

PROCEDURAL INSTRUCTION

AESTHETIC INSPECTION CRITERIA (WI-0813) FOR COMMERCIAL LIGHTING

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1.0 PURPOSE

The purpose of this document is to define the aesthetic appearance criteria for specific surfaces at Lighting Systems. This Process instruction provides details for inspection criteria previously defined in WI-0813. The work instruction provides a parts classification list, which specifies the physical location or classification of a part when installed on or in an aircraft. This document also defines the aesthetic acceptability criteria to which product is accepted or rejected based on visual inspection.

This aesthetic inspection can be subjective, therefore, the Quality Manager or designee, should be consulted to make the final determination as needed.

This document works in concert with the supporting documentation listed in Section 2.1.

2.0 REFERENCES

2.1 Reference Documents

The following documents form a part of this procedure to the extent that they are referenced herein.

Document Number		Title
INPX-QA-0045-PRO		Sampling
INPX-QA-0041-PRO		Receiving Inspection
INPX-QA-0042-PRO		In-process, Final Inspection and Test
PHX-QA-0008-PRO		Control of Non-Conforming Product

3.0 RESPONSIBILITIES

3.1 Content

Quality Engineering is responsible for keeping this PI current and up to date. Report any comments and/or discrepancies found within this PI to the Quality Engineer.

3.2 Implementation

The following affected departments must be trained to the requirements of this document.

- Quality
- Engineering
- Manufacturing Engineering

Incoming, in-process, and final inspection personnel are responsible for compliance to this document, with the support of Engineering and Quality.

4.0 DEFINITIONS

4.1 General Definitions

Table 1 – General Definitions

Aesthetic	Data Description
Aesthetic	The appearance of the part's surface, over and above functionality, that requires acceptance or rejection based on visual inspection
Back/Rear Surface	The inside of the lens closest to the light source
Classification	A list identifying the physical location where a part is installed in or on the aircraft
Clear Coat	A hard coating applied to protect a plated part surface
Clear Lens	A smooth lens that does not significantly alter the color or reduce the light output of a light source
Cover Lens	A clear or diffused glass or plastic cover designed to protect other components
Diffused	A texture applied, usually to the outside surface, to scatter and soften light and hide components
Diffused Lens	A lens that contains a colorant or pigment (usually white), in or printed on the plastic, designed to provide a uniform background on which the lettering or design is applied
Double or Multiple Pass	One or more color pigments applied over the same area to darken the lettering or provide contrast
FAR25.812	Code of Federal Regulations for emergency lighting on aircraft with 10 or more passengers. This controls height-to-width ratio of lettering, contract ratios between lettering, and the background and consistency of the background contract when illuminated
Front Surface	The outside facing surface of the lens when assembled
Machine Finish	Final surface condition, as specified on the drawing
MIL-PRF-1380B	Military Standard covering the quality and aesthetic acceptability for non-diffused optical lenses
Optic	A part designed to reflect, focus, and/or direct light
Pad Printed	A process whereby a porous pad cut in the shape of letters or designs is dipped in a pigment such as paint or ink and pressed against the part
Polishing Grain	Visual indication of the direction and/or grit of metal finishing
Reflectivity	Quality of an image shown in or cast back by a material surface
Single Pass	A single-color pigment applied to the front or back surface
Stencil Printed	A process whereby a pigment such as paint or ink is applied over a thin mask with letters or designs cut into it
Texture	Rough or raised area on the surface the part

4.2 Condition Definitions and Applicability

Table 2 - Condition Definitions and Applicability definitions

Aesthetic	Data	Applicability
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	Description	Metal - Unfinished	Metal - Finished	Plastic – Not Lenses	Plastic – Not Lenses	Glass - Lenses	Printed Surfaces	Fiberglass
Bleed	A condition where one color blends with another color and/or extends out of its defined area						X	
Blister	Bulge in the coating caused by a lack of adhesion between the coating and parent material. In glass components: any bubble >0.06" in diameter		X			X		X
Blush	Area where the finish is dull under ambient and/or reflected light			X	X			
Boning Effect	An accumulation of plating at the extremes of the part		X					
Bubble	Spherical air/gas pocket in either coating or parent material In glass components: ≤0.06", can also be referred to as a 'seed' In mirrors: 'speckle-like' feature in the mirror metallization		X	X	X	X		
Burn	Thermal decomposition usually accompanied by discoloration			X	X			X
Burr	Raised edge on the surface or edge of the part	X	X					
Chip	Loss of adhesion on the edge of the part resulting in the base material being exposed. In glass/plastic components: material void along an edge or surface	X			X	X	X	
Contaminant	Material or substance that is not intended to be left on the product; such as, oil, grease, or adhesive from a previous process	X	X	X	X		X	
Cord	Apparent line or thread within a glass matrix					X		
Crack	Visible break or discontinuity (may or may not include separation) in the surface or interior of the material	X	X	X	X			X
Craze	Fine cracks at, or underneath, the surface of the laminate							X
Crizzle	A series of fine cracks/fractures in a glass matrix or on surface					X		
Delamination	Separation of the layers of material at the edge or internally in laminate							X
Dent	A smooth depression in the surface of the part	X	X		X			
Discoloration	A change or inconsistency in color, either from the intended color of the part or across the visible surface of a single part. For plated parts: appearance may additionally be tarnished, faded, foggy, dull, blurry and/or flat		X	X	X			
Dry Spot	Area of incomplete surface film where the reinforcement (glass weave) has not been wetted with resin							X
Fine Glass	Very fine pieces of glass that are stuck to the surface of the main glass product: they appear as small, pinpoint, raised bumps on the surface.					X		
Fish Eye	Small round rings where the material is thinner in the middle and thicker on the perimeter; can appear globular			X	X			X
Flaking	Loss of adhesion on the part surface resulting in the base material being exposed		X				X	
Flash	Excess parent material on the surface or edge of the part			X	X			
Flow Mark	In mirrors: a visible spot on the surface or in the metallization where the spot and the material around the spot appear haloed or comet shaped			X				
FOD	Foreign material, not part of the original piece, that is attached to surface or under the coating of the part	X	X	X	X	X	X	X



