Prince of Portugal
USFG SSC Grand Master Gem

Design by Ernie Hawes
Test cut by Jeff Theesfeld & Jim Clark
The Wolf in Sheep's Clothing

To begin with, the cutting sequence, as identified by Ernie Hawes, will not result in the ability to follow a pure meet-point faceting technique. The cutting instructions for Tier 2 states to "Cut close to TCP so g1 is about 1/3 width of stone". This relies on an inherently inaccurate measurement, which, if even slightly off, will set up issues with the remainder of the gem. This is compounded by the fact that a competition gem must be cut within tight size requirements. Ernie did not design this to be cut to a specific width tolerance. Thus, the competition cutter is pretty much forced to use another technique. There are two primary choices: 1.) Re-sequence, or 2.) Develop and use a CAM Preform.

1.) The Re-Sequencing option can result in a completely meet-point fashion design. If the cutter uses 5, 6 & 4 (to PCP), then g3, 3, 2, g2, 1, g1 sequence this works. The problem with this technique, is the facet which will ultimately determine the tight width tolerance (g1) is the very last facet, thus requiring a complete re-cut of all facets as the final width dimension is obtained. This would be incredibly difficult and time consuming.

Thus

2.) The CAM preform option was the only real solution I considered for this gem for competition. Facets 1, 2 and 3 do not meet at a TCP, thus they cannot be used for a CAM preform. This requires the cutter to demonstrate a full knowledge of CAM development. This, to me, is beyond typical Master level ability. Now, with a CAM, the new cutting sequence was C1, C2, C3 (to TCP), then g1, g2, g3 to a very exact final width and finish. Any variation from exact will begin to introduce accumulative error, when the gem is transferred to the crown. Once the exact CAM was established, the pavilion sequence of 1, 2, 3, 4, 6, 5 proceeded. The

need to cut 4, 5 and 6, to an exact PCP culet will be critical to a good score. All 20 facets meet at the culet, creating the first real “technical area”

Cutting the *Prince of Portugal (PoP)* in topaz introduces the typical Topaz challenges. The cutter must identify the primary cleavage plane, and orient the gem on the dop in such a way to avoid the plane by about 10 degrees. There are many write ups for how to treat Topaz, and the cutter should be familiar with them. This is no different here.

The pavilion alone, and the need to design and use a CAM, did not make the *PoP* particularly challenging. It was the crown that made this distinction.

With the pavilion complete, the transfer to the crown facets proceeded. I cut the crown break facets as listed, in a typical fashion. There was no real difficulty here, other than an exactly level girdle must be established for a good score. As previously stated, any variation from an exact CAM will have introduced accumulative error, which will build up in the crown break facets **a**, **b**, and **c**. This will begin to show up once the first set of crown mains, **d** and **e** are placed. Again, any errors in **a**, **b**, **c**, **d** and **e** will result in error accumulation.

The next 3 tiers, facets **f**, **g** and **h**, is where the real challenge to this gem exists.
Cutting in **f** will appear to be no problem at first, because the only meet is at the **a** and **d** juncture. Any accumulated error was unseen, but it was present.
The tier **g** was next. On the surface, **g** appeared to be a “main-break” facet with **e**. But, this is not the case.

I would define a “main-break” facet as a layer of two, or more, facets with identical index settings. Last year, the Kiev Triangle had many tiers of “main-break” facets. Those did not create exceedingly challenging meet-points for the remaining tiers.

On the Prince of Portugal, Tiers **e** and **g** are cut at different index settings. This means that tier **g** will require meets to two different uneven sets of meet-points. These are **b**, **d** & **e**, as well as **c** meet-points. If there is any accumulated error, anywhere on the gem, it will start to show up in a big way with the **g** tier. The **f** tier will look very uneven at this point. If the cutter is not aware of this, this will get very confusing. Adjustments to tier **g** were difficult with two different meet-points to maintain. That meant that the only available option for **g** adjustments was to adjust the cut angle of each **g** facet individually. It appeared to work, as I made the **f** tier look even. However this set up an almost non-adjustable options as the next tier, **h** was cut.

The next tier, **h**, had two meets to join as well, **d**, **f** and **g**, as well as the **f** meet as the next **h** “neighbor” facet was created. The table had not been cut in yet. Adjustments to **h** tier effected the **g** and **h** “neighbor” juncture, which had been created.

A very difficult choice I had to make, was, when to cut-in the table, and to which meet-points? In a perfectly cut gem, the table will come in to all 8 meet-points created by **f**, **g** and **h** tiers. Any accumulation of error, anywhere in this gem, will make adjustments to the star facets very, very difficult.

If the cutter expects to use the “advanced” method of cutting in the table early, then making adjustments to the star facets, they are in for a significant challenge. Because none of the needed table meets are established until the final star facets are cut, this will not be an option for this gem.
Because tiers **f**, **g** and **h** are so closely linked, any adjustment to any one tier affected all 3 tiers. This effectively “locked-in” all three tiers, and made all 8 table meets nearly impossible. Because of the unique way, **g** tier relates to **e** tier, any adjustment to star facets threw off the adjacent meet-points.
When using GemCad, with the exact index and angle settings, this gem appears to cut very easily. GemCad does not simulate accumulated error at all. It makes this gem look easy to cut.

The only real answer to this challenge, is 100% accuracy throughout the cut, or completely coordinated adjustments to 3 tiers of facets simultaneously. This is the real challenge of this gem. Although it looks easy in GemCad, the unique way the **g** tier relates to all the tiers around it, and the way it “locks-in” the cutter, makes this an incredibly difficult gem to cut to pinpoint accuracy. It will greatly test the skill of any Master faceter who aspires to the level of Grand Master.

When I finished my test cut, I had an amazing, beautiful gem, knowing just how challenging this was. My meets were not perfect by any means. There are very fine facets throughout this gem which were extremely challenging.

I think Ernie Hawes knows this very well. We discussed the *PoP* once, and he stated that he would be very interested in seeing how well I was capable of this “Wolf in Sheep’s clothing” challenge. He really is a Grand Master level designer.

This test cut and evaluation was conducted by Jeff Theesfeld

Test cutting Prince of Portugal

by Jim Clark

I had a little extra time this week, so I went ahead and finished the Prince. It's a stunner but a bugger to photograph.

I had no problems that were not of my own making (chipped culet, grrrrrr). However, I did not use Jeff's CAM or Ernie's sequencing. I just cut it as I normally would. Study the design, figure what would work best for me and have at it. It was a little difficult getting the right size on some facets (p-2 & p-3) but worked out. Not sure but think using the CAM might have made it a little easier.

There are a couple of issues with the GemCad design. The cutting instructions indicate

that 20 facets meet at the culet, but the pavilion view kinda looks like a 4 meet point culet (just GemCad I suppose). I cut it as a 20 meet point which I think was intended.

Cut another stone using Jeff's CAM. It might have been a little easier to cut to size, but otherwise no difference. Absolutely no problem with the crown. I didn't use Ernie's sequence on the pavilion, but that isn’t unusual for me.