



Workmanship Standards Acceptance Criteria		
Document #: QWI_8_2_4_007	Approved By: Vince Fallon	Revision Date: 9/28/2021

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1.0 Purpose

This manual outlines the “preferred” and “minimum acceptable” standards of workmanship to be followed when not otherwise stated on the drawings, specifications, or on contractual agreement. In the event of conflict between this manual and the engineering drawings, the criteria laid out in engineering drawings overrule the criteria in this manual

2.0 Scope

All products produced at NMG Aerospace.

3.0 Reference

AMS 3276, AMS 3277, AMS 3284, AMS 3374, AMS-S-8802, AMS-C-27725,
ASTM R0069, ASTM D3951-10, FED-STD-245, SAE J1058
ASME B46.1-2009 Surface Texture (Surface Roughness, Waviness, and Lay)
Micro scan Workmanship Manual 04-000010-01 Rev. AG
NMG Aerospace Visual Inspection Standards for Machined Parts 0006ERP000)

4.0 Responsibility

Quality
Operations
Engineering

5.0 Process

5.1 Administrative

5.1.1 Order of Precedence

In the event of conflict, the following Order of Precedence shall be followed

Purchase Order
Engineering drawing
Referenced Specifications
Regulatory requirements
NMG Instructions
NMG Workmanship Standard

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5.1.2 Definitions

The use of the words “may”, “shall”, “should” and “will” in this manual express mandatory and non-mandatory provisions as follows

- May – Used to express a non-mandatory provision.
- Shall – Used to express a provision that is binding.
- Should – Used to express a non-mandatory provision.
- Will – Used to express a declaration of purpose on the part of the contracting agency.

5.1.3 Material Tolerances

Aluminum: Standard tolerances on Aluminum raw stock are defined in ASTM R0069. Additional information for aluminum extrusions is contained in FED-STD-245

Steel: All purchased steel material shall be ordered to American Society for Testing and Materials (ASTM) standard specification tolerances. Additional tolerance information for sheet steel is contained within SAE J1058

5.1.4 Standard Tolerances

The tolerances noted on engineering drawings (or in the tolerance block on older drawings) apply to dimensioned quantities only. Unless otherwise specified on the engineering drawing, normal tolerances for dimension quantities without specified tolerances are

- . X = (+/-) .1
- . XX = (+/-) .03
- . XXX = (+/-) .010
- Fractional = (+/-) .03
- Angles = (+/-) 0.5°

5.1.5 24-Hour Clock

The 24-hour clock is a time keeping format that assigns a unique hour number to each hour of a 24 hour “day”.

5.1.5.1 The basic format is hhmmss where hh is hour and mm is minutes

Example: 3:19 PM is 1519 :

<u>hh hours</u>	<u>mm minutes</u>
15	19

5.1.5.2 The extended format can be written as hh:mm, where hh is hour and mm is minutes

5.1.5.3 The relationship between 24-Hour and 12-Hour formats is shown in this matrix:

12-Hour Format	24-Hour Format	12-Hour Format	24-Hour Format
12:00 am (Midnight)	2400 or 0000	12:00 pm (noon)	1200
1:00 am	0100	1:00 pm	1300
2:00 am	0200	2:00 pm	1400



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3:00 am	0300	3:00 pm	1500
4:00 am	0400	4:00 pm	1600
5:00 am	0500	5:00 pm	1700
6:00 am	0600	6:00 pm	1800
7:00 am	0700	7:00 pm	1900
8:00 am	0800	8:00 pm	2000
9:00 am	0900	9:00 pm	2100
10:00 am	1000	10:00 pm	2200
11:00 am	1100	11:00 pm	2300

5.1.6 O-rings

- 5.1.6.1 100% O-rings shall be lubricated prior to installation. Only appropriate lubricates shall be used unless otherwise specified or approved.
- 5.1.6.2 O-rings are to be individually packaged and labeled per AMS2817.
- 5.1.6.3 Plastic or protected metal caps shall be used to protect O-rings or other seals from damage during handling or installation. Protected metal caps must always be kept in protective enclosure to prevent raised burrs due to damage.
- 5.1.6.4 Slide or push O-rings or other seals into place (i.e. do not roll into place).
- 5.1.6.5 When mating parts with O-rings or other seals, positive alignment tooling shall be used to prevent blind cutting of seal due to misalignment.

5.2 Cosmetic

5.2.1 Viewing Condition

Parts and products shall be inspected under the following conditions. Uniform, non-directional illumination between 40 and 150 foot-candles. At levels greater than 150 foot-candles, caution should be used to not over inspect' Holding the product at the designated distance from you at chest level, scan the part in sweeping motion (similar to reading) from left to right and top to bottom for 2 to 5 seconds per characteristic. Parts shall not be manipulated to reflect a single light source in order to accentuate surface flaws, the viewing angle should be approximately 45-degrees to the light source

Note: Magnification is not to be used when inspecting for cosmetic defects.

5.2.2 Facilities and Environmental Controls

Inspections shall occur in sufficiently clean and controlled environmental ambient conditions (e.g., in a foreign-object-debris-free environment at ambient temperature, humidity, and air pressure) to enable repeatable and reproducible results to be obtained commensurate with the required accuracy and criticality of the characteristic being verified. For items moved or transported from one environmental condition to another, consideration shall be given to allowing items to fully stabilize and acclimate, especially for critical inspection characteristics or those requiring a higher degree of accuracy, prior to verification

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5.2.3 Cosmetic Class Codes

The cosmetic class codes used for this standard are Class A, B, and C. Where possible; the cosmetic requirements should be clearly defined with Flag notes or similar conventions on the fabricated part drawings.

Class A (highly decorative surface) is any surface, on the exterior of the final product, which is immediately visible to the receiving customer.

Class B (moderately decorative surface) is surfaces that are external. However, they are primarily surfaces utilized to mount the product or for labels, and will be covered from view after customer installation

Class C (non-decorative surface) surfaces are internal surfaces, not visible to the customer

Table 1: Viewing Time and Distance

Indicates the viewing time and distance to be used for various cosmetic standard codes

Cosmetic class	A	B	C
<i>Application</i>	Primary external surface	Secondary external surface	Internal surface
<i>Viewing distance</i>	18 " (460mm)	18" (460mm)	24" (610mm)
<i>Viewing time</i>	8 seconds	5 seconds	3 seconds

5.2.4 Accept/Reject

When flaws are observed within the specified time and distance and the accept/reject decisions difficult to make, refer to the Cosmetic Reference Standard (Table 2). Parts are often cosmetically acceptable even though flaws are noticeable.

NOTE: A flaw that occurs repeatedly in the same surface location becomes more easily noticed. If this same cosmetic flaw was judged acceptable at the beginning of the inspection of the run or lot, it shall also be acceptable at the end

Table 2: Cosmetic Reference Standard

This table constitutes the reference standard of cosmetic acceptability. The total number of allowable mixed flaws shall not exceed the limit specified for the flaw with the largest allowable quantity limit. Table 2 is primarily used to assist in making an accept/reject decision

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Cosmetic class	A	B	C
<i>Specs & discoloration</i>	TWO .02" (0.50mm) DIA	FOUR .03" (0.75mm) DIA	FOUR .06" (1.50mm) DIA
<i>Scratches & lint</i>	TWO .01" (0.25mm) x .03" (0.75mm)	FOUR .02" (0.50mm) x .09" (2.25mm)	FOUR .03" (0.75mm) x .12" (3.00mm)
<i>Runs & marks</i>	NONE	TWO .03" (0.75mm) DIA	TWO .06" (1.50mm) DIA
<i>Blister & bare spots</i>	NONE	TWO .03" (0.75mm) DIA	TWO .06" (1.50mm) DIA

Reference dots:

• .02" (0.50mm)	◦ .02" (0.50mm)
• .03" (0.75mm)	◦ .03" (0.75mm)
• .06" (1.50mm)	◦ .06" (1.50mm)

5.2.5 Definitions

Bare spots - Areas that have insufficient or missing coating.

Blisters – Non-adhesion. Lack of proper sticking of the coating to the surface.

Burnish Mark – A polished surface, which is finer than the adjacent surface. Similar to scuff marks, these are ACCEPTABLE as long as they do not violate print surface finish requirements.

Burrs/sharp edges– A sharp jagged edge or rough ridge of raised material at the intersection of two surfaces caused by machining or damage are **UNACCEPTABLE**. All areas of the parts shall be free of burrs detectable by sight or feel. Edges shall be broken to the drawing requirement, which is .015 unless otherwise specified. This protects personnel when handling parts. A simple check for sharp edges or burrs is to drag a fingernail across the edge in question. The edge should be broken sufficiently enough that no part of the nail is scrapped away. Loose burrs are **NEVER ACCEPTABLE** and are critically inspected in areas of nozzle or flow passages. Tight, rolled over material that will not become detached and does not deviate from the drawing will not be interpreted as a burr and is **ACCEPTABLE**

Magnification Only in functional and critical areas shall magnification be required to ensure 100% compliance.

Discoloration - Any change from original color/gloss or unintended inconsistent color.

Lint - Any unintended foreign substance in the coating or on the surface.

Marks - Pits, dents, sanding or other marks on the base material that remain visible after coating.

Runs - Excessive coating that causes drips or non-uniform coverage.

Scratches - Shallow grooves.





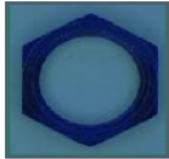

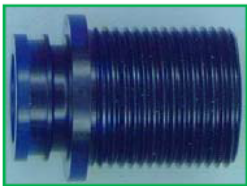
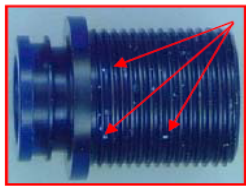
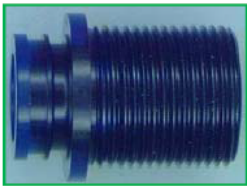
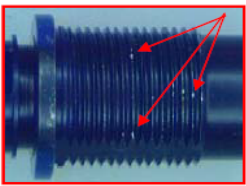
Specks - Small particles

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5.2.6 Acceptable/Unacceptable

Acceptable: Slight imperfections on non-critical surfaces that do not affect fit, form or function

Unacceptable: Imperfections on critical surfaces or slight imperfections on non-critical surfaces that affect fit, form or function

	Acceptable Workmanship	Unacceptable Workmanship
A	 Chromate Is Uniform	 Chromate Is Not Uniform
B	 Minor Dark Spots	 Excessive Amount of Scratches (No More Than 5 Isolated Spots)
	Acceptable Workmanship	Unacceptable Workmanship
A	 Anodizing Uniform	 Anodizing Not Uniform
B	 No Foreign Material On Threads	 Foreign Material On Threads
C	 No Anodizing Missing On Threads	 Anodizing Missing On Threads

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Machined products: Follow ASME B46.1-2009 for surface texture if not otherwise specified on the drawing. Per ASME B46.1-2009, flaws are identified as unintentional, unexpected and unwanted interruptions in the topography typical of the surface. Such interruptions (including tool line / marks) which do not follow a continuous tool pattern / path, are not acceptable regardless if the profilometer readings within these areas in question meet the surface finish requirement on the drawing. Parts shall be in compliance to the surface finish as specified on the engineering drawing and the tool pattern/path shall be continuous and uniform. See examples. Note: examples are not all inclusive but only provided as a guide and further clarification.

