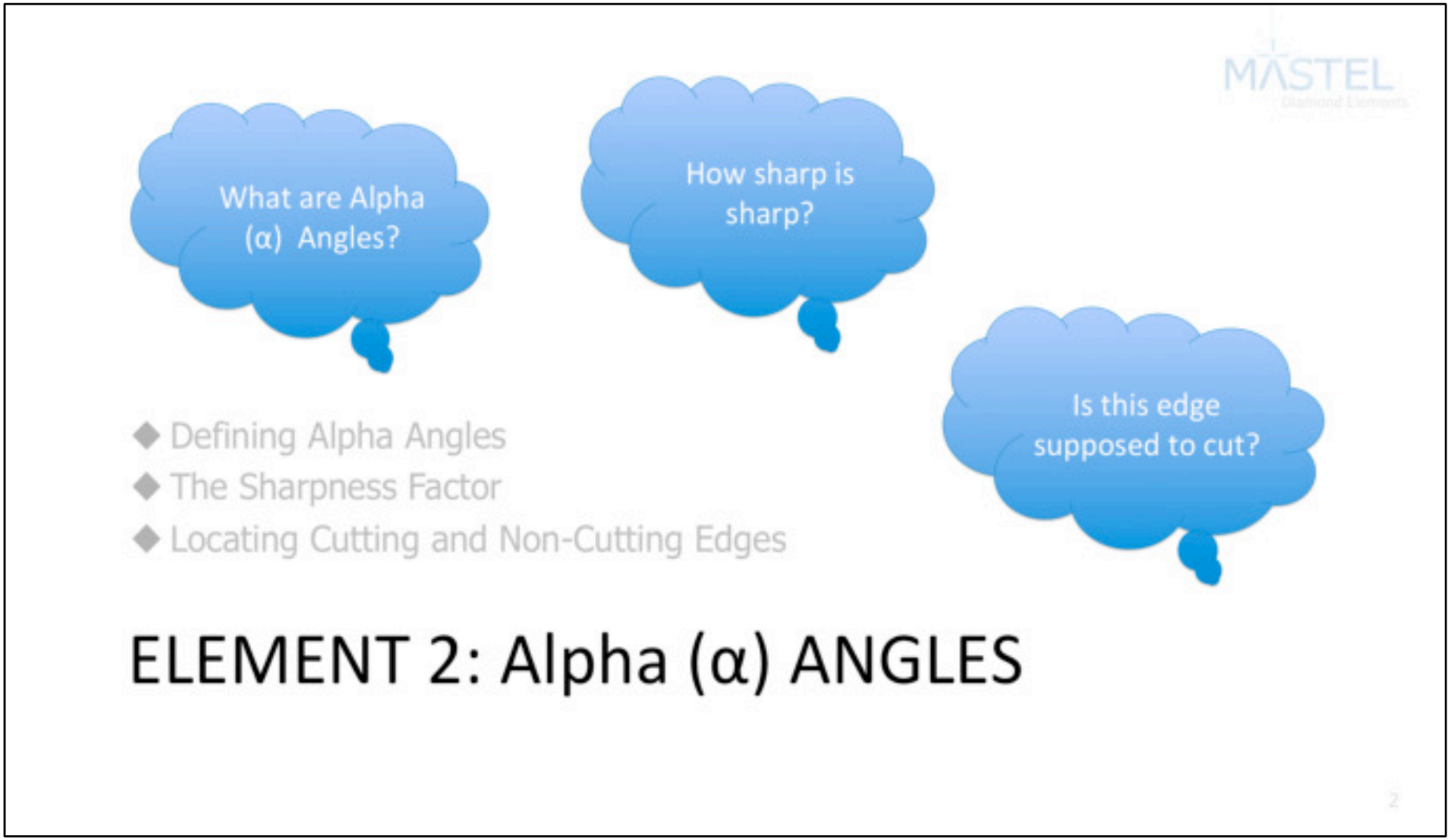
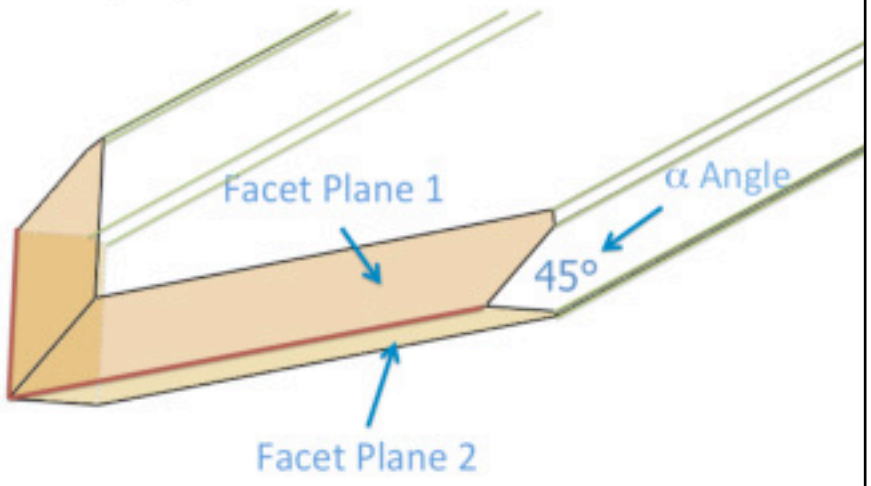
Welcome to the Diamond Elements series by Mastel. In this series, we hope to assist our clients in making more informed scalpel purchases. We aim to promote the understanding of blade design in relation to wound architecture, and to encourage customers to purchase lances in place of spears. This presentation covers Element 2, Alpha Angles.

