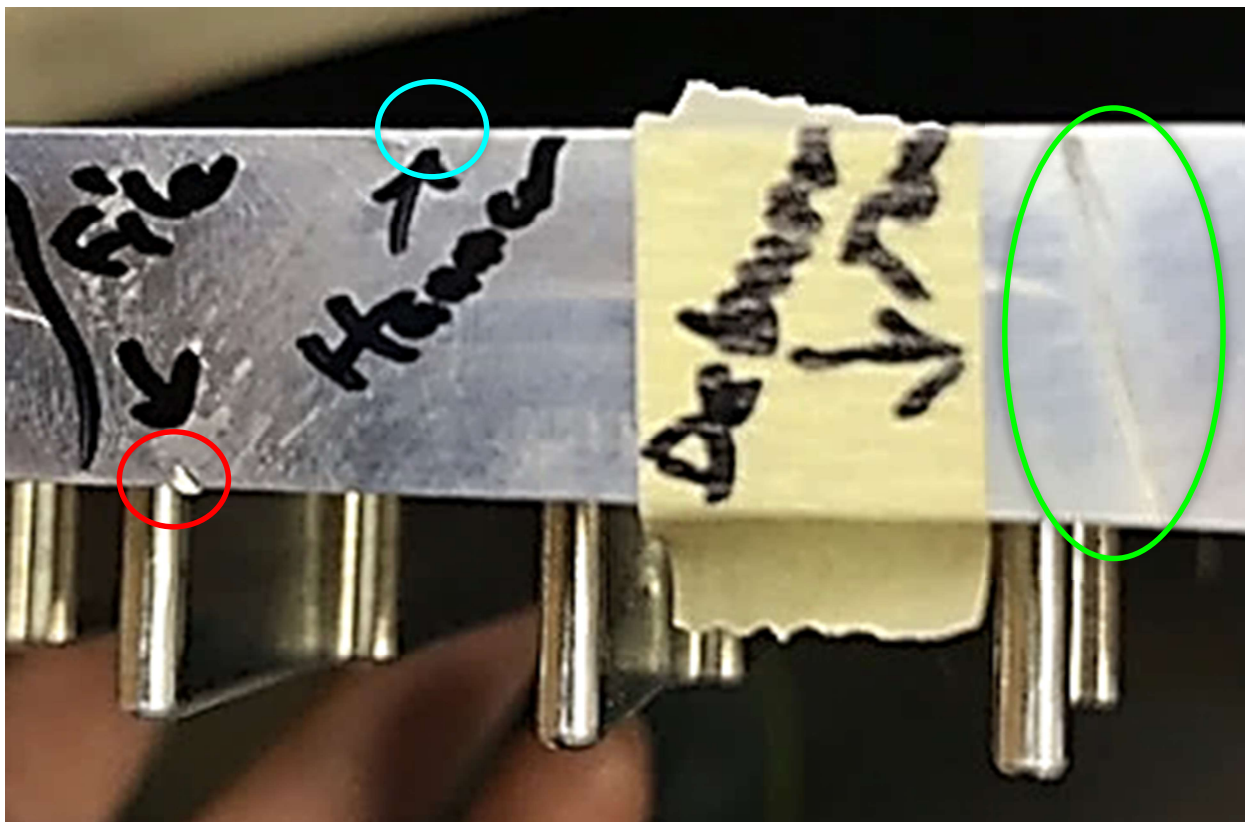


### 10. Paint Defects

- 10.1. Painted parts should be handled with extreme caution and minimizing handling is best practice.
- 10.2. If parts must be handled the following precautions must be taken:
  - 10.2.1. Avoid touching painted surfaces, if possible. If the paint must be touched, then clean gloves should be worn.
  - 10.2.2. If the paint is touched without gloves:
    - 10.2.2.1. Visually inspect the part thoroughly for smudges, oil residues and imperfections.
    - 10.2.2.2. If any defects are found, then do not try and clean or touch them up yourself unless you are trained to do so. Parts exhibiting paint defects must be non-conformed.
- 10.3. Operators should become familiar with all paint defects so that they can be easily identified.
  - 10.3.1. A formal list of paint defects can be found in the paint inspection work instruction.