Aesthetic	Data Description	Applicability						
		Metal - Unfinished	Metal - Finished	Plastic – Not Lenses	Plastic – Not Lenses	Glass - Lenses	Printed Surfaces	Fiberglass
Gloss	An area of excessive or deficient shine due to coating quality or thickness		X					
Gouge	A measurable sharp detent in the surface of the part	X	X					
Grain	Intentional variation in color or shade to provide a decorative finish similar to the grain in wood. Grain direction should be uniform and may be specified on the drawing		X					
Haze	Cloudiness on an otherwise smooth shiny surface; On metals: may indicate corrosion. On plastics: material goes from an ordered appearance to a random pattern of marks resulting in cloudiness	X	X	X	X			
Inclusion	A solid, liquid, or gaseous material embedded into the matrix of the part. An inclusion is 'fractured' if it exhibits small cracks protruding into the matrix	X	X	X	X	X		
Incomplete Fill	Area of molded part where material is missing; In fiberglass: where resin has not filled out			X				X
Knot	Transparent area of incompletely melted glass in matrix. The knot is 'fractured' if it exhibits small cracks protruding into the matrix					X		
Lap	An aesthetically visible line on the surface where glass has folded over on itself					X		
Lüder Lines	A group of lines – usually parallel – that appear on the surface of a metal (Al)		X					
Machine Mark	Surface imperfection that is assignable to a specific machine process	X	X					
Non-Uniform	Area on the part that has more or less coating/diffusion/paint/plating than rest of surface or is non-uniform in color or appearance	X	X		X	X	X	X
Orange Peel	Rough appearance, similar to that of an orange peel, on a plated/finished surface		X					
Pinhole	Small circular void in the surface of the part, bottom is not visible	X	X					X
Pit	A measurable edged depression in the surface of the part, bottom is visible	X	X	X	X	X		X
Porosity	Area dense with pits, pinholes and/or voids	X	X					X
Protrusion	Bump or significant ridge on the surface of the part	X	X	X	X			X
Registration	The alignment between a printed layer stack-up; can be two different colors, two passes of the same color, or part features relative to each other						X	
Resin Pocket	An apparent accumulation of excess resin in a small localized area within the laminate							X
Rounding Off	Softening on the edges or corners of the part or engraving		X					
Run	Excessive coating that appears as a drop or line – sometimes referred to as a sag		X				X	
Sawtooth	A ragged appearance on the edge of the pigment						X	
Scale	Reddish-brown deposit on the surface of glass					X		
Scratch, Hairline	A visible line of measurable length on the part or in a mirror that cannot be felt using the pin test; coated parts – no exposed base/parent material	X	X	X	X	X	X	X

Aesthetic	Data Description	Applicability						
		Metal - Unfinished	Metal - Finished	Plastic – Not Lenses	Plastic – Not Lenses	Glass - Lenses	Printed Surfaces	Fiberglass
Scratch, Major	A visible line of measurable length and width on the part; coated parts – no exposed base/parent material	X	X	X	X	X	X	X
Scratch, Minor	A visible line of measurable length on the part; coated parts – no exposed base/parent material	X	X	X	X	X	X	X
Scuff	Variation in glossiness on the metal, plastic, or coated surface	X	X	X	X			
Shear Mark	Linear surface irregularity on glass surface					X		
Sink Mark	Soft depression, round or linear, in the molded surface; where material has retracted from the mold			X				X
Splay	Splash-like appearance or pattern on the surface of a molded part			X	X			
Streak	Line in the pigment; in mirrors: a line in the mirror metallization						X	
V-Lap	Interior void shaped like a “v” or smile			X		X		
Void	Area where masking/painting/coating/plating and base material are missing or light can be seen		X	X	X		X	
Wash	Area where reinforcement material has shifted resulting in resin-rich areas							X
Water Mark	Variation in ink color and laydown giving a wave affect to color opacity						X	
Waviness	Non-dimensional linear grooving or circular rippling on the surface of a molded part, sometimes called Flow Lines				X			
Weld Line	An aesthetically visible line between two or more melt flow fronts–also called Knit Line			X	X			
Worm Hole	Elongated air bubble in the coating or parent material, may or may not break the surface of the part				X			
Wrinkle	An unevenness or ripple appearance in the surface; In fiberglass: has the appearance of a wave molded into one or more plies of fabric/reinforcement material		X			X		X

5.0 PART CLASSIFICATION AND SUB-CLASS, PRECEDENCE

5.1 This classification system identifies different levels of cosmetic importance based on function, relationship to the user's field of view and viewing frequency.

5.1.1 Inspectors may use this system to classify surfaces that do not have requirements defined on the part drawing (see 5.4).

5.1.2 If an aesthetic specification on the Engineering drawing (e.g., contained notes, callouts, etc.) is in conflict with the content of this work instruction, the requirements of the Engineering drawing shall take precedence over the requirements of this document.

5.1.3 If the aesthetic criteria standard for a specific customer is known and a copy of the standard is held by Collins Aerospace and the criteria of the customer standard is different than the criteria herein, the requirements of the customer standard shall take precedence over the requirements of this document.

5.2 Part Classification:

This assignment is based on the user (customer) of the sight and angle of view in both sitting and standing position.

Table 3 – Part Classification:

Classification	Description
Class I	Parts are in direct view and 24" or less above or below the user line of sight either when sitting or standing. These surfaces are highly visible and aesthetically appealing when viewed by the passenger or customer during the operation of the aircraft.
Class II	Parts are more than 24" above or below the user line of sight, are normally viewed at an angle that precludes seeing any surface conditions or are decorative parts inside drawers or cabinets. These surfaces can be aesthetically appealing when viewed by the passenger or customer during the operation of the aircraft.
Class III	Part surfaces are not visible by the passenger or customer when installed or are not installed in the passenger area of the plane or are visible only during the installation or removal of the parts.

5.3 Part Sub-Classification:

This assignment is based on how frequently the part is viewed by the user:

Table 4 – Part Sub-Classification:

Sub-Classification	Description
Sub-Class A	Parts are frequently viewed by the user
Sub-Class B	Parts are infrequently viewed by the user
Sub-Class C	Parts are never viewed by the user

5.4 General Classification Assignments:

This guideline may be used when part classifications have not been identified on the drawing.