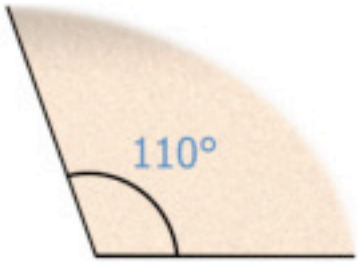


Today we will locate and define an alpha angle on the diamond scalpel, we will then define what constitutes a sharp or blunt alpha angle, and finally we will demonstrate how the alpha angles should vary based on location on the diamond Scalpel and intended use.

Defining Angle Alpha (α)

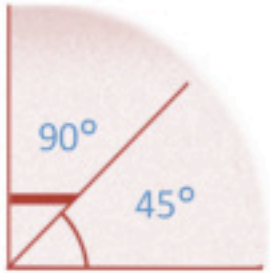
- An α angle is the **included angle** between two facet planes that forms an edge.
- If an α angle is less than 110°, it forms a cutting edge.





Defining Angle

Noncutting Angle (Blunt)



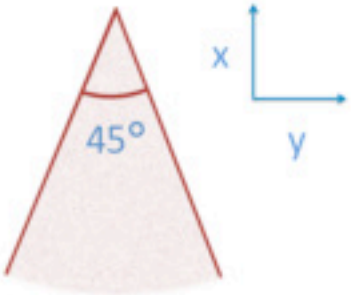
Cutting Angles

An alpha angle is the included angle between two facet planes. As such all edges on a diamond blade have alpha angles. A cutting angle is defined as an angle that is less than 110 degrees. There are two major types of alpha angles non-cutting or blunt and cutting angles.

Cutting Edge Alpha (α) Angles

- The smaller the α angle, the sharper the cutting edge.
  - ✓ Sharp 45° (standard)
  - ✓ Sharper 35°
  - ✓ Sharper 30°
  - ✓ Dull 90°

