

Cosmetic Specification of Mechanical Parts & Inspection Criteria

Document Number:

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Revision **G**




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REVISION HISTORY

Rev	By	Section	Description	Date
A	J. Park	ALL	Initial Release	12/29/2010
B	J. Park	4.1	Update 4.1 Class A Surface Spec	6/27/2011
C	J. Park	1.3.1	Add SPI Mold Finish Guide Spec	8/13/2011
D	J. Park	1.3.1 & ALL	Section 1.3.1: Was: Definition of Classification Is: Surface Classification and Requirements Update to new Zii format	9/30/2015
E	G. Seal, S. Lao, S. Parrish, S. Uota	ALL	General rewrite and clarification; separated tables into General, Plastics, Metals and textures	5/18/2018
F	G. Seal, S. Lao, S. Parrish, D. Dang, S. Uota	ALL	Add picture examples. Defined Class D surface. Added Blemish and Overspray conditions.	3/18/2019
G	Spence Uota	2.1, Table 5	Add requirements for Dry lubricant coating requirements	8/5/19

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1.0 COSMETIC ACCEPTANCE CRITERIA

1.1 SCOPE

To establish a classification guideline for acceptable cosmetic criteria. This criterion addresses the cosmetic quality of mechanical piece parts and completed LRUs (Line Replaceable Units). This criterion is specific to drawings that call out the 28-0002-00 document as a requirement.

1.2 PURPOSE

The purpose of this criteria is to define inspection rules and cosmetic acceptance criteria for different surfaces of mechanical parts.

1.3 SURFACE CLASSIFICATION AND REQUIREMENTS

The specification criteria are separated into three classifications A, B, and C based on function of the piece part and by location of the LRU.

1.3.1 Class A Surface (external-high priority)

Class A refers to surfaces that are readily visible by the passenger and have a high gloss or have an optical component. This surface shall be viewed from 18 to 20 inches, under normal lighting conditions and under no extra magnification.

1.3.2 Class B Surface (external-high priority)

Class B refers to surfaces that are readily visible by the passenger. This can include galley's, under seats and inside overhead bins. This surface shall be viewed from 18 to 20 inches, under normal lighting conditions and under no extra magnification.

1.3.3 Class C Surface (internal or external – medium priority surface)

Class C refers to surfaces that are not readily visible by the passenger. This surface may exhibit some minor cosmetic defects which may be visible to the inspector when viewed from 18-20 inches under normal lighting conditions.

1.3.4 Class D Surface: (predominantly internal)

Class D refers to surfaces that will never be visible by the passenger. Undesignated surfaces on the drawing, by default, are classified as Class D. This surface may exhibit some minor cosmetic defects which may be visible to the inspector when viewed from 18-20 inches under normal lighting conditions.

1.4 STANDARD VIEWING CONDITION

Piece parts: All quality decisions of cosmetic acceptability will be made under normal lighting conditions (80-120 foot-candles) in white fluorescent light, viewed at a distance of 18-20 inches. Viewing time should be less than 20 seconds per feature. Cosmetic inspection is to be performed via non-destructive methods.

LRU Parts: All quality decisions of cosmetic acceptability will be made under normal lighting conditions (80-120 foot-candles) in white fluorescent light, viewed at an angle similar to a seated or standing passenger. Viewing time should be less than 20 seconds per feature. Cosmetic inspection is to be performed via non-destructive methods.

1.5 COLOR MATCHING

Decisions regarding color matching are made by comparison to known standards using a spectrophotometer, color meter or suitable color matching coupons.

1.6 Surface Finish and Texture Matching

Judgement as to the conformance of surface finish and texture is to be made by comparing a part to an SPI Mold Finish Guide coupon, equivalent coupon sample or identified known standard. Comparison is by unaided eye unless otherwise specified by the standard.