Table 5 – Part Sub-Classification:

Sub-Classification	Description
Class IA	plated and anodized (black and clear) outlets, and all parts with high value plating (gold, silver, etcetera) and high gloss painted parts
Class IB	plated spotlights, reading lights, air gaspers and ordinance lights, clear and diffused lenses and optics, exit light lenses and matte finish painted parts
Class IIA	plated accent and guidance lights, unfinished aluminum reading lights, air gaspers and outlets that may be plated by the customer
Class IIB	passenger storage compartments, stairway and galley
Class IIIB	baggage compartment or cockpit lights and panels separate from the passenger compartment; exterior metal parts primer coated for painting
Class IIIC	power supplies, lighting and outlet housings not visible after installation and areas such as holes, racking points, and internal threads.

5.5 Classification of Mirrors:

The classification of mirrors is denoted on the part drawing and is a letter assignment.

6.0 TIME AND DISTANCE INSPECTION METHOD

6.1 Time and Distance (T&D) Inspection Method

The Time and Distance (T&D) Inspection Method shall be used to determine the cosmetic acceptability of parts, by classification, per the table below. All Incoming and Final Inspectors will be trained in the T&D method of inspection for each section of this work instruction.

Table 6 – Time/Distance Inspection Method

Classification	Inspection Distance	Inspection Time	Inspection Orientation
Class IA	12"	8 seconds	Line of sight and installed
Class IB	18"	8 seconds	Line of sight and installed
Class IIA	24"	4 seconds	Line of sight and installed
Class IIB	Arm Length	4 seconds	Line of sight and installed
Class IIIB	Arm Length	4 seconds	Installed only
Class IIIC	Arm Length	4 seconds	Installed only

6.2 Inspection Times & Distances

The Inspection Times and Distances are based on a viewing area of 6 inches by 6 inches. For surfaces greater than 6 inches by 6 inches like inspection times will be used for each additional 6 by 6 area to be inspected. Spherical surfaces, such as reading light ball covers, will be rotated approximately 90° and viewed for the specified time and distance until the entire surface has been inspected.

6.3 Flaws:

Flaws located in the same areas on the part may become more easily noticed when inspected a number of times or on many parts. If the flaw was deemed acceptable when inspection began, it must be deemed acceptable throughout the inspection process.

7.0 WORKMANSHIP

Conditions indicative of poor workmanship may be deemed unacceptable, thereby resulting in part rejection. This assessment may be made regardless of the classification assignment and associated acceptance criteria, as defined in the detailed Appendices.

APPENDIX A - METAL PARTS - UNFINISHED

Table A.1: Acceptance Criteria For Exterior Metal Parts –Primer Coated for Painting				
Applicability – These inspection criteria apply to all non-fatigue critical cast, formed or machined metal parts used on aircraft exteriors and are primer coated for painting ^[1] . These standards are to be used by Suppliers, at Collins Aerospace PHX Incoming Inspection for applicable detail parts, In Process by Certified Operators, and Final Inspection of finished assemblies.				
Condition	I-A/B	II-A/B	III-B	III-C
Burr	N/A		None	N/A
Contaminant	N/A		Allowed ≤5% of critical surface area and so long as paint integrity is not impacted; Otherwise, none allowed, must be removed.	N/A
Crack	N/A		None	N/A
Dent	N/A		4 ≤0.08" dia. None on load bearing area Must be >the maximum dimension to any edge	N/A
FOD	N/A		None	N/A
Gouge	N/A		1 ≤1/8" x 0.06" None on load bearing area Must be >the maximum dimension to any edge	N/A
Inclusion	N/A		None	N/A
Machine Mark	N/A		4 ≤0.25" dia.	N/A
Non-Uniform	N/A		4 ≤0.25" dia.	N/A
Pinhole ^[c]	N/A		2 ≤0.03" dia. per 2"x2" area ^[3] Must be separated by a distance ≥3X the diameter of the largest pinhole	N/A
Pit	N/A		1 ≤0.03" dia. per 1" sq. ^[2]	N/A
Porosity ^[c]	N/A		No evidence of localized porosity allowed	N/A
Protrusion	N/A		1 ≤0.03" dia. per 1" sq. ^[2]	N/A
Scratch, Minor	N/A		1 ≤0.25" long ≤4 if part of a Machine Mark	N/A
Scratch, Major	N/A		None	N/A
Scuff	N/A		4 ≤0.25" Dia.	N/A

^[1] acceptance criteria of castings for visual discontinuity based on AMS2175A: Classification and Inspection of Castings: Class 3, Grade C or better.

^[2] per AMS2175A, section 3.4.1.4.2

^[3] per AMS2175A, Table 4, note [2]

^[c] condition applies to cast parts only

**Table A.2: Acceptance Criteria For Interior Metal Parts –
Unfinished or to be Plated/Finished**

Applicability – These inspection criteria apply to all fabricated metal used parts used as-is or will be plated/finished and installed in/on the aircraft interior. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition	I-A	I-B	II-A	II-B	III-B	III-C
Burr	None	None	None	None	None	**
Contaminant	None, must be removed					
Crack	None	None	None	None	None	**
Dent*	None	None	1 ≤0.04" dia.	1 ≤0.04" dia.	2 ≤0.08" dia.	**
Gouge*	None	None	None	None	1 ≤0.12"x .06"	**
Haze	None	1 ≤1/8" dia.	1 ≤0.25" dia.	2 ≤0.25" dia.	4 ≤0.25" dia.	**
Inclusion	None	None	None	None	None	**
Machine Mark	None	None	None	2 <0.25" dia.	4 ≤0.25" dia.	**
Pinhole	None	None	None	None	2 ≤0.03" dia. per 2"x2" area	**
Pit	None	None	None	None	1 ≤0.03" dia. per 1" sq.	**
Porosity	None	None	None	None	** with no evidence of localized porosity	
Protrusion	None	None	None	None	1 ≤0.03" dia. per 1" sq.	**
Scratch, Hairline	None	1 ≤0.25" long	2 ≤0.25" long	2 ≤0.25" long	2 ≤0.25" long	**
Scratch, Minor	None	None	None	1 <0.25" long ≤2 if part of Machine Mark	1 <0.25" long ≤4 if part of a Machine Mark	**
Scratch, Major*	None	None	None	None	1 ≤0.25" long	**
Scuff	None	1 ≤1/8" dia.	1 ≤0.25" dia.	2 ≤0.25" dia.	4 ≤0.25" dia.	**

