


Cosmetic Specification of Mechanical Parts & Inspection Criteria

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28-0002-00

Revision H

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REVISION HISTORY

Rev	By	Section	Description	Date
A	J. Park	ALL	Initial Release	29-DEC-2010
B	J. Park	4.1	Update 4.1 Class A Surface Spec	27-JUN-2011
C	J. Park	1.3.1	Add SPI Mold Finish Guide Spec	13-AUG-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	30-SEP-2015
E	G. Seal, S. Lao, S. Parrish, S. Uota	ALL	General rewrite and clarification; separated tables into General, Plastics, Metals and textures	18-MAY-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.	18-MAR-2019
G	S. Uota	2.1, Table 5	Add requirements for Dry lubricant coating requirements	05-AUG-2019
H	B. Esmaeilpour	All	Updated format to Safran standard format. Added glue cosmetic section and updated Class B definition	27-SEP-2021

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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, C, and D 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

Class B (Customer facing) 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.

Class B (Non-customer facing) refers to external 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. These surfaces include but are not limited to back of the display, non-visible DDS surfaces, etc. Refer to appendix C for pictorial examples of customer facing and non-customer facing surfaces.

Unless otherwise specified, any class B surface without further clarification should be considered as a "customer facing" surface.

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 or unit. 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. - Crazeing
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


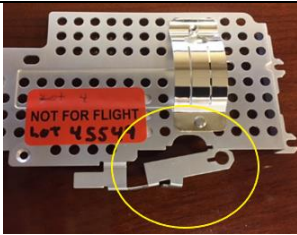


Table 5: DRY LUBRICANT COATING FINISH




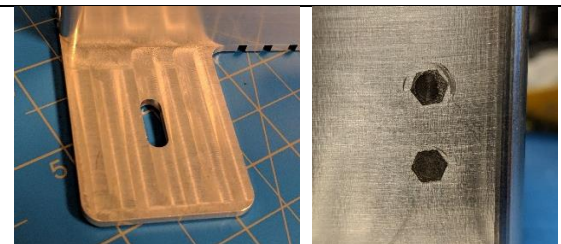
- 31. Texture
- 32. Coverage
- 33. Color
- 34. Thickness

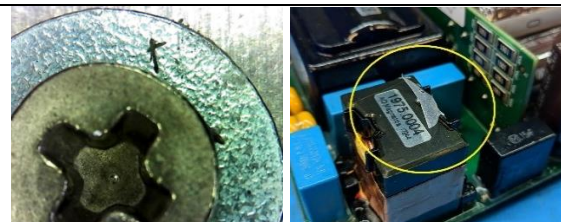

Table 6: ADHESIVE AND GLUED SURFACE FINISH


- 35. Protrusion above surface

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	 
3	CRACKING: Stress induced splitting or fissures causing separation of material.	None allowed	None allowed	None allowed.	None allowed.	

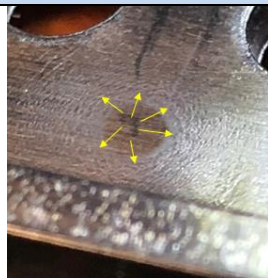
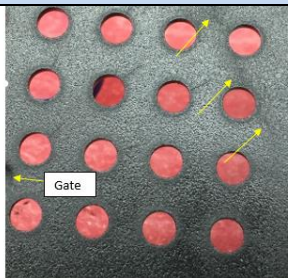
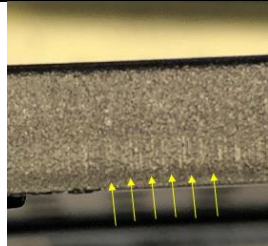
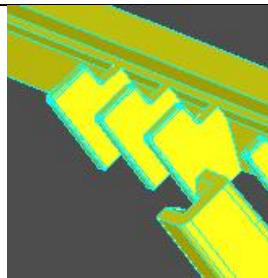

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	Example
4	NICKS: Like gouges but of short length. Cause by impact rather than abrasion.	None allowed	Customer Facing: None allowed Non-Customer Facing: Allowed (See Appendix A)	Allowable: 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	Customer Facing: None allowed Non-Customer Facing: Allowed (See Appendix A)	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	
7	MANUFACTURING PROCESSING MARKS (including as seen through paint/powder coat surfaces): Marks left from a manufacturing process	None allowed	Customer Facing: None allowed Non-Customer Facing: Allowed if the part still	Allowed if the part still meets the print/model dimensions and tolerances.	Allowed if the part still meets the print/model dimensions and tolerances.	


