# *Cutting Style*

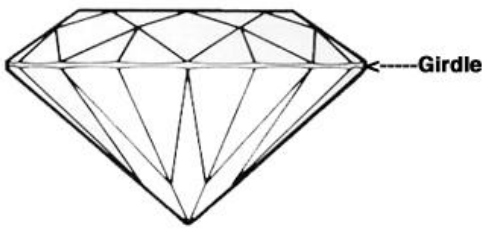
**Faceted and cabochon cut are the two most common ways in which gems are fashioned.**

**<u>Faceted stones</u> are usually cut from transparent rough of relatively high clarity. They are fashioned with a top (crown) and a bottom (pavilion) that have intersecting flat planes called facets, on their surfaces. These facets have shapes that are generally triangular, kite shaped or rectangular.**

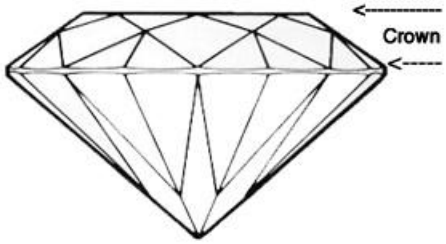
**<u>Cabochon</u> cutting is most often used for translucent and opaque gems and such pieces generally have a flat bottom and a smoothly curved top called a dome.**

***[Faceted peridot, cabochon cut lapis lazuli]***

**<u>The parts of a faceted gem</u>**

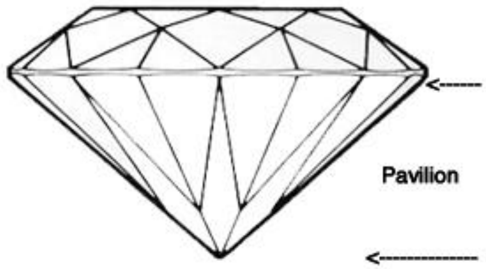



**Girdle: The girdle is the divider between the top and bottom of the gem. It defines the face-up outline, and the maximum dimensions of a faceted gem. In well proportioned stones, it usually comprises about 2% of the total depth of the gem.**

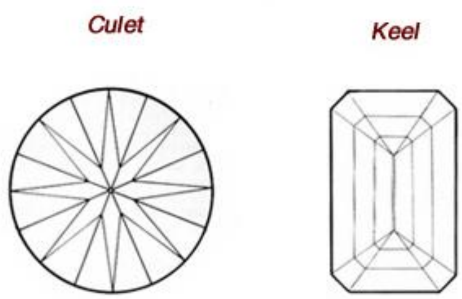



**Crown: The top, the part of the gem above the girdle is known as its crown. In a well proportioned stone it makes up 1/4 to 1/3 of the total depth of the gem.**

**Table: The largest, usually central, facet on the crown of a faceted gem is the table. Generally, it makes up between 40 - 70% of the crown diameter.**

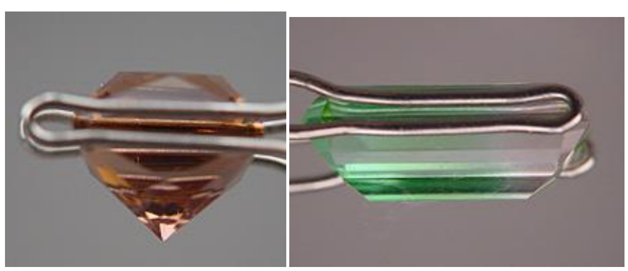



**Pavilion: The pavilion is the bottom, the part of the gem below the girdle. In a well proportioned gem, it usually accounts for 2/3 to 3/4 of the total depth of the gem.**




***[Pavilion view diagrams of round and emerald cut faceted gems]***

**Culet/Keel: The tip or line at the bottom of the pavilion on a faceted stone where the pavilion facets meet.**



***[Culet on a square cut stone, keel on an emerald cut stone]***

# *Background Information on Faceting*

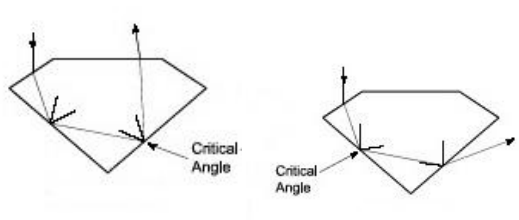
**<u>Pavilion and Crown:</u> In the faceted gem, the pavilion and crown have different *functions*. The crown acts as a window or lens to collect the light which strikes it, and direct or focus it into the pavilion of the gem, whereas the pavilion must act**