2.0 INSPECTION CRITERIA

2.1 INSPECTION CRITERIA DEFECTS AS SHOWN IN TABLES 1, 2, & 3

TABLE 1: GENERAL DEFECTS

1. - Finish
2. - Broken
3. - Cracking
4. - Nicks
5. - Scratch
6. - Flash
7. - Manufacturing Processing Marks
8. - FOD
9. - Welds
10. - Printing

TABLE 2: PLASTIC DEFECTS

11. - Flow Marks
12. - Drag Marks
13. - Short Shot
14. - Sink Marks
15. - Weld lines
16. - crazing
17. - Blemish

TABLE 3: METAL DEFECTS

18. - Flow Marks
19. - Drag Marks
20. - Short Shots
21. - Sinks
22. - Grease
23. - Manufacturing Processing Marks
24. - Porosity or Pitting
25. - Sheet metal bulging

TABLE 4: Texture and Coating Finish

26. - Color
27. - Texture
28. - Hanging/Drying Marks
29. - Flaking
30. - Overspray

Table 5: Dry Lubricant Coating finish

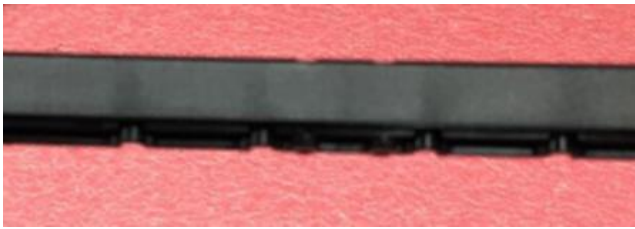
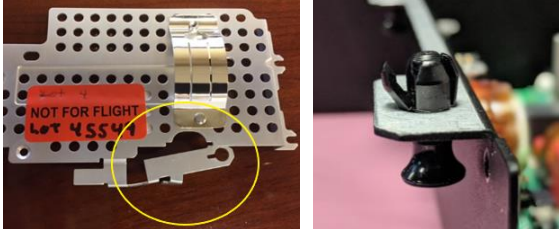
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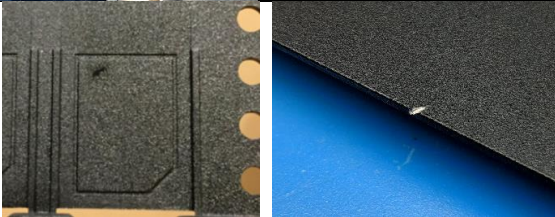


32. Coverage

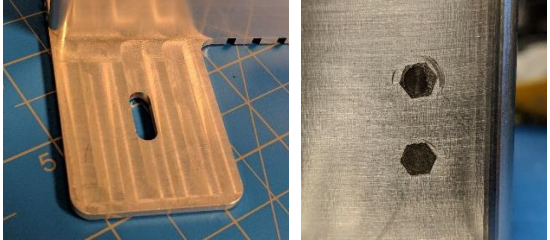
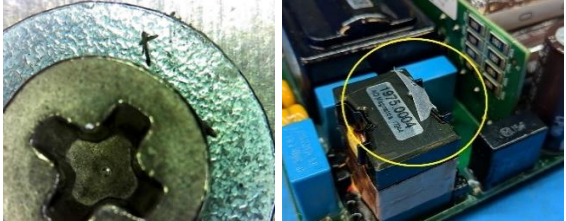
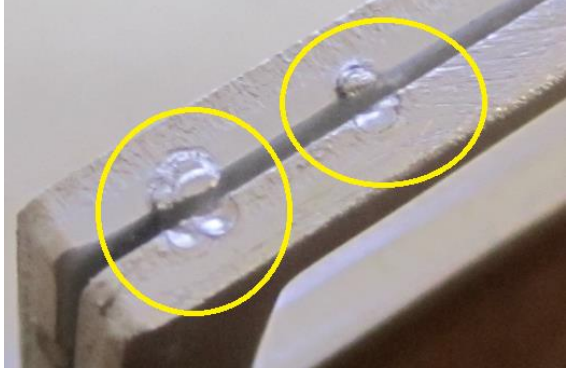
33. Color


34. Thickness

Table 1: General Defects

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	Example
1	FINISH: Any deviation from surface roughness or texture such as to immediately focus the attention of the viewer upon them. A noncontinuous or inconsistent surface finish or texture.	None allowed	None allowed	May deviate slightly or exhibit minor imperfections from a specified finish guide or texture plaque.	No specific finish requirement	
2	BROKEN: General damage. Bent/broken tabs or ribs.	None allowed	None allowed	None allowed	None allowed	