* None allowed on a load bearing surface

** Allowed as long as structural integrity is not affected; poor workmanship shall not be evident

APPENDIX B - METAL PARTS – FINISHED

Table B.3: Acceptance Criteria For Interior/Exterior Plated, Finished, and/or Coated Parts

Applicability – These inspection criteria apply to all interior/exterior finished metal parts, excluding sheet metal (see Table B.3). These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition	CLASS I-A/I-B	CLASS II-A/II-B	CLASS III-B/III-C
Blisters ^[c]	None	None	None
Boning Effect	None	None	None
Burr	None	None	None
Chip ^[c]	None	1 ≤0.01 Wide x ≤0.25 Long	**
Contaminant	None allowed, must be removed	None allowed, must be removed	**
Crack	None	None	None
Dent	None	None	**No exposed base metal None allowed in load bearing location
Discoloration	None	≤5% of total surface Area	**
Flaking ^[c]	None	1 ≤0.01" Wide x ≤0.25 Long	**
FOD	None	1 ≤0.02" dia. per 3"x3" area	**
Gloss	None	≤ 5% of total surface Area	**
Gouge	None	1 ≤0.02" dia. per 6"x6" area, no exposed base material ^[1]	** No exposed base metal None allowed in load bearing location
Grain	Must be uniform	Must be uniform	**
Haze	None	1 ≤0.25" dia.	**
Inclusion	None	1 ≤0.02" dia. per 3"x3" area	**
Machine Mark	None	1 ≤0.25" dia. per 6"x6" area, no exposed base material ^[1]	** No exposed base metal
Non-Uniform	Slight variation from part to part is allowed if mounted ≥20" apart.	Slight variation from part to part is allowed.	**
Pinhole	None	1 ≤0.02" dia. per 3"x3" area no exposed base material ^[1]	** No exposed base material ^[1]
Pit	None	1 ≤0.02" dia. per 3"x3" area, no exposed base material ^[1]	** No exposed base material ^[1]
Porosity	None	None	None
Protrusion	None	None	None
Rounding Off	None	None	**
Run ^[c]	None	None	**
Scratch, Hairline	≤1 ^[2] in any 6"x 6" area	≤2 ^[2] in any 6"x 6" area	**

Table B.3: Acceptance Criteria For Interior/Exterior Plated, Finished, and/or Coated Parts

Applicability – These inspection criteria apply to all interior/exterior finished metal parts, excluding sheet metal (see Table B.3). These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition	CLASS I-A/I-B	CLASS II-A/II-B	CLASS III-B/III-C
Scratch, Minor	None	$\leq 1^{[2]}$ in any 6"x 6" area	$\leq 2^{[2]}$ in any 6" x 6" area
Scratch, Major	None	None	None
Scuff	None	1 in any 6"x 6" area	**
Void	None	None	**
Wrinkle	None	$\leq 5\%$ of total surface Area	**

[c] Discontinuity applies to coated parts only

[1] 'Base material' on a coated part is the plating finish; 'Base material' on a plated part is the base metal

[2] Total length of scratch not to exceed 0.25" or 50% of the smallest dimension of the part, whatever is smaller

** Allowed as long as structural integrity is not affected; poor workmanship shall not be evident

Table B.2: Acceptance Criteria For Interior Aluminum Clad, Finished Skins

Applicability – These inspection criteria apply to all exterior finished parts. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition*	TYPE I (Matte/Semi-Matte)	TYPE II (Reflective/Bright)
Blister	None	None
Burr	None visible @2 ft inspection distance	None visible @2 ft inspection distance
Crack	None	None
Dent	None visible @2 ft inspection distance	None visible @2 ft inspection distance
Discoloration and/or Non-uniformity	None visible @6 ft inspection distance	None visible @3 ft inspection distance
Lüder Lines	None	None
Orange Peel	None	None
Pit	None	None
Polishing Grain	Some visible grain allowed @<2 ft inspection distance	Some visible grain allowed @<2 ft inspection distance
Reflectivity	N/A	See requirements in Note 1 below
Scratch, Hairline or Minor	None visible @2 ft inspection distance	None visible @2 ft inspection distance
Void	None	None

* Any condition indicative of poor workmanship may be grounds for rejection

NOTE 1:

BA Part Numbers (per BAPS 136-120): The reflectivity of the Type II surface shall be considered acceptable when the definition of the reflected image allows the operator to read the words in the tag below in the reflection from the skin; and following the method herein.

- The inspector shall hold the tag shown here such that it is located one (1) foot away from a curved skin or two (2) feet away from a flat skin.
- The tag shall be parallel to the polished surface as if it were a mirror.
- If the tag here is not used, an equivalent tag must be created using:
 - Helvetica, Bold, 24 Point font
 - Black letters on a white background



Embraer Part Numbers: The reflectivity of the polished surface shall be considered acceptable when the definition of the reflected image allows the inspector to read the words off the skin, following the distance

- Two Feet (24 in) away from a flat skin holding the tag parallel to the polished surface as if it were a mirror.
- Letters shall be black and background shall be white color, Arial font, point 26 size. This page can be printed and used as tag.



Table B.3: Acceptance Criteria For Fabricated Sheet Metal Parts

Applicability – These inspection criteria apply to all fabricated sheet metal parts with protective finish to prevent corrosion and used on aircraft interiors or exteriors. These standards are to be used by Suppliers, at Collins Aerospace PHX Incoming Inspection for applicable detail parts, In Process by Certified Operators, and Final Inspection of finished assemblies.