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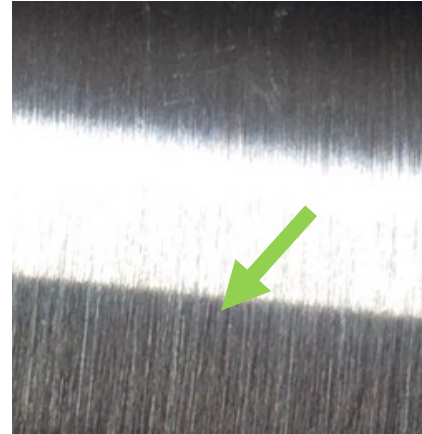
Examples of interruptions in the topography



Heavy Tool Lines
Unacceptable



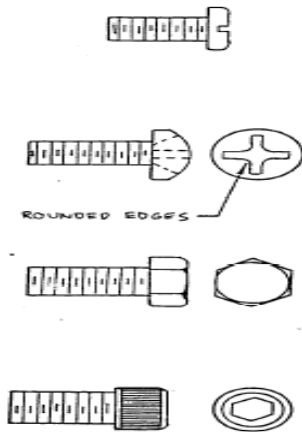
Spiral lines, not continuous
(may meet surface finish)
Unacceptable



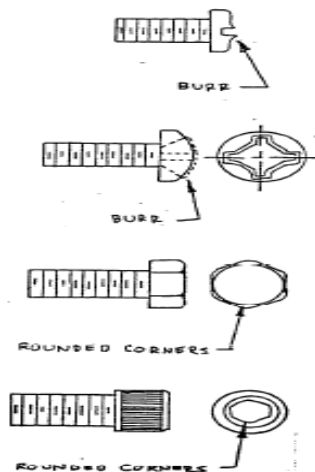
Uniform finish and continuous
Tool path. Acceptable if surface
finish meets drawing requirement.

5.3 Fasteners

ACCEPTABLE



REJECTABLE



5.3.1 Threaded Type Fastener Installation

Interference with adjacent parts, or thread damage, and/or plating damaged shall be cause for rejection. Unless otherwise specified, installations shall comply with the following

- Loctite or other liquid locking devices shall not be used unless specified on drawing and work instructions
- No evidence of loose hardware or movement between supporting hardware and attached parts

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- Use the prescribed tool for installing fasteners per work instructions, drawing, specifications, parts list, or other job documents
- If the prescribed tool is a torque limiting hand tool, verify that the tool is set to the correct torque value before use
- Torque limiting hand tools have a primary click or physical break to indicate that the fastener has reached the set torque value.

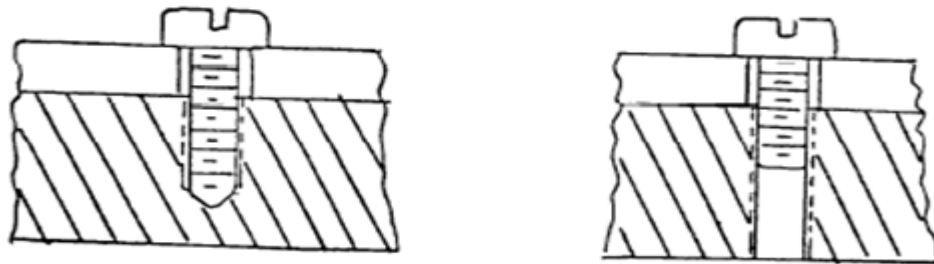
WARNING! Hand driven tools can accidentally overtighten fasteners

- If the prescribed tool has no torque limiting ability, like a manual screwdriver, use caution to achieve the hand-tightness as prescribed per work instructions, drawing, specifications, parts list, or other job documents.
- Verify that fastener was not over-torqued.
- No evidence of forced installation of bolts or screws into holes, distortion or compression of supporting parts

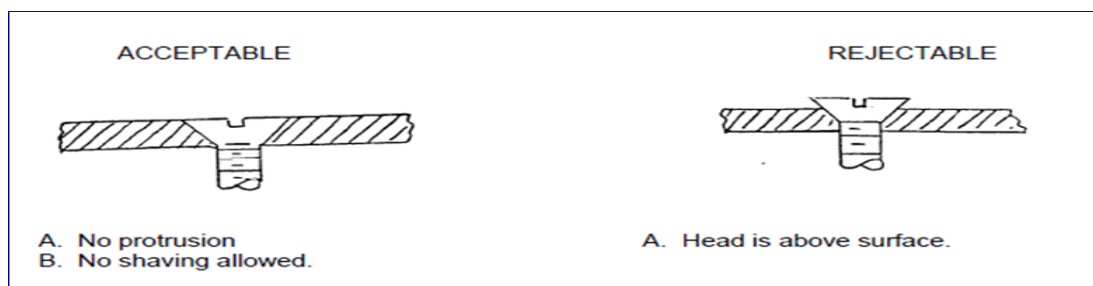
5.3.1.1 Thread Engagement

- Threads of screws, bolts, or threaded material shall be free from visual evidence stripping, cross threading, or distortion
- Evidence of the use of TAPS within self-locking devices, shall be cause for rejection.

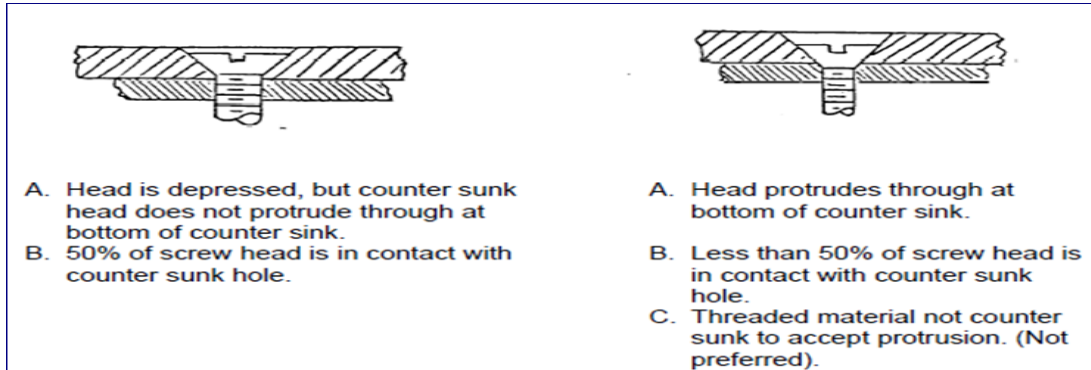
Minimum Acceptable Thread Engagement



5.3.1.2 Flushness Requirements

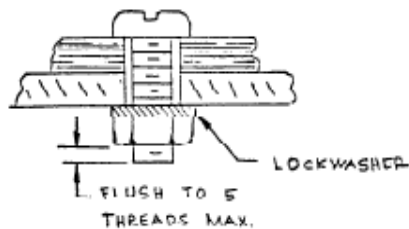


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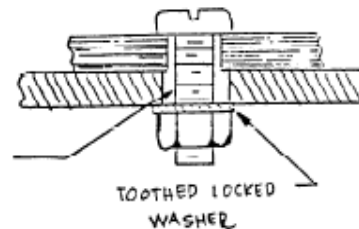
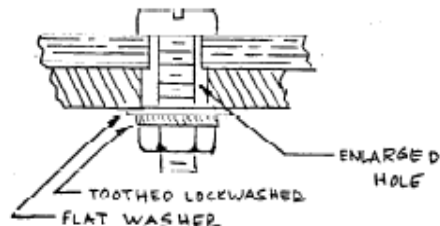
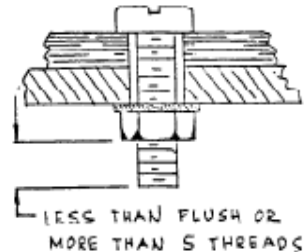


5.3.1.3 Holes/Nut Assembly

ACCEPTABLE



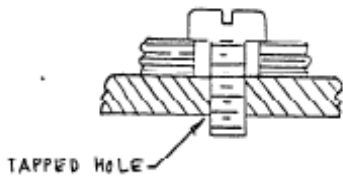
REJECTABLE



5.3.1.3.1 Oversize Holes

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ACCEPTABLE



- A. Head of screw completely covers hole.
- B. If unable to provide adequate coverage a flat washer may be used under screw head.

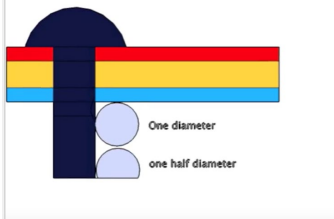
REJECTABLE



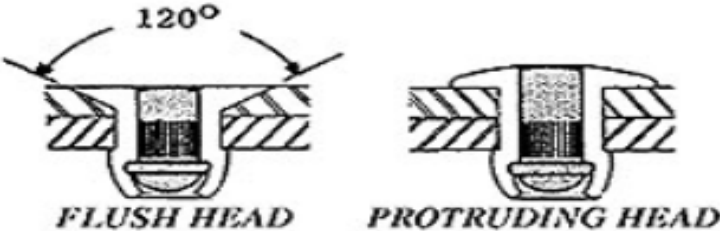
- A. Screw head pulled into mounting hole.
- B. Flat washer not used.

5.3.2 Rivets

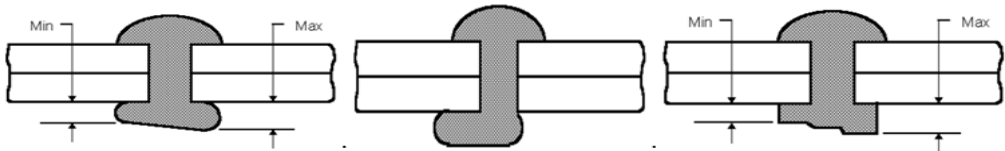
The riveting operation should be carefully performed such that the rivets are tight and satisfactorily headed with the rivet heads tightly seated against their bearing surface. Rivet should protrude 1 ½ X diameter prior to squeezing



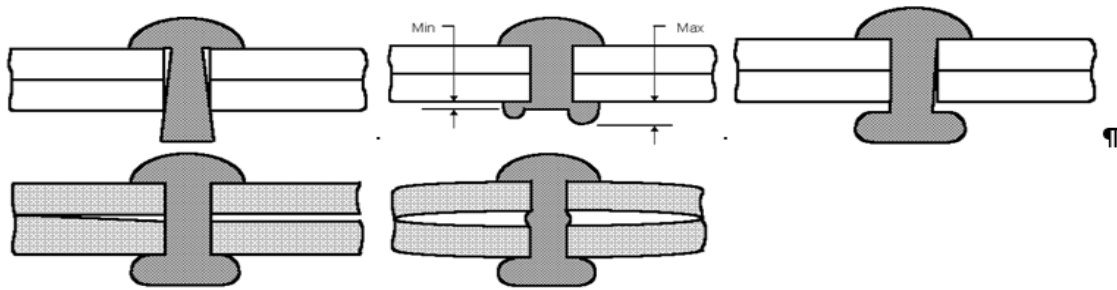
Acceptable



Unacceptable



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Some rivets require specific installation tools – please refer to the specification for specific requirements.

	Acceptance Criteria	Comments
1	Fastener not broken or sheared, or cracked.	A broken or sheared fastener will be loose, or spin in hole.
2	Fastener itself is undamaged.	No damage to fastener. Check work instructions or other documents to see if minor damage is allowed.
3	Hole or material surface not deformed, distorted, or cracked.	Check work instructions or other documents to see if some deformity/ distortion/ cracking is allowed.

5.4 Glues & Adhesives

5.4.1 Definitions

Adhesive – a substance used to bond two surfaces together.

Two-Component Adhesive – A mixture that requires one component to be mixed with another component. The resulting chemical reaction creates a final mixture with specific adhesive characteristics.

Cup – Any container used to mix or handle adhesives outside the primary original manufacturer's container.