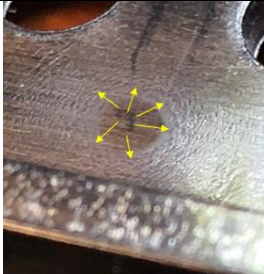
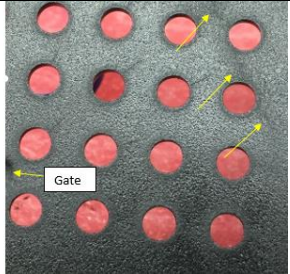
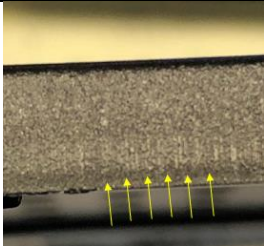
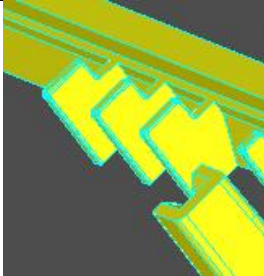

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	Example
3	CRACKING: Stress induced splitting or fissures causing separation of material.	None allowed	None allowed	None allowed.	None allowed.	
4	NICKS: Like gouges but of short length. Cause by impact rather than abrasion.	None allowed	None allowed	Allowable: See Appendix A	Allowable, as long as the nick does not affect FFF.	
5	SCRATCH: Surface imperfection due to abrasion that removes small amounts of material. Depth may or may not be measurable.	None allowed	None allowed	Allowable: See Appendix A	Allowable, as long as the scratch(es) does not affect FFF.	
6	FLASH: Excess material at parting line or mating surface of the mold.	None allowed	.003" or less in any direction. Edges must adhere to UL1439 standard.	.005" or less in any direction. Must adhere to UL1439 standard, FFF is not affected and cannot produce FOD	.005" or less in any direction. Must adhere to UL1439 standard, FFF is not affected and cannot produce FOD	

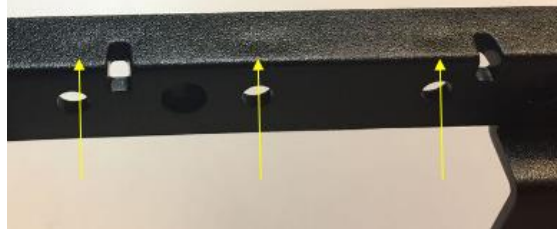
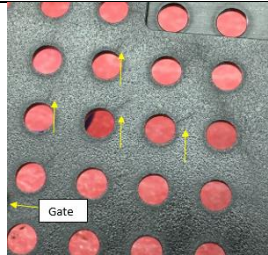


Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	Example
7	MANUFACTURING PROCESSING MARKS (including as seen through paint/powder coat surfaces): Marks left from a manufacturing process or fixture used in the manufacture of an item.	None allowed	None allowed	Allowed if the part still meets the print/model dimensions and tolerances. Cannot affect FFF.	Allowed if the part still meets the print/model dimensions and tolerances. Cannot affect FFF.	
8	FOD – Including cutting oils, mold release, cleaning agents.	None allowed	None allowed	None allowed	None allowed	
9	WELDS: Tack, bead, seam, laser, spot or chemical weld/bonding.	No evidence of weld or bonding allowed	May be visible unless otherwise noted. If allowed, must be continuous and consistent in size with no cracks or voids through the weld. Cannot distort surrounding material	Must be continuous with no cracks through the weld. Cannot affect FFF of the final product. Cannot distort any surrounding Class A or B surface.	Must be continuous with no cracks through the weld. Cannot affect FFF of the final product. Cannot distort any surrounding Class A, B or C surface.	

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	Example
10	PRINTING: Labels, symbols, marking, etching and printed details.	All characters and symbols must be fully formed and human readable with an unaided eye. All barcodes must be scannable.	All characters and symbols must be fully formed and human readable with an unaided eye. All barcodes must be scannable.	All characters and symbols must be fully formed and human readable with an unaided eye. All barcodes must be scannable.	All characters and symbols must be fully formed and human readable with an unaided eye. All barcodes must be scannable.	

*note: all FFF (Form, Fit and Function) determinations shall be made by Zii Brea Engineering.