Condition*	I-A/B	II-A/B	III-B	III-C
Discoloration		N/A		No drips. No wipe smears covering 50% of the smallest dimension. No multi-colored signatures. Coating integrity must appear nominal and fully intact. Affected area may not exceed 5% of total surface area. Up to 20% piece to piece variation allowed
FOD		N/A		None allowed
Gouge		N/A		≤1 ≤3/16" in length, must be coated
Machine Marks		N/A		No unexpected machine marks, e.g., unexpected punch/clamping/machining artifacts with dimension, stepping on a linear feature, jagged or saw-tooth edges. Superficial swirl marks are acceptable.
Scratch, Hairline		N/A		Allowed so long as coating integrity is intact.
Scratch, Minor		N/A		None allowed
Scratch, Major		N/A		None allowed
Void (in Coating)		N/A		None allowed

* Any condition, whether listed in this table or not, that is indicative of poor workmanship may be grounds for rejection

APPENDIX C – PLASTIC PARTS – NOT USED AS LENSES

Table C.1: Acceptance Criteria For Interior/Exterior Plastic Parts – Not Lenses

Applicability – These inspection criteria apply to all molded, cast, formed, and fabricated plastic parts not used as lenses. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition	I-A	I-B	II-A	II-B	III-B	III-C
Blush*	None	None	2 ≤0.02" dia.	2 ≤0.125" dia.	2 ≤0.25" dia.	**
Bubble	None	None	2 ≤0.02" dia.	2 ≤0.03" dia.	4 ≤0.05" dia.	**
Burn*	None	None	2 ≤0.02" dia.	2 ≤0.125" dia.	2 ≤0.25" dia.	**
Contaminant	None, must be removed					
Crack	None	None	None	None	None	None
Discoloration*	None	1 ≤0.02" dia.	2 ≤0.125" dia.	2 ≤0.25" dia.	4 ≤0.25" dia.	**
Flash	None	None	2 ≤0.02" x 0.250" long	2 ≤0.02" x 0.5" long	**	**
FOD*	None	None	None	None	None	**
Haze*	None	None	2 ≤0.02" dia.	2 ≤0.125" dia.	2 ≤0.25" dia.	**
Inclusion*	None	1 ≤0.02" dia.	2 ≤0.02" dia.	2 ≤0.03" dia.	4 ≤0.05" dia.	**
Pit*	None	1 ≤0.02" dia.	2 ≤0.02" dia.	2 ≤0.03" dia.	4 ≤0.05" dia.	**
Protrusion*	None	1 ≤0.02" dia.	2 ≤0.02" dia.	2 ≤0.03" dia.	4 ≤0.05" dia.	**
Scratch, Hairline*	None	None	≤1 ^[1]	≤2 ^[1]	≤4 ^[1]	**
Scratch, Minor*	None	None	1 ≤0.25" long	2 ≤0.25" long	4 ≤0.25" long	**
Scratch, Major*	None	None	None	None	None	**
Scuff*	None	None	1 ≤0.125" dia.	2 ≤0.125" dia.	2 ≤0.25" dia.	**
Sink Mark*	None	1 ≤0.02" dia.	1 ≤0.02" dia.	2 ≤0.03" dia.	4 ≤0.05" dia.	**
Splay	None	None	None	None	None	None
Weld Line*	None	None	2 ≤0.02" x 0.25" long	2 ≤0.02" x 0.5" long	**	**

^[1] Total length of scratch not to exceed 50% of the smallest dimension of the part or part diameter

* Allowed on non-critical/non-visible surfaces; critical surfaces must follow criteria in table

** Allowed as long as structural integrity is not affected; poor workmanship shall not be evident

Table C.2: Acceptance Criteria For Interior Plastic Parts – Mirrors

Applicability – These inspection criteria apply to all fabricated polycarbonate used for mirrors. These standards are to be used by Suppliers during mapping, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition	Grade B Critical Face (per ft ²)	Grade C Non-Critical Face (per linear ft X Grade C width)	Grade E Edge (per linear ft)
Surface Condition			
Chip(dig) or Pit ^[*]			
Reflected ^[1]	≤1 ≤0.01" ^[2]	≤1 ≤0.02"	≤2 ≤0.02"
Non-reflected ^[1]	N/A	N/A	≤5 ≤0.03"
Contaminant ^[*]	None Allowed ^[3] , must be removed		
FOD ^[*]	None	None	≤5 <0.03"
Scratch ^[4] – Reflected ^[*]	None	None	≤3 ≤1/8" long surface to edge (per piece)
Void in Finish ^[5] ^[*]	None Allowed		
Internal Condition			
Black Specks ^[*]	None	≤1 <0.01" ^[2] (per piece)	≤3 ≤1/16" max. dimension non-critical edge only ^[6] ^[7]
Bubble ^[8] ^[*]	Allowed <0.02" ≤1 0.02"-0.03"	Allowed <0.02" ≤2 0.02"-0.03"	
FOD/Inclusion – not black ^[*]	≤1 ≤0.02" (per piece)	≤1 0.03" (per piece)	
Streak ^[*]	Allowed in one (1) ft ² area. Must be dull and undefined in width. Cannot be viewable at installed angle.		
Metallization ^[*] micro-cracks	None	Allowed in one area and not viewable at installed angle	
Metallization ^[*] hairline scratch/lap	≤2 ≤0.5" (per piece) Not viewable at installed angle	≤2 ≤1" (per piece) Not viewable at installed angle	
Void in Finish ^[5] ^[*]	None Allowed		
Flow Mark ^[*] (comet/halo shape)	None	≤2 ≤1/16" (per piece)	
Clustering ^[*]	No more than 2 of the above conditions may exist in a 1" circle (excluding edge conditions)		

[1] reflected: condition can be seen on surface and in metallization non-reflected: condition is not visible on metallization

[2] maximum dimension of surface condition measured

[3] adhesive residue from protective film excluded

[4] cannot be felt with pin gauge or fingernail

[5] loss of metallization in face (internal) or loss of ink on edge (surface) that causes light bleed

[6] measured through top surface of mirror

[7] non-critical edge is an edge not in direct line of site of user approach

[8] bubble: "speckle-like" condition that exists naturally in the mirror metallization; bubbles smaller than 0.02" in diameter cannot be reliably measured or counted

[*] After inspection of the mirror surface horizontally, place the mirror in a vertical position using the same acceptance criteria and complete the inspection.



