



TRANSPARENT ARMOR INFORMATION

THE ADVANTAGES AND DISADVANTAGES OF UL LISTED TRANSPARENT ARMORS

Armor Type	Advantages	Disadvantages
GLASS CLAD POLYCARBONATE	<p>Weight: weighs 40 % less than Glass.</p> <p>Attack resistance: offers resistance to attack.</p> <p>Self Extinguishing: does not support combustion</p> <p>UL rating: UL listed for levels 1, 2, 3, 4,5,6,7,& 8.</p>	<p>Scratches: although one side is glass, the other is not and may be scratched.</p> <p>Cost: costs is 1.25 times that of laminated glass.</p> <p>Delamination: could be a problem, since it is a lamination of polycarbonate and glass which have different rates of expansion and contraction.</p>
GLASS CLAD POLYCARBONATE WITH AIR GAPS	<p>Weight: weighs 40 % less than glass.</p> <p>Attack resistance: offers resistance to attack.</p> <p>Minimal delamination: air separates the glass and polycarbonate layers which have different expansion rates.</p> <p>Scratch resistant on customer side only: There is glass on the customer side which is most scratch resistant which is also replaceable if broken.</p> <p>Self Extinguishing: does not support combustion.</p> <p>UL rating: UL listed for levels 1, 2, 3, 4 & 8.</p>	<p>Scratches: although one side is glass, the other is not and may be scratched</p> <p>Cost: costs is 1.5 times that of laminated glass.</p> <p>Polycarbonate delamination: heat trap caused by air gaps may cause delamination in the polycarbonate.</p>



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LAMINATED POLYCARBONATE	<p>Weight: 1/2 the weight of glass clad polycarbonate.</p> <p>Attack resistance: offers resistance to attack.</p> <p>Minimal delamination: expansion rates are similar among polycarbonate layers.</p> <p>Self Extinguishing: does not support combustion.</p> <p>UL rating: UL listed for levels 1, 2, 3, and 5.</p>	<p>Scratches: polycarbonate scratches and must be cleaned properly.</p> <p>Cost: costs is 2 times that of laminated glass.</p>



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LAMINATED GLASS	<p>Cost: least expensive of all transparent armors</p> <p>Size: available in large sizes (some up to 80"w x 120"h)</p> <p>Scratch resistant: glass is still the hardest transparent product in the industry and offers the most resistance to scratching.</p> <p>Minimal delamination: because the expansion rates are similar among glass, the probability of delamination is less than mixed material laminates</p> <p>UL rating: Available in UL level 1,2, 3, and 4.</p>	<p>Weight: Glass can be 56% heavier than the glass clad polycarbonate products and 3 times the weight of an all polycarbonate product. Floor loading and labor considerations need to be made.</p> <p>Cutting: It is difficult to find a manufacturer who will cut notches and miters.</p> <p>Breakage: Glass breaks; therefore, while being bullet resistant, it does not offer any prolonged attack resistance.</p>
ACRYLIC	<p>Monolithic: when the edges are flame polished, they become as clear as the face of glass with no seams. Acrylic is used for bandit barriers when the edges are visible to the public.</p> <p>No delamination</p> <p>Weight: 1/2 the weight of glass.</p> <p>Light transmission: up to 92% light transmission</p> <p>Attack resistance: some attack resistance</p> <p>UL rating: listed for UL level 1 only</p> <p>Price: 4 x more than glass.</p> <p>UL rating: Only available in UL level 1.</p>	<p>Scratches: Although some manufacturers will say that their acrylic is scratch resistant, acrylic is softer than glass and requires special cleaning instructions. (A scratch resistant coating, SAR, is available, but it would add an additional 15-20% to the cost)</p>



TRANSPARENT ARMOR CHART

Armor	Ballistic Level	Thickness <small>May vary depending on manufacturer</small>	Weight/Sq. Ft	Pricing
Laminated Glass	1	1-3/16"	16	Least expensive transparent armor available
	2	1-1/2"	21	
	3	1-3/4"	25	
	4	2"	28	
Monolithic B.R. Acrylic	1	1-1/4"	7.8	4 times the price of glass
Glass Clad Polycarbonate	1	3/4"	8.4	1.25 times the price of glass
	2	15/16"	11.2	
	3	1-3/16"	13.2	
	4	1-1/4"	13.6	
	5	2-1/4"	27	
	6	1-1/5"	13.4	
Glass Clad Polycarbonate with air gap	1	.92"	6.4	1.5 times the price of glass or more
	2	1.11"	8.8	
	3	1.25"	9.8	
	4	1.84"	15.3	
	5	1.84"	15.3	
	8	2.51"	24.9	
Laminated Polycarbonate	1	.775"	5.1	2 times the price of glass or more
	2	1.06"	6.6	
	3	1.33"	8.1	
	5	1.25"	8.02	

UL listed levels and H.P. White 7.62 NATO

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