LOGO IDENTIFICATION AND SPECIFICATIONS

- The requirement for a Logo will be determined and specified by the customer.
- Automotive glass will be marked with the Fastemp DOT number, and the ANSI Z-26.1 'AS' number as specified on the manufacturing print or work ticket.
- Safety Glass used as glazing materials will be marked ANSI Z-97.1-1994, 16 CFR 1201-II as specified on the manufacturing print or work ticket.
- The glass will be permanently marked with the appropriate logo and must be legible and readable by an untrained observer.
- Unless otherwise specified on the manufacturing print or work ticket, the logo will be placed along the base dimension, 1" in from left glass edge and 1" up from bottom glass edge.
- Location tolerance is +/- 3/16" from the designated position.

BOW AND WARP TOLERANCES

- The bow and warp tolerance, and the method to determine compliance, for Fastemp Glass tempered safety glass has been adapted from the ASTM C-1048-90 overall bow and warp tolerance charts and procedures.
- Overall bow and warp tolerance for 1/8" glass with both the length and width dimensions less than 28 inches shall not exceed 1/32" over any 12 inch span using the horizontal test method.
- Overall bow and warp tolerance for 1/8" glass with either the length or width dimension greater than 28 inches shall not exceed 1/16" over any 12" span using the vertical test method.
- Overall bow and warp tolerance for all other glass regardless of length and width dimension shall not exceed 1/16" over any 12 inch span using the vertical test method.
- Refer to Fastemp Glass Operating Procedure DCN: 500-003.DOC for further information regarding testing frequency, methods and tolerance inspection charts.

GLASS THICKNESS TOLERANCES

- The thickness tolerance for Fastemp Glass tempered safety glass is determined from the ASTM C-1036-90 thickness charts.

TRANSPARENT FLAT GLASS THICKNESS TOLERANCES

Traditional Designation	Nominal Thickness	Minimum Thickness	Maximum Thickness
1/8" (3.0mm)	0.12"	0.115"	0.134"
5/32" (4.0mm)	0.16"	0.149"	0.165"
3/16" (5.0mm)	0.19"	0.180"	0.199"
1/4" (6.0mm)	0.23"	0.219"	0.244"

PATTERNED GLASS THICKNESS TOLERANCES

Traditional Designation	Nominal Thickness	Minimum Thickness	Maximum Thickness
1/8" (3.2mm)	0.141	0.110	0.172
5/32" (4.0mm)	0.157	0.142	0.172
3/16" (4.8mm)	0.196	0.172	0.219
1/4" (6.4mm)	0.266	0.234	0.297

DIMENSIONAL INSPECTION STANDARDS

- Dimensional inspection will occur with the part in a horizontal position.
- For dimensions up to 30 inches, calipers will be used to perform dimensional inspection. Accuracy of caliper measurements will be rounded to the next 100th of an inch (0.00").
- For dimensions over 30 inches, tape measures will be used to perform dimensional inspection. Accuracy of tape measure measurements will be to the nearest 1/32".
- When a component part, template or tracing is supplied, dimensional inspection will be comparative to the component part, template or tracing within reason.
- Deviation from these tolerances must be approved by both production and quality managers and documented on the work ticket and prints.
- Unless stated otherwise on the manufacturing print, dimensional tolerances are as shown on the following charts.

LENGTH AND WIDTH DIMENSIONAL TOLERANCES

GLASS WITH SEAMED EDGES OR GLASS WITH SOME, BUT NOT ALL EDGES GROUND				
Glass Thickness	Rectilinear Tolerance		Diagonal Tolerance	
1/8"	+/- 1/32"	(+/- 0.031")	+/- 1/16"	(+/- 0.063")
5/32"	+/- 3/64"	(+/- 0.047")	+/- 1/16"	(+/- 0.063")
Patterned, all	+/- 1/16"	(+/- 0.063")	+/- 3/32"	(+/- 0.094
3/16"	+/- 1/16"	(+/- 0.063")	+/- 3/32"	(+/- 0.094")
1/4"	+/- 1/16"	(+/- 0.063")	+/- 3/32"	(+/- 0.094")

GLASS WITH ALL EDGES GROUND REGARDLESS OF THICKNESS				
Glass	Rectilinear Tolerance		Diagonal Tolerance	
Shapes	+/- 3/64"	(+/- 0.047")	N/A	
Rectangular	+/- 1/32"	(+/- 0.031")	+/- 1/16"	(+/- 0.063")

ANGLE AND RADII DIMENSIONAL TOLERANCES

Angle	+/- 2 degrees, such that the rectilinear dimensions and tolerances are not exceeded.
Radius	Dimension of radius not to exceed above dimensional tolerances for glass thickness and type specified.

