Wheel Selection For Conventional Glass Cutting

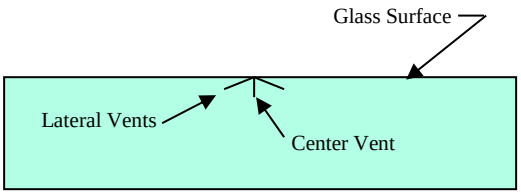
Glass edge cut quality is one of the most important factors that affects glass edge strength. Poor edge cut quality can weaken glass edges by 50% or more in cases of severe edge damage (see Vitro TD-119).

We are often asked what is the best wheel size and edge angle for producing good, clean cut glass edges. This technical document is intended to help answer that question.

The information presented here is intended as a starting point only, and may not give you the desired result for your specific glass cutting situation. For a detailed analysis of your particular glass cutting wheel needs, we recommend that you contact the various manufacturers of glass cutting wheels.

What is a score?

A score is a fracture that is put into the glass by the action of the cutting wheel. When a cutting wheel scores the glass, actually 3 fractures are made in the glass.



The center vent penetrates into the glass body to a certain depth, depending on wheel angle and pressure. A lateral vent is always created on each side of the center vent. The lateral vents go into the glass at roughly right angles to the angle faces of the wheel edge. This means that the lateral vents go much deeper into the glass body on a 148° wheel than on a 120° wheel. These lateral vents usually cannot be seen. If they are visible, then the pressure was too high on that particular wheel. With excessive wheel pressure, these lateral vents will actually propagate some depth into the glass, then curve back out to the glass surface, resulting in sliver chips along the score line.

A good score is a solid line across the top surface of the glass, with no skips, and should appear as a continuous line reflection off the bottom surface of the glass. There should be no plowing, digging, or crush, and no sliver chips.

Skips in the score line reflection are a good visual indicator that the score needs adjustment.

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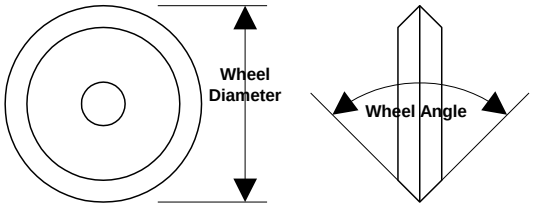
The use of cutting oils often masks an overpressure condition, by hiding sliver chips that may fly out along the score line when too much wheel pressure is applied. Dry cutting makes it much easier to quickly recognize an overpressure condition, reducing the chance of a large quantity of glass being cut before realizing that it has poor edge cut quality.

However, dry cutting can lead to shorter wheel life. Also, cutting fluid has been shown to improve the ease of "breaking out" the cut glass.

Glass Cutting Wheels

Glass cutting wheels are available in a variety of combinations of wheel diameter and edge angle (see below).



Larger wheel edge angle means the wheel has a flatter edge.

Different diameters and different edge angles produce different results relative to edge cut quality. Also, wheel load (wheel force against the glass) will affect edge cut quality.

It has been said that getting good edge cut quality is more of an art than a science, and we agree to a certain extent. However, as the table below indicates, there is some logic to it. Although not an exact answer, these numbers will give you a good starting point, and should help you produce fissure depths in the target range of 6% to 10% of glass thickness.

	Glass Thickness				
Wheel Diameter (inches)	2mm	3mm	4mm	5mm	6mm
.140	134°	145°	145°	148°	154°
.156, .175	128°	140°	140°	145°	152°
.196, .215, .219	124°	134°	134°	138°	145°
.228, .230, .245	120°	128°	128°	128°	140°
Wheel Load (lbs.)	3 to 4	4 to 5	5 to 6	6 to 7	10 to 12

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As a general rule, for any given glass thickness, as wheel diameter increases, wheel angle should decrease to produce good edge cut quality. Also, for any given wheel diameter, or range of diameters as listed in the table, as glass thickness increases, wheel angle should increase to produce good edge cut quality. You can also see from the table, that as glass thickness increases, wheel load should be increased, to produce the desired 6% to 10% fissure depth.

Although not indicated in the table, it should be noted that increasing either the wheel diameter or angle generates deeper fissures at higher wheel loads, while maintaining score quality.

Coated glasses and specialty glasses may require sharper wheel angles than indicated in the table.

Once you discover the right wheel diameter, angle, and pressure combination, your glass edge cut quality should improve. And better edge cut quality means stronger glass edges.

For further information, you may wish to contact one of the following manufacturers of glass cutting wheels and equipment.

The Fletcher-Terry Co.
http://www.fletcher-terry.com/

MacInnes Tool
http://www.macto.com/

Bohle America, Inc.
http://www.bohle-america.com/

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HISTORY TABLE		
ITEM	DATE	DESCRIPTION
Original Publication	4/15/2002	TD-117
Revision 1	9/15/2011	Added Bohle America Hyperlink
Revision 2	2016-10-04	Updated to Vitro Logo and format