The new GIA Diamond Cut Grading System

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There has been a lot of debate about what exactly is "ideal cut". In 1997, GIA's president Bill Boyajian issued a public statement calling for abolition of the term "ideal" as an adjective because it unfairly implied the supremacy of stones cut to proportions espoused by Marcel Tolkowsky in 1919. Boyajian claimed that GIA's studies of diamond brilliance proved that Tolkowsky's recommended table percentage, as well as crown and pavilion angles, were only one set of proportions that produced optimal brilliance in diamonds.

Today there is widespread agreement that the diamond industry has a need for a widely accepted and reliable cut grading system. Debate over the best diamond cut, which began when the American Gem Society in 1966 developed a cut grade, moved into high gear with the publication of the new diamond cut grading system by the Gemological Institute of America this year.

Today, however, the AGS regards itself as the first and premier authority in the cut-grading assessment of diamonds.

In the 1950's, GIA created the International Diamond Grading System, and established the standards color and clarity that revolutionized the diamond industry. After more than 15 years of research, the GIA is in the process of introducing a new grading system to the diamond industry to assess and predict the cut appearance and quality in round brilliant diamonds.

The new GIA diamond cut grading system aims to show that you can get "ideal" brilliance from a set of proportions that have *not* traditionally been considered to be "ideal". The GIA intends to change the use of the phrase "ideal cut" by introducing a grading system which allows for a much wider range of proportions and measurements. For example, the AGS defined the old parameters for the ideal cuts as a table percentage of 52.4-57.5% and a depth percentage of 58.4-62.9%. Going forward, the new GIA parameters will include table percentages of 47-61%. The GIA believes that the new system will set the standards for cut quality the way they have been set for color and clarity for more than 50 years.

A weakness of the “ideal cut” standard dating back to the work of Tolkowsky is that two diamonds that were both rated as well cut could still have quite different “face-up” appearances. Conversely, some “shallow cut” diamonds with unusual proportions and angles appeared just as attractive as stones meeting the “ideal cut” standards.

The new diamond cut grading system evaluates seven different components of each diamond's cut to understand the various factors that determined how the cut of that particular stone affected its appearance. The changes in proportion values created observable distinctions in appearance. In addition to table size, crown angle and pavilion angle, GIA research has found that the lengths of star and lower-girdle facets affect both fire and brilliance, which previous cut studies did not take into account.

There are certain combinations of table size, crown angles and pavilion angles that can either intensify or increase the brilliance of a diamond and there are also combinations that can severely reduce the beauty of the diamond. For example small crown angles boost brilliance but larger crown angles along with smaller tables increase fire.

The GIA research showed that many different proportions can produce attractive diamonds. The main idea is that all of these parameters are interrelated in their effects on light performance, and that no single proportion, or subset of proportions, can be considered alone. As a result proportion-based metrics were developed to predict how diamonds would perform with regard to brilliance and fire. The GIA has also developed software that provides a method of estimating a cut grade and a database that is embedded into a number of leading diamond measuring devices so that this estimation can be automated.

For now, GIA will not offer the new cut grading system for fancy colored or fancy shaped diamonds, or to round diamonds modified with different faceting arrangements. In contrast, the AGS already moved a step ahead by introducing the first cut grading system for square princess cut diamonds in May 2005. The AGS, early in 2005, also revamped its cut-grading system for round brilliants. The updated ratings are based, in significant part, on assessment of a diamond's performance in the crucial areas of brilliance and fire.

1. Assessment and Prediction of cut quality in round brilliant cut diamonds

The GIA has calculated cut grading results for 38.5 million proportion sets based on the assessment of the seven components mentioned above. Over 70,000 observations were made on more than 2,300 diamonds, using observers from all sectors of the jewelry industry: diamond manufacturers, dealers, retailers, and potential customers. The combination of proportions has been found to be more important than any individual proportion value. Thus it is not any one proportion, but rather the interrelationship of all proportions that determines whether a particular diamond will perform well enough to receive a top grade.

The GIA Diamond Cut Grading System assigns one of five grades from excellent, very good, good, fair and poor to describe the overall cut quality of a standard round brilliant diamond in the GIA D-to-Z color range, and the flawless-to-I_3 clarity range.

There are many different proportion sets that provide top-grade diamonds, and even wider ranges of proportions that are capable of providing pleasing upper-middle to middle-grade diamonds. Thus each cut grade represents a wide range of proportion sets.

The seven components of assessment are divided into face-up appearance-based aspects and those which are related to the design and craftsmanship of a diamond.

Diamond Cut Quality: Face-up appearance, Design and Craftsmanship

The face-up appearance of a polished diamond is measured in terms of its brilliance, fire and scintillation.

Brilliance is the appearance, or extent, of internal and external reflections of "white" light seen in a polished diamond when it is viewed face-up.

Fire is the appearance, or extent, of spots of light dispersed into spectral colors seen in a polished diamond when it is viewed face-up.

Scintillation has been defined as the flashes or sparkles of white light reflected from a polished diamond seen when either the diamond, the light source or the observer moves.