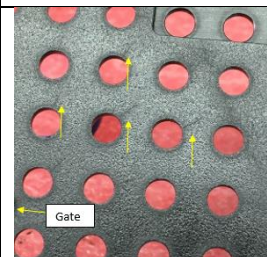

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	Example
	or fixture used in the manufacture of an item.		meets the print/model dimensions and tolerances. Cannot affect FFF.	Cannot affect FFF.	Cannot affect FFF.	
8	FOD – Including cutting 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 SPI Brea Engineering.

Table 2: Plastic Defects

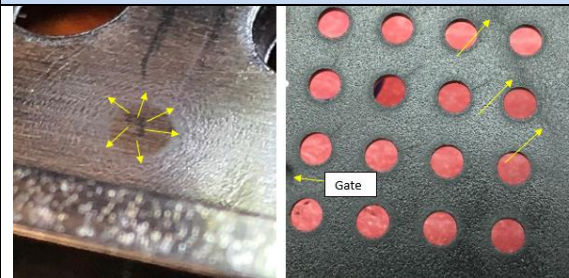
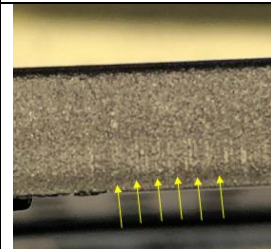

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
11	FLOW MARKS: Waviness of edge or excessive linear junction between venting of gases generated during the molding cycle.	None allowed	Customer Facing: None allowed Non-Customer Facing: .50" or less in any direction is acceptable. Allow 4 per surface. No closer than 1 inch.	.50" or less in any direction is acceptable. 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	Customer Facing: None allowed Non-Customer Facing: 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	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	Customer Facing: .005" Max. and cannot affect FFF and cannot affect an adjacent Class A surface. Non-Customer Facing: .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 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	Customer Facing: None allowed Non-Customer Facing: 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.	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	


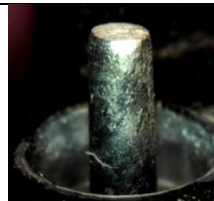

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
17	BLEMISH: A variation in the surface texture that can be seen but no felt. This can affect sheen or gloss and sometimes color.	None allowed	Customer Facing: None allowed Non-Customer Facing: Acceptable, but should be kept to a minimum via design or process control.	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 SPI 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	Customer Facing: None allowed Non-Customer Facing: .50" in any direction or less. Allow 4 per surface. No closer than 1 inch.	.50" in any direction or less. Allow 4 per surface. No closer than 1 inch.	.50" in any direction or less.	
19	DRAW MARKS: Clusters of scratches from metal dragging against mold details when a part is ejected from a mold.	None allowed	Customer Facing: None allowed Non-Customer Facing: Acceptable if dimensions, tolerance and model are not violated	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	None allowed	None allowed	None allowed	None allowed	



Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
	smooth, shiny and rounded surfaces.					
21	SINK: Surface depression such as voids or cavities.	None allowed	Customer Facing: None allowed Non-Customer Facing: .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 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.	

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
23	MANUFACTURING PROCESSING MARKS: Tooling, fixturing, machining marks, chatter or lines.	None	Customer Facing: None allowed Non-Customer Facing: 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.	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	
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.	

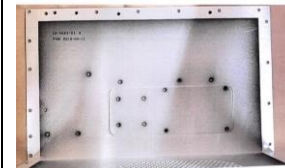
*note: all FFF (Form, Fit and Function) determinations shall be made by SPI Brea Engineering.

