




# ULE Mirror Edging Project Requirements Review



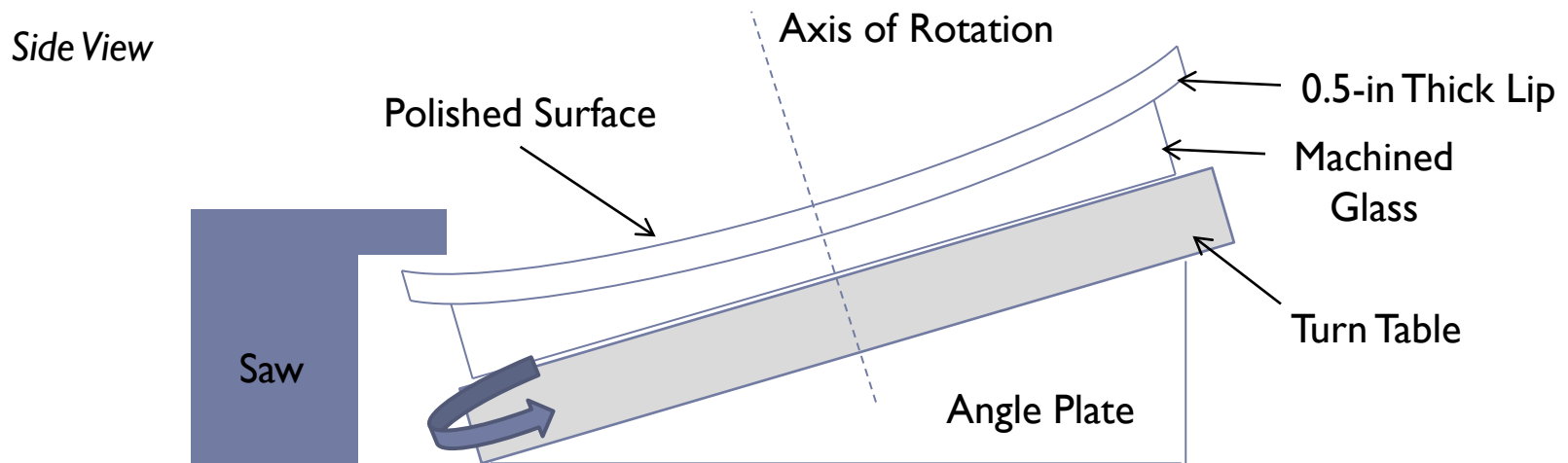
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# Overview