5.4.2 Requirements

Verify that adhesive and cups are acceptable before each application. Acceptance criteria:

	Acceptance Criteria	Comments
1	Shelf life not expired as listed on the primary original manufacturer's container.	Expired adhesive is a nonconformance. Follow existing nonconformance procedures.
2	Cup is verified clean, or has never been used.	Cup must not contain FOD including left over adhesive or components. Clean the cup per procedures, or use a new cup.
3	Mixed adhesive must	Adhesive must not be used if it is outside the acceptable pot

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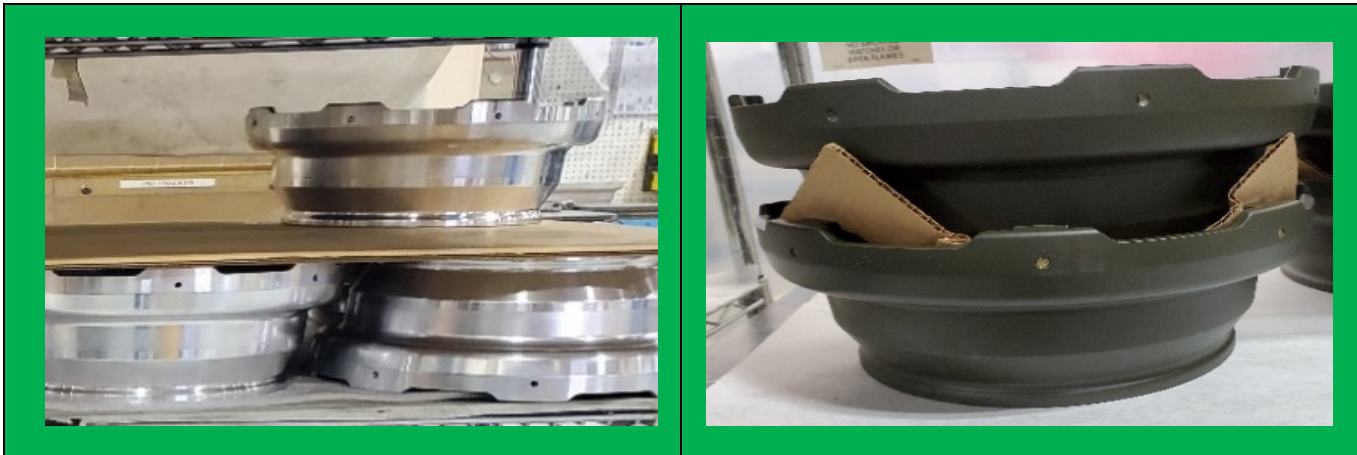
	be used within the allowable pot life	life listed in the Mfg. instructions, applicable specification, WI, or technical data sheet
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5.5 Handling

To protect the quality of our products and the hard work that goes into machining, please ensure that the proper material handling practices are being utilized. Below are guidelines with examples of proper versus improper part staging as guidance.

-Minimize part to part contact by placing cardboard, foam, or similar protection under the parts and between them if stacking is necessary.

Correct



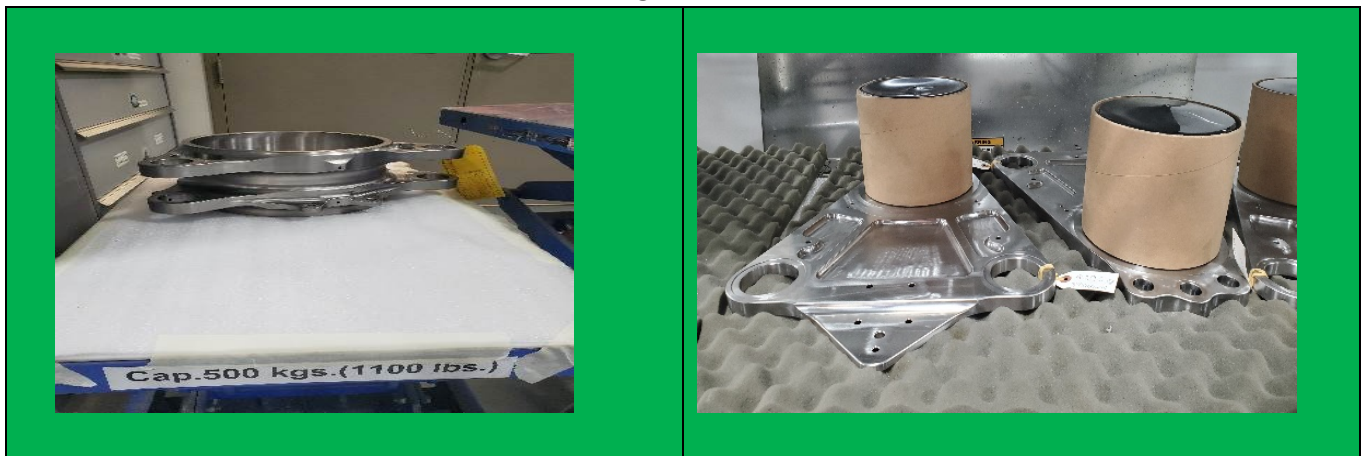
Incorrect

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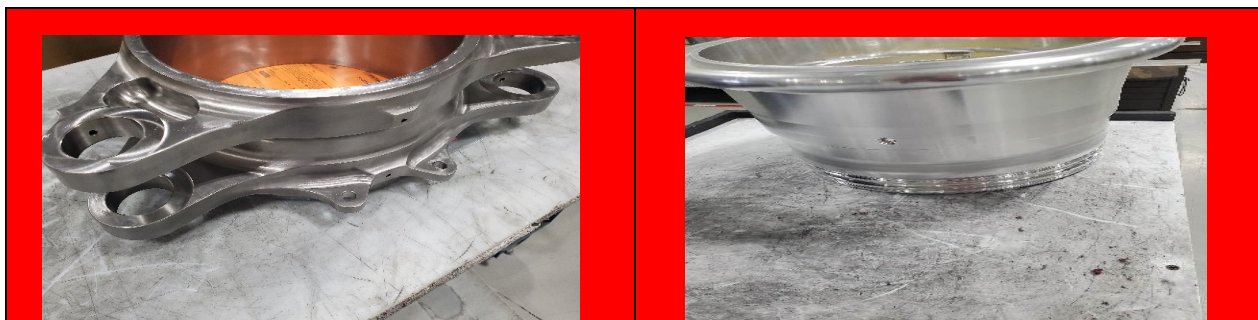


- Protect parts from dirt and chips that could be on surfaces by placing a layer of foam or cardboard under them.

Correct



Incorrect






Additional guidelines:

- Do not slide finished part surfaces when moving a part. Lift and reposition the part. If sliding or turning the part is necessary, turn the material that the part is placed on (cardboard, mat, etc.).

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- b. Use the same care and precautions when placing a non-conforming part in the bond room for the evaluation.
- c. Protect functional surfaces using protection designed for the part. For example, protect tubes with cardboard sleeves and caps.

Materials useful for protecting parts	
Mats and/or cardboard	
Bubble wrap and Foam	 
Egg crates	
Cardboard tubes and caps	

5.6 Nylon Cord

No evidence of fraying or cut loops



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Acceptable

Unacceptable

5.7 Packaging

Package shall be so designed and constructed that it will contain the contents with no damage to them and minimal damage to the package during shipping, storage, and subsequent handling

5.7.1 Cleanliness

Items shall be free of dirt and other contaminants (F.O.D.), which would contribute to deterioration of the item or which would require cleaning by the customer prior to use. Coatings and preservatives applied to the item for protection are not considered contaminants

5.7.2 Preservation

Items susceptible to corrosion or deterioration shall be provided protection such as preservative coating, barrier protection, volatile corrosion inhibitors, or desiccated unit packs.

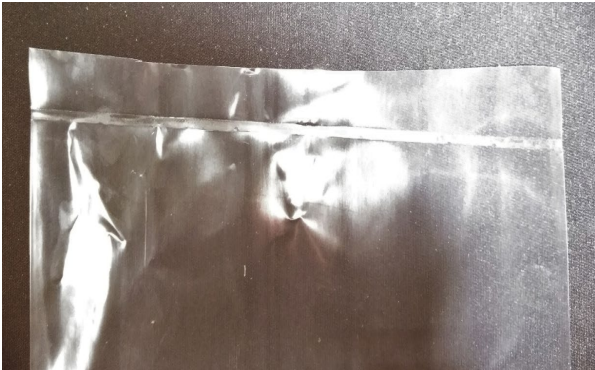
5.7.3 Protect

Protect parts from FOD and damage to threads using sealed plastic bags, caps and/or plugs.

5.7.3.1 Heat Sealed Plastic Bags

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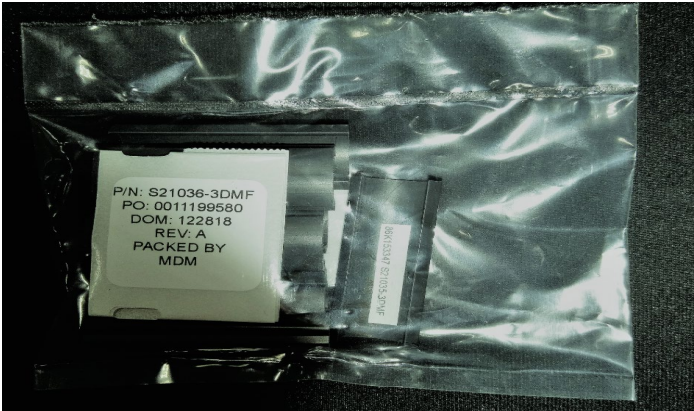
Use a bag that is the correct size for the parts. Place parts in the bag and place bag on heat sealer and press foot pedal for 2-3 seconds. Release the foot pedal and wait approx. 2 seconds before removing the bag.



Acceptable



Unacceptable



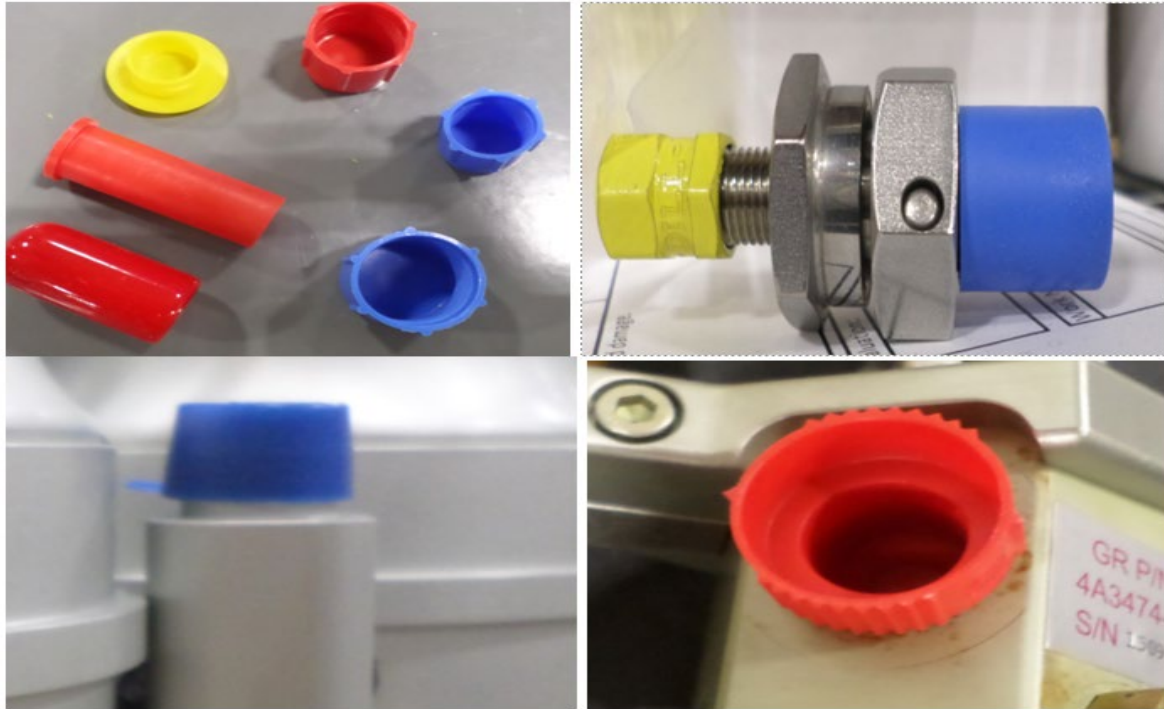
Acceptable



Unacceptable

5.7.3.2 Thread caps and plugs

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5.7.4 Cushioning

Items requiring protection from physical and mechanical damage or which are fragile, shall be protected by wrapping, cushioning, pack compartmentalization, cartonizing, or other means to mitigate shock and vibration to prevent damage during handling and shipment. Acceptable cushioning materials include foam, Bubble wrap, paper, and compartmental packaging.