Table 4: Texture and coating finish

Applies to Powder coat, paint, anodize, chem film., EMI paint, line grain

	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	Customer Facing: Required Non-Customer Facing: Can vary, unless otherwise stated. Must meet print requirements and FFF.	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	Customer Facing: Required Non-Customer Facing: Can vary, unless otherwise stated. Must meet print requirements and FFF.	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.	

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

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
28	HANGING/DRYING MARKS	Not allowed	Customer Facing: Required Non-Customer Facing: Allowed if drawing FFF are met and no bare metal is showing.	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	Customer Facing: Required Non-Customer Facing: Allowed as defined by the print.	Allowed as defined by the print.	Allowed as defined by the print.	


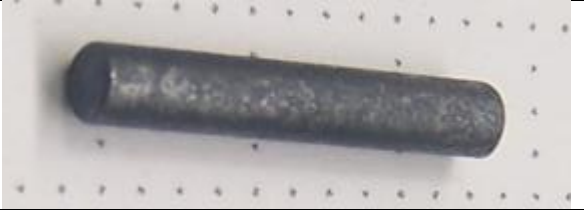

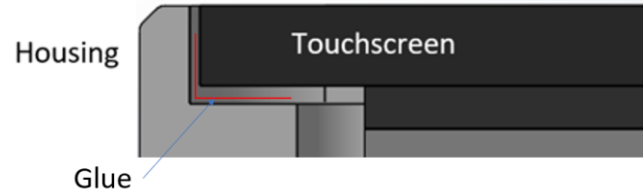

31	<p>Wrinkling/Blistering - This defect is the appearance of irregular blisters on the paint finish.</p> <p>Wrinkling is the development of wrinkles in the paint film as it dries, usually due to the formation of a skin.</p>	Not Allowed	<p>Customer Facing: Not Allowed</p> <p>Non-Customer Facing: Allowed as defined by appendix A.</p>	Allowed as defined by appendix A.	Allowed as defined by appendix A.	<p>Not acceptable example:</p> 
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Table 5: Dry Lubricant Coating

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
32	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	
34	Color – no specific color requirement.	Not Applicable	Not Applicable	Varying color is acceptable;	Varying color is acceptable;	No Pic
35	Thickness	Not Applicable	Not Applicable	.0000" - .0005" thickness where applicable	.0000" - .0005" thickness where applicable	No Pic

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

Table 6: Adhesive and Glue Surface Finish

Defect #	Cosmetic Defect Description	Class "A" Surface*	Class "B" Surface*	Class "C" Surface*	Class "D" Surface*	
36	Protrusion above surface: Bumps and protrusions as a result of glue curing above the nominal surface.	Not Allowed	Customer Facing: Not Allowed Non-Customer Facing: Allowed	Allowed	Allowed	Acceptable example: Glue is flush or lower than the Housing lip/Touchscreen  Unacceptable examples: 

APPENDIX A**Nicks:**

- 1) Cannot propagate into a Class A or Class B Customer Facing 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 Customer Facing 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"

Wrinkling/Blistering:

- 1) Cannot propagate into a Class A or Class B Customer Facing surface.
- 2) Cannot affect FFF
- 3) wrinkle/blister /qty
 - a. Max total length 2"
 - b. Max 2 wrinkle/blister on any one surface
 - c. Min Distance between wrinkle/blister: .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 SPI 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.

