

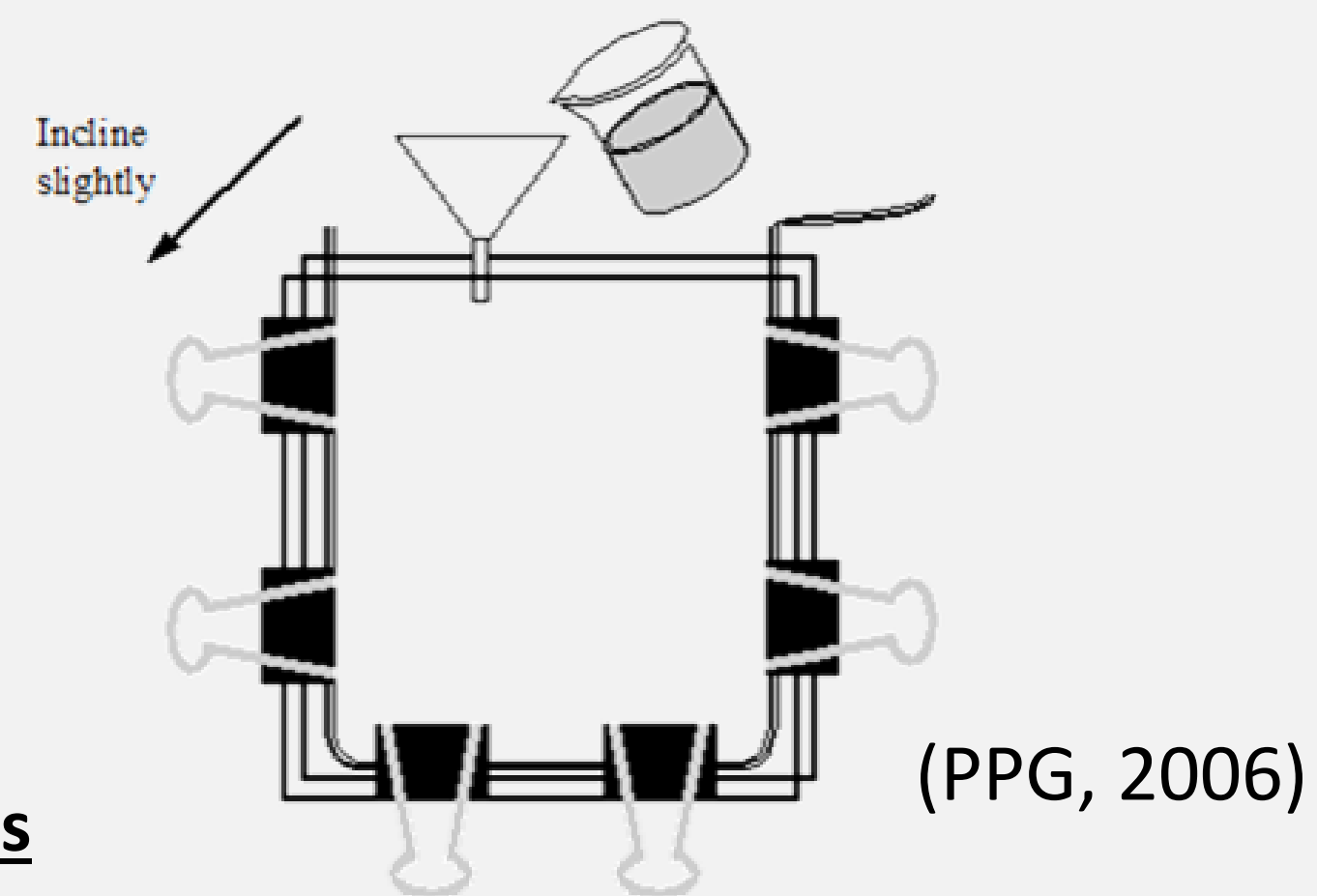
Introduction

Coloursmith Labs Inc.

- Coloursmith Labs, Inc. is an ophthalmic technology company which specializes in the development of optical filtering additives for eyeglasses and contact lenses.

Project Scope

- The objective of this project is to design and fabricate a curing mold capable of creating consistent sample lenses which Coloursmith will use to test the optical quality of their proprietary liquid lens formulation.
- Currently, Coloursmith's mold consists of tempered glass, a gasket, and various binder clips to create lens samples.