In addition to these parameters, GIA research found that a comprehensive diamond cut grading system must also take into account elements of design and craftsmanship. The design element is assessed in terms of **weight ratio** - a description of a diamond's overall weight in relation to its diameter- and **durability** - and craftsmanship in terms of **polish** and **symmetry**.

Measuring proportions that influence the face-up appearance of a diamond

The new diamond cut grading system uses precision intervals when measuring the proportions. The precision intervals involve the rounding of parameters to for example the nearest tenth of a percentage point when calculating total depth or the nearest whole percentage point when measuring the table size. As a result, the GIA uses averaged, rounded values for proportions when assessing diamond cut quality (see proportions calculation below).

The GIA said that the research results demonstrated that very subtle changes in measurements seldom altered a final prediction, or human assessment, of overall appearance. Therefore there was no need to demand tighter tolerances at this point.

The GIA system uses the average diameter - calculated by the sum of the minimum and maximum diameter (distance between two opposing points along the girdle's outline) measurements divided by two - to calculate the following proportions:

- **Total depth** (measured from table plain to culet) relative to the average diameter reported to the nearest tenth of a percentage point (0.1%):
Total depth percentage = (total depth ÷ average diameter) x 100

- **Table size**: Average table size relative to the average diameter, reported to the nearest whole percentage point (1%):
Table percentage = (average table size ÷ average diameter) x 100

- **Crown height percentage:** Average crown height relative to the average diameter, reported to the nearest half of a percentage point (0.5%):
Crown height percentage = (average crown height ÷ average diameter) x 100

- **Average pavilion depth** relative to the average diameter, reported to the nearest half of a percentage point (0.5%):
Pavilion depth percentage = (average pavilion depth ÷ average diameter) x 100

The other measuring proportions are:

- **Crown angle average:** Average of all eight crown angles, reported to the nearest half of a degree (0.5°). A crown angle is the angle of the bezel facet plane relative to the table plane.

- Pavilion angle average: Average of all eight pavilion angles, reported to the nearest multiple of 0.2° (e.g., 41.0°, 41.4°). Pavilion angles ending in odd numbers are always rounded up, for example 40.7° would be rounded to 40.8°. A pavilion angle is the angle of the main facet plane relative to the table plane.

- **Average star length**: The horizontally projected distance from the point of the star facet to the edge of the table, relative to the distance between the table edge and the girdle edge. This is averaged for all 8 star facets and reported to the nearest five percent (5%).

- **Lower-half length percentage:** Average lower-half length relative to the distance between the girdle edge and the center of the culet listed to the nearest 5%

Visually assessed parameters include girdle thickness, culet size, polish and symmetry:

- **Girdle thickness**: A range from the thinnest to the thickest "valley" areas i.e. "thin places" located between the bezel-main intersection and where the upper and lower halves meet. Descriptions include extremely thin, very thin, thin, medium, slightly thick, thick, very thick, and extremely thick. "Extremely thin" appears as a knife-edge, an area where the crown meets the pavilion with no girdle in between.

- **Culet size:** Average width of the culet relative to the average diameter of the girdle. Descriptions include none, very small, small, medium, slightly large, large, very large, and extremely large. "None" is used when there is no culet facet, which is sometimes referred to by the trade as a pointed culet.

The input of all the above measuring proportions into the GIA Facetware cut estimator, a free online service that allows the access to GIA's database of more than 38.5 million diamond proportion sets, will estimate the cut grade for any standard round brilliant diamond in the GIA D-to-Z color range and Flawless-to-I_3 clarity range.

Additionally, Sarin and OGI have introduced new software in their optical measuring devices that has embedded the new GIA system, enabling users to estimate cut grades and gain advice on polishing from rough and recutting.

2. Dilemma: Near to Perfect light absorption produces higher yield at the expense of weight loss? The effect of the new system on future pricing?

The new cut grading system gives a wider range of proportions with the potential for high quality light performance. The system demonstrating the possibility that you can get "ideal" brilliance from a set of proportions that are not traditionally considered to be "ideal".

The positive feature about GIA's system is that it allows many different combinations as tastes may differ from one person to the other. Some people prefer fewer broader chunkier flashes of light while others may prefer smaller flashes.

As a result, the GIA argues that manufacturers will be able to use the predictive power of the reference system to plan the cutting of polished diamonds from rough. This will allow them to attain higher cut qualities while also maximizing their yield in the cutting process. At the same time, more of the diamond could be lost in the cutting process, because the goal is not to cut the heaviest diamond, but the best performing diamond.

However on testing a number round brilliant cut stones, we noticed that some of the proportions that would be

Future Pricing

The market currently has a comparatively narrow band of price differentials for variations in cut quality. For instance a dealer to dealer 1.00 ct good cut round brilliant according to the Rapaport pricing list can cost twice as much as a bad cut. The question is what will the market do with this new information and the potential variations on cut grading? It is believed likely that over time a new market pricing will evolve.

