

Estimating a Cut Grade Using the GIA Diamond Cut Grading System

This chart summarizes the main concepts of the GIA Cut Grading System for round brilliant diamonds that was introduced by the GIA Laboratory in January 2006. The chart is intended to provide information to help members of the jewelry trade better understand the attributes of diamond appearance, and how these are evaluated within the GIA Cut Grading System.



The GIA Cut Grading System for standard round brilliant cut diamonds (D to Z colors only, 0.15 carat and larger) was launched on GIA Laboratory grading reports in January 2006. Standard round brilliant diamonds are evaluated for one of five possible cut grades: **Excellent, Very Good, Good, Fair, and Poor**.

The cut grade is determined from a combination of measured parameters and visual observations. Table Size (%), Pavilion Angle, Crown Angle, Lower Half Length (%), Star Length (%), Girdle Thickness (%), Culet Size (%), and degree of painting and/or digging out are all measured. Symmetry, Polish, Girdle Thickness (verbal description), and Culet Size (verbal description) are evaluated visually by Laboratory grading staff. The combination allows the *Face-up Appearance* (the brightness, fire, and scintillation—especially pattern—seen when viewing a diamond), *Design* (the weight ratio—which prevents “thick makes,” and the durability-related to “knife-edge” or extremely thin girdles), and *Craftsmanship* (the care in execution seen in the diamond’s polish and symmetry) to be evaluated in a consistent manner. Within the GIA cut grading system, Face-up Appearance is further broken down into visual factors such as *Brightness, Fire, and Scintillation* (including sub-components such as sparkle and pattern). *Weight Ratio and Durability* are considered in evaluating the Design. *Polish and Symmetry* are components of Craftsmanship. The GIA cut grading system is a “deductive” system in which a diamond’s cumulative cut grade is determined by the lowest value for any one of the seven components.

The cut grading system is based on a combination of computer modeling (of diamond appearance), predictive metrics, and observations of the appearance of actual diamonds. GIA applied ray-tracing to theoretically perfect diamonds to model light paths and to predict the varying degrees of brightness (light return) and fire (dispersion) exhibited by round brilliant diamonds. Then researchers compared those results with comprehensive observation testing of actual diamonds using members of the trade and public. Observations helped determine thresholds for brightness, fire, and pattern metrics, where certain diamonds appeared less attractive than the reference diamonds representing a grade range. GIA used the results of the observation testing to set the boundaries of the five grades.

As with other areas of diamond grading, the accurate and consistent assessment of face-up cut appearance requires a standardized lighting and viewing environment.

Keep in mind that the GIA Cut Grading System guides consumers toward the diamonds with the most commonly preferred appearances. To better appreciate that a diamond may look different under different types of lighting, someone considering a diamond purchase should look at the gem in a variety of lighting environments. This lets them choose the diamond with the look that they personally deem the most pleasing to their own eyes.

There are several ways to estimate a GIA Cut Grade for a standard round brilliant cut diamond.

- Using *GIA Facetware® online* (<http://facetware.gia.edu>). In this online software program that is available at no charge, the user will need to input accurate proportion measurement information of a diamond to obtain an estimate of the cut grade. Such measurements can be derived from a non-contact measuring device, a millimeter gauge, a Proportionscope, or by other visual means using a microscope. Visual estimation techniques to evaluate round brilliant diamond proportions taught by GIA Education can also help. Examples of look-up tables for cut grades used for GIA Facetware® are repeated in GIA’s *Diamond Grading Lab Manual*, available through the GIA Education Department. The Facetware® Cut Estimator predicts the overall cut grade that a particular standard round brilliant diamond would receive from GIA, based on GIA’s examination and measurement of the diamond’s proportions and other limiting parameters.
- Using a *non-contact proportion measurement device*. This device measures the diamond and estimates a GIA cut grade with the GIA Facetware® in one operation.

The actual overall cut grade received from the GIA Laboratory for a diamond may differ from that predicted by the GIA Facetware® for the following reasons:

- The diamond’s actual measured proportions (e.g., the crown angle) or grading parameters (e.g., the symmetry) as determined by GIA are different than those used as input by Facetware®.
- The accuracy and tolerances of different measurement methodologies (including optical) that are used in the trade may differ from those used by GIA to measure proportions.
- The displayed girdle thickness and/or total depth (when not entered by the user) is derived from other input proportions. In some cases, this may lead to girdle thickness and/or total depth values that are different than the actual values due to rounding and/or conversion from verbal descriptions (culet size and girdle thickness).