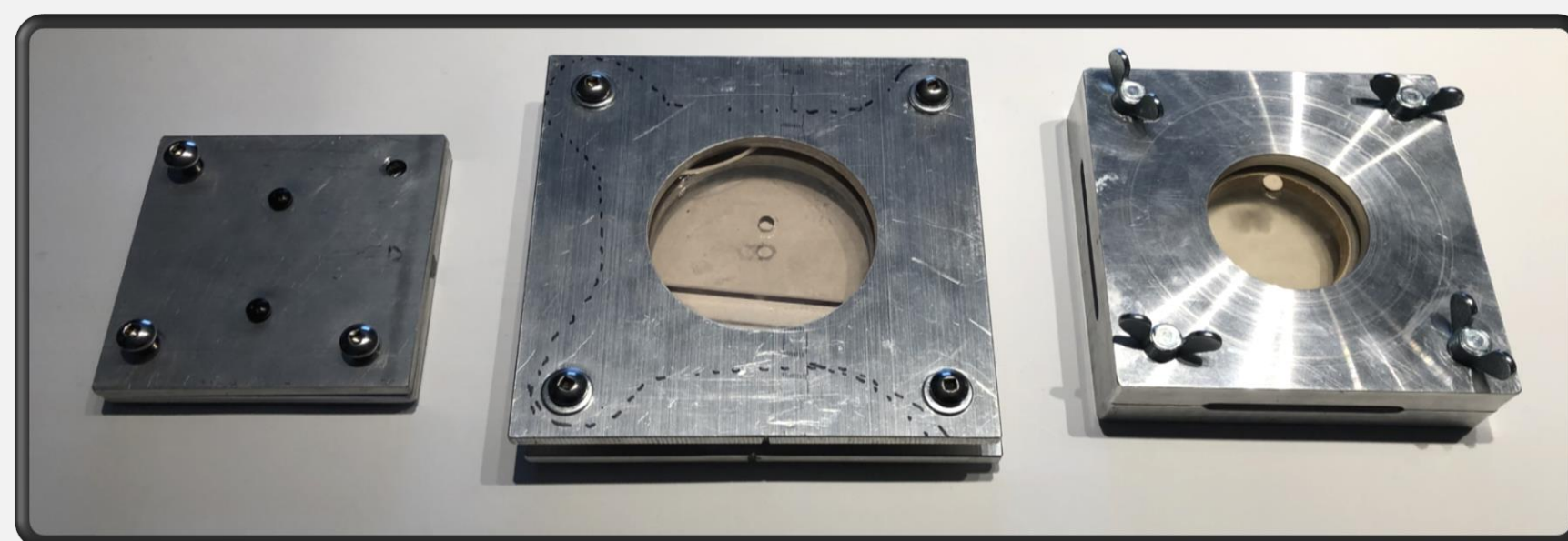
Requirements

The final mold design shall:

