

CONCAVE FACET

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The following article contains excerpts from the book *CONCAVE FACET* by Dalan Hargrave, copyright 2010.

Introduction

The history of cutting and polishing concave surfaces in gemstone material can be traced back over one thousand years. In fact, both concave and convex surfaces have been at the heart of numerous scientific experiments since man first noticed their ability to alter the path of light, and therefore, sight.(eyeglasses, telescopes and microscopes)

The use of concave cuts in a purely decorative fashion is well documented in the cut glass and crystal industry for nearly two hundred years, and can even be seen in rare examples of gemstone carving. However, it wasn't until the 1990's when Mr. Hoffman designed and patented the OMF Machine, that the concave facet would make headlines in the gemstone media. Those fortunate to test drive the first model of the OMF machine would soon be winning awards for their gem artistry with this age old technique by using precision equipment(pictured below).



The OMF machine has the ability to precisely place and repeat concave facets, transforming the way gems look in a dramatic way. Today, a

variety of production machines are available to cut concave facets including a few Facetrons fitted with concave attachments(pictured below).



The latest newcomer is Ultra-Tec with its Concave and Fantasy machine(pictured above in alignment mode). This new Fantasy Machine even has the ability to help the gem artist go far beyond the concave facet with the added feature of indexed alignment and a variety of cutting mandrels currently being developed, according to Joe Rubin at Ultra Tec.

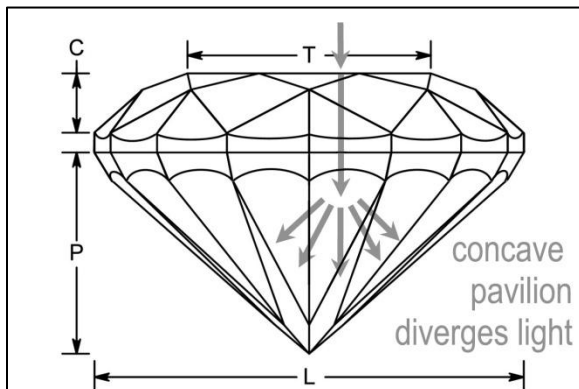
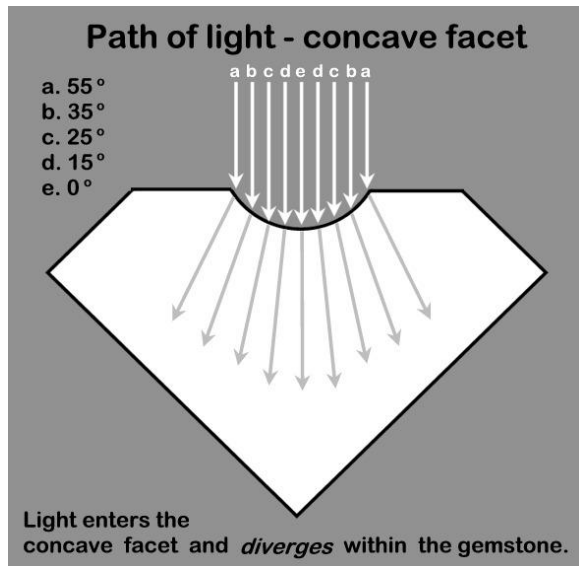


Add to this list the number of home built machines, like my own, and it's safe to say that concave facets and fantasy cutting are here to stay. These machines give the lapidary the ability to push the envelope of gemstone design, limited only by the imagination of the gem artist.

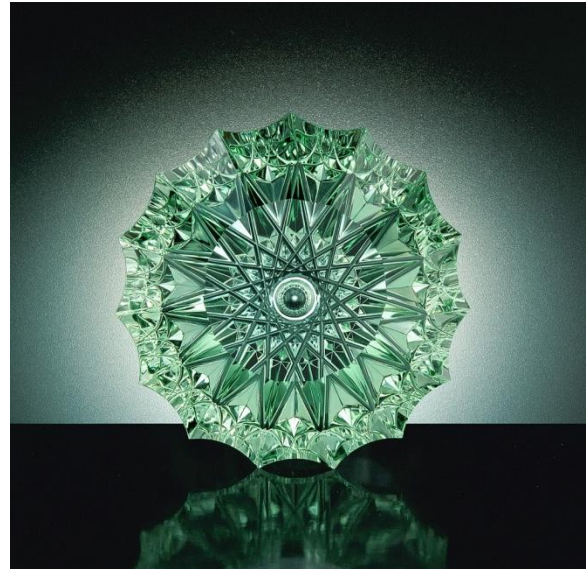
Technical Tips

Concave faceting comes with a whole new set of challenges since concave facets interact differently than flat facets. To begin with, there are a few principles to keep in mind when designing concave gems.