The five sets of virtual images shown below demonstrate face-up static patterns associated with the appearance of each of the five cut grades as seen under identical lighting and viewing conditions, and are best understood when seen as the diamond is rocked or tilted.

Grading System Definitions

Brightness is the result of all internal and external reflections of white light. Note that if there is light leakage through the pavilion facets due to the chosen proportions, there is less light reflected through the crown facets making the diamond appear less bright.

Fire results when white light is dispersed into its spectral colors, which appear to the observer as areas of extremely bright and distinct colors.

Scintillation is a combination of:

- Sparkle** is the appearance or extent of spots of white or colored light that flash as the diamond, the observer, or the light source moves.
- Pattern** is the relative size, arrangement, and contrast of bright and dark areas that result from a diamond’s internal and external reflections when it is viewed face-up. Note that pattern is also affected by light leakage; the manner in which it is affected depends on the overall proportion combination. Pattern includes aspects of tilt, such as at what point of tilt a “fish-eye” pattern appears to the observer. Culet size is part of pattern since a very large culet would be a light or dark spot in the center of the pattern.

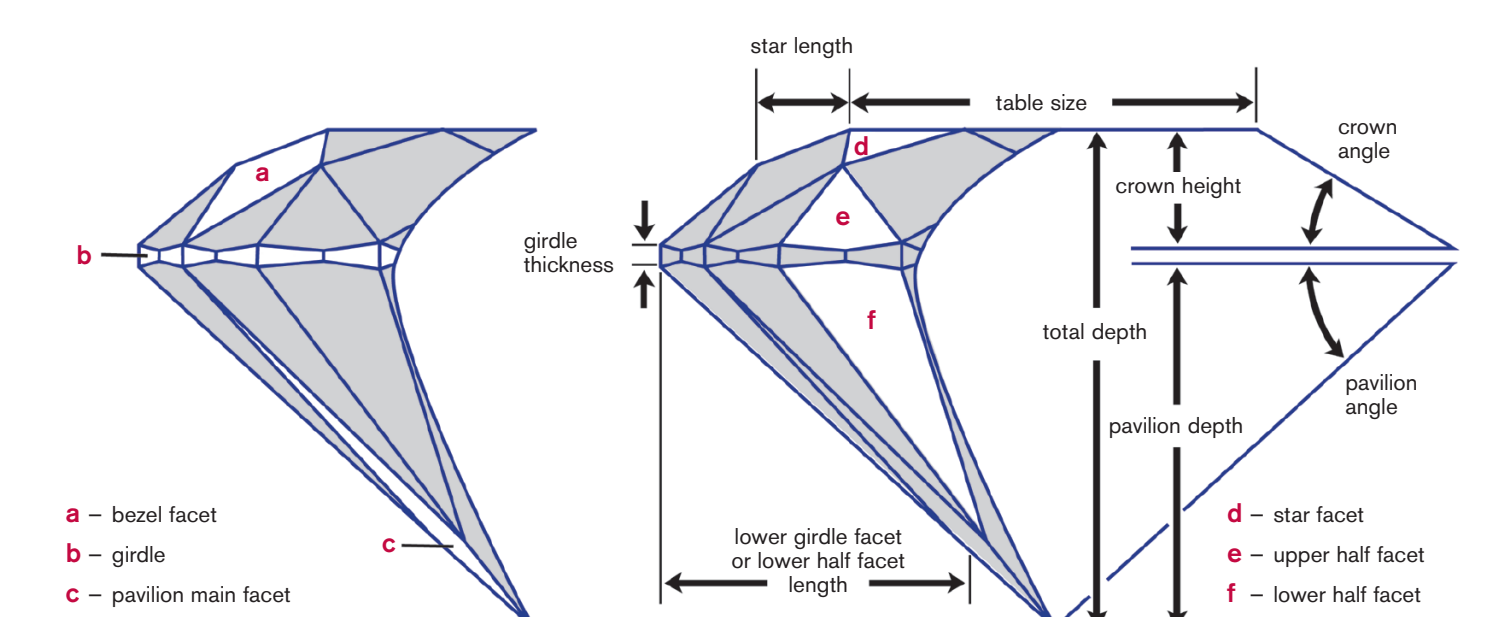
Weight Ratio is a comparison of a diamond’s weight to its diameter. A diamond can have too much or too little weight for its diameter. The girdle thickness is an important factor for weight ratio if the thickness adds a substantial increase in weight. Total depth percentage helps evaluate the weight ratio (see the Parameter Tables).