**as a mirror to reflect that light around the pavilion, and then *back to our eyes* through the crown. If the pavilion fails to do so, the gem lacks brilliance and is lifeless. Crown angles are much less crucial to the optical performance of a gem than are those of the pavilion, and can vary substantially from stone to stone without severely affecting a gem's brilliance. The crown and pavilion are cut in two separate sequences of operations. The gem is initially adhered to the "dop stick" until one side is finished, then removed, turned exactly 180 degrees, and attached to a new dop, to go through corresponding operations for the other side.**

**<u>The Critical Angle:</u> Each gem species, depending (with an inverse relationship) on its refractive index, has a pavilion faceting angle below which it loses brilliance.**

***Think for a moment of skipping flat stones on water. What controls whether the stone will skim and bounce along the surface, or go kerplunk into the depths?.......The angle at which it hits the water! So it is with light that enters a gem and strikes the pavilion facets. When that beam hits <u>outside</u> the critical angle it will be reflected to another facet and/or to the crown, but if it hits <u>inside</u> the critical angle it will not reflect, but pass right out through the side or bottom of the gem, not to return to our eye-->the gem loses brilliance.***

**In the graphics below we see two gems cut to the same proportions (pavilion main angles at 38 degrees) one is a diamond (RI = 2.42), the other is a fluorite (RI = 1.43). The critical angle for diamond is about 24 degrees, that of fluorite is 44 degrees. At 38 degrees on the pavilion facets much of the light hitting the fluorite is lost, whereas almost all that which hits the diamond is reflected. The diamond would appear bright and the fluorite lifeless, especially in the center: we would say it has a "window". If, instead, we were to cut the fluorite to a pavilion angle of 45 degrees or above, we would then eliminate the window and it would be brilliant, and conversely we would get a lifeless diamond if we were to cut its pavilion at 20 degrees or below.**




***[Reflection when the pavilion angle is above the critical angle, lack of reflection "windowing"when it is not: Graphic courtesy of Joe Mirsky]***

**In the first picture below you can see two similar looking gems (each is light yellow and rectangular). The golden beryl gem on the left was cut with its pavilion facets <u>above</u> its critical angle, and it appears brilliant, the yellow**

**spodumene on the right was cut with the pavilion facets below its critical angle and has a "window". We call it a window because the light passes right through it, like window glass, so that you can easily read the printing underneath. The second set of pictures shows a top and bottom view of a badly windowed topaz. You can see how shallow (low angle) the pavilion is. In order for this gem to be fully brilliant, the necessary recutting would reduce its face up diameter and carat weight substantially.**


*[Non-windowed and windowed gems]*

*[A windowed topaz gem with a very shallow pavilion: Images courtesy of thaiambergems.com]*

**Yield vs Brilliance, Clarity and Color: Faceting is a series of compromises. The yield, that is the carat weight of the finished stone versus the carat weight of the rough, can be as high as 40 - 50% or as low as 1-2% depending on the attributes of the rough, and of decisions that are deliberately made by the facetor.**

**For example:**
**1) The shallower the pavilion angles, the greater the yield (but the less the brilliance).**
**2) Included rough can be oriented (with loss of yield) to eliminate or minimize the appearance of inclusions.**
**3) Pleochroic stones will give different colors and different yields depending on how the stone is oriented for cutting.**
**4) Rough that happens to be somewhat "gem shaped" yields more than thin and flat, or highly asymmetrical rough.**

***Given a moderately well shaped, clean piece of rough, which is cut to correct pavilion angles, the average yield is about 20%. To put it another way: start with gem rough = 5 ct, end up with finished gem = 1 ct.***

**Source:**
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