1. Since concave facets are an arc, each facet is a range of angles rather than simply the one you set on your machine. The angle increases the farther you get away from centerline.
2. Unlike flat facets, concave facets are limited by the diameter of the cutting mandrels. Simple scaling the size of a gem isn't possible and mandrel size also needs to be worked into scaling.
3. Concave facets gather and diverge light from a much wider range of angles than flat facets, both in the crown and the pavilion.(simple illustrations below)



To illustrate the curved reflections of concave pavilion facets, the mint green beryl below shows a reflection of the straight carved lines on the bottom of the gem.

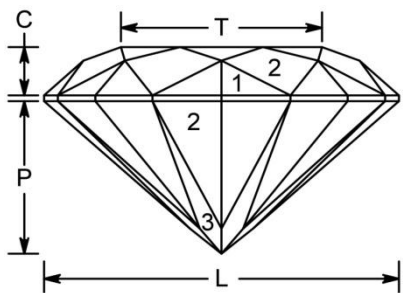
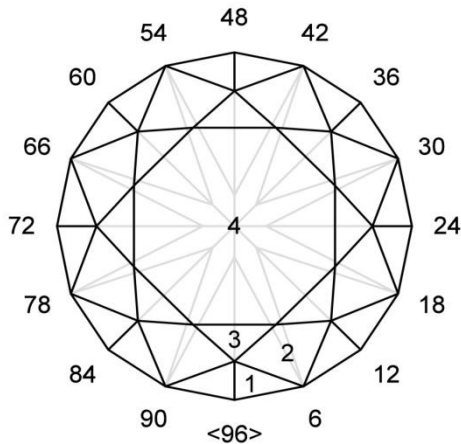


With slight modifications to equipment, concave facets can also be cut to curve in two directions(compound concave) such as the morganite pictured below. This effect creates elliptical reflections rather than the straight bars of light in concave facets.



Application

This will help you start cutting concave facets by comparing a Standard Round Brilliant(SRB) with a Concave Round Brilliant(CRB) but keeping the plan view intact. You **cannot** always substitute facets without adjustments.



Standard Round Brilliant 12mm

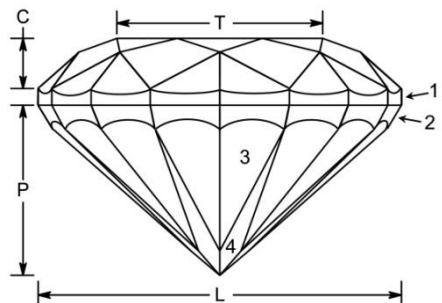
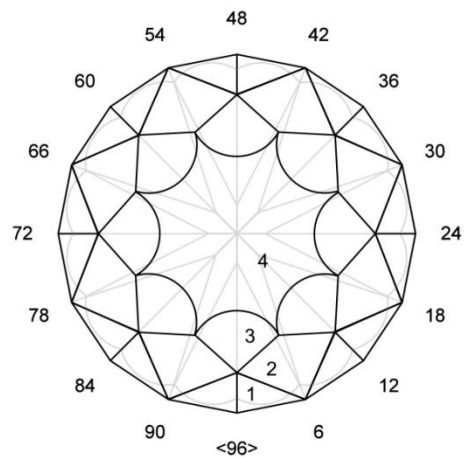
Angles for R.I. = 1.540
 57 + 16 girdles = 73 facets
 8-fold, mirror-image symmetry
 96 index **Note:** Any size gem.

PAVILION

- 1 90.00° 03-09-15-21-27-33-39-45-51-57-63-69-75-81-87-93
- 2 42.00° 03-09-15-21-27-33-39-45-51-57-63-69-75-81-87-93
- 3 41.00° 06-18-30-42-54-66-78-90

CROWN

- 1 42.00° 03-09-15-21-27-33-39-45-51-57-63-69-75-81-87-93
- 2 35.00° 06-18-30-42-54-66-78-90
- 3 19.00° 96-12-24-36-48-60-72-84
- 4 0.00° Table



Concave Round Brilliant (CRB) 12mm

Angles for R.I. = 1.540
 73 + 16 girdles = 89 facets
 8-fold, mirror-image symmetry
 96 index **Note:** The 60 degree angle on the pavilion provides a level surface for setting the gemstone.

PAVILION

- 1 **90.00°** 03-09-15-21-27-33-39-45-51-57-63-69-75-81-87-93 **flat facet**
- 2 **60.00°** 03-09-15-21-27-33-39-45-51-57-63-69-75-81-87-93 **flat facet**
- 3 **43.00°** 03-09-15-21-27-33-39-45-51-57-63-69-75-81-87-93 use a 13mm mandrel and cut close to girdle
- 4 **41.00°** 06-18-30-42-54-66-78-90 cut with 13mm mandrel

CROWN

- 1 **42.00°** 03-09-15-21-27-33-39-45-51-57-63-69-75-81-87-93 cut with 17mm mandrel
- 2 **30.00°** 06-18-30-42-54-66-78-90 cut with 17mm mandrel
- 3 **10.00°** 96-12-24-36-48-60-72-84 cut with 17mm mandrel
- 4 **0.00°** Table