Durability is the potential risk of damage due to vulnerable thin girdles or points. GIA does not consider a shallow crown a durability risk unless the girdle thickness is very thin. Unusually thin girdles create a high risk for damage in normal jewelry wear.

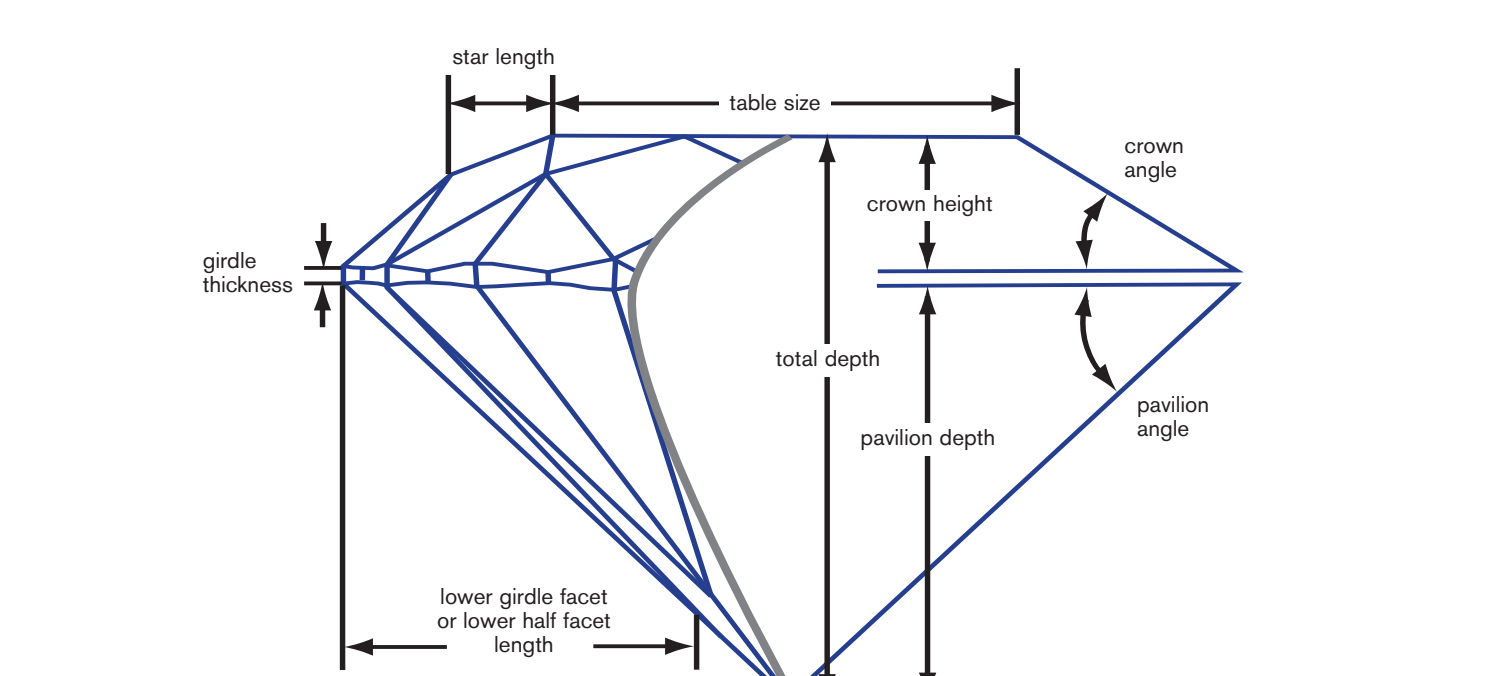
Polish describes the quality of the surface condition of the facets of a diamond.

Symmetry is the exactness of the shape of a diamond, and the symmetrical arrangement and even placement of the facets. Symmetry has two aspects:

- Proportion symmetry** is an evaluation of the alignment and balance of the stone’s table, culet, girdle outline, and angles.
- Facet symmetry** is an evaluation of the shape, placement, and presence or absence of the facets themselves.