NOTE: Packing Peanuts and shredded paper are NOT allowed

Preformed foam



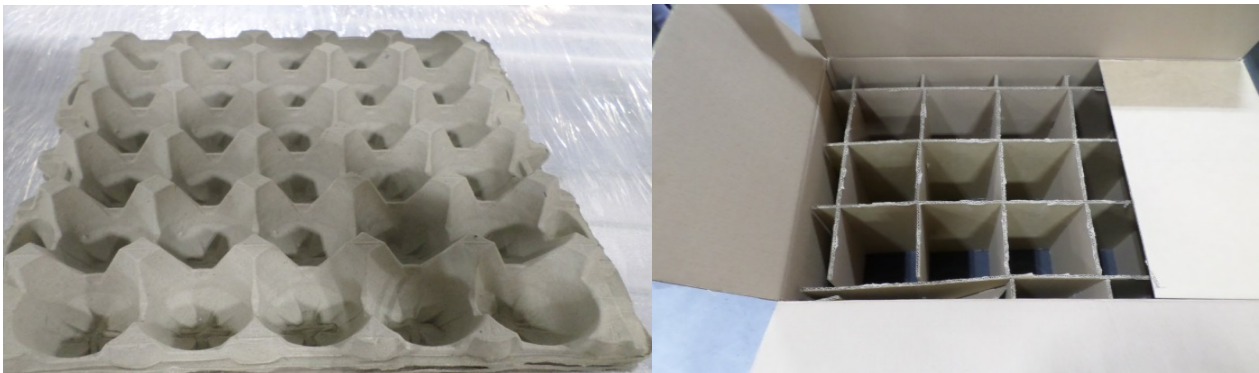
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Foam Sheets/ Bubble Wrap



Roll paper



Compartmental

5.7.5 Unit Package

A unit package shall be so designed and constructed that it will contain the contents with no damage to them and with minimal damage to the unit pack during shipment and storage in the shipping container configuration, and shall allow subsequent handling

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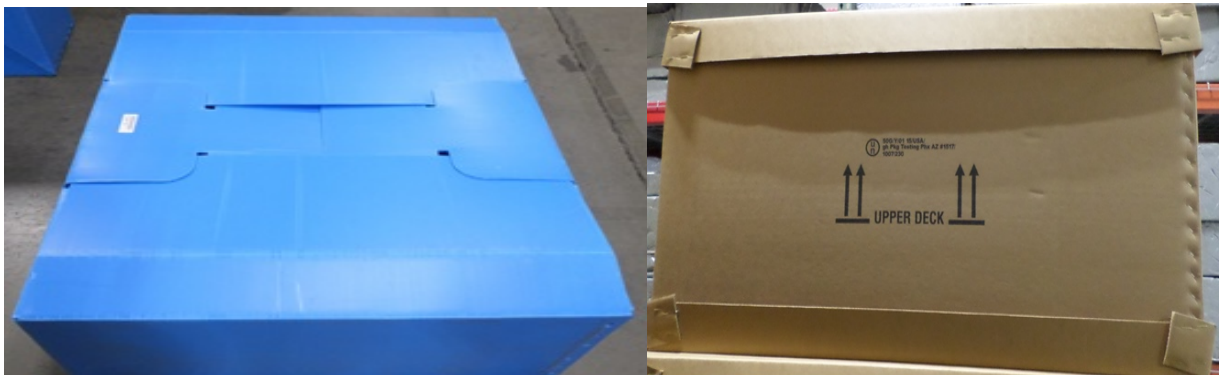
5.7.5.1 Unit Package Quantity

Unless otherwise specified in the contract or purchase order, the unit package quantity shall be one each part, set, or assembly. Small lightweight items, for example, industrial hardware, will be packaged in quantities that are standard in the industry. Single items weighing over 5 pounds shall be individually packaged



5.7.6 Shipping Containers

The shipping container shall comply with the regulations of the carrier used and shall provide fort safe delivery to the destination. The shipping container shall be capable of multiple handling and storage periods at a minimum of one year in enclosed facilities



5.7.7 Unitization

Shipments should be considered for unitization where appropriate, or as specified in the contract or purchase order. Unitization encompasses, but is not limited to, bundling, consolidation in a container, or placement on a pallet.

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5.7.8 Export Shipment

When shipping overseas, additional preservation methods, and the use of weather resistant grades may be required to ensure that the packaging successfully protects the item in the export-shipping environment. Containers should be sealed as opposed to closed.

5.7.9 Shelf Life limited parts

Shelf life limited parts that are not installed into another component must have a least 80% of it's life remaining by the time it arrives at the customer.

5.8 Part Marking

Unless otherwise specified, parts are to be identified in such a way to easily differentiate them from other similar parts



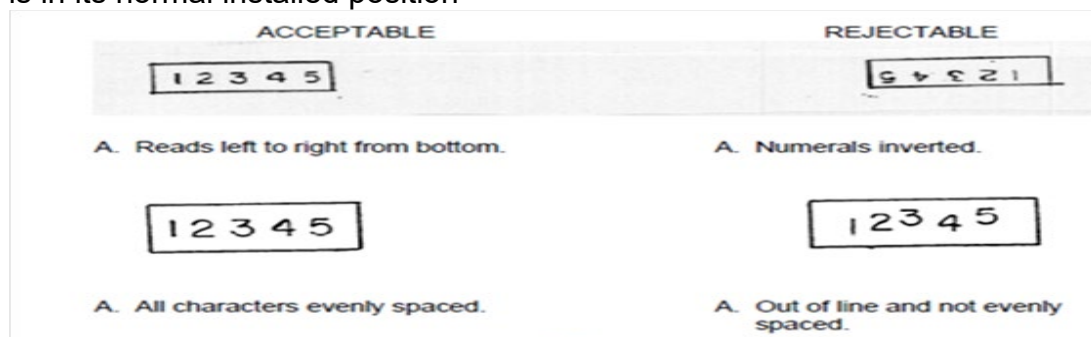
RoHS compliant label example



Non-RoHS label example

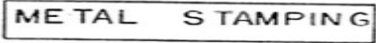
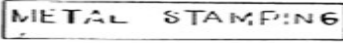



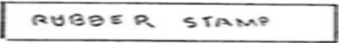
5.8.1 Marking Orientation

All marking shall be clear and legible. There shall be no fuzzy edges. Markings shall be placed so that they can be read from the bottom, front, or right hand side when the assembly is in its normal installed position



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5.8.2 Legibility

ACCEPTABLE	REJECTABLE
 <p>A. Sharp and clear, uniform in depth and thickness.</p>	 <p>A. Hard to read and not uniform in depth and thickness.</p>
 <p>A. Characters are sharply defined and of uniform depth.</p>	 <p>A. Unclear outline or uneven.</p>
 <p>A. Characters clean and clear.</p>	 <p>A. Smeared or smudged.</p>

5.9 Sealing

5.9.1 Appearance

The applied and cured sealant shall be uniform in appearance **and** have no visible voids, air bubbles, metal chips or discontinuities on, along, or in sealed areas

5.9.2 Faying and Surface Sealing

After fastening, the sealant layer shall be uniform as demonstrated by positive squeeze out along the entire joint. The positive squeeze out shall be faired to produce a 0.06 in (1.5mm) minimum width fillet bead along the entire

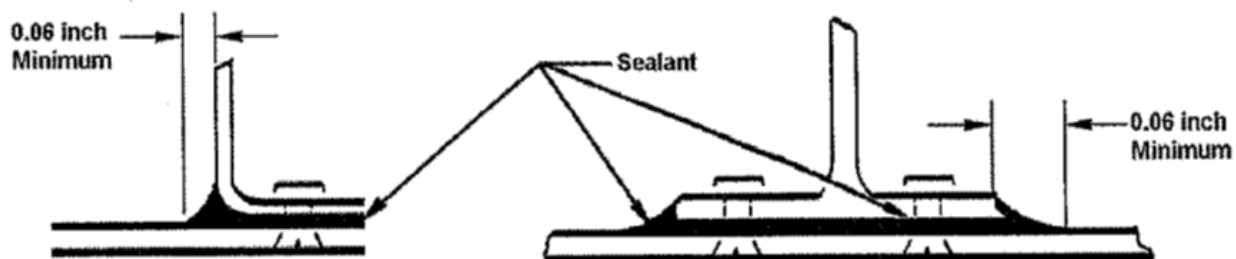


Figure 1. Faying Surface Sealing

5.9.3 Injection Sealing

5.9.3.1 Hole Filling

On the pressure side of the hole, the sealant shall be feathered away from the hole a minimum of 0.25 inch (6.4 mm) or at least a distance greater than the width of the hole. (Figure 2)

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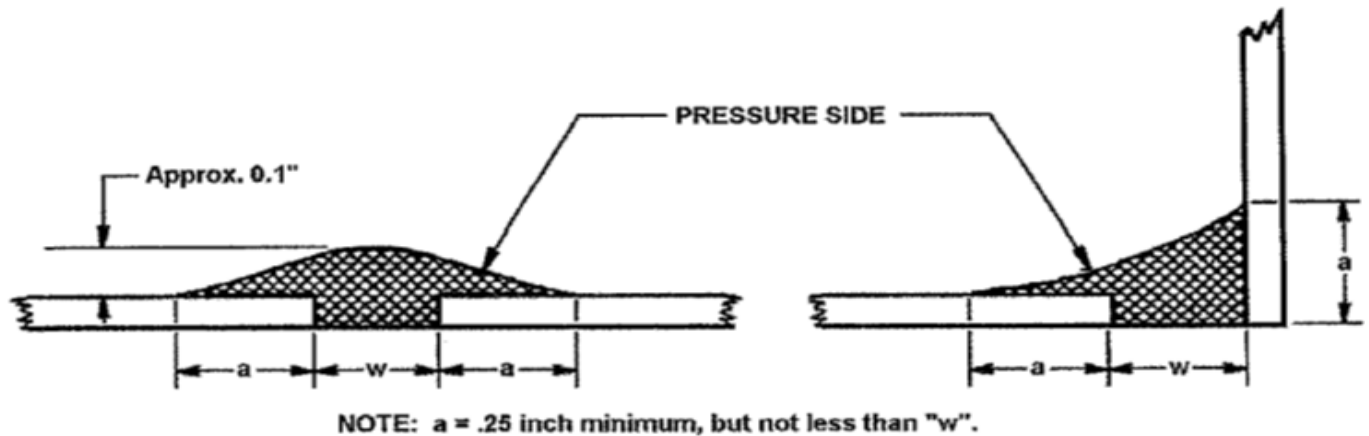


Figure 2. Hole filling.

5.9.4 Slot Filling

The sealant injected to fill a slot shall have continuous contact with the bottom and sides of the slot. (Figure 3)

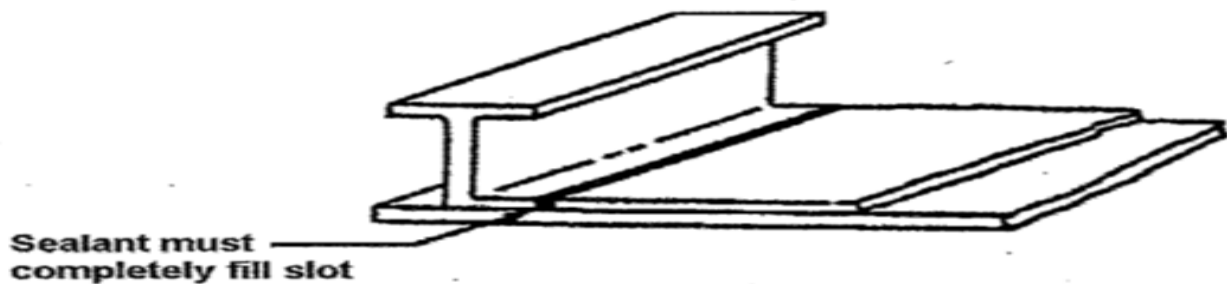


Figure 3. Slot sealing

5.9.5 Fillet Sealing

Fillet seal beads (after fairing) shall have a minimum width (w) of 0.125 inches (3.2mm). If one of the surfaces along the joint (b) to be sealed is less than 0.125 inch (3.2 mm) thick, fillet overlap (a) shall extend a minimum of 0.04 inch (1.0 mm) onto this surface (Figure 4).