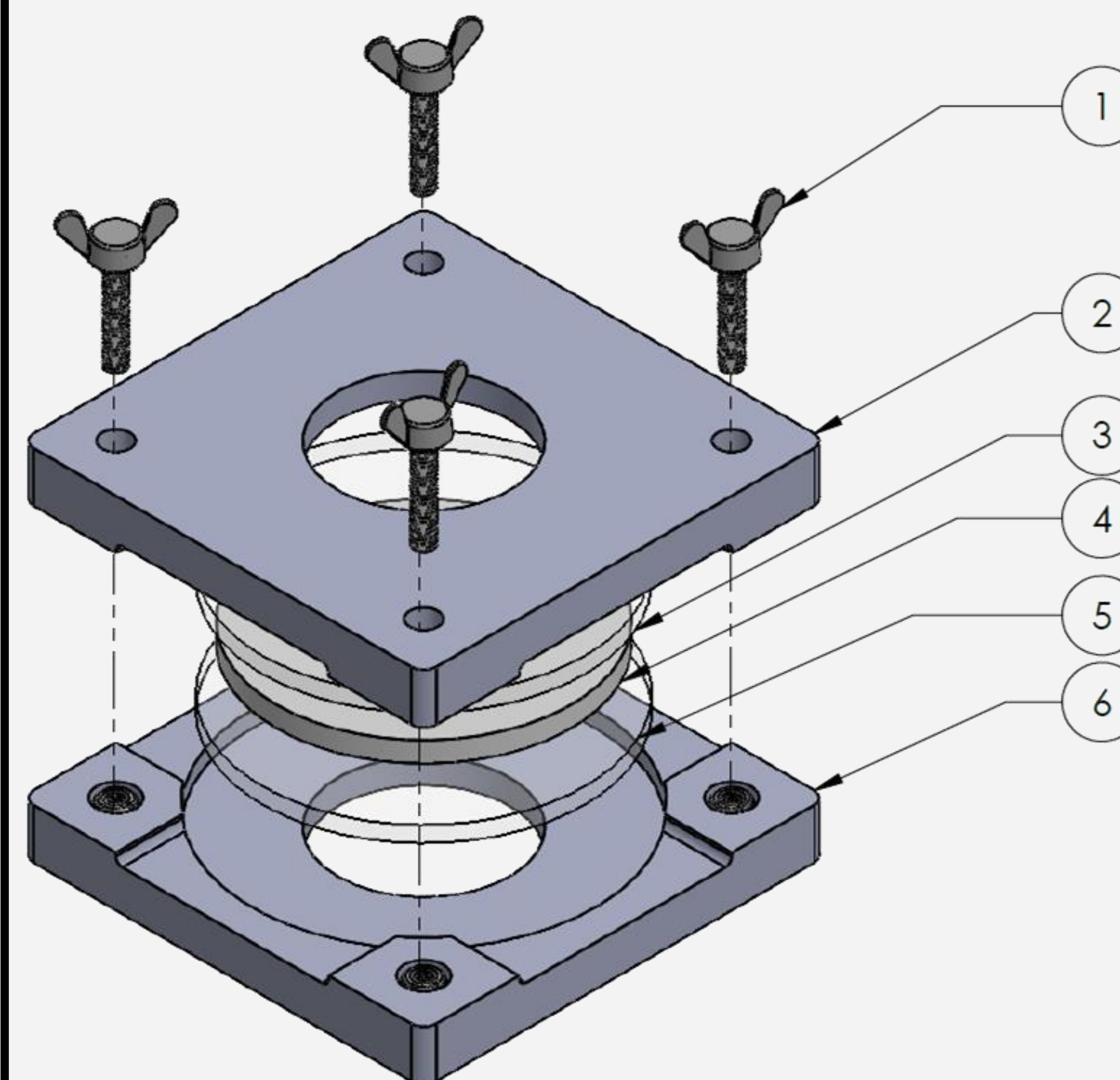
- Survive a curing temperature of 150°C for at least 19 hours. ✓
- Produce a lens of uniform thickness and an optical transmittance in the visible spectrum of >85%. ✓
- Produce a lens of overall diameter equal to 2". ✓
- Be easy to assemble, fill, and separate from the cured lens. ✓
- Cost less than \$250 to construct, including prototype costs. ✓

Design Process

- Three prototypes were created over the course of the project timeline.
- The mating surface of the mold was changed from aluminum to glass to achieve higher transmittance for final lenses.
- A window was created in order to fill the mold cavity using a fill port and to allow for inspection of air bubbles before the oven curing process.
- Thumb screw bolts were added, and aluminum was machined so that bolts applied consistent pressure, bottoming out on the aluminum surface when sufficient force was achieved.



Details of Design



Components	
1	4X Thumb screws for ease of assembly
2	Top half of aluminum mold casing (5" x 5" x 0.5"), machined for constant applied force
3	Circular neo ceram glass with fill port for high quality surface finish
4	Nitrile gasket for curing liquid containment
5	Circular neo ceram glass for high quality surface finish
6	Bottom half of aluminum mold casing (5" x 5" x 0.5") machined for constant applied force with added key locking threaded inserts to preserve threads

Image below showing the clarity and distortion of the final lens. The molded lens offers a clear view of the photo behind.