### 11. Uniform Part Appearance

- 11.1. If any of the following imperfections are identified, then non-conform the part, and notify the area supervisor.
  - 11.1.1. Surface imperfections:



**Figure 13:** This shows three common damages from a file (red), hammer (blue) and a deburring tool (green).





**Figure 14:** The above image shows damages from hitting the parts on an unprotected cart surface.



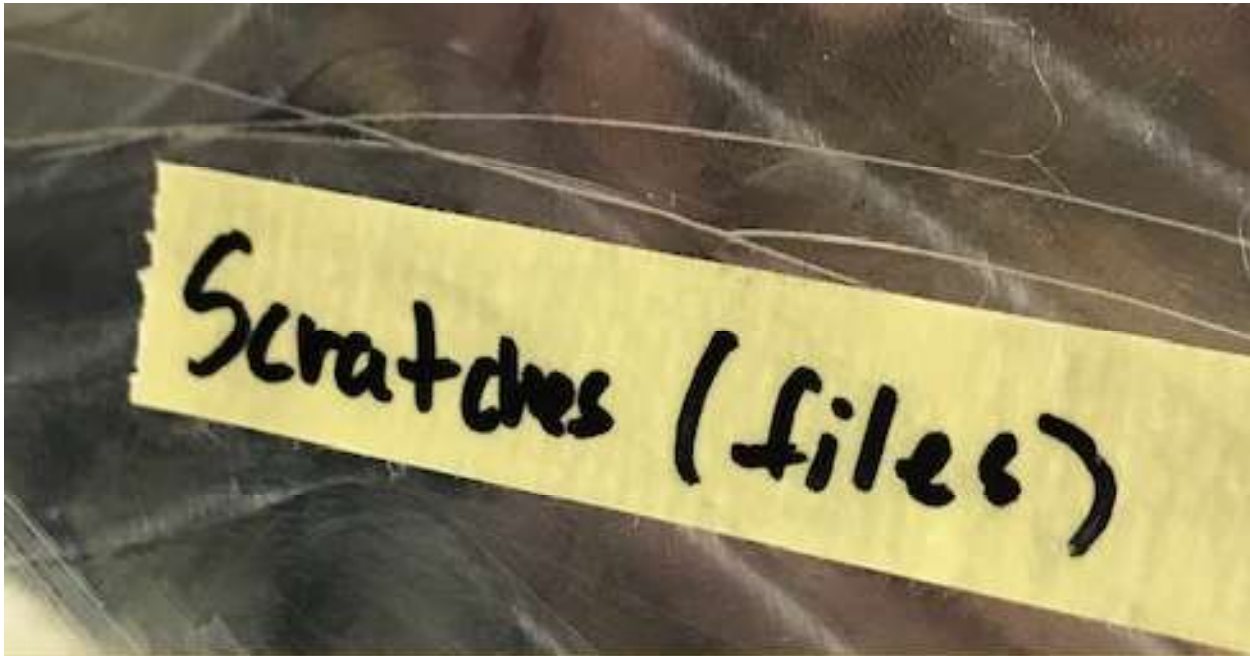
**Figure 15:** The above image shows damages from a hammer.



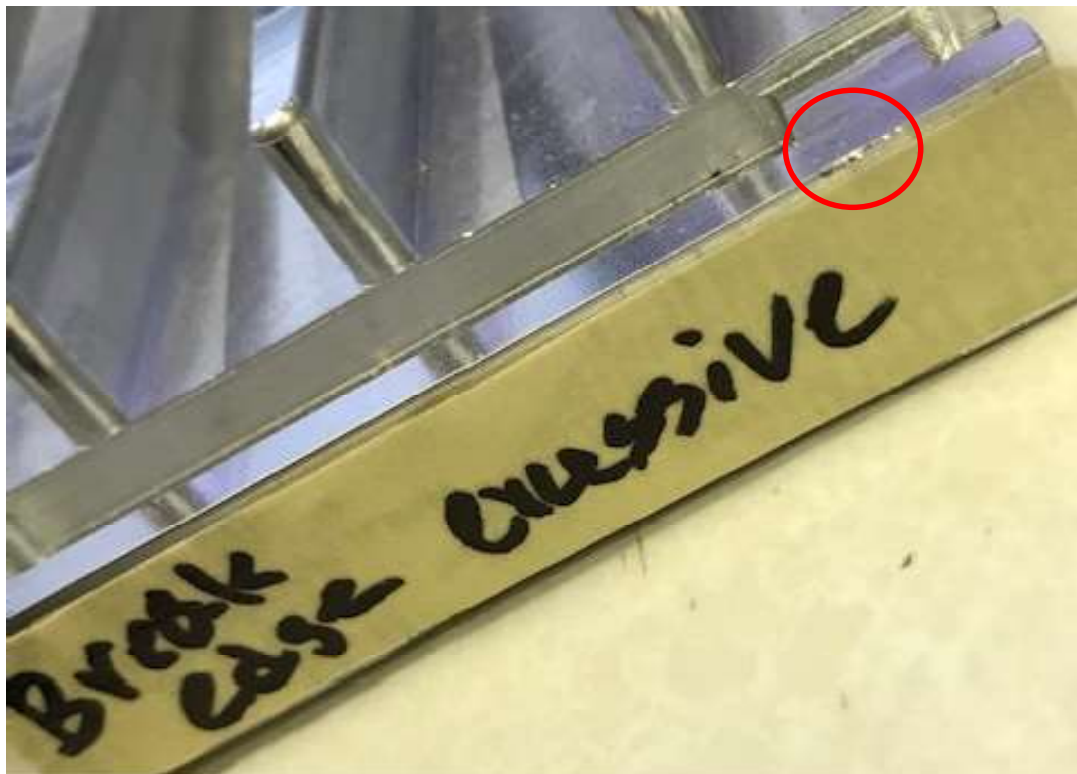
**Figure 16:** The above image shows damage from improper deburring around a threaded hole.