The facets and proportions of a standard round brilliant include bezel facet, girdle, pavilion main facet, star facet, star facet length, upper half facet (or upper girdle facet), table size, crown angle, crown height, girdle thickness, pavilion angle, pavilion depth, lower half facet (or lower girdle facet), lower half facet length, culet size, pavilion depth, and total depth.



GIA Diamond Grading Reports include a graphic scaled to depict the actual parameters of the following factors: table size, crown angle, pavilion angle, crown height, pavilion depth, star length, lower half length, girdle thickness, culet size, and total depth.

For more information on GIA’s Cut Grading System, visit http://www.diamondcut.gia.edu/10_learn_more.html

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EXCELLENT	VERY GOOD	GOOD	FAIR	POOR
<p>Table size: 53% Crown angle: 34.5° Pavilion angle: 40.8° Star length: 55% Lower half length: 80% Girdle thickness: 2.5% (Medium) Culet size: None Total depth: 62.5% Polish: VG Symmetry: EX Pavilion depth: 43.0% Crown height: 16.0%</p> <p><i>An even distribution of bright and dark patterns typifies the best looking diamonds. Here, the pavilion main facets reflect dark, but the areas surrounding them are bright.</i></p>	<p>Table size: 53% Crown angle: 34.5° Pavilion angle: 40.8° Star length: 55% Lower half length: 80% Girdle thickness: 4.5% (Slightly Thick to Thick) Culet size: Medium Total depth: 64.2% Polish: VG Symmetry: EX Pavilion depth: 43.0% Crown height: 16.0%</p> <p><i>All parameters are within the Excellent range except total depth, girdle thickness, and culet size. The face-up appearance may be as good as those in the Excellent range, but the diamond has too much weight for its diameter.</i></p>	<p>Table size: 53% Crown angle: 32.0° Pavilion angle: 42.8° Star length: 55% Lower half length: 80% Girdle thickness: 3.5% (Medium) Culet size: None Total depth: 59.8% Polish: VG Symmetry: EX Pavilion depth: 46.5% Crown height: 14.5%</p> <p><i>While this diamond is Excellent, it lacks a strong or distinct reflection pattern.</i></p>	<p>Table size: 53% Crown angle: 32.0° Pavilion angle: 42.8° Star length: 55% Lower half length: 80% Girdle thickness: 3.5% (Medium) Culet size: None Total depth: 59.8% Polish: VG Symmetry: EX Pavilion depth: 46.5% Crown height: 14.5%</p> <p><i>The overall dark appearance is a result of shallow pavilion and crown angles.</i></p>	<p>Table size: 49% Crown angle: 39.0° Pavilion angle: 42.0° Star length: 55% Lower half length: 80% Girdle thickness: 5.5% (Thick) Culet size: None Total depth: 71.3% Polish: G Symmetry: VG Pavilion depth: 45.0% Crown height: 21.0%</p> <p><i>The unusual face-up pattern is a result of the extreme crown angle and small table size. The culet is also off-center.</i></p>
<p>Table size: 57% Crown angle: 35.5° Pavilion angle: 40.8° Star length: 55% Lower half length: 80% Girdle thickness: 3.0% (Medium) Culet size: None Total depth: 61.2% Polish: EX Symmetry: VG Pavilion depth: 43.0% Crown height: 15.5%</p> <p><i>An even distribution of bright and dark patterns typifies the best looking diamonds. The balanced even reflection pattern is more visible when the diamond is in movement.</i></p>	<p>Table size: 53% Crown angle: 30.0° Pavilion angle: 41.4° Star length: 55% Lower half length: 80% Girdle thickness: 3.5% (Medium) Culet size: None Total depth: 60.9% Polish: VG Symmetry: VG Pavilion depth: 44.0% Crown height: 15.5%</p> <p><i>A shallower crown angle tends to darken the overall appearance of a diamond. The pattern of darker reflected main facets is somewhat prominent.