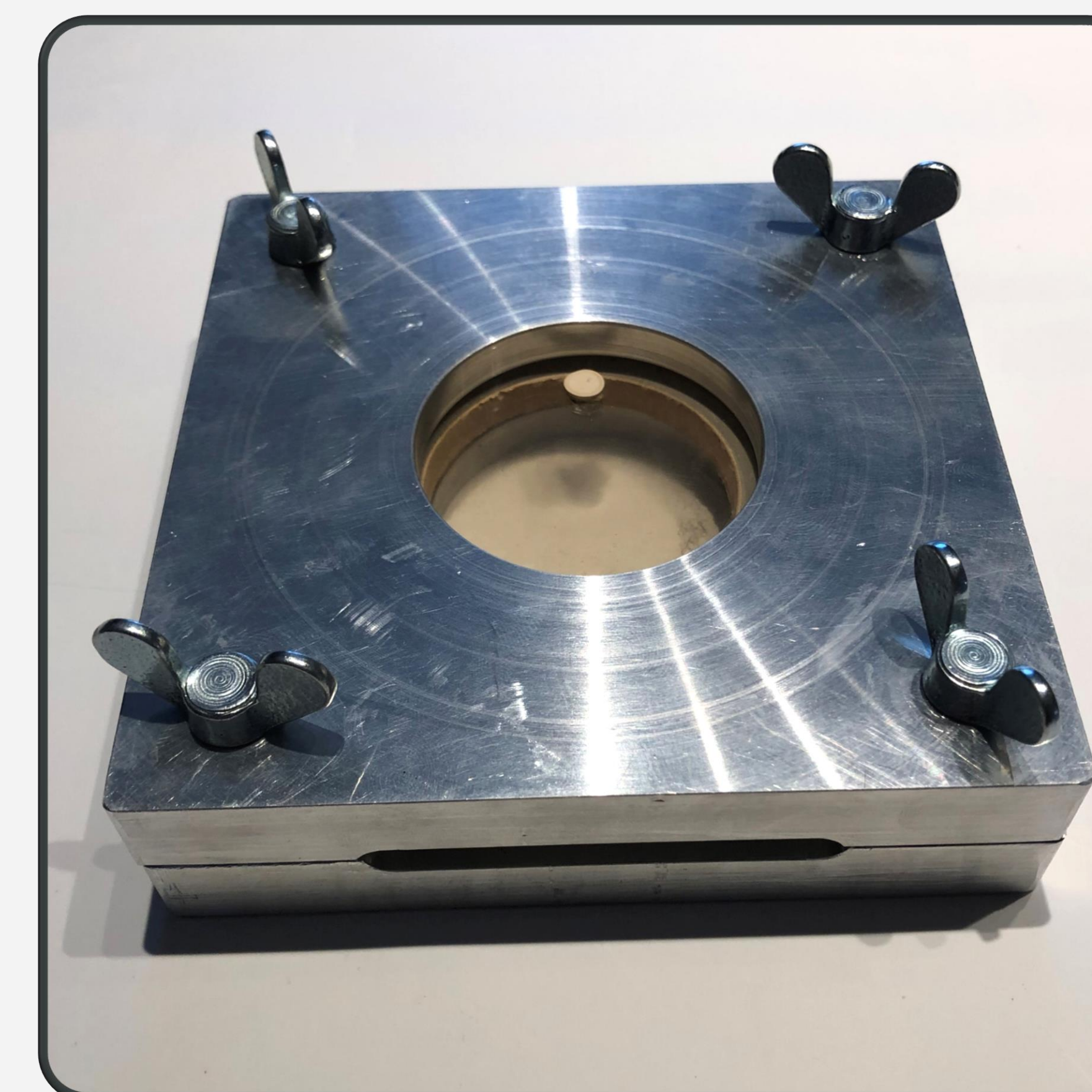
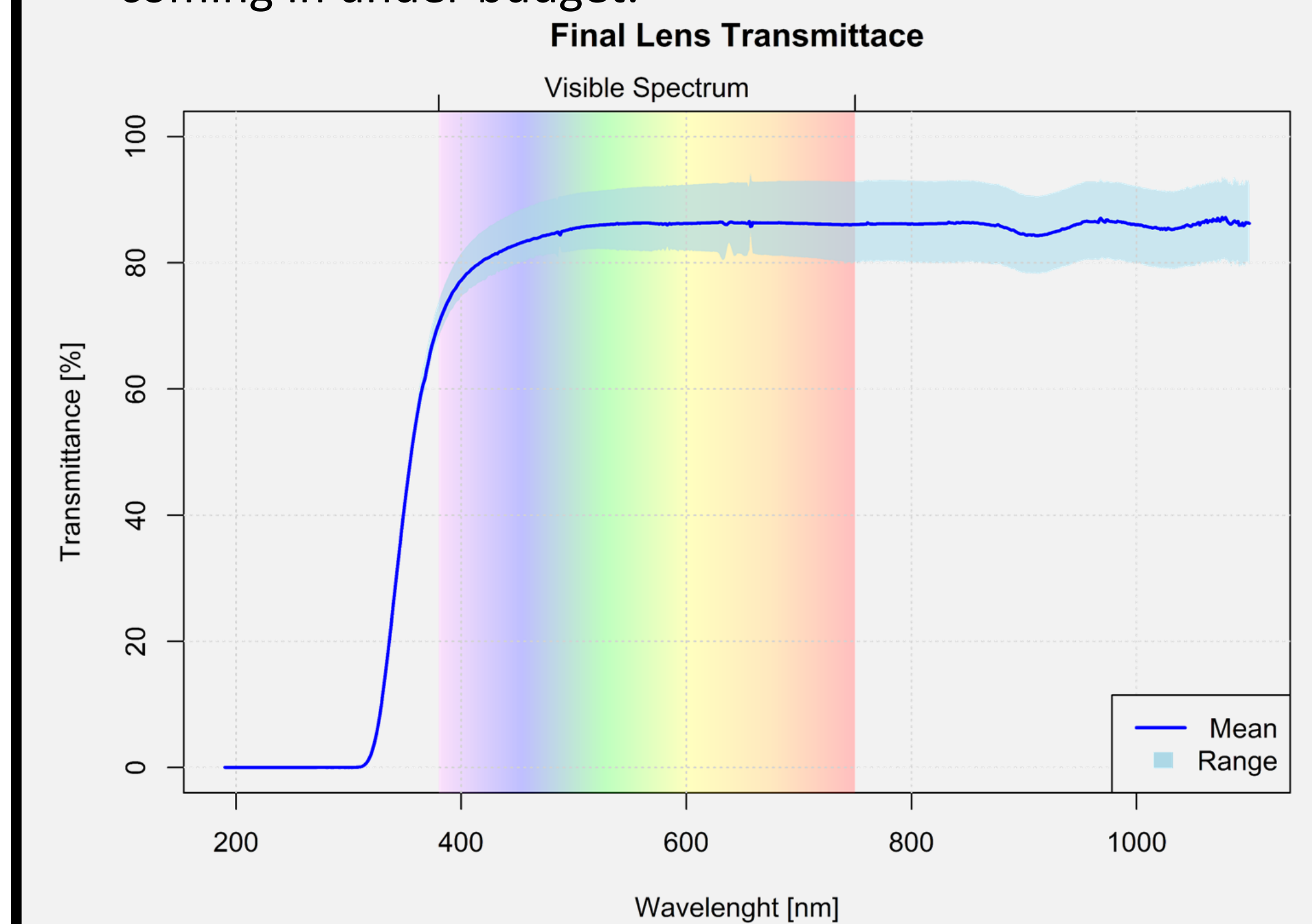


Image above showing the final design of the mold in its fully assembled state. (Lens cavity empty).

Project Results

- The produced lens was tested for transmittance using a UV-Vis Spectrophotometer measuring device.
- Average transmittance was sufficient at a value of 86% in the visible spectrum (see figure below).
- The sample lens had uniform thickness, had no air bubbles, and was easily removed from glass after curing.
- Mold was easy to assemble and created no spillage when filling.
- Final cost of mold including prototyping was \$240.48, coming in under budget.



Project Status

Project Completed

- Design will be used by Coloursmith to produce test lenses.
- Drawings and material vendor information will be sent to Coloursmith to create more molds in the future.
- A Standard Operating Procedure will be created and sent to Coloursmith for mold assembly, filling, and sample removal.

Recommendations for Improvements

- Reduce aluminum thermal mass by reducing overall thickness of aluminum plates.

References

PPG. (2006, April 20). CR-39TM Product Bulletin.