APPENDIX C

Example of Customer Facing Surfaces:

- 1) Surfaces shown below in green are considered customer facing surfaces:

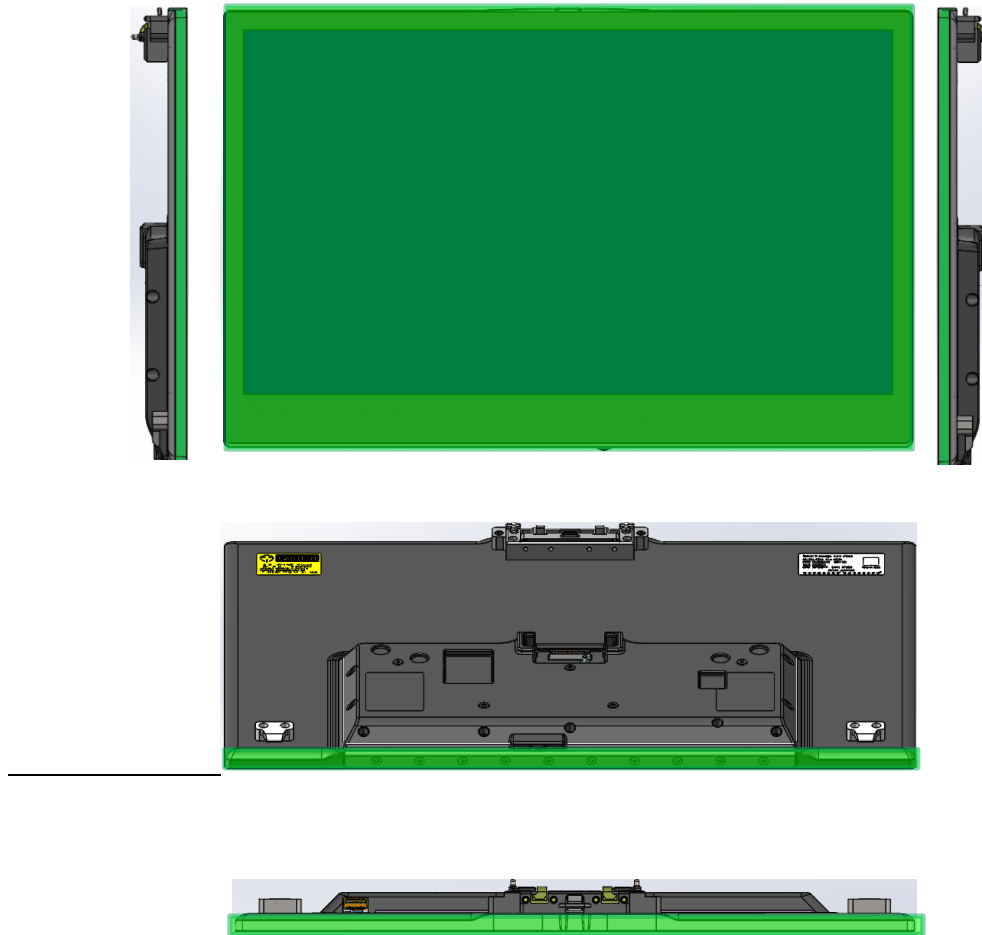
13.3" Ultra RDU

The entire front surface as well as three sides (Top, Left, Right) are considered customer facing



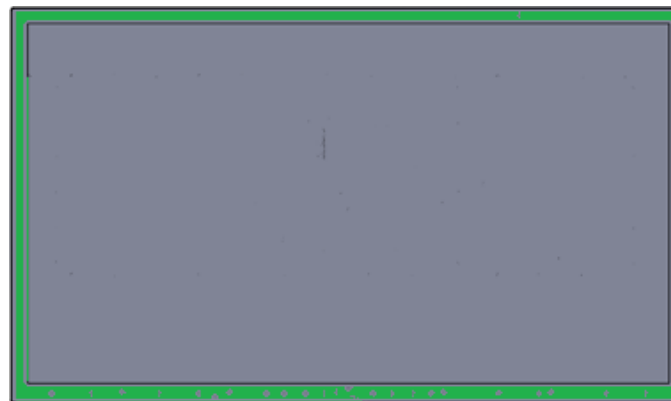
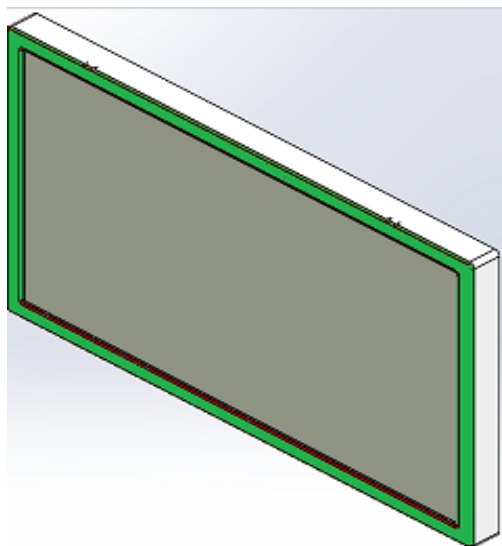
15.6", 17.3" and 24" Ultra RDU