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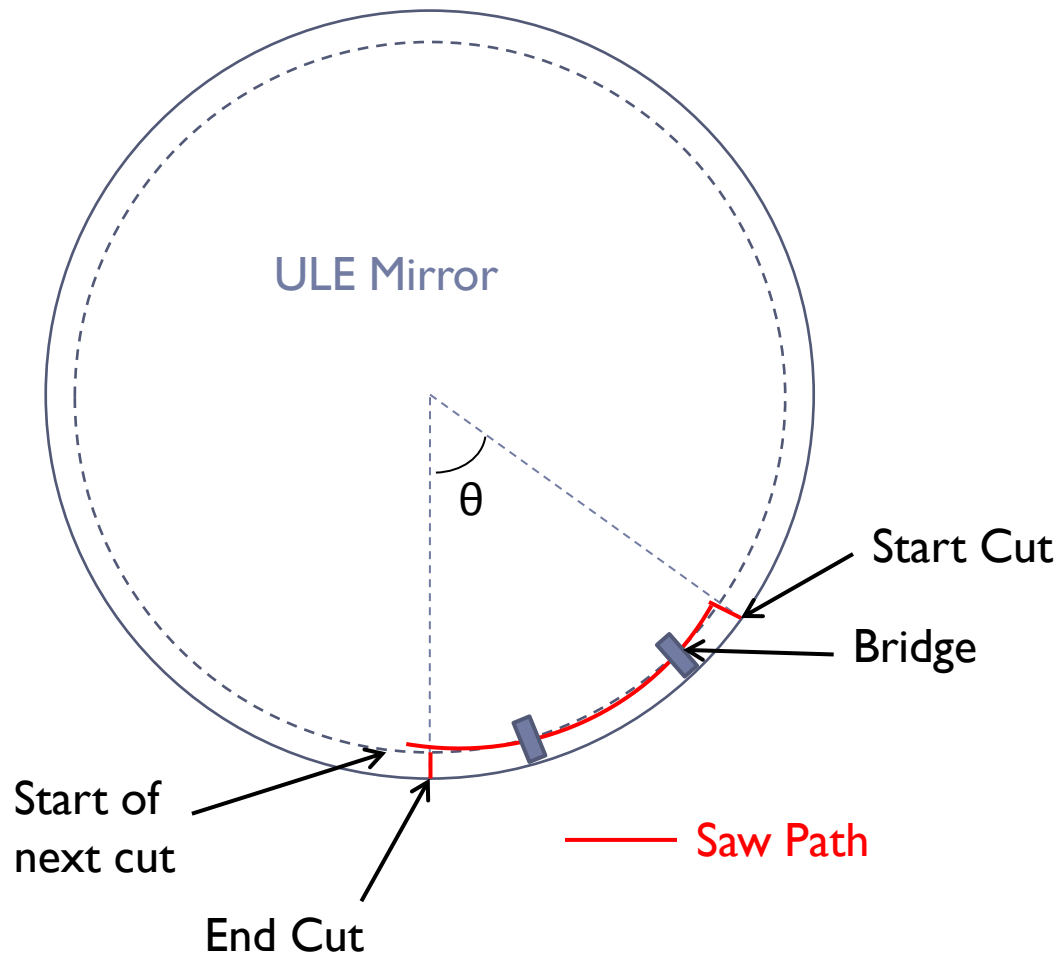
- ▶ During fabrication of large mirrors, a lip is sometimes kept around the outer diameter (OD) in order to manage edge effects during aspheric polishing.
- ▶ Once the polished surface is close to the final figure, the edge is typically ground down to the final OD of the mirror.
- ▶ This project suggests a new method for edging which proposes removing sections of the edge. To do so, the residual glass must be secured during cutting to prevent stress from fracturing the remaining glass.

# ULE Mirror Edging Geometry



- ▶ Meter-class optic is mounted at an angle on a turn-table running at  $0.025^\circ/\text{sec}$
- ▶ Black-box saw creates a 0.1" kerf in the ULE

# ULE Mirror Edging Geometry



- ▶ Mirror edging parameters that will be presented:
  - ▶ Size of cut (in terms of the angle)
  - ▶ Number and type of bridging components required.
  - ▶ Supporting finite element analysis using a model of the ULE mirror

# Top Level Requirements

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- ▶ All modeling and analysis shall be completed in Pro-E/  
Mechanica
- ▶ The overall stress in the residual shall stay less than **1000psi** until the last millimeter of the cut (stress due to the weight of the residual, ignoring any stresses due to the saw)
  - ▶ Shall maintain a safety factor (SF) of at least **5**
  - ▶ Stress defined as Max Principal (not von Mises)
- ▶ Optic safety shall be maintained with no risk of damage to the final diameter or the polished surface (damage defined as anything outside the expected fractures inherent to the sawing operation)
- ▶ Mirror edging shall complete in less than **40 hours**

# Derived Requirements / Preferences

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- ▶ All cuts should be continuous to avoid discontinuities around the edge
- ▶ A bridging mechanism between the final optic and the residual glass shall be defined as follows:
  - ▶ Can be an adhesive or mechanical device, or combination of both
  - ▶ Shall avoid or minimize the use of metal
  - ▶ Shall bridge the gap on the polished surface (as it is easier to clean than a machined, acid-etched surface)
  - ▶ Shall not scratch or damage the polished surface
- ▶ Would prefer to complete edge cut in larger pieces, possibly the entire edge at once

# Interface Requirements

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- ▶ Edging method shall interface with a “black box” saw tool which can be stopped to apply brackets; however stops shall be minimized to decrease artifacts around the edge of the glass

# Operational Environment

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- ▶ Edging of the ULE mirror will occur on a shop floor
- ▶ Working temperature ranges between 65 and 75°F



# Schedule and Cost

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## ▶ Schedule

- ▶ Mechanical analysis shall be completed within the timeframe of the Opti523 course schedule
- ▶ Mirror edging shall complete in less than 40 hours

## ▶ Cost

- ▶ No specific cost restraints were given for this project