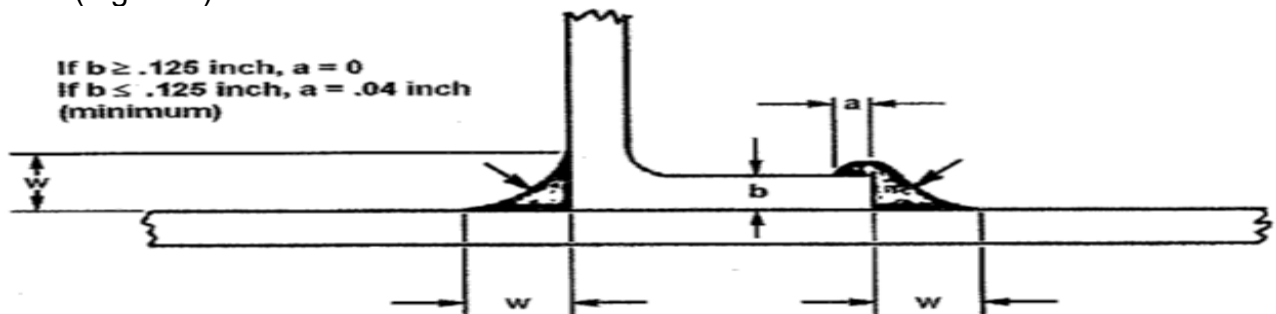


Figure 4. Fillet sealing

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5.9.6 Fastener Sealing

Apply sealant to the fastener head and/or shank at installation (Figure 8). Remove excess sealant with a solvent dampened clean cloth. **NOTE:** Do not apply any sealant to any threaded portions of the fastener

5.9.7 Fastening Over coating

The sealant applied over fasteners shall have a minimum depth of 0.006(0.15mm) at the base of the protruding heads or nuts and 0.005-inch (0.13mm) minimum thickness over the balance of the fasteners. (Figure 5)

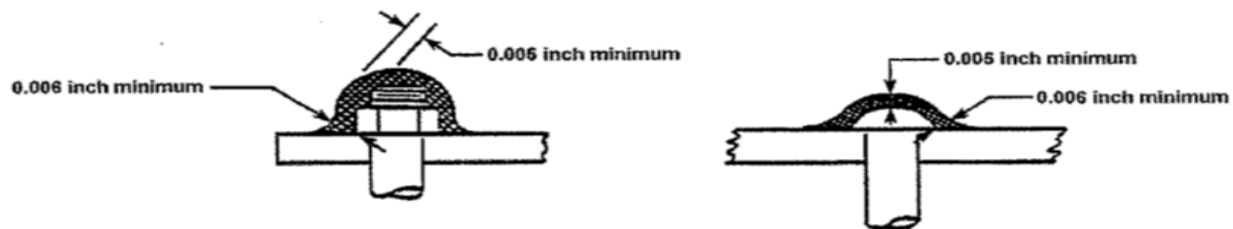


Figure 5. Fastener overcoating

5.9.8 Edge Sealing of Composite/Bonded panels

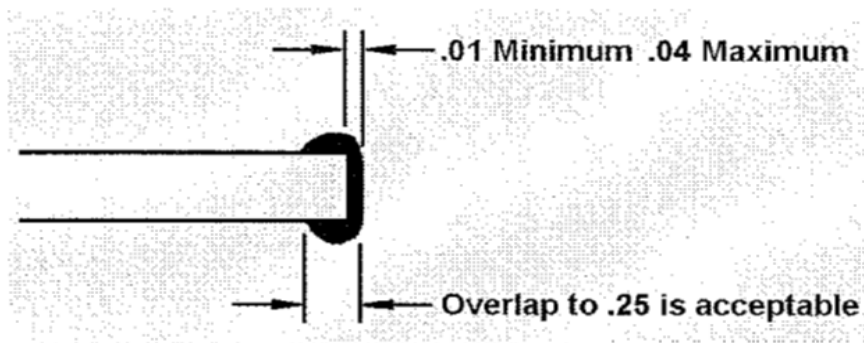


Figure 6. Edge sealing of composite/bonded panels

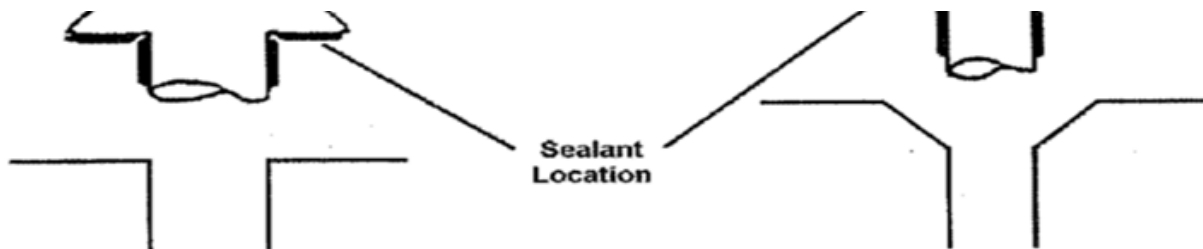


Figure 8. Fastener sealing.

5.10 Safety Wire

Install safety wire so that the loop passing through the fastener will be put in tension if the fastener tends to loosen. Figure 7 through Figure 10 show typical examples of installations for fasteners with right-hand threads. Left-hand threaded fasteners are wired opposite. A

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right-hand twist of the safety wire is typical of all double twist installations. Keeping the wire in tension, twist the strands until the end of the twisted section is within 1/8 inch of the fastener, as shown in Figure 7 through Figure 10, above. Apply the number of twists per inch of wire as defined in Table III. While taut, twist the strands until the twisted part is just short of the nearest lock wire hole in the next unit. The twisted portion shall be within 1/8 inch of the holes in each fastener as shown in Figure 7, Figure 8 and Figure 10. Exercise caution during the twisting operation to keep the wire tight without over-stressing it or allowing it to become nicked, kinked or otherwise mutilated. Abrasions normally caused by commercially available wire-twisting pliers are acceptable

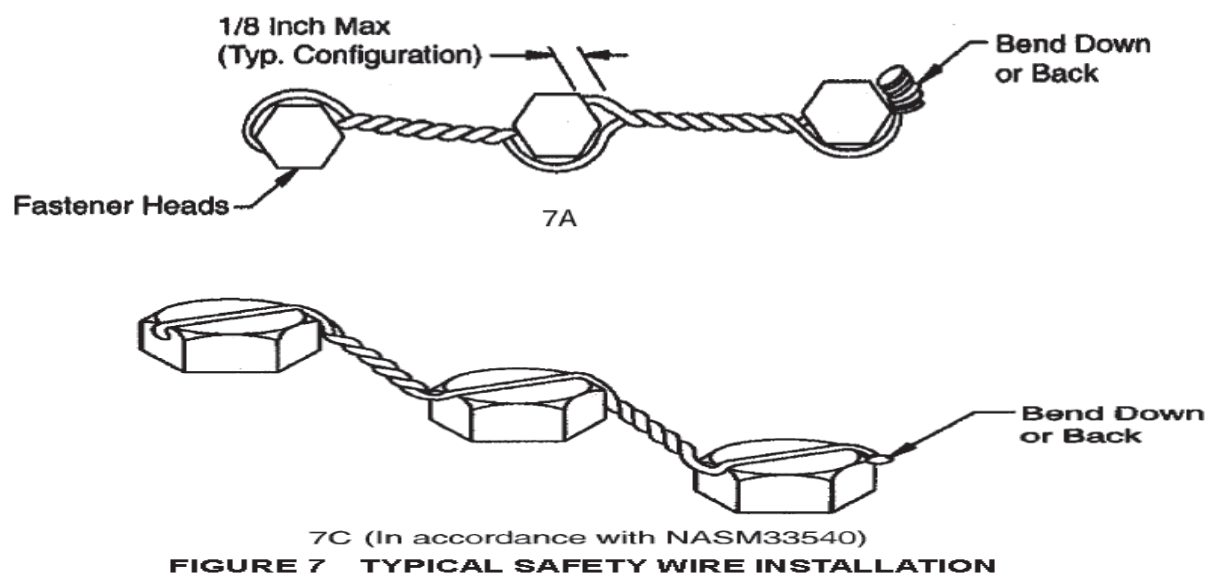


FIGURE 7 TYPICAL SAFETY WIRE INSTALLATION

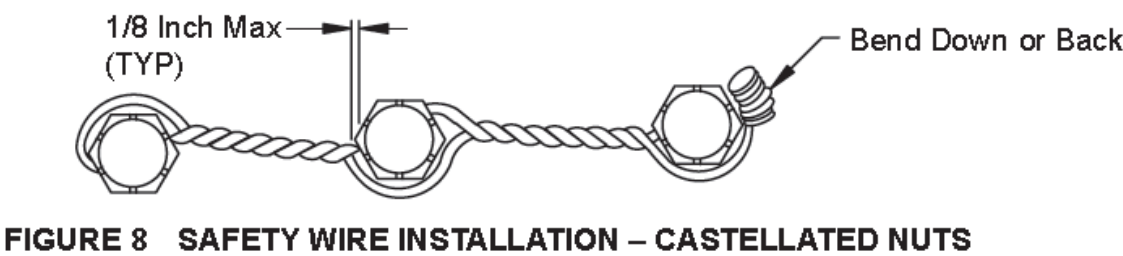


FIGURE 8 SAFETY WIRE INSTALLATION – CASTELLATED NUTS

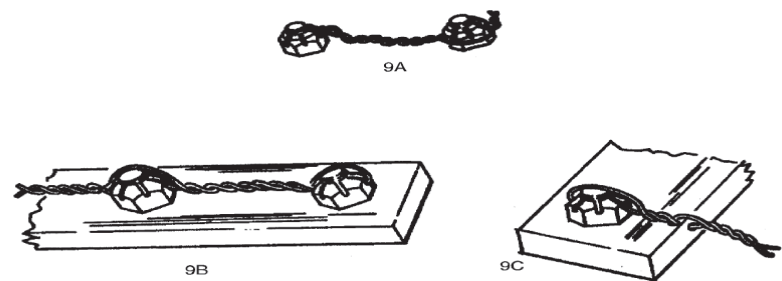


FIGURE 9 SAFETYING CASTELLATED NUTS – DOUBLE-TWIST METHOD (RH INSTALLATION SHOWN)

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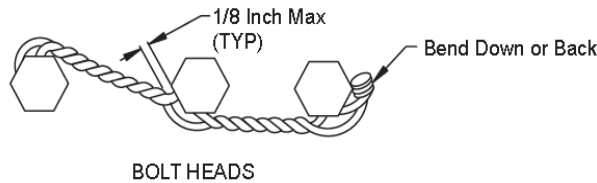
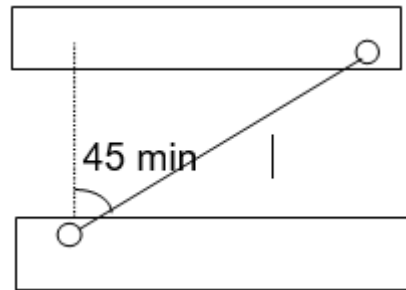


FIGURE 10 SAFETY WIRE INSTALLATION FOR BOLT HEADS DRILLED AT AN ANGLE (NAS673)

5.10.1 Tamper-proof Aluminum Seals

Install as shown when allowed per Drawing and/or SOP. Make the appropriate pigtail and then feed the individual wires through the holes of the seal as shown. Each individual twist wire should go through each hole of the seal. Resume the twist and pigtail. Press the pigtail down into the cavity of the seal and crimp the seal using the appropriate seal tool.



