

## Design and Analysis of a Portable Traffic Light (PTL)

### Site 2020

Site 2020 is an organization that develops traffic control devices throughout North America. The flagship device designed and sold by Site 2020 is the Guardian SmartFlagger which is an Automated Flagger Assistance Device (AFAD) shown below.