</i></p>	<p>Table size: 57% Crown angle: 33.5° Pavilion angle: 42.8° Star length: 55% Lower half length: 80% Girdle thickness: 3.0% (Medium) Culet size: None Total depth: 58.8% Polish: VG Symmetry: EX Pavilion depth: 41.5% Crown height: 13.5%</p> <p><i>The shallower pavilion angle contributes to the darker appearing pattern seen in this diamond.</i></p>	<p>Table size: 57% Crown angle: 34.0° Pavilion angle: 40.2° Star length: 55% Lower half length: 85% Girdle thickness: 3.0% (Thin to Medium) Culet size: None Total depth: 62.2% Polish: VG Symmetry: G Pavilion depth: 42.0% Crown height: 9.5%</p> <p><i>The extremely shallow crown angle is a major cause of the darkening in this diamond. The culet is off-center.</i></p>	<p>Table size: 50% Crown angle: 40.0° Pavilion angle: 41.0° Star length: 55% Lower half length: 70% Girdle thickness: 5.5% (Thick) Culet size: None Total depth: 69.7% Polish: G Symmetry: VG Pavilion depth: 43.5% Crown height: 21.0%</p> <p><i>Although proportions are similar to the diamond above, the shorter lower half facets cause a dramatic difference in appearance.</i></p>
<p>Table size: 57% Crown angle: 32.0° Pavilion angle: 41.8° Star length: 55% Lower half length: 80% Girdle thickness: 2.5% (Slightly Thin to Medium) Culet size: None Total depth: 60.5% Polish: VG Symmetry: EX Pavilion depth: 44.5% Crown height: 13.5%</p> <p><i>An even distribution of bright and dark patterns typifies the best looking diamonds. The balanced even reflection pattern is more visible when the diamond is in movement.</i></p>	<p>Table size: 57% Crown angle: 29.0° Pavilion angle: 41.8° Star length: 55% Lower half length: 80% Girdle thickness: 2.5% (Thin to Medium) Culet size: None Total depth: 59.8% Polish: VG Symmetry: VG Pavilion depth: 44.5% Crown height: 12.0%</p> <p><i>While a shallower crown angle darkens the overall appearance of a diamond, the larger table opens the diamond up, brightening it, but altering the reflection pattern from that created by a smaller table (see above).</i></p>	<p>Table size: 57% Crown angle: 33.5° Pavilion angle: 43.0° Star length: 55% Lower half length: 80% Girdle thickness: 3.5% (Medium to Slightly Thick) Culet size: None Total depth: 63.8% Polish: VG Symmetry: EX Pavilion depth: 46.5% Crown height: 12.0%</p> <p><i>This diamond lacks a strong or distinct reflection pattern.</i></p>	<p>Table size: 57% Crown angle: 40.0° Pavilion angle: 43.0° Star length: 55% Lower half length: 70% Girdle thickness: 2.5% (Thin) Culet size: None Total depth: 68.2% Polish: VG Symmetry: G Pavilion depth: 46.5% Crown height: 18.0%</p> <p><i>This diamond lacks life and is quite unattractive, a result of the steep crown and pavilion angles. The diamond is also slightly out of round.</i></p>	<p>Table size: 57% Crown angle: 41.0° Pavilion angle: 44.0° Star length: 55% Lower half length: 80% Girdle thickness: 5.5% (Thick) Culet size: None Total depth: 72.2% Polish: G Symmetry: F Pavilion depth: 48.5% Crown height: 12.5%</p> <p><i>The steep pavilion angle and crown angle create a dark appearance. The culet is also off-center.</i></p>