Cut quality commands a premium, you are paying for a highly skilled diamond cutter's time, and it can take many hours to get all the proportions and angles to fall within the "ideal" or less "ideal" ranges. The new GIA cut grading system may help to facilitate and shorten the time effort in this process by the usage of the GIA Facetware cut estimator. This development could also affect future pricing. However, prices may still go up as a result of the investment in the purchase of new cut grading equipment, and the software needed to adapt to the new valuation system.

3. How does the new GIA Cut Grading system compare to one that AGS has come out with?

While the GIA evaluates seven factors in its cut grade, AGS evaluates in its updated cut grading system 11 factors - brightness, contract, dispersion, leakage,

weight ratio, tilt, girdle thickness, culet size, durability are considered in addition to polish and symmetry - when assigning a final cut grade.

Here's how AGS will rate stones: First, diamonds will be scanned by a Sarin or OGI machine for detailed readings of all angles. Then Sarin or OGI measurements will be fed into a computer with special software that creates a 3-D model of the diamond in cyberspace. This virtual diamond will then be subjected to ray tracing analysis for both brilliance and fire.

Based on these readings, a stone will be assigned a grade of Zero for best to 10 for worst. Those round brilliants judged 'best' will be considered "ideal."

The GIA devised a system that allows a lot more room for individual taste than the AGS system does. Stones that receive the top grade of "excellent" in the GIA system wouldn't get that grade from AGS.

GIA is using average measurements, ie. average crown angles (the average of 8 angles measured on the crown), average pavilion angles, average lower girdles, etc. and they will also be rounding the measurements to the nearest percentile while the AGS system will not be using averages but a more precise facet by facet analysis.

GIA's top grade proportions appear looser than the top grade of the proposed new AGS system; these GIA category 1 stones would likely fall within the top 3 AGS grades of 0-2. Therefore after both GIA and AGS grading systems are implemented on grading reports, it is likely that the stricter AGS 0 system will continue to achieve a seller's premium.

4. Process of change to new GIA diamond cut grading system – challenge to the diamond industry

Although the new GIA diamond cut grading system is already in place, the new reports will only be available from January 1 2006. The transition will take place with the help of the following parameters:

Diamonds that are graded between August 1 and December 31 2005, will not be subject to a reissue fee and they do not need to be returned to the laboratory. But the original reports will have to be submitted.

Diamonds which are graded between January 1 and July 31 2005, will be subject to a nominal reissue fee. Diamonds may have to be returned to the laboratory for updated measurement information.

For diamonds graded before January 1 2005, a service to update the grading information including a cut grade for reports will be provided.

To further support the implementation, GIA has also released: a standardized viewing environment, the trademarked GIA DiamondDock, which provides optimal lighting for both assessing and displaying the cut quality of round brilliant cut diamonds; the GIA Multi-Purpose Gemological Reticule, which provides a way to measure the proportions of a diamond manually with a microscope; and a new brochure for the industry that explains the new system and how it will be presented on GIA lab reports.

However, many jewelers and dealers in the industry have recently raised concerns about what they are expected to do about their diamond stock, which is graded according to the old valuation system. The concerns regard the potential change or loss in value for their stock and the question of who is going to pay for the change from the old grading reports to the new grading reports.

5. Winners and losers

According to the GIA, the new cut grading system will enable manufacturers to plan and predict cut grades. Buyers can compare cut qualities and retailers will be able to communicate the effects of cut round brilliant diamonds. Gemological laboratories will have to bear the costs of upgrading their systems and purchasing new equipment tools, which in turn may affect the prices they charge.

When the system is introduced, it could profoundly change the way that manufacturers cut diamonds and retailers sell them. The latter are among those who are concerned about the trade's lack of preparedness for such a development. On the one hand, they fear that consumers accustomed to the ideal cut will lose confidence in the industry's ability to agree on the issue of diamonds' appearance. On the other hand, the new system has been criticized by retailers for requiring the knowledge of a "scientist" to be able to fully understand the content and conclusions.

The GIA cut system has also raised concerns largely among dealers who are longtime supporters of the ideal cut and those with their own cut grade system.

But supporters say a third-party evaluation of cut will help people at all points of the supply chain sell diamonds previously considered unsalable. Although the jewelry industry may benefit from allowing more diamonds into a new category two, it could give the consumer a false sense of value.

The winners will be the big companies. They will have the latest, most sophisticated machines like the Sarin and OGI and can train their cutters to cut to GIA’s

Specifications. In contrast, not all the small cutters can afford these devices.

6. Market reactions: Effect on the market

The GIA's decision to include cut grades on its grading reports has elicited mixed reactions from retailers and other industry insiders. The industry sees both an upside and a downside to GIA's decision. Some fear cut grading will reduce diamond selection to a matter of statistics, thus co-modifying the product and making it easier for online retailers to sell them, sight unseen. On the other hand, cut grading could give jewelers and consumers a standard similar to those used in assessing the other three Cs (clarity, color and caratage) boosting their confidence in the product.

TABLE: Examples of diamonds with Excellent cut qualities

This diamond scores in the "Excellent" category,
and it has an even pattern of bright and dark areas.

Table size: 54%
Crown angle: 34.0°
Pavilion angle: 40.8°
Star length: 50%
Lower-girdle length: 75%