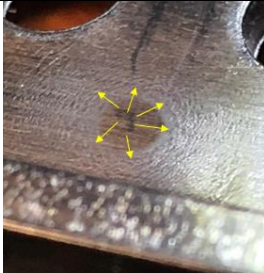
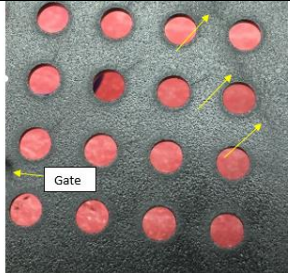
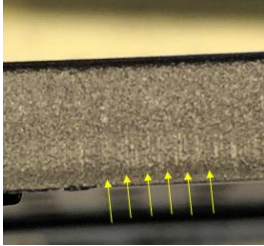

Table 2: Plastic Defects

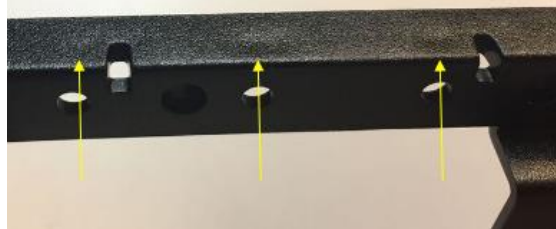
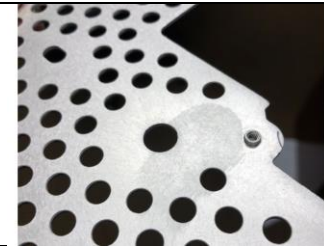
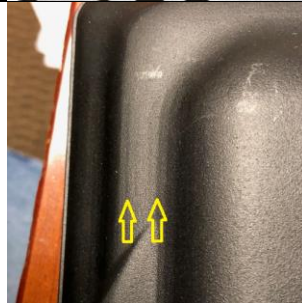
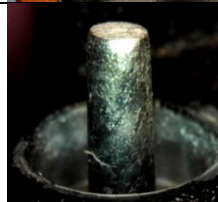
Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
11	FLOW MARKS: Waviness of edge or excessive linear junction between venting of gases generated during the molding cycle.	None allowed	None Allowed	.50" or less in any direction is acceptable. Allow 4 per surface. No closer than 1 inch.	.50" or less in any direction is acceptable.	 
12	DRAW MARKS: Clusters of scratches from plastic dragging against mold or another hard surface.	None allowed	None allowed	Acceptable if drawing and model dimensions are not violated and FFF is not affected	Acceptable if drawing and model dimensions are not violated and FFF is not affected	
13	SHORT SHOT: Missing plastic due to incomplete filling of the mold cavity. Parts are not completely formed.	None allowed	None allowed	None allowed	None allowed	 

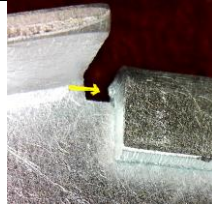
Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
14	SINK: Surface depression such as voids or cavities.	None allowed	.005" Max. and cannot affect FFF and cannot affect an adjacent Class A surface.	.015" Max. and cannot affect FFF and cannot affect an adjacent Class A or B surface.	.015" Max. and cannot affect FFF and cannot affect an adjacent Class A, B or C surface.	
15	WELD LINES: Witness line where 2 or more fronts of molten plastic converge.	None allowed	None Allowed	Allowed but cannot propagate through the material in the form of a void or crack.	Allowed but cannot propagate through the material in the form of a void or crack.	
16	CRAZING: Multiple tiny cracks due to stress exerted on the part.	None allowed	None allowed	None allowed	None allowed	
17	BLEMISH: A variation in the surface texture that can be seen but no felt. This can affect sheen or gloss and sometimes color.	None allowed	None allowed	Acceptable, but should be kept to a minimum via design or process control.	No specific texture requirement	

*note: all FFF (Form, Fit and Function) determinations shall be made by Zii Brea Engineering.

Table 3: Metal Defects



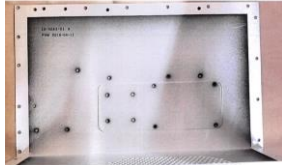
Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
18	FLOW MARKS: Waviness of edge or lines along surface. Normally seen in castings	None allowed	None allowed	.50" in any direction or less. Allow 4 per surface. No closer than 1 inch.	.50" in any direction or less.	 
19	DRAG MARKS: Clusters of scratches from metal dragging against mold details when a part is ejected from a mold.	None allowed	None allowed	Acceptable if dimensions, tolerance and model are not violated	Acceptable if dimensions, tolerance and model are not violated	
20	SHORT SHOT: Missing metal due to incomplete filling of the mold cavity. Parts are not completely formed. Can usually be identified by smooth, shiny and rounded surfaces.	None allowed	None allowed	None allowed	None allowed	