<p>Table size: 59% Crown angle: 35.0° Pavilion angle: 41.0° Star length: 55% Lower half length: 80% Girdle thickness: 3.5% (Medium) Culet size: None Total depth: 61.2% Polish: VG Symmetry: EX Pavilion depth: 43.5% Crown height: 14.5%</p> <p><i>An even distribution of bright and dark patterns typifies the best looking diamonds. The balanced even reflection pattern is more visible when the diamond is in movement.</i></p>	<p>Table size: 57% Crown angle: 37.5° Pavilion angle: 40.2° Star length: 55% Lower half length: 80% Girdle thickness: 3.5% (Medium) Culet size: None Total depth: 62.2% Polish: VG Symmetry: VG Pavilion depth: 42.0% Crown height: 16.5%</p> <p><i>Producing a pattern of darkened main facet reflections with a steeper crown angle is accomplished by lowering the pavilion angle. The overall result is a slight darkening of the diamond’s general appearance.</i></p>	<p>Table size: 61% Crown angle: 31.0° Pavilion angle: 41.4° Star length: 55% Lower half length: 80% Girdle thickness: 3.5% (Medium) Culet size: None Total depth: 59.0% Polish: VG Symmetry: VG Pavilion depth: 44.0% Crown height: 11.5%</p> <p><i>The shallow pavilion angle creates a strong, dark reflection pattern.</i></p>	<p>Table size: 61% Crown angle: 26.0° Pavilion angle: 39.8° Star length: 45% Lower half length: 85% Girdle thickness: 4.0% (Slightly Thick) Culet size: None Total depth: 55.2% Polish: VG Symmetry: G Pavilion depth: 41.5% Crown height: 9.5%</p> <p><i>While the general proportions would cause this diamond to fall into the Good range (even though it is out-of-round and the culet is off-center), the extremely thick girdle lowers the diamond into the Fair range.</i></p>	<p>Table size: 60% Crown angle: 41.5° Pavilion angle: 43.4° Star length: 65% Lower half length: 85% Girdle thickness: 5.0% (Slightly Thick to Thick) Culet size: None Total depth: 70.2% Polish: G Symmetry: G Pavilion depth: 47.5% Crown height: 17.5%</p> <p><i>The steep crown angle, pavilion angle, and large star facets combine to make a dark center and unusual pattern in this diamond.</i></p>
<p>Table size: 61% Crown angle: 33.0° Pavilion angle: 41.2° Star length: 55% Lower half length: 80% Girdle thickness: 2.5% (Medium) Culet size: None Total depth: 59.2% Polish: VG Symmetry: EX Pavilion depth: 43.5% Crown height: 12.5%</p> <p><i>Diamonds with large table facets only have a few proportion combinations that contribute to an appearance that qualifies them for the Excellent cut grade.</i></p>	<p>Table size: 61% Crown angle: 31.0° Pavilion angle: 41.4° Star length: 55% Lower half length: 80% Girdle thickness: 3.5% (Medium) Culet size: None Total depth: 60.0% Polish: VG Symmetry: VG Pavilion depth: 44.0% Crown height: 11.5%</p> <p><i>The slightly shallower crown angle (compared to the Excellent image at left) contributes to a slight overall darkening of the diamond’s appearance.</i></p>	<p>Table size: 61% Crown angle: 31.0° Pavilion angle: 41.4° Star length: 55% Lower half length: 80% Girdle thickness: 3.5% (Medium) Culet size: None Total depth: 60.0% Polish: VG Symmetry: VG Pavilion depth: 44.0% Crown height: 11.5%</p> <p><i>The grade is lowered due to digging out on the pavilion which radically changes the face-up view of the diamond on the left, changing its pattern and darkening its appearance.</i></p>	<p>Table size: 61% Crown angle: 26.0° Pavilion angle: 39.8° Star length: 45% Lower half length: 85% Girdle thickness: 4.0% (Slightly Thick) Culet size: None Total depth: 55.2% Polish: VG Symmetry: G Pavilion depth: 41.5% Crown height: 9.5%</p> <p><i>The shallow crown and pavilion angles are the primary cause of the overall darkness in this diamond. The culet is also slightly off-center.</i></p>	<p>Table size: 60% Crown angle: 41.5° Pavilion angle: 43.4° Star length: 65% Lower half length: 85% Girdle thickness: 5.0% (Slightly Thick to Thick) Culet size: None Total depth: 70.2% Polish: G Symmetry: G Pavilion depth: 47.5% Crown height: 17.5%</p> <p><i>The steep crown angle, pavilion angle, and large star facets combine to make a dark center and unusual pattern in this diamond.</i></p>