HOLE DRILLING DIMENSIONAL TOLERANCES

Hole Diameter	+/- 1/64" (+/- 0.016)"
Distance Between Hole Centers - up to 30" span - over 30", up to 80" span	 +/- 3/64" (+/- 0.047") +/- 5/64" (+/- 0.078")
Location of Holes with respect to distance from a specified glass edge	+/- 3/64" (+/- 0.047")

EDGE INSPECTION STANDARDS

- These standards apply to the edge of the glass.
- The requirement for edgework type, removing sharp corners or nubbing sharp corners will be determined and specified by the customer.
- Unless otherwise specified on the manufacturing print or work ticket, glass with seamed edges will have sharp corners removed.
- A 6" rule, feeler gauges or dimensional comparison standards will be used to perform dimensional edge inspection.
- Deviation from these tolerances must be approved by both production and quality managers and documented on the work ticket and prints.
- Unless stated otherwise on the manufacturing print, edge inspection tolerances are as shown on the following charts.

DEFINITIONS

Chatter	A series of chips, on a ground edge, without discernible size (less than 1/64" in width). May be felt with a finger nail or thumb nail. Not readily visible at 36 inches.
Grind Abrasion	Variation in the texture, coloring and appearance of the machined surface of a ground edge.
Shiner	A section of the ground edge that has been partially skipped by the grinding wheel reveling the natural cut surface of the glass thickness.
Ground Edge Irregularity	Variation of a straight ground edge from being true.
Shell Chip	A small piece of glass broken from the edge of the glass in a clamshell like configuration. Clearly visible from the surface of the glass and having shallow depth into the thickness.
Vee Chip	A small piece of glass broken from the edge of the glass in a 'V' like configuration. Clearly visible from the surface and edge of the glass.
Ground Edge	The surface of the glass thickness is machined to form a slightly curved or semi-rounded edge. The surface exhibits abrasion markings which appears frosted and diffuses reflected light. Also called Pencil Ground (PG) Edge.
Polished Edge	A ground edge that has been further processed to remove abrasion markings and appears reflective or glossy in appearance, similar to the glass surface. Also called Pencil Polished (PP) Edge
Seamed Edge	The edges of the glass thickness are lightly sanded to remove the extreme sharpness of the edges. The natural cut surface of the glass thickness remains however the sharp edges appear to be a thin white line from the sanding operation. Also called SAE #4 (standard) or SAE #3 (heavy) edge
Break Sharp Corner	The edge of the corner of the glass is lightly sanded at approximately 45 degrees.
Nub Sharp Corner	The edge of the corner of the glass is heavily sanded at approximately 45 degrees.
Bevel or Flare	A deviation from a right angle break on the glass edge.

SEAMED GLASS EDGE TOLERANCES

Shell Chip	Chips are not to exceed 3/16" diameter X 20% of the glass thickness. Minimum separation of maximum size defects is 12". (i.e. separation of a 3/32" dia. defect would be 6")
'V' Chip	None permitted.
Grind Abrasion	N/A
Chatter	N/A
Shiners	N/A
Ground Edge Irregularity	N/A
Bevel or Flare	Not to exceed the overall dimensional tolerances.

GROUND GLASS EDGE TOLERANCES

Shell Chip	Chips are not to exceed 1/8" diameter X 20% of the glass thickness. Minimum separation of maximum size defects is 12". (ie. separation of a 1/16" dia defect would be 6")
'V' Chip	None permitted.
Grind Abrasion	Permitted
Chatter	Less than 1/64" in width and not readily visible at 36 inches under normal lighting.
Shiners	Shiners are not to exceed 1/2 the glass thickness in width and are not to exceed 2 times the glass thickness in length.
Ground Edge Irregularity	+/- 0.016" from true straight edge.
Bevel or Flare	N/A

POLISHED GLASS EDGE TOLERANCES

Shell Chip	Chips are not to exceed 1/16" diameter X 20% of the glass thickness. Minimum separation of maximum size defects is 12". (ie. separation of a 1/32" dia defect would be 6")
'V' Chip	None permitted
Grind Abrasion	None permitted
Chatter	Less than 1/64" in width and not readily visible at 36 inches under normal lighting.
Shiners	None Permitted.
Ground Edge Irregularity	+/- 0.016" from true straight edge.
Bevel or Flare	N/A