The entire front surface as well as all four side profiles (Top, Bottom, Left, Right) are considered customer facing surfaces



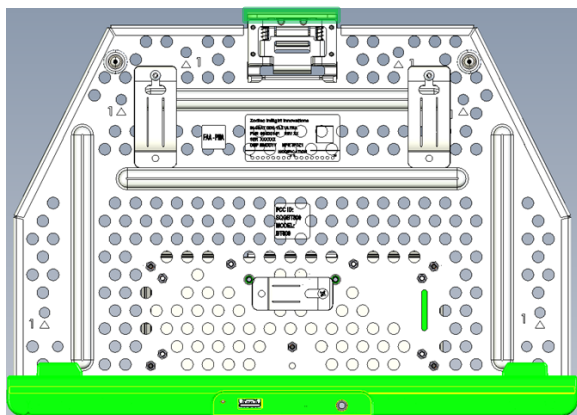
27" Ultra RDU and 32" Ultra SDU

The entire front ledge is considered a customer facing surface (Not the side profiles)



13.3" Ultra DDS

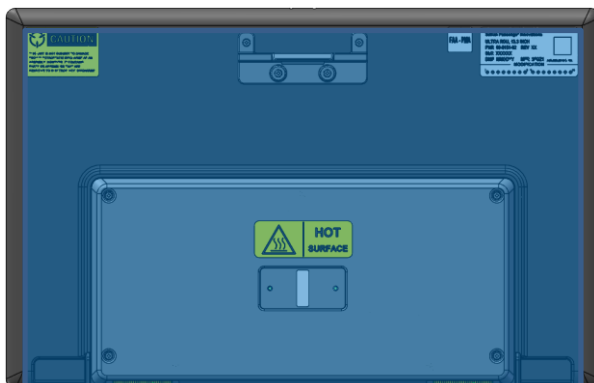
The entire plastic chin as well as the top ledge of the latch are considered customer facing



- 2) Surfaces shown below in blue are considered Non-Customer Facing surfaces:

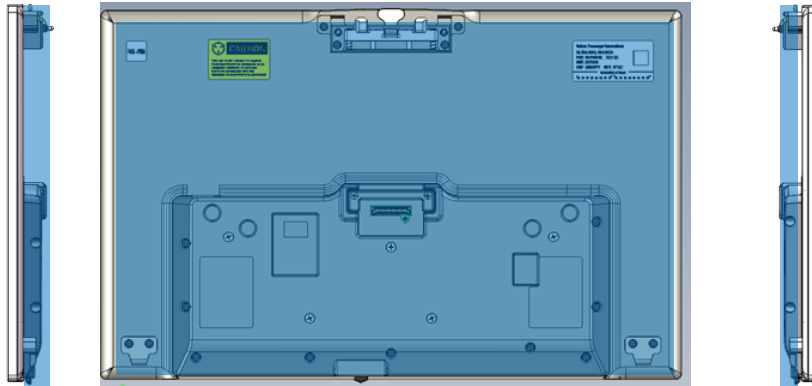
13.3" Ultra RDU

The entire back surfaces as well as the bottom edge are considered non-customer facing