Parameter Tables

The following tables provide ranges of individual limiting parameters for each GIA cut grade. However, the GIA Cut Grading System *also* considers a round brilliant diamond’s proportions *together* as well as individually. Even though all of a diamond’s parameters might be within the limits for a particular grade, a diamond might actually receive a lower cut grade when the parameters interact in a negative way to lessen a diamond’s appearance. The interactions of the table percentage, crown angle, and pavilion angle are especially critical. If two or more of these parameters are close to their respective grade boundaries, their interaction will probably lower the diamond’s cut grade.

Further, the limits for crown height and total depth are applied to derived values based on rounded key proportions, rather than on the direct measurements of these two quantities. This insures that GIA cut grades are predictable from rounded proportions and that diamonds with the same rounded proportions and verbal calls will obtain the same grade.

GIA provides additional charts—not included here (See GIA’s *Diamond Grading Lab Manual*, available from GIA Education)—showing that certain combinations of angles and table percentages also lower the grade further. A diamond’s cut grade can also be affected by severe tilting of the upper or lower half facets, known in the diamond trade as painting or digging (see the “Finish, Culet Size and Girdle Thickness; Categories of the GIA Diamond Cut Grading System” chart).

NOTE: The final components: Finish—polish and symmetry—along with girdle thickness and culet size are evaluated visually and recorded as a verbal description. A diamond’s polish and symmetry ratings can be one grade lower than its cut without affecting the final cut grade (see the “Finish, Culet Size and Girdle Thickness; Categories of the GIA Diamond Cut Grading System” chart).

Please see GIA’s *Diamond Grading Lab Manual* for further information.

Table Size	
Possible Grade	Parameter Range
Excellent to Poor	52% to 62%
Very Good to Poor	50% to 66%
Good to Poor	47% to 69%
Fair to Poor	44% to 72%
Poor	<44% to >72%

Crown Angle	
Possible Grade	Parameter Range
Excellent to Poor	31.5° to 36.5°
Very Good to Poor	26.5° to 38.5°
Good to Poor	22.0° to 40.0°
Fair to Poor	20.0° to 41.5°
Poor	<20.0° to >41.5°

Pavilion Angle	
Possible Grade	Parameter Range
Excellent to Poor	40.6° to 41.8°
Very Good to Poor	39.8° to 42.4°
Good to Poor	38.8° to 43.0°
Fair to Poor	37.4° to 44.0°
Poor	<37.4° to >44.0°

Culet Size	
Possible Grade	Parameter Range
Excellent to Poor	none to small
Very Good to Poor	none to medium
Good to Poor	none to large
Fair to Poor	none to very large
Poor	none to extremely large

Star Facet Length	
Possible Grade	Parameter Range
Excellent to Poor	45% to 65%
Very Good to Poor	40% to 70%
Good to Poor	any value
Fair to Poor	any value
Poor	any value

Lower Half Facet Length	
Possible Grade	Parameter Range
Excellent to Poor	70% to 85%
Very Good to Poor	65% to 90%
Good to Poor	any value
Fair to Poor	any value
Poor	any value

Girdle Thickness %	
Possible Grade	Parameter Range
Excellent to Poor	2.5%* to 4.5%
Very Good to Poor	up to 5.5%
Good to Poor	up to 7.5%
Fair to Poor	up to 10.5%
Poor	any value

Girdle Thickness Verbal Description									
		Thickest Portion							
		Extremely Thin	Very Thin	Thin	Medium	Brightly Thick	Thick	Very Thick	Extremely Thick
Thinnest Portion	Extremely Thin	Good	Very Good	Very Good	Very Good	Very Good	Good	Fair	
	Very Thin	Very Good	Very Good	Very Good	Very Good	Very Good	Good	Fair	
Medium		Excellent	Excellent	Excellent	Very Good	Very Good	Good	Fair	
Thick				Excellent	Excellent	Very Good	Very Good	Fair	
Very Thick					Very Good	Very Good	Good	Fair	
Extremely Thick							Good	Fair	

Polish	
Possible Grade	Polish Grade
Excellent to Poor	Excellent
Excellent to Poor	Very Good
Very Good to Poor	Good
Good to Poor	Fair
Poor	Poor

Symmetry	
Possible Grade	Symmetry Grade
Excellent to Poor	Excellent
Excellent to Poor	Very Good
Very Good to Poor	Good
Good to Poor	Fair
Poor	Poor

Crown Height	
Possible Grade	Parameter Range
Excellent to Poor	12.5% to 17.0%
Very Good to Poor	10.5% to 18.0%
Good to Poor	9.0% to 19.5%
Fair to Poor	7.0% to 21.0%
Poor	<7.0% to >21.0%

Total Depth	
Possible Grade	Parameter Range
Excellent to Poor	57.5% to 63.0%
Very Good to Poor	56.0% to 64.5%
Good to Poor	53.0% to 66.5%
Fair to Poor	51.0% to 70.9%
Poor	<51.9% to >70.9%