A NOTE ON TANGENT RATIO FACET ANGLE TRANSLATION

Most published facet cutting designs are presented with specific elevation angle recommendations which are quite suitable for stones having refractive indices in the range of Quartz. This is a reasonable condition for amateur facetors if we are limited to the most common materials ...since Quartz is among the most critical and readily available facetable materials. However, there are situations where facetors might wish to cut stones with different angle combinations e.g. to use thinner rough, to reduce areas with undesireable inclusions, to recut previously cut stones, to adapt the design to more optimum angles. Indeed this "angle translation" is one of the most frequently asked questions whenever we discuss the mathematics of faceting design.

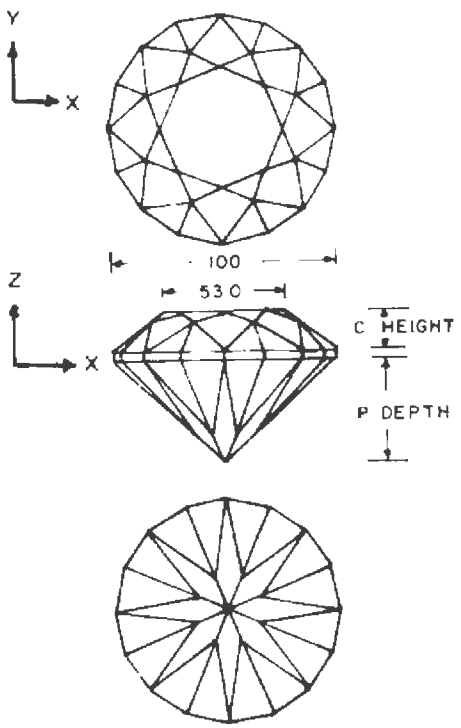

Figure 1 DIAGRAM OF STANDARD BRILLIANT

Although this system is not limited to the Standard Brilliant, we will use the basic design as an example. Figure 1 is the usual three view sketch of the Standard Brilliant. Consider the CROWN plan view ...there are only three different types of facets, the "Main" facets which are the diamond shaped ones, the "Break" facets which are triangular facets which adjoin the girdle, and the "Star" facets which adjoin the Table.

As a result of the translation process we wish to change the angles of these facets WITHOUT CHANGING THE APPEARANCE OF THE DESIGN IN THE PLAN VIEW. Mathematically we will permit changes only in the "z" dimension (not either x or y) in the cartesian coordinate system. In faceting terms there can be changes in height adjustment and elevation angles, but not in the bearings.

This can be done only when the design itself can be uniquely specified mathematically, as it is in all "meet point" designs and most designs whose outline can be formed by a CAM preform. However, some freeforms and most step cut designs cannot be handled in this manner because the facets are not uniquely specified.

It is practicable to calculate different sets of cutting angles which if used will exactly duplicate the facet design as far as appearance from the top (or bottom) is concerned, but any angle adjustments will change the Crown height (or Pavilion depth)... and unless we also change the girdle thickness total proportions and weight distribution will change also.