When using safety wire to lock a position of one part relative to another, the angle of the lock wire should be 45 degrees min.

(Table 3) Twists per Inch

RANGE OF WIRE DIAMETERS (IN)	LESS THAN 0.019	0.019 TO 0.026	0.027 TO 0.042	0.043 TO 0.065	MORE THAN 0.065
Twists per inch	11 to 14	9 to 12	7 to 10	5 to 8	4 to 7

Quality Records: See QFRM 4.1-002

Revisions: See archives for previous revisions

Revision	Changes	Major/Minor
2/13/20	Added reference to ASME B46.1-2009, Machined products to 5.2.6 and Appendix A, Added NMG Internet reference, Revised 5.2.1 to 40 foot candles min.	Major
3/10/20	Added examples to Machined products in 5.2.6	Minor
9/28/21	Clarified 24-hour clock information	Minor

UPDATE INTERNET

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Appendix A IWG Workmanship Standards Acceptance Criteria

A1 Definitions

Chips – Edges that are roughed up and unsmooth.

Crooked- having an angular offset.

- **Noticeably crooked**- having an angular offset that can be seen from the naked eye from a specified range.

Loose- not completely fastened.

- **Too Loose**- Insufficiently fastened and at risk of coming undone.

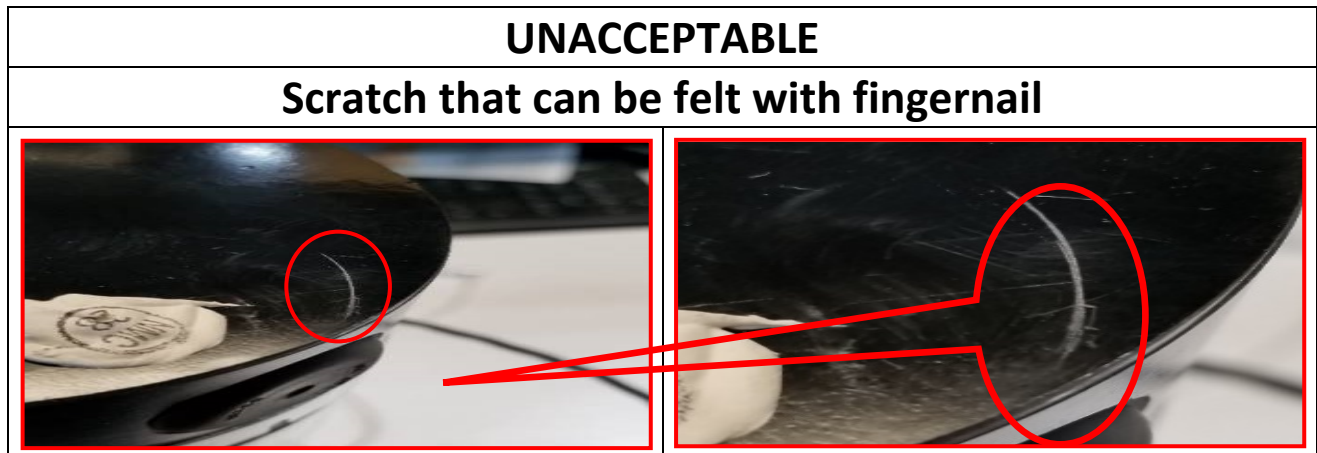
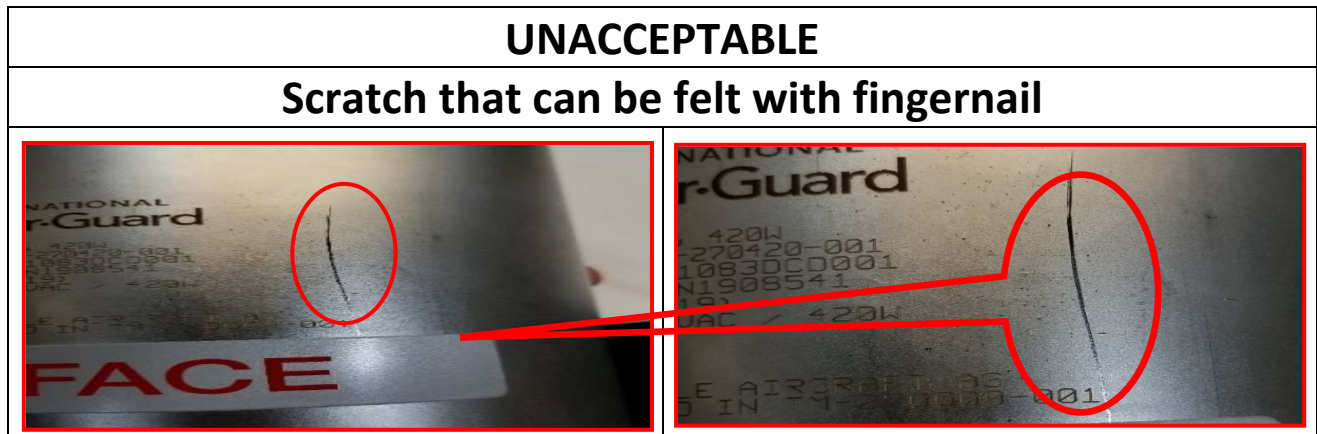
Pin holes – pores on the surface.

Profiles – Projections of debris from the mold, transferred onto the cast.

Scratches - Shallow grooves.

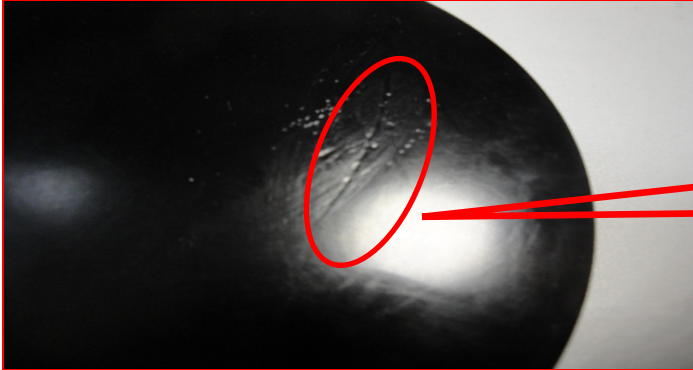

- **Deep Scratches** – Scratches that have noticeable depth, which you can feel with your fingernail.


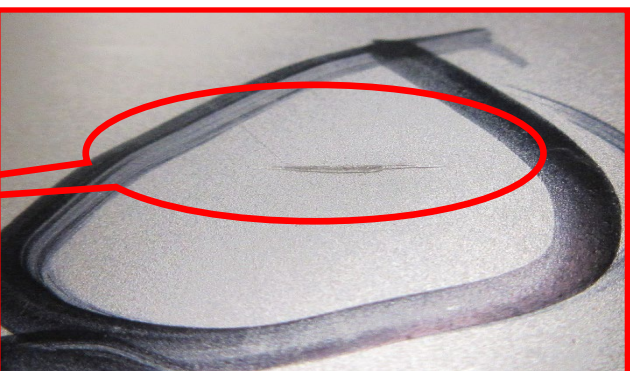
A2 Visual Standards



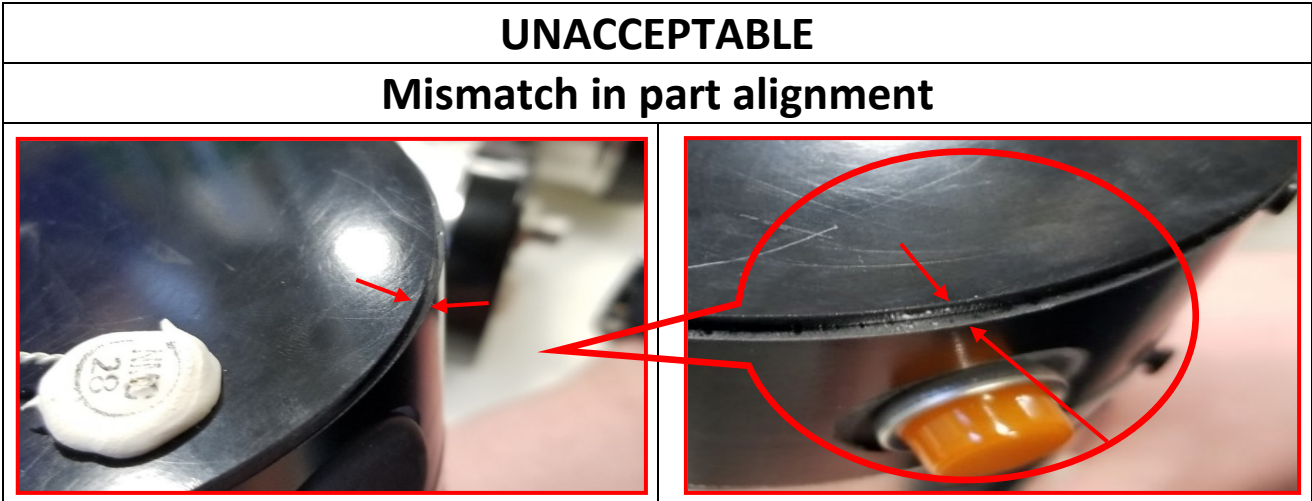
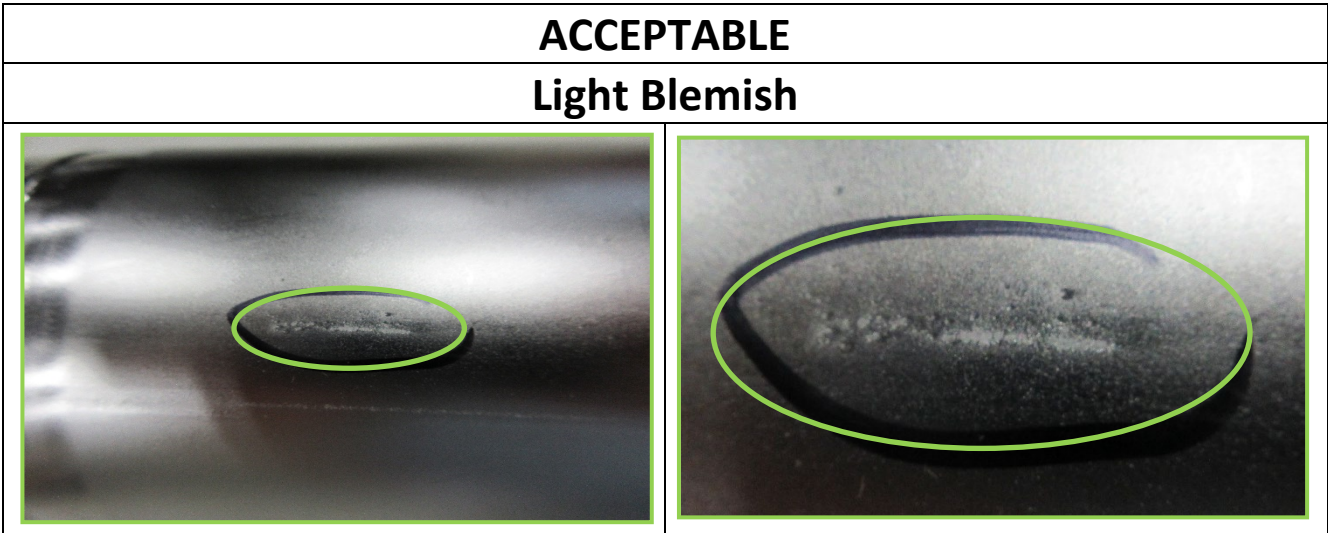
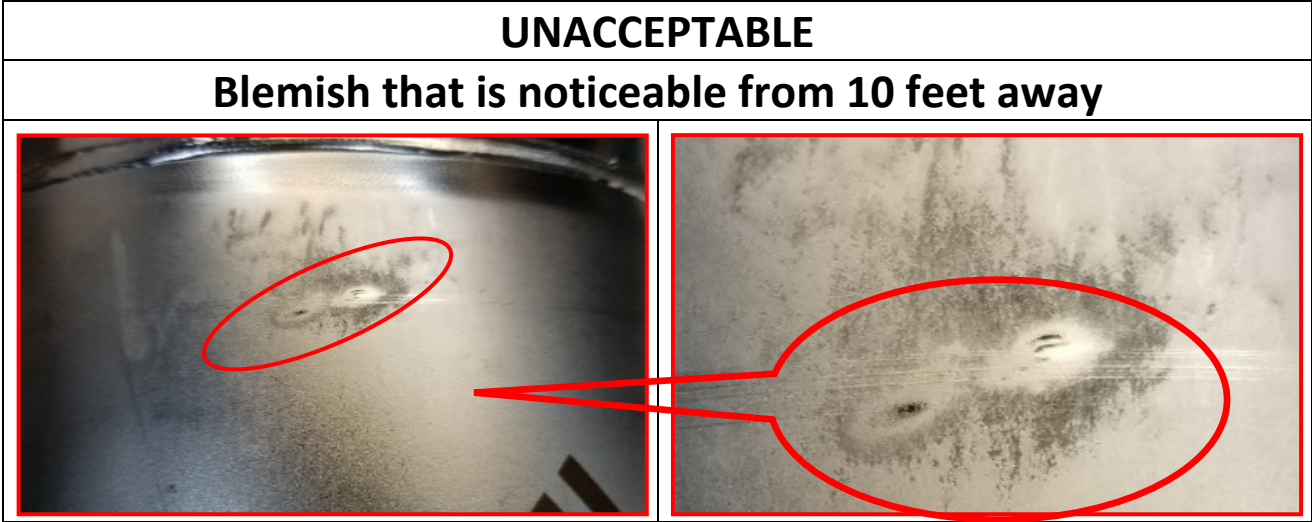
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ACCEPTABLE	
Light scratches that can't be felt with fingernail	
	