Table C.3: Acceptance Criteria For Plastic Parts – Vacuum Metalized Reflectors

Applicability – These inspection criteria apply to all molded, cast, formed and fabricated plastic parts that are vacuum metalized by the part supplier or vacuum metalize supplier. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition	I-A	I-B	II-A	II-B	III-B	III-C
Blush*	None	None	2 ≤0.02" dia.	2 ≤0.125" dia.	2 ≤0.25" dia.	**
Contaminant	None allowed, must be removed					
Discoloration*	None	None	≤ 5% of part surface area	≤ 5% of part surface area	**	**
Fish Eyes*	None	None	≤2 ≤0.05" dia.	≤4 ≤0.05" dia.	**	**
Flash	None	None	None	None	None	**
FOD	None	None	None	None	None	**
Haze*	None	None	None	None	None	**
Protrusions*	None	1 ≤0.02" dia.	2 ≤0.02" dia.	2 ≤0.03" dia.	4 ≤0.05" dia.	**
Scratch, Hairline*	None	None	1 ≤0.5" long	2 ≤0.5" long	4 ≤0.5" long	**
Scratch, Minor*	None	None	1 ≤0.5" long	2 ≤0.5" long	4 ≤0.5" long	**
Scratch, Major	None	None	None	None	None	**
Sink Marks*	None	1 ≤0.02" dia.	2 ≤0.02" dia.	2 ≤0.03" dia.	4 ≤0.05" dia.	**
Void	None	None	None	None	None	**

* Allowed on non-critical/non-visible surfaces; critical surfaces must follow criteria in table

** Allowed as long as structural integrity is not affected; poor workmanship shall not be evident

Table C.4: Acceptance Criteria For Exterior Plastic Parts – Vacuum Metalized Optics

Applicability – These inspection criteria apply to all molded, formed and fabricated plastic parts used as an optic that are vacuum metalized by the part supplier or vacuum metalize supplier. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition	Reflective Surface	Non-Reflective Surface
Blush	None	N/A
Contaminant	None, must be removed	None, must be removed
Discoloration	None	N/A
Fish Eyes	None	N/A
Flash	None	Allowed ^[1] , but cannot break off to contaminate part
FOD	None	No loose material
Pit	None	None*
Rainbow	None	N/A
Scratch, Fine or Hairline	None	None*
Void	None	None*
Weld Line	None	None*

^[1] must not affect form, fit, or function of the part

* Allowed on non-critical/non-visible surfaces; critical surfaces must follow criteria in table

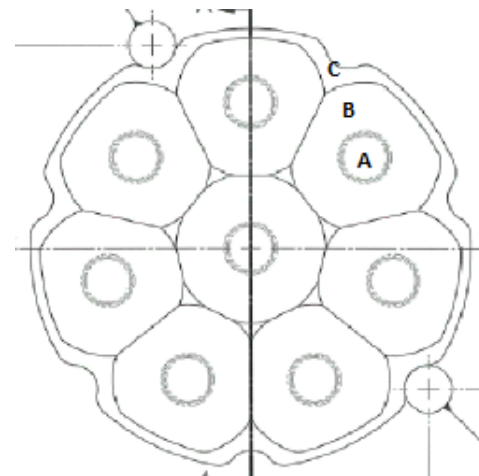
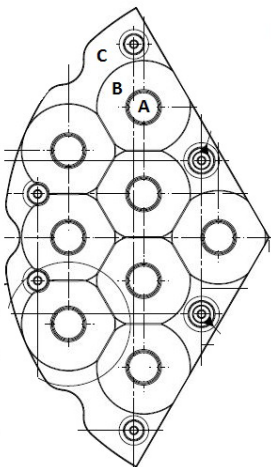
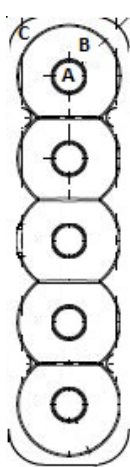
Table C.5: Acceptance Criteria For Exterior Plastic Parts – Clear Optics

Applicability – These inspection criteria apply to all molded, formed and fabricated plastic parts used as an optic in an exterior light. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies. Refer to surface classification drawing below.

Condition	Region A	Region B	Region C
Bubble	$\leq 1 < 1/12$ dia. of A	$\leq 2 < 1/20$ distance of A to C	Allowed ^[2]
Burn	≤ 2	≤ 5	Allowed ^[2]
Chip	None	None	None
Crack	None	None	None
Fish Eye	≤ 2	Allowed ^[2]	Allowed ^[2]
Inclusion - fractured	None	None	None
Inclusion – non-fractured	$\leq 1 \leq 0.03$ " dia.	$\leq 5 \leq 0.02$ " dia. $\leq 1 \leq 0.03$ " dia.	Allowed ^[2]
Incomplete Fill	None	None	None
Scratch - non-hairline	None	Allowed ^{[1] [2]}	Allowed ^[2]
V-Lap	None	None	None
Weld Line	Allowed ^{[1] [2]}	Allowed ^{[1] [2]}	Allowed ^[2]

^[1] total length of condition not to exceed 50% of the smallest dimension of the affected region

^[2] must not affect form, fit, or function of the part



APPENDIX D – PLASTIC PARTS - LENSES

Table D.1: Acceptance Criteria For Plastic Parts – Exterior Lenses and Covers Applicability – These inspection criteria apply to all molded, formed and fabricated plastic used as exterior cover lenses and optics. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.		
Condition	Size	Number of Occurrences
Blush	0.04"-0.08" dia. 0.08"-0.25" dia.	≤4 in a 3" dia. Area ≤1 in a 3" dia. Area
Bubble*	0.02"-0.04" dia. 0.04"-0.05" dia. > 0.05"	≤4 in a 3" dia. Area ≤2 in a 3" dia. Area None
Contaminant	None allowed, must be removed	
Crack	Any Size	None
Fish Eye (in coating)*	0.02"-0.04" dia. 0.04"-0.05" dia. > 0.05" dia.	≤4 in a 3" dia. Area ≤2 in a 3" dia. Area None
FOD*	Any Size	None
Inclusion*	0.02"-0.04" largest dim. 0.04"-0.05" largest dim. > 0.05"	≤4 in a 3" dia. Area ≤2 in a 3" dia. Area None
Non-Uniform	Non-uniformity that results in significant shadows when the light is shown on a white surface is grounds for rejection	
Scratch, Hairline*	0.5"-1.5" Long 1.5"-3.0" Long	≤4 in a 3" dia. Area ≤1 in a 3" dia. Area
Scratch, Minor	0.125"-0.25" Long 0.25"-0.5" Long	≤4 in a 3" dia. Area ≤1 in a 3" dia. Area
Voids (in coating)	≤0.02" >0.02"	≤2 in a 3" dia. Area None
Waviness	Waviness or distortion that results in significant shadows when the light is shown on a white surface is grounds for rejection	
Worm Hole	Any Size	None

* Allowed on non-visible surfaces; critical surfaces must follow criteria in table

Table D.2: Acceptance Criteria For Plastic Parts – Interior Clear and Diffused Lenses