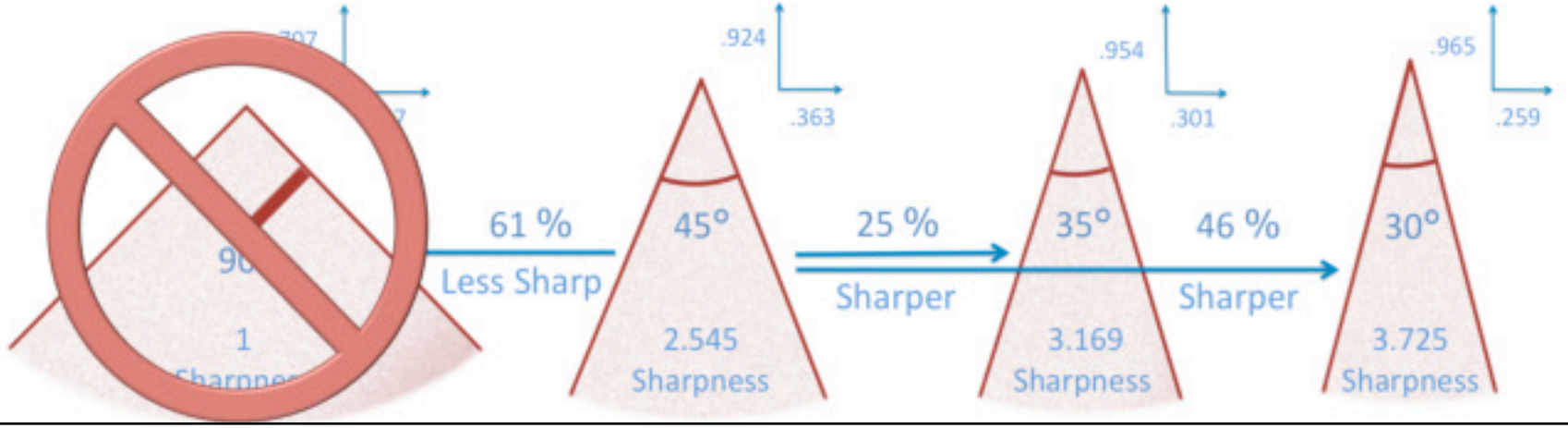
Force Distribution :



Sharpness Calculation:

$\frac{x}{y}$ = Sharpness

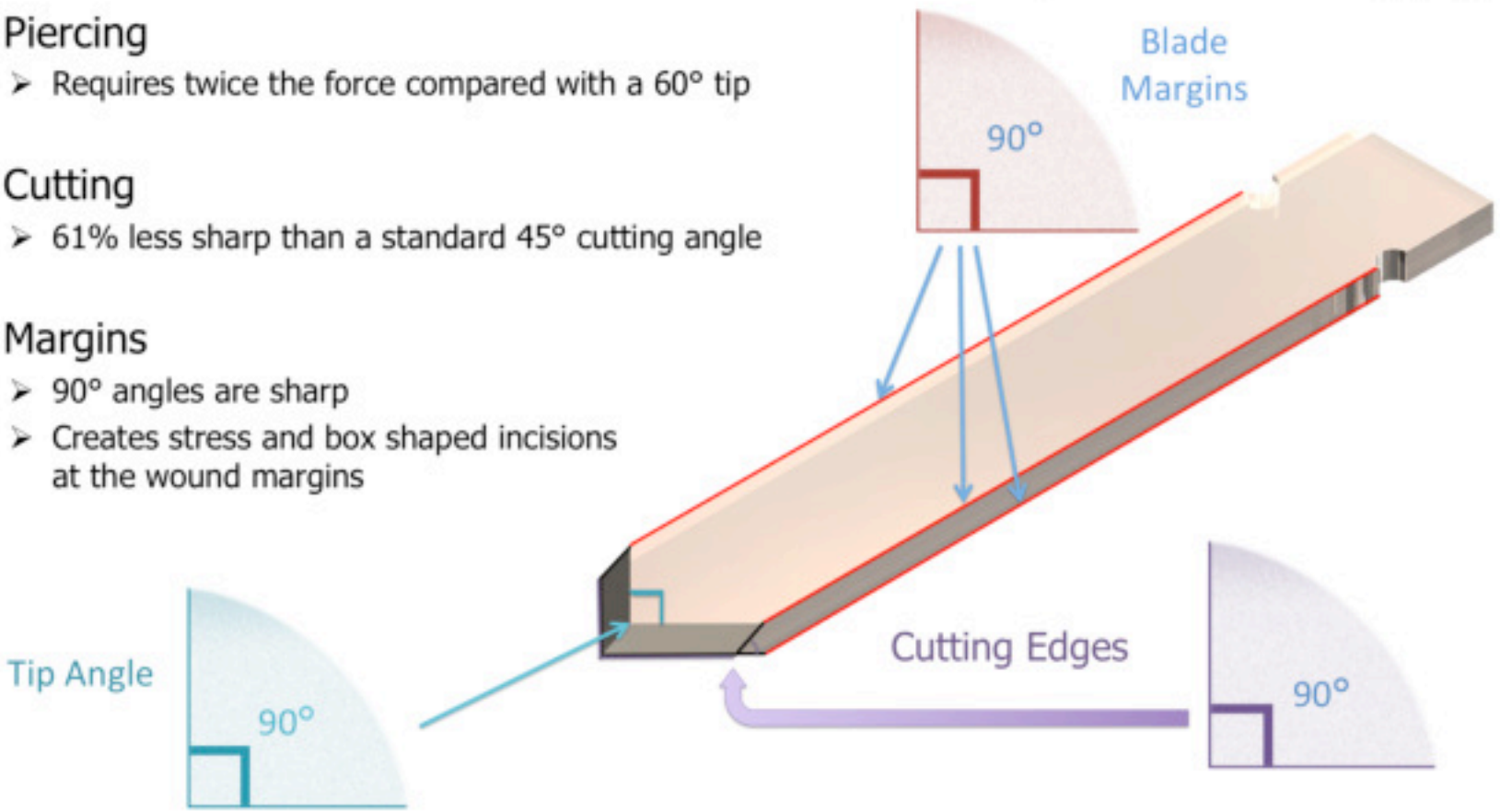
90° Angles are not Ideal for Diamond Blades.