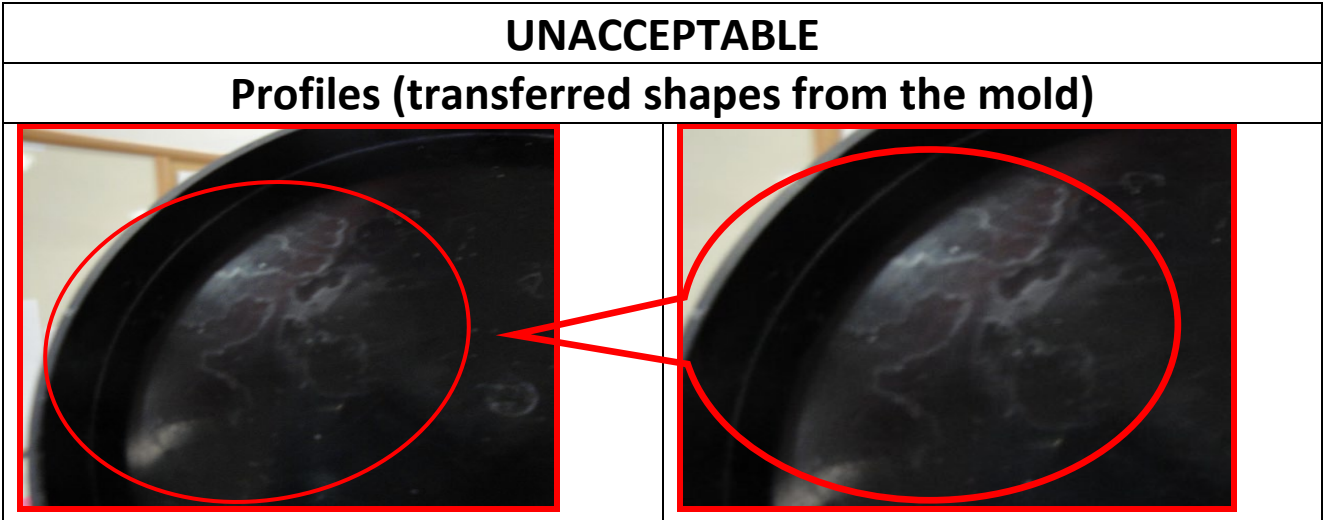
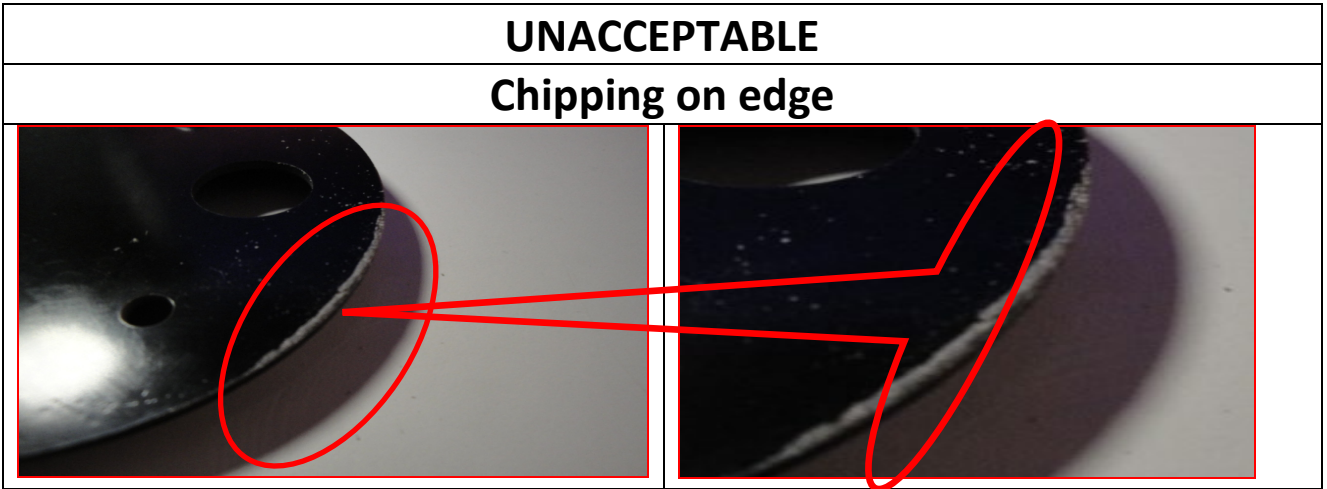
UNACCEPTABLE	
Scratches that you can feel with your fingernail	
	