15.6", 17.3" and 24" Ultra RDU

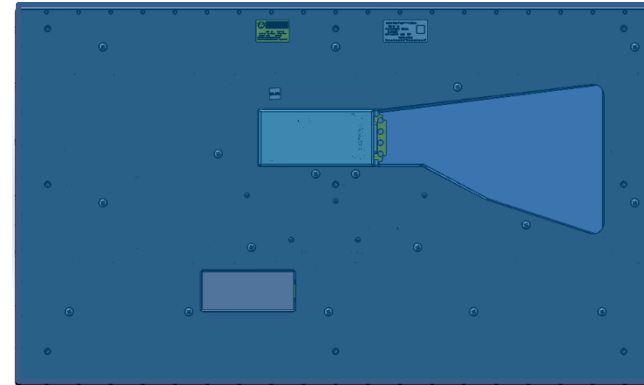
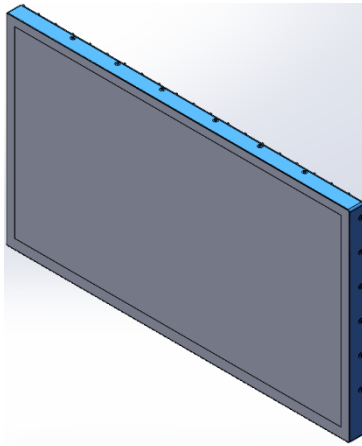
The entire back surface is considered non-customer facing



**15.6" image shown for reference

27" Ultra RDU and 32" Ultra SDU

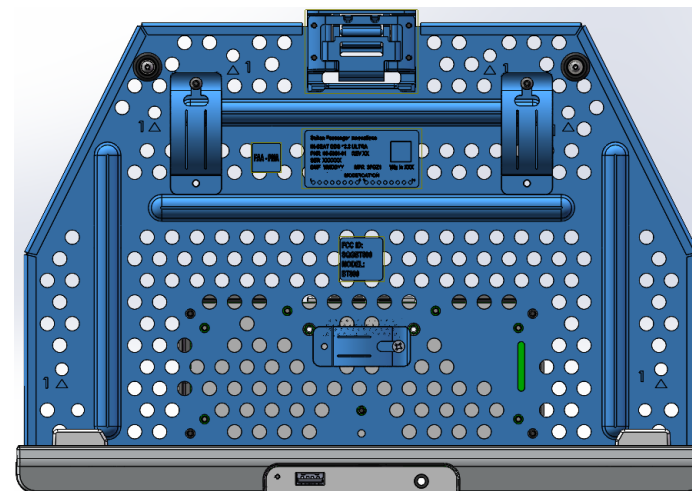
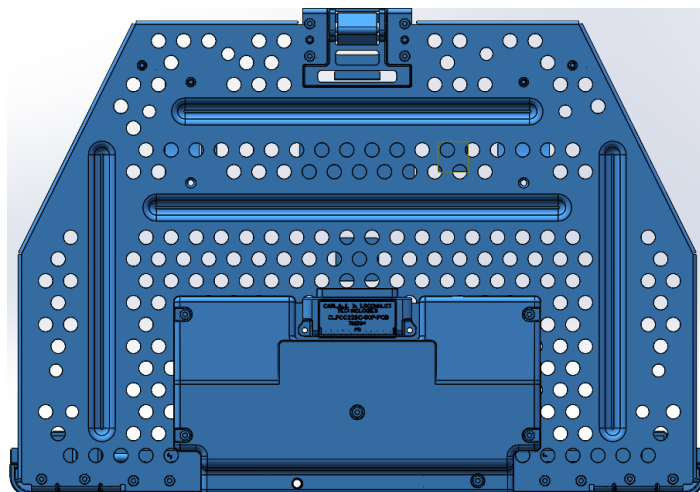
All four sides (Top, Bottom, Left, Right) as well as the back surface are considered non-customer facing



**32" image shown for reference

13.3" Ultra DDS

The entire DDS (except for the plastic chin and top of the latch) are considered non-customer facing



15.6", 17.3", 24" and 27" Ultra DDS

The entire DDS is considered non-customer facing (front and back)