Every blades cutting ability is directly related to its cutting edge alpha angles. To compare the efficiency of different cutting edge angles we will use the same vector mathematics from Diamond Element 1. Most industries use 45 degree alpha angles as cutting edges. Therefore, we will be using 45 degrees as our standard cutting edge angle. Now we will compare the 45 edge to 35 and 30 degree edges. The 35 degree edge is 25% sharper than the 45 and the 30 degree edge is 46% sharper than the 45. Moving backwards, you can see that the 90 degree spear is 61% less sharp than the 45. From this we can conclude that 90 degree are less efficient and require more force into the

The Inefficient 90° Angle

- Piercing
  - Requires twice the force compared with a 60° tip
- Cutting
  - 61% less sharp than a standard 45° cutting angle
- Margins
  - 90° angles are sharp
  - Creates stress and box shaped incisions at the wound margins



As expressed in element 1 a 90 degree tip angle though technically a cutting angle requires twice as much force as a 60 degree lance in order to pierce. For cutting included angles of 90 degrees are dull when compared with the standard 45 degree edge. Just imagine slicing a tomato with a chisel. Similarly, 90 degree angles are not appropriate for blade margins.

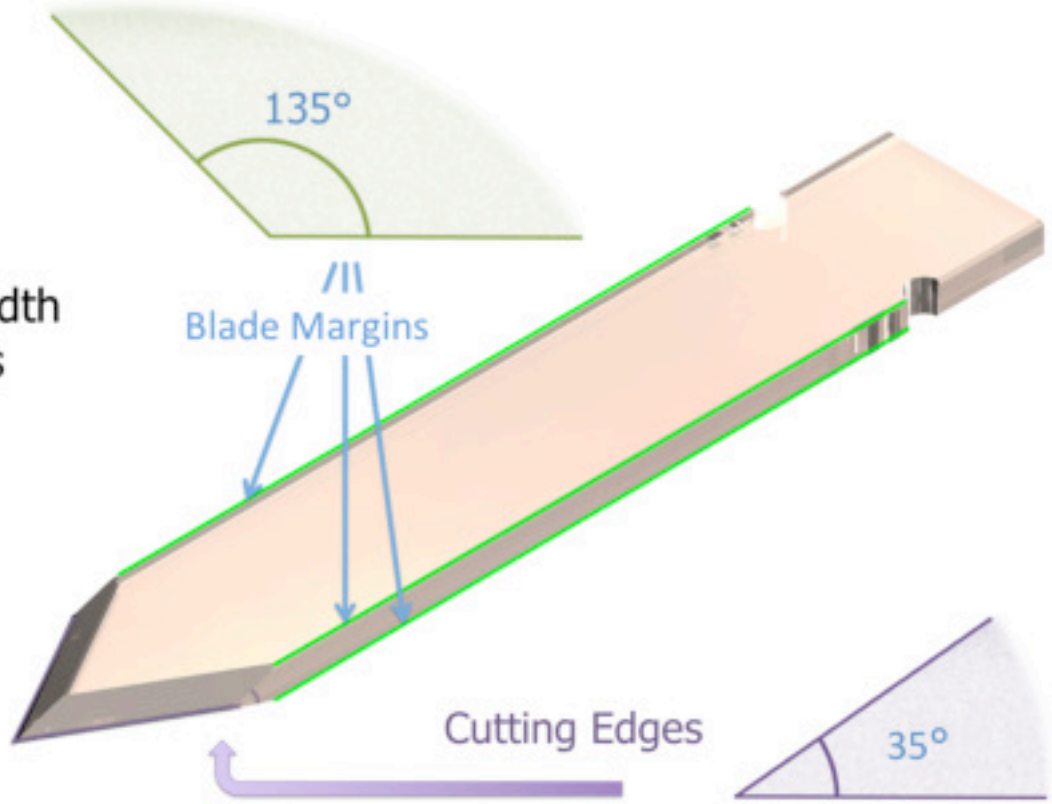
The Inefficient 90° Angle

- Piercing
  - Requires twice the force compared with a 60° tip
- Cutting
  - 61% less sharp than a standard 45° cutting angle
- Margins
  - 90° angles are sharp
  - Creates stress and box shaped incisions at the wound margins

For the blade margins 90 degree angles are actually considered sharp. 90 degree edges at the wound margins create box shaped incisions that can be detrimental to wound closure.

Correctly Applied α Angle

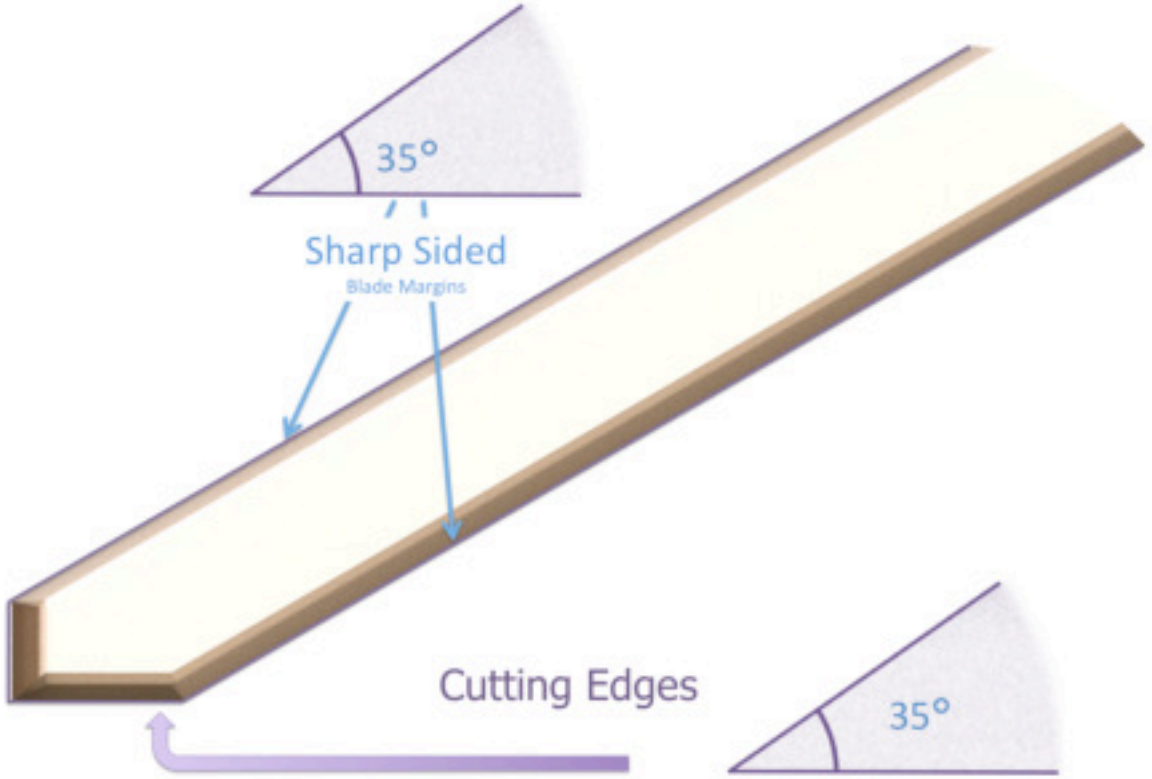
- Cutting edges
- Blade Margins
  - ✓ Dedicated Width Blunt Margins



When alpha angles are correctly applied to blade geometry any cutting edges will be sharp angles between 30 and 45 degrees. The blade margins will come in two main forms blunt edges for **dedicated width blades**, or sharp edges that feature cutting edges along the margins. The key here is to place cutting edges only where they are desired.