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
21	SINK: Surface depression such as voids or cavities.	None allowed	.005" Max. and cannot affect FFF and cannot affect an adjacent Class A surface.	.015" Max. depth and cannot affect FFF and cannot affect an adjacent Class A or B surface.	.015" Max. depth and cannot affect FFF and cannot affect an adjacent Class A, B or C surface.	
22	GREASE: Any type of machine lubrication on the surface of a part.	None allowed	None allowed	Staining is acceptable if less than .75" in any direction. No standing oil or grease.	Staining is acceptable if less than .75" in any direction. No standing oil or grease.	
23	MANUFACTURING PROCESSING MARKS: Tooling, fixturing, machining marks, chatter or lines.	None	None	Allowed if the part still meets the print/model dimensions and tolerances. Cannot affect FFF.	Allowed if the part still meets the print/model dimensions and tolerances. Cannot affect FFF.	
24	POROSITY OR PITTING: Holes or voids on the surface.	None	None	None	None	

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
25	DEFORMATION: Sheet metal bulging at folds.	None	Acceptable if it is within tolerance and does not affect FFF	Acceptable if it does not affect FFF.	Acceptable if it does not affect FFF.	



*note: all FFF (Form, Fit and Function) determinations shall be made by Zii Brea Engineering.

Table 4: Texture and coating finish
 Powder coat, paint, anodize, chem film., EMI paint, line grain

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
26	COLOR – Color must be continuous and consistent throughout the indicated surface.	Required	Required	Can vary, unless otherwise stated. Must meet print requirements and FFF.	Varying color is allowed.	
27	TEXTURE - Texture must be continuous and consistent throughout the indicated surface.	Required	Required	Can vary, unless otherwise stated. Must meet print requirements and FFF.	Texture can vary if the part still meets the print/model dimensions and tolerances.	
28	HANGING/DRYING MARKS	Not allowed	Not allowed	Allowed if drawing FFF are met and no bare metal is showing.	Allowed if drawing FFF are met and no bare metal is showing.	No pic
29	FLAKING	Not allowed	Not allowed	Not allowed	Not allowed	No-pic
30	OVERSPRAY - Excess paint, liquid or dye media which is found in an unintended area. Overspray coverage can be from 0.00% to 100%.	Not Allowed	Not Allowed	Allowed as defined by the print.	Allowed as defined by the print.	

*note: all FFF determinations shall be made by Zii Brea Engineering.

Table 5: Dry Lubricant Coating

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
31	Texture –	Not Applicable	Not Applicable	Texture should be relatively smooth with little build up.	Texture should be relatively smooth with little build up.	
32	Coverage – can have interruptions in the coverage. Typically has minimum 75% coverage.	Not Applicable	Not Applicable	Hanging and drying marks are acceptable	Hanging and drying marks are acceptable	
33	Color – no specific color requirement.	Not Applicable	Not Applicable	Varying color is acceptable;	Varying color is acceptable;	No Pic
34	Thickness	Not Applicable	Not Applicable	.0000" - .0005" thickness where applicable	.0000" - .0005" thickness where applicable	No Pic

APPENDIX A

Nicks:

- 1) Cannot propagate into a Class A or Class B surface.
- 2) Cannot affect FFF
- 3) Cannot expose bare metal (see Appendix B)
- 4) Nick size/qty
 - a. Max size .1" in any direction
 - b. Max 2 Nicks in a 1 in-square area (1"x1")
 - c. Distance between any nicks: .1" or greater

Scratch:

- 1) Cannot propagate into a Class A or Class B surface.
- 2) Cannot affect FFF
- 3) Deep scratches with potential FOD are not acceptable.
- 4) Cannot expose bare metal (see Appendix B)
- 5) Scratch size/qty
 - a. Max total length 2"
 - b. Max 2 scratches on any one surface
 - c. Min Distance between scratches: .1"

APPENDIX B

Acceptable rework: Metals (Aluminum only)

- 1) Scratches, nicks dents, drag marks, etc.... that expose bare metal
 - a. Part must meet the criteria as stated in Table 1 or 3
 - b. Exposed metal can be repaired via
 - i. Remove potential FOD
 - ii. Treat with Alodine or similar approved process
 - iii. Provide all necessary documentation (CofC, material certs) for the Alodine or similar approved process
 - iv. Provide Zii with a Deviation request prior to rework and shipping of parts
 - c. Rework area cannot exceed 1" square total (or 1 % of total surface, whichever is smaller) or any length longer than 2 inches.
 - d. Structural integrity cannot be compromised.
 - e. FFF cannot be affected.