Magellan Aerospace, Winnipeg

BAL-QS-003

WORKMANSHIP STANDARDS

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Change Record Sheet

Issue	Description	Date	Author
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1 Purpose

This instruction is intended to document workmanship standards in use at Magellan Aerospace, Winnipeg and ensure that they are consistent with acceptable good industry practices and contractual obligations.

2 Application

This instruction applies to all Production & Inspection personnel where no other customer's or drawing requirements are applicable. In the event of conflict between product or customer specifications and this document, the product or customer specification shall govern.

3 Definitions

3.1 Abrasion

A mark or series of marks on a surface which interrupts the perceived continuity of the surface. These marks are usually observed as changes in shade or gloss of the material surface.

3.2 Blowhole

Smooth cavity caused by gas in molten metal.

3.3 Burrs

A rough edge at the intersection point of two planes as a result of machining process or impact damage.

3.4 Cold Shut

Linear discontinuity caused by incomplete fusion of metal converging from opposite directions in the mold.

3.5 Crack

A linear indication 3 times in length compared to its width. Generally a propagating defect.

3.6 Gouge

A removal of material best described as a depression with rough raised edges. Usually caused by a blunt object being scraped across the surface or impact damage.

3.7 Hot Tear

Casting fractures as it contracts around the mold and fracture of weld metal due to constriction during solidification.

3.8 Lap

Similar to cold shut but occurring in forgings, rolled stock, etc.

3.9 Nicks

A sharp raised area of any size as a result of impact damage.

3.10 Pinhole

Small blowhole appearing in clusters.

3.11 Pitting

Small irregular cavities in surfaces generally rough or dark bottomed, usually resulting from corrosion.

3.12 Prefinished Material

Any raw stock, part or assembly which has had an organic or inorganic coating applied.

3.13 Shrink

Rough cavity caused by contraction of molten metal upon solidification.

3.14 Scratched, Shallow Grooves and Burnish Marks

Tears, indentations and discoloration, linear in form and measureable, usually the result of foreign object damage or excessive friction.

3.15 Step

An abrupt rise or fall in surface material resulting from adjacent cutter path either being higher or lower.

3.16 Slug Mark

Marks that result from loose pieces of material being embedded in the surface of the part.

3.17 Toolmark

A gouge or imperfection in a machined feature resulting from a cutting tool being driven by any means into the part material (not cutter trials).

4 General Requirements

4.1 Any visual defect, which will be removed when processed to final drawing characteristics and does not adversely affect this processing, shall be considered acceptable.

4.2 When measuring any characteristic, the 10 to 1 rule will apply whereby, when possible, the instrument being used to measure the feature shall be capable of accurately measuring to a precision 10 times greater than that required by the dimension.

4.3 Evidence of scratches, pitting or slug marks in the specified functional or aesthetic area of a part made from prefinished stock is not acceptable.

4.4 Evidence of abrasions on the aesthetic surface of a part made from prefinished stock is not acceptable. For parts requiring good appearance and specifying a finished operation, the abrasion must be controlled such that the finishing operation will conceal the mark.

4.5 The base material shall be free of flakes, cracks, laps, inclusions, hard spots, porosity, slivers, rolled-in-scale, gas cavities, which, due to their nature, degree or extent will adversely affect the suitability of the parts for service intended.

4.6 Magnification will not normally be used to examine workmanship except to evaluate defects observed by the naked eye.

5 Machined Components

5.1 Scratches, shallow grooves, and burnish marks are acceptable provided they do not exceed .002 inches in depth and cannot be felt using a 0.020 inch spherical radius probe, do not reduce the material thickness below the lower specification limits and do not affect fit, form, or function of the final component.

5.2 Toolmarks, nicks, gouges, and tool marks, which are not inherent to the manufacturing process and exceed the limits of sub paragraph 5.1, are not acceptable on final features.

5.3 Burrs and unbroken edges are not acceptable and shall be removed to a maximum radius of .015 inches or a chamfer to a maximum of .015 inches across the flat.

5.4 Steps up to 0.005 inches are acceptable provided they are within the limits of size, do not prevent a mounting surface from seating properly on any mating part or tool and do not affect form, fit, or function of the final component.

5.5 Cracks visible to the unaided eye are not acceptable and are cause for rejection. When specified, liquid penetrant, or other suitable non destructive test methodology shall be applied.

5.6 Surface finish shall not exceed 125 RMS.

6 Cast or Forged Components

6.1 Surfaces Subject to Subsequent Machining

Surface imperfections such as:

- Scale
- Pits
- Corrosion

Are acceptable provided, the imperfection is removed by and will not adversely affect subsequent processing.

Visible defects such as cracks, tears, cold shut, laps and other linear defects are not acceptable.

Obvious defects such as severe shrinkage and large inclusions are not acceptable.

6.2 Surfaces Not Subject to Subsequent Machining

Surface imperfections such as: pits, nicks, and blow holes should be blended out avoiding sharp radii, where possible. They shall be considered acceptable if they:

- Are no longer than .010 inches in any direction
- Do not form a line or cluster
- Do not extend through section

All surfaces shall be clean, free from scale, corrosion, oxidation, etc.

Gates, risers, runners, part lines and flash shall be trimmed and blended flush with the part line as shown in Figure 1.

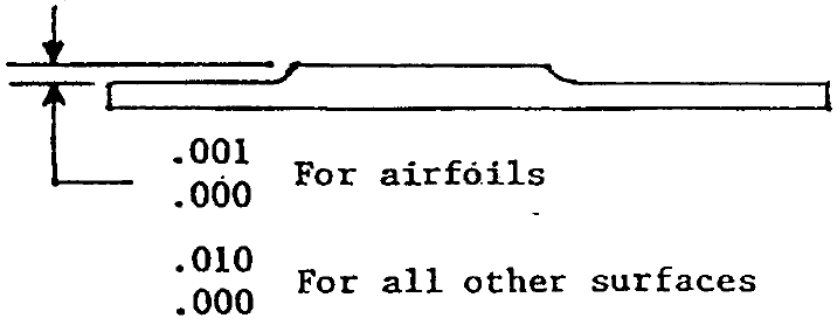

Figure 1

7 Sheet Metal Components

7.1 Die Pressure Marks

Are acceptable provided functional limits of size requirements of the part are met and there is no abrupt change of contour or small radii.

7.2 Rough Areas

That are visually rougher than the surrounding surfaces can be accepted if dimensional requirements are met.

7.3 Scratches, Shallow Grooves, Burnish Marks, and Gouges

Are acceptable provided they do not exceed .002 inches in depth, cannot be detected using a .020 inch spherical radius probe, do not reduce material thickness below specification limit, and cladding is not penetrated.

7.4 Dirt and Slivers

On the part surface is not acceptable and shall be removed with an appropriate cleaning method.

7.5 Burrs and Sharp Edges

Are not acceptable and shall be removed to a radius or chamfer (across the flat) in accordance with Table 1. Deburring shall be performed in a manner so as to avoid the condition depicted in Figure 2.

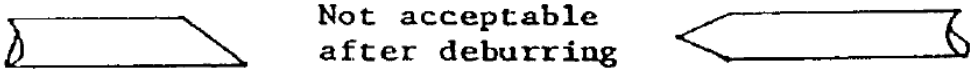

Figure 2

Nominal Thickness (inches)	MAX Rad or Chamfer (inches)
Up to .025	.005
.025 to .062	.010
.062 & over	.015

Table 1

7.6 Cracks

Are not acceptable and are cause for rejection.

7.7 Edge Bulges (Due to Bending)

Within the limits of part size are acceptable.