Applicability – These inspection criteria apply to all molded, formed and fabricated plastic used as lenses. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition^{[3][4]}	I-A	I-B	II-A	II-B	III-B,C
Blush ^[2]	None	1 ≤ 0.25" dia. per 2" dia.	1 ≤ 0.25" dia. per 2" dia.	2 ≤ 0.25" dia. per 2" dia.	N/A
Bubble ^[2]	None	1 ≤ 0.01" dia. per 2" dia.	1 ≤ 0.01" dia. per 2" dia.	3 ≤ 0.02" dia.	N/A
Burn	None	None	None	None	N/A
Contaminant	None allowed, must be removed				
Crack	None	None	None	None	N/A
Dent	None	None	None	None	N/A
Discoloration	None	None	None	None	N/A
Fish Eye ^[2]	None	None	1 per 2" dia.	1 per 2" dia.	N/A
Flash	None	None	None	None	N/A
FOD	None	None	None	None	N/A
Haze	None	1 ≤ 0.125" dia.	1 ≤ 0.25" dia.	2 ≤ 0.25" dia.	N/A
Inclusion ^[2]	None	1 ≤ 0.01" dia. per 2" dia.	1 ≤ 0.01" dia. per 2" dia.	3 ≤ 0.02" dia. per 2" dia.	N/A
Pit ^[2]	None	1 ≤ 0.02 dia. per 2" dia.	1 ≤ 0.02" dia. per 2" dia.	3 ≤ 0.02" dia. per 2" dia.	N/A
Protrusion	None	None	None	2 ≤ 0.02" dia. per 2" dia.	N/A
Scratch, Hairline	None	≤ 2 ^[1]	≤ 2 ^[1]	Any Qty ^[1]	N/A
Scratch, Minor	None	2 ≤ 0.25" long	2 ≤ 0.25" long	4 ≤ 0.25" long	N/A
Scratch, Major	None	None	None	None	N/A
Scuff	None	1 ≤ 0.06" dia.	1 ≤ 0.125" dia.	2 ≤ 0.125" dia.	N/A
Splay	None	None	None	None	N/A
Void	None	None	None	1 ≤ 0.01" dia. per 2" dia.	N/A
Weld Line	None	None	2 ≤ 0.02" x 0.25" long	2 ≤ 0.02" x 0.5" long	N/A

^[1]Total length of scratch not to exceed 50% of the smallest dimension of the lens or lens diameter; ^[2] for lenses <2" diameter, use lens size; ^[3] conditions in molded and extruded plastics <0.01" are not considered a condition per "Cosmetic Specifications of Injection Molded Parts"; The Society of the Plastics Industry; ^[4] conditions of any size that create shadowing when lit may be cause for rejection

APPENDIX E – GLASS PARTS – USED AS LENSES

Table E.1: Acceptance Criteria For Glass Parts – Molded and Finished Exterior Lenses and Covers^[1]

Applicability – These inspection criteria apply to all molded and finished glass used as exterior cover lenses and optics. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition	Size	Number of Occurrences
Bubble	>0.06" 0.031"-0.06" 0.011"-0.03" ≤0.01"	See Blister ≤3 per 1" X 1" area ≤10 in a 1"x 1" area Allowed
Blister	>0.1" 0.061"-0.1"	None allowed ≤3 per item, no clustering
Cord	Measurable width Non-measurable width	Not allowed in critical optical or mechanical area of glassware Allowed so long as light output is not negatively impacted
Chip	≤0.06" max dimension 0.06 – 0.20" max dimension	Allowed so long as no cracks protrude from the chip site Edge: allowed so long as no cracks protrude from the chip site and the condition is not visible in the assembly Rest of part : None allowed
Crizzle	Any size/location	None allowed
Fine Glass	Fine glass is acceptable unless determined to risk physical/optical performance of the glassware	
FOD	Any size/location	None allowed
Inclusion ^[2] – fractured	Any size/location	None allowed
Inclusion ^[2] – non-fractured	≤0.06" >0.06"	≤3 per item None allowed
Knot – fractured	Any size/location	None allowed
Knot – non-fractured	≤0.06" >0.06"	≤3 per item None allowed
Lap	0.5"-1.5" long 1.5"-3.0" long	≤4 in a 3" dia. area so long as light output is not negatively impacted ≤1 in a 3" dia. area so long as light output is not negatively impacted
Non-Uniform	Intended color shall be homogeneous throughout the glassware No stains resolvable at 3ft inspection distance	
Scale	None, must be removed	

*** Table Continued on Next Page ***

Condition	Size	Number of Occurrences
Scratch, based on Scratch Paddle assessment	≤ 60 80 on non-critical surface 80 on critical surface ≥ 120 on any surface	Allowed ≤ 3 per item up to 0.5" long None allowed None allowed
Shear Mark	Rough shear marks, characterized by a raised mark or abraded edges, are grounds for rejection. Shear marks may not be present on areas of the lens that affect light output	
Wrinkle	Waviness or distortion that results in significant shadows when the light is shown on a white surface is grounds for rejection, otherwise acceptable	

^[1] reference SAE AIR5689: Definition and Inspection Criteria for Light Transmitting Glass Covers for Exterior Aircraft Lighting & MIL-C-7989 Class B

^[2] also referred to as a "stone"

APPENDIX F – PRINTED SURFACES

Table F.1: Acceptance Criteria For Printed Surfaces – Stencil/Pad Printing

Applicability – These inspection criteria apply to all molded, formed and fabricated parts - including flat and curved, clear and diffused plastic - with a single or double pass stenciled or pad printed feature on the front or back surface of the part. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.