Correctly Applied α Angle

- Cutting edges
- Blade Margins
  - ✓ Sharp Sided



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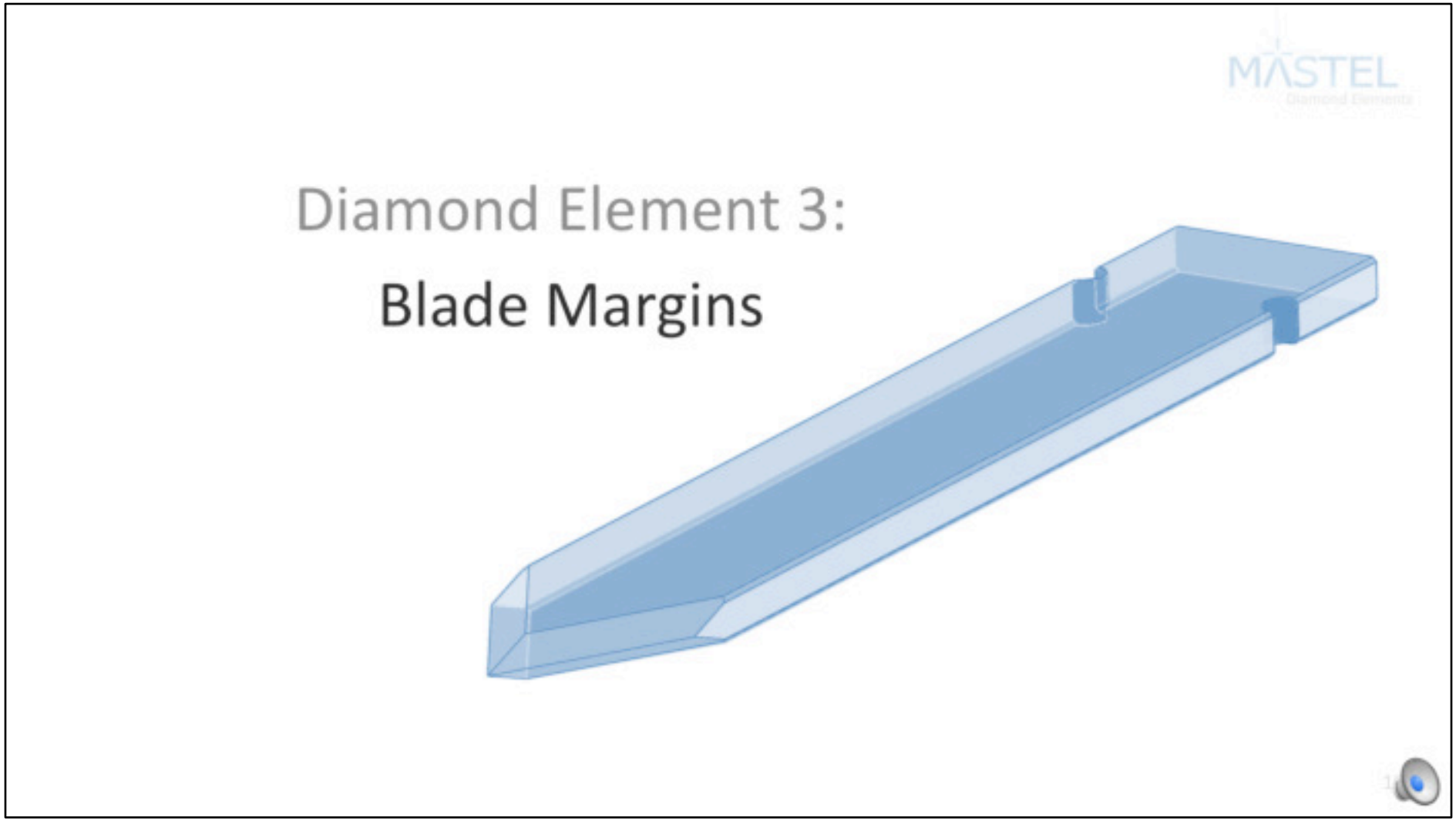
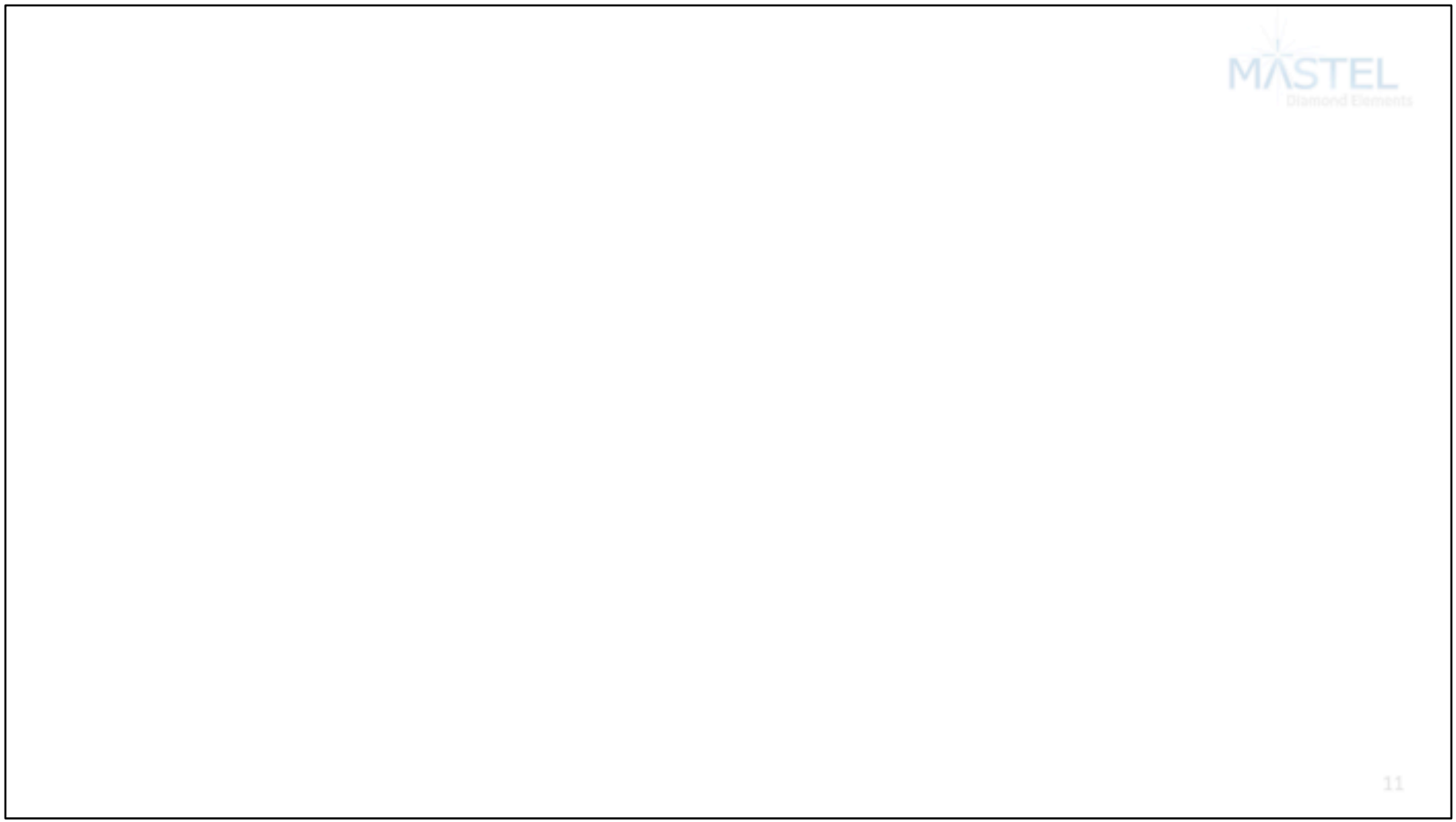
Conclusions

- Alpha angles are included angles between facet planes that form an edge.
  - ✓ Cutting angles are less than 110°
  - ✓ Noncutting (blunt) angles are greater than 110°
- The smaller the α angle, the sharper the edge.
- Alpha angles vary in location and size for different blade functions.

In this presentation we defined the alpha angle which is the included angle between two facet planes and we've shown how to differentiate sharp and blunt alpha angles. We compared sharpness levels of different cutting alpha angles between 30 degrees and 90 degrees. Doing so we proved that smaller angles produce sharper edges. Finally we discussed how strategic placement of alpha angles will increase blade efficiency and safety.



This concludes Diamond Elements 2. In Diamond Elements 3, we will discuss dedicated width blade margin optimization.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