**Figure 17:** The above image shows generic cut damage on a part.



**Figure 18:** The above image shows scratches from a file.



**Figure 19:** The above image shows damage to the edge of this part, this could be from over deburring or from it hitting off a hard surface.



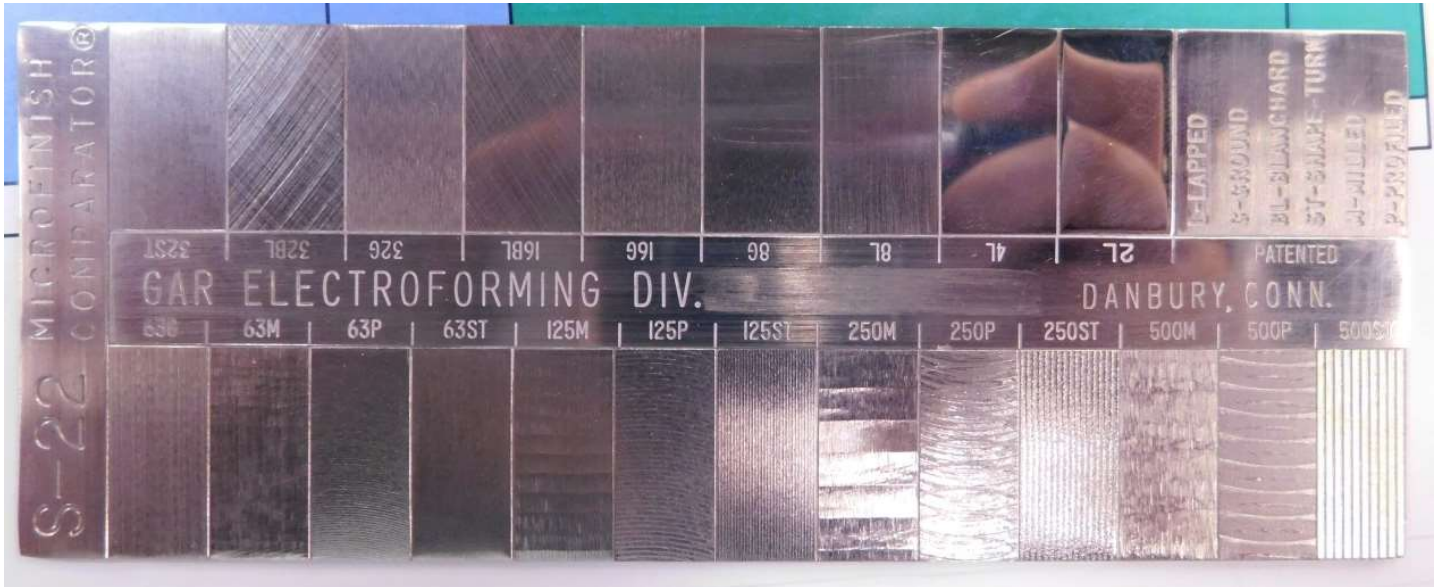
**Figure 20:** The faded area to the right of the tag (circled in green) shows over buffing known as a buff burn.



**Figure 21:** Example of a non-uniform powder-coated surface



11.2. To visually verify surface finish, a surface finish comparator can be used to quickly check a part (this is department and traveler specific.) If an improper surface finish is found, then non-conform the part and notify the area supervisor. Note that this is a manufacturing aid and should not be used for official acceptance of product.



**Figure 22:** Surface finish guide.



### Revision Record

Revision	Date	Section(s) Affected	Description of Change/Change Request Reference/Remarks
00	01/27/2020	All	New Document
01	08/15/2022	8.3, Revision Record	Updated descriptions to include tables/workstations as well as carts. Updated revision block to current format.

### Document Control

<b>Prepared By &amp; Date:</b>
<b>Safety Review &amp; Date:</b>
<b>Manufacturing Engineering Review &amp; Date:</b>
<b>Design Engineering Review &amp; Date:</b>
<b>Production Review &amp; Date:</b>
<b>Quality Approval &amp; Date:</b>