Condition	I-A	I-B	II-A	II-B	III-B,C
Bleed	None	None	None	*[3]	N/A
Bubble	None	None	2 ≤0.05" dia.	2 ≤0.05" dia.	N/A
Chip	None	None	1 ≤0.02" dia. per 2" dia.	1 ≤0.02" dia. per 2" dia.	N/A
Contaminant	None allowed, must be removed				
Flaking	None	None	None	None	N/A
FOD, including errant ink deposits	None	1 ≤0.01" per 2" dia.	2 ≤0.01" per 2" dia.	3 ≤0.02" per 2" dia.	N/A
Non-Uniform (color)	None	None	None	None	N/A
Registration	≤0.005" [2]	≤0.005" [2]	≤0.01" [2]	≤0.01" [2]	N/A
Run	None	None	1 ≤0.25" long	1 ≤0.25" long	N/A
Sawtooth	None	≤0.01"	≤0.01"	≤0.01"	N/A
Scratch, Hairline	None	≤2 ^[1] in 6"x 6" area	≤2 ^[1] in 6"x 6" area	≤3 ^[1] in 6"x 6" area	N/A
Scratch, Minor	None	None	2 ≤0.25" long	4 ≤0.25" long	N/A
Scratch, Major	None	None	None	None	N/A
Streak	None	None	1 per 2" dia. ^[3] ≤0.02"x 0.03"	1 per 2" dia. ^[3] ≤0.02"x 0.03"	N/A
Void	None	None	**	**	N/A
Watermark	None	1 ≤0.01" in 2" dia. ^[3]	1 ≤0.01" in 2" dia. ^[3]	2 ≤0.01" in 2" dia. ^[3]	N/A

^[1]Total length of scratch not to exceed 50% of the smallest dimension of the lens or lens diameter

^[2]In both vertical and horizontal directions

^[3]Cannot affect the legibility of the letters and/or symbols

*No more than 10% of ink fill-ins of letters and/or symbols

**None visible at viewing distance.

APPENDIX G – FIBERGLASS PARTS – FABRICATED AND FINISHED

Table G.1: Acceptance Criteria For Fiberglass Parts				
Applicability – These inspection criteria apply to all molded, formed and fabricated fiberglass parts that are raw, coated, or finished. These standards are to be used by Suppliers, at Incoming Inspection for detail parts and Final Inspection of finished assemblies.				
Condition	I-A	I-B/II-A Per 3" X 3" area unless otherwise indicated	II-B/III-B Per 3" X 3" area unless otherwise indicated	III-C
Blister	None	$\leq 1 \leq 1/8"$ dia.	$\leq 2 \leq 1/4"$ dia	*
Burn	None	None	None	None
Chip	None	$\leq 1 \leq 1/8"$ dia.	$\leq 2 \leq 1/4"$ dia	*
Crack	None	None	None	None
Craze	None	$\leq 1 \leq 0.5"$ max dim	$\leq 2 \leq 1"$ max dim	*
Delamination	None	None	None	*
Dry-Spot	None	$\leq 1 \leq 3/8"$ max dia.	$\leq 2 \leq 0.5"$ max dia.	*
Fish Eye	None	$\leq 1 \leq 3/8"$ max dia.	$\leq 2 \leq 0.5"$ max dia.	*
FOD	None	$\leq 1 \leq 0.03"$ max dia. per ft ²	$\leq 2 \leq 0.06"$ max dia. per ft ²	*
Incomplete Fill	None	None	None	None
Non-Uniform	None	None	None	None
Pinhole	None	$\leq 0.02"$ dia.	$\leq 0.03"$ dia.	*
Pit	None	$\leq 0.02"$ dia.	$\leq 0.03"$ dia.	*
Porosity	None	≤ 25 pits/pinholes	≤ 50 pits/pinholes	*
Protrusion (pimple)	None	None	$\leq 2 \leq 1/8"$ dia.	*
Resin Pocket	None	$\leq 1 \leq 1/8"$ dia.	$\leq 2 \leq 1/8"$ dia.	*
Scratch, Hairline	*	*	*	*
Scratch, Minor	None	$\leq 1 \leq 1"$ length	$\leq 2 \leq 1"$ length	*
Scratch, Major	None	$\leq 1 \leq 1"$ length, 0.005" width	$\leq 2 \leq 1"$ length, 0.01" width	*
Sink Mark	None	$\leq 1 \leq 3/8"$ max dia.	$\leq 2 \leq 0.5"$ max dia.	*
Wash	None	$\leq 1 \leq 0.75"$ max dim	$\leq 2 \leq 1 1/8"$ max dim	*
Wrinkle	None	Wavelength $\leq 1" \times 1"$ wide, no deeper than 10% of wall thickness	Wavelength $\leq 1" \times 1"$ wide, no deeper than 15% of wall thickness	*

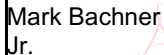
^[1]Reference ASTM D2563-08 (2015) for additional detail

* Allowed as long as structural integrity is not affected; poor workmanship shall not be evident

DOCUMENT REVIEW & APPROVAL FORM

TITLE: AESTHETIC INSPECTION CRITERIA (WI-0813) FOR COMMERCIAL LIGHTING		DOC NO: PI-104.03					
PROJECT: COMMERCIAL LIGHTING INSPECTION CRITERIA		REV: -	DATE: 5/25/2023				
ORIGINATOR/PH #: LEAH WHITAKER		CUSTOMER DUE DATE: 5/30/2023					
NOTES (Description/Reason for release): WI-0813 IS A NEW BERLIN DOCUMENT AND WILL NO LONGER BE VALID ONCE NEW BERLIN CLOSES. PI-104.03 REPLACES WI-0813.							
LIST ALL DOCUMENTS REQUIRING OBSOLESCENCE/UPDATES AS A RESULT OF THIS UPDATE: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; border-bottom: 1px solid black;">Doc/Dwg #</td> <td style="width: 25%; border-bottom: 1px solid black;">Rev</td> <td style="width: 25%; border-bottom: 1px solid black;">Doc/Dwg #</td> <td style="width: 25%; border-bottom: 1px solid black;">Rev</td> </tr> </table>				Doc/Dwg #	Rev	Doc/Dwg #	Rev
Doc/Dwg #	Rev	Doc/Dwg #	Rev				

- Please expedite and return comments to **by COB**

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Name: ERIC TANORI Title: QUALITY ENG MANAGER		Digitally signed by Eric Tanori Date: 2023.05.26 12:35:46 -07'00' 
Name: ANTHONY BARTELS Title: ENGINEERING MANAGER		Digitally signed by Anthony Bartels Date: 2023.05.25 15:00:33 -07'00' 
Name: MARK BACHNER Title: PROJECT ENGINEER		Digitally signed by Mark Bachner Jr. Date: 2023.05.25 14:49:40 -07'00' 
Name: BRYAN CHAMBERS Title: SR. SUPPLY CHAIN MGR	APPROVAL BY E-MAIL. 26 MAY 2023	
Name: KRUPAKAR REDDY Title: IND QUALITY MANAGER	APPROVAL BY E-MAIL. 25 MAY 2023	
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