UNACCEPTABLE	
Scratches can be felt with fingernail	
	

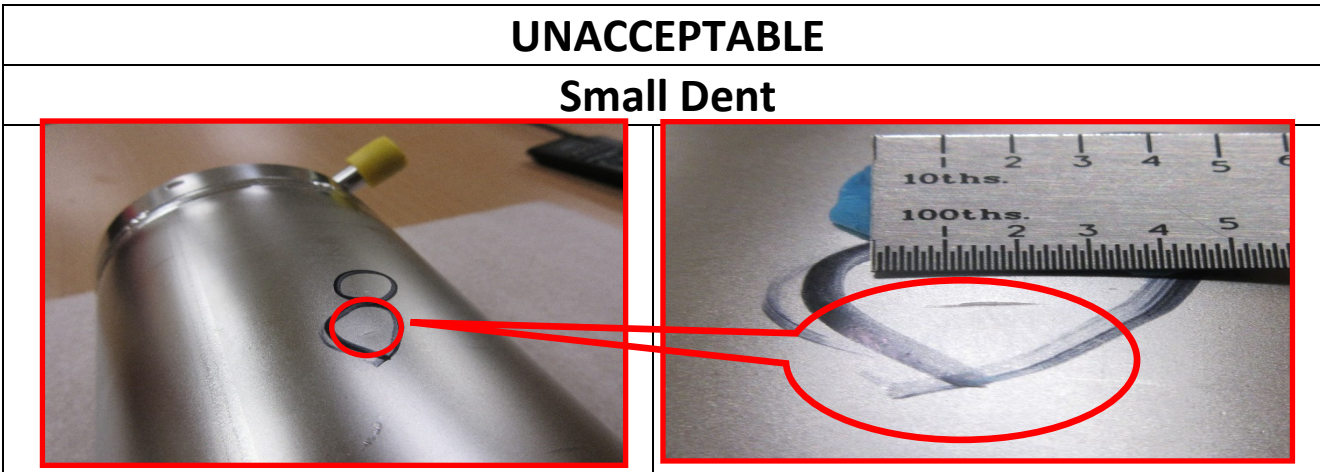
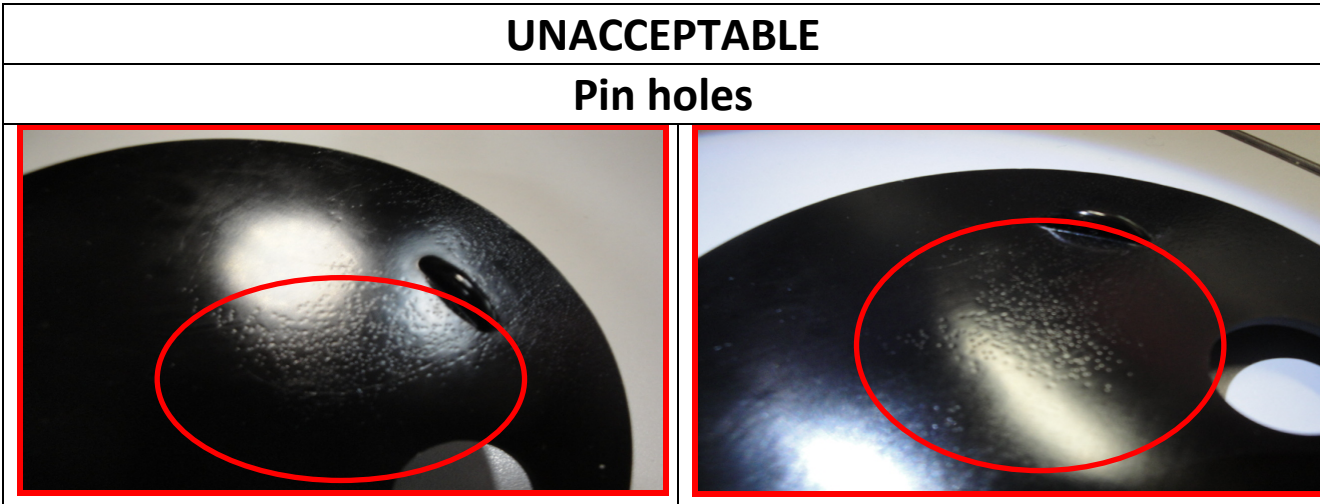
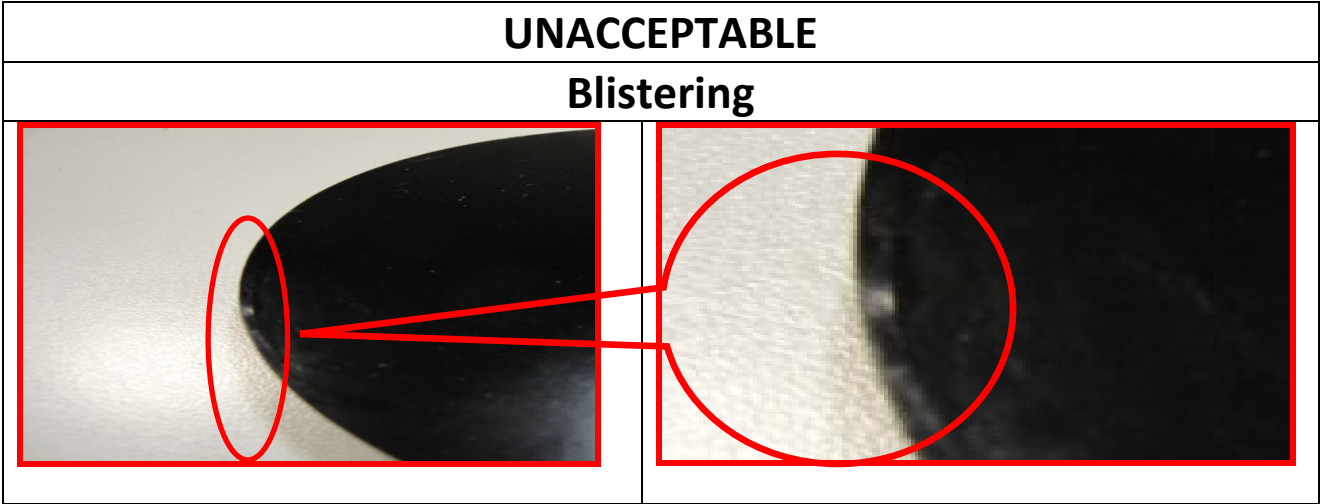
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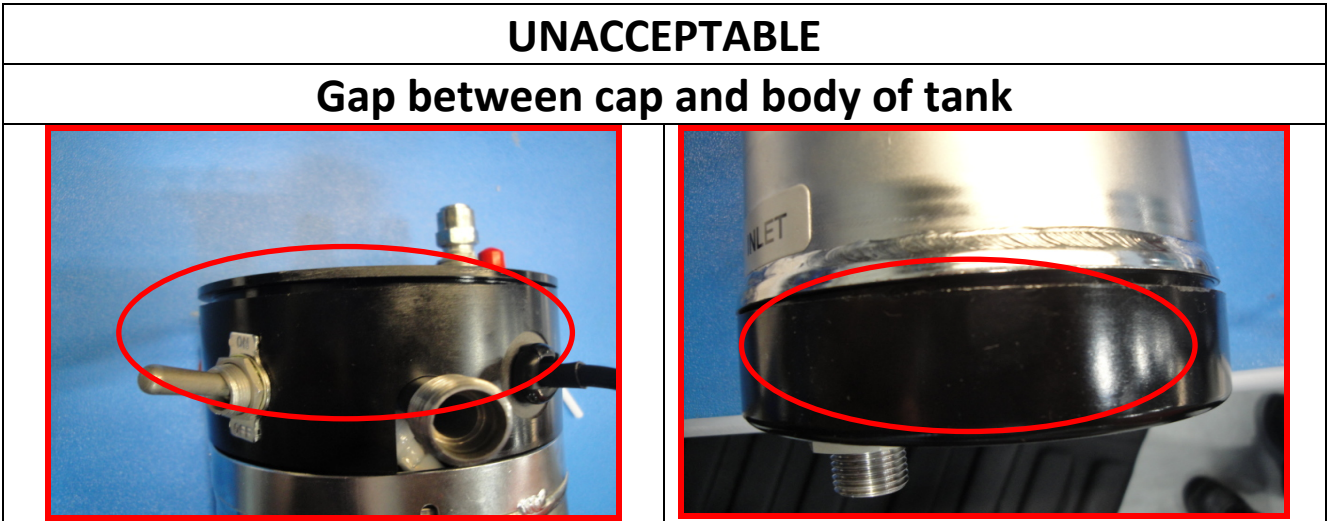
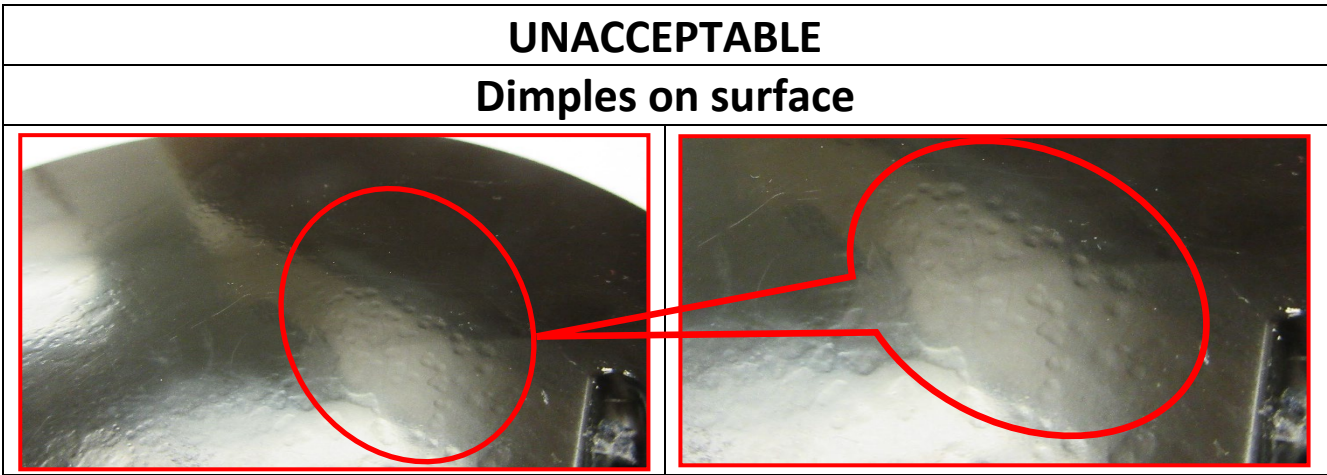
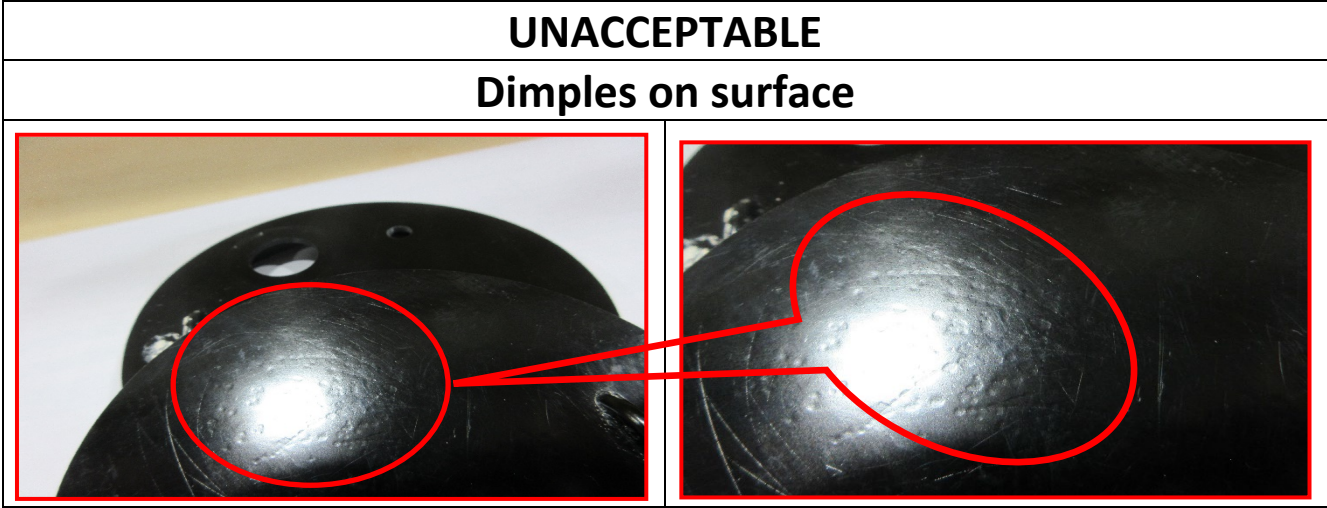
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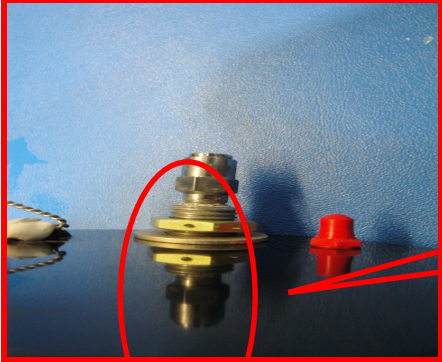

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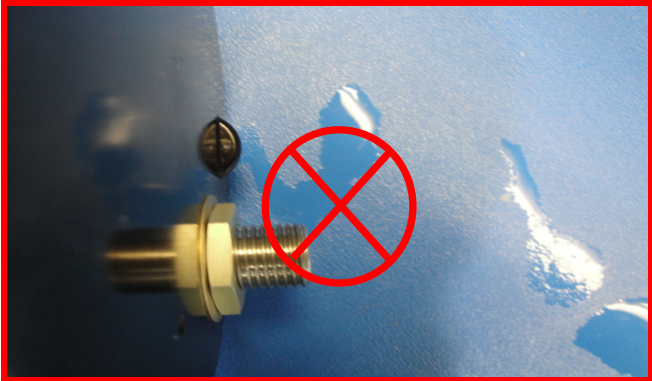


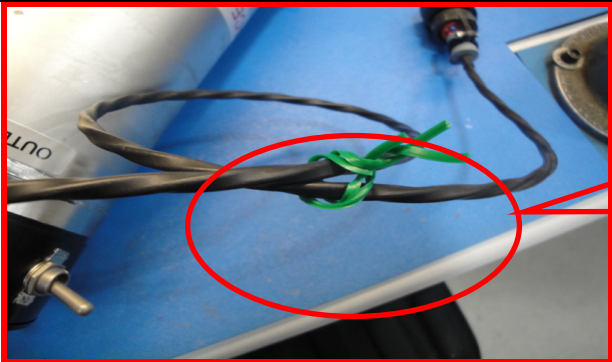
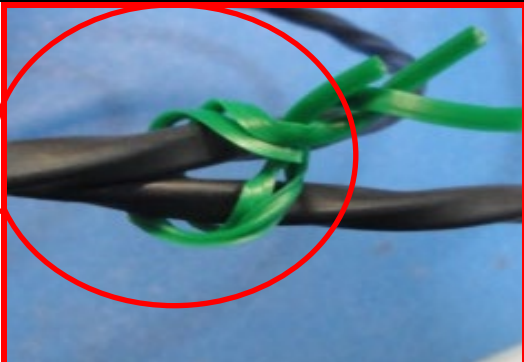
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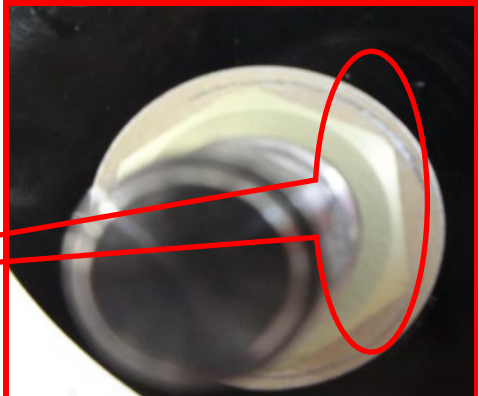
UNACCEPTABLE	
Any gap between top nut and cover of surface	
	



UNACCEPTABLE	
Water left in the tank	
	<p>There should be no visible amount of water left in the tank.</p>

UNACCEPTABLE	
Wire harness twist ties are too loose	
	



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UNACCEPTABLE	
Wire splice connector protruding through hole	
	<p>The Splice connector must not protrude.</p>

UNACCEPTABLE	
Marred finish on washer from socket	
	

UNACCEPTABLE	
Crooked labels	
	

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UNACCEPTABLE	
Labels that are noticeably crooked from 5 feet	
	

ACCEPTABLE	
Labels to be level with no edges raising	
	