CORNER TOLERANCES

Remove Sharp Corner	The diagonal dimension of a remove sharp corner shall be 3/64" +/- 1/32".
Nub Sharp Corner	The diagonal dimension of a nubbed corner shall be 1/8" +/- 1/32"

SURFACE INSPECTION STANDARDS

DEFINITIONS

Adhesion Chip	A small projection on the surface of the glass produced by the adhesion of a small glass particle.
Bubbles	Gas inclusions in the glass.
Crush	A small lightly pitted area in the glass surface, having a dull grayish appearance. Follow intensity guidelines for scratches.
Dig	A very short, deep scratch, sometimes without discernible length. Follow intensity guidelines for scratches.
Haze	Surface imperfections that create a smoky appearance to the glass. Faint - Not detectable at 8 inches when inspected in accordance with the inspection methods for surface defects. Light - Not detectable at 36 inches when inspected in accordance with the inspection methods for surface defects.
Rub	An abrasion of the glass surface having appreciable width and a frosted appearance. Follow intensity guidelines for scratches.
Seeds	Minute bubbles less than 1/32" in diameter in the glass
Stones	Opaque foreign matter in the glass which may be refractory, unmelted batch or devitrification.
Strings and Reams	Wavy, transparent lines, appearing as though a string of glass had been incorporated into the sheet. Follow intensity guidelines for scratches.
Scratch	Any marking or scoring of the surface produced during manufacturing or handling which appears as though done by a sharp or rough instrument. Faint - Not detectable at 8 inches when inspected in accordance with the inspection methods for surface defects. Can not be felt with finger nail or thumb nail. Light - Not detectable at 36 inches when inspected in accordance with the inspection methods for surface defects. Can not be felt with finger nail or thumb nail. Medium - Detectable at 36 inches but not at 72 inches when inspected in accordance with the inspection methods for surface defects. Can be felt with finger nail or thumb nail. Heavy - Detectable at 72 inches when inspected in accordance with the inspection methods for surface defects. White in appearance. Can be felt with finger nail or thumb nail.

GLASS GRADING AREAS

- For the purpose of inspection and application of surface defect tolerances, the glass will be divided into the following inspection areas.

Concealed Area	The area of the glass 1/2" from the seamed edge of the glass. Edges that are ground or polished are considered to be in the outer area and not considered concealed.
Outer Area	The area of the glass 1" from the edge of the glass for glass that is up to one square foot in size. The area of the glass 2" from the edge of the glass for glass that is up to two square feet in size. The area of the glass 3" from the edge of the glass for glass that is two square feet or more in size.
Central Area	The area of the glass surrounded by the outer area. This is considered the main viewing area of the glass.

INSPECTION METHOD

- Glass is to be viewed in a well lit area, against a black or dark background (not the lighting source itself). View the glass perpendicular to the surface and look through the glass from a distance of 36" (unless otherwise stated) with the glass 12" to 36" from the viewing background. Inspect the glass for the period of time as shown for the various sizes below.

SURFACE DEFECT TOLERANCES

- Maximum size defects in the central, outer and concealed areas of the glass surface for glass up to one square foot in size. Inspection time is 2 to 3 seconds. Outer area is a 1" perimeter.

	Central	Outer	Concealed
Stones, Bubbles, Knots, Seeds, Pits	1/32" Dia. or 1/64" X 3/64" (w/ distortion)	1/16" Dia. or 1/32" X 1/16" (w/ distortion)	3/32" Dia. or 3/64" X 1/8" (w/ distortion)
Adhesion Chips	1/64" Dia.	1/32" Dia.	1/16" Dia.
Stings and Reams	Faint	Light	Medium
Dig or Crush	Faint	Light	Heavy
Scratches and Rubs			
Faint	Allowable	Allowable	Allowable
Light	Less than 2"	Less than 3"	Allowable
Medium	None permitted	Less than 1"	Allowable
Heavy	None permitted	None permitted	Allowable
Haze	Faint	Faint	Allowable

- These standards apply to the central, outer and concealed areas of the glass surface for glass up to two square feet in size. Inspection time is 3 to 4 seconds. Outer area is a 2" perimeter.

	Central	Outer	Concealed
Stones, Bubbles, Knots, Seeds, Pits	3/64" Dia. or 1/32" X 3/32" (w/ distortion)	3/32" Dia. or 3/64" X 1/8" (w/ distortion)	Allowable
Adhesion Chips	1/32" Dia.	1/16" Dia.	Allowable
Stings and Reams	Faint	Light	Allowable
Dig or Crush	Faint	Light	Allowable
Scratches and Rubs			
Faint	Allowable	Allowable	Allowable
Light	Less than 3"	Less than 4"	Allowable
Medium	None permitted	Less than 2"	Allowable
Heavy	None permitted	None permitted	Allowable
Haze	Faint	Faint	Allowable

- These standards apply to the central, outer and concealed areas of the glass surface for glass two square feet or more in size. Inspection time is 4 to 6 seconds. (add 1 second for each two additional square feet of glass to be inspected over 3 square feet). Outer area is a 3" perimeter.

	Central	Outer	Concealed
Stones, Bubbles, Knots, Seeds, Pits	3/64" Dia. or 1/32" X 3/32" (w/ distortion)	3/32" Dia. or 3/64" X 1/8" (w/ distortion)	Allowable
Adhesion Chips	1/32" Dia.	1/16" Dia.	Allowable
Stings and Reams	Faint	Light	Allowable
Dig or Crush	Faint	Light	Allowable
Scratches and Rubs			
Faint	Allowable	Allowable	Allowable
Light	Less than 5"	Less than 6"	Allowable
Medium	None permitted	Less than 4"	Allowable
Heavy	None permitted	None permitted	Allowable
Haze	Faint	Faint	Allowable

DECORATED GLASS INSPECTION STANDARDS

INSPECTION METHOD

- Glass is to be viewed in a well lit area, against a black or dark background (not the lighting source itself). View the glass perpendicular to the surface and look through the glass from a distance of 36" (unless otherwise stated) with the glass 12" to 36" from the viewing background. Inspect the glass for the period of time as listed in the surface defect tolerance charts.

SILK SCREEN DECORATED TOLERANCES

Excess Ink	Central Area	Outer Area	Concealed Area
1/32" Diameter	1 permitted	2 permitted	Permitted
1/16" Diameter	none permitted	1 permitted	Permitted
1/4" Diameter	none permitted	none permitted	Permitted
Voids, Pinholes, Skips	1/64" diameter pinholes acceptable if not in a concentrated area. Pin holes, voids or skips may be repaired with a non-ceramic paint pen provided each repair is no larger than 5/32" diameter and is not readily detectable when viewed from the surface opposite the painted surface. 10 touch ups allowed on glass up to 2 square feet, 15 touch ups on glass up to 3 square feet and 20 touch ups maximum for glass 3 square feet or more.		
Dot Matrix - Missing, Smudged, Blurred	Maximum size defect 1/8" X 1/4" or 3/16" Diameter. No more than one maximum size defect per unit. Defects half the maximum size may have 2 per unit with 12" minimum separation between the defects.		
Blistered, Bubbled	Any amount is acceptable up to 1/4" in from the glass edge. In the remaining outer area, one 3" X 1/8" or one 3/16" diameter defect is allowed per side. A rectangle with one maximum defect along each of its four sides would be acceptable. No blistering or bubbling is allowed on the pain in the central area.		
Interior Image Edge Irregularities	Breaks or gashes are not allowed and should be fixed. If smooth and gradual, a 1/16" deviance from the inside line is the maximum allowable. If the departure from the line occurs over less than a 3" span, the maximum deviance shall be 1/32".		
Margin Edge	Breaks or gashes are allowed up to 1/4" in from the glass edge. Edge margin shall be per print or 1/32", whichever is larger. Edge margin tolerance is +/- 1/32".		
Opacity	When inspected in accordance with the inspection method, from the side opposite the painted surface, the paint band should be uniform and even in appearance and an object 6 inches behind the glass should not be readily visible.		

SANDBLAST DECORATED TOLERANCES

Opacity	When the glass is viewed at a distance of 36" with normal light, from the side opposite the sandblasted surface, the sandblasted area should be uniform and even in frosted appearance.

FINGER PULL INSPECTION STANDARDS

Overall Dimensions	1.90" (Length) X 0.63" (Width) (Standard Pull Size)
Tolerances	+/- 0.010" Width +/- 0.094" Length +/- 0.094" Location
Appearance	The surface exhibits abrasion markings which appears frosted. Chatter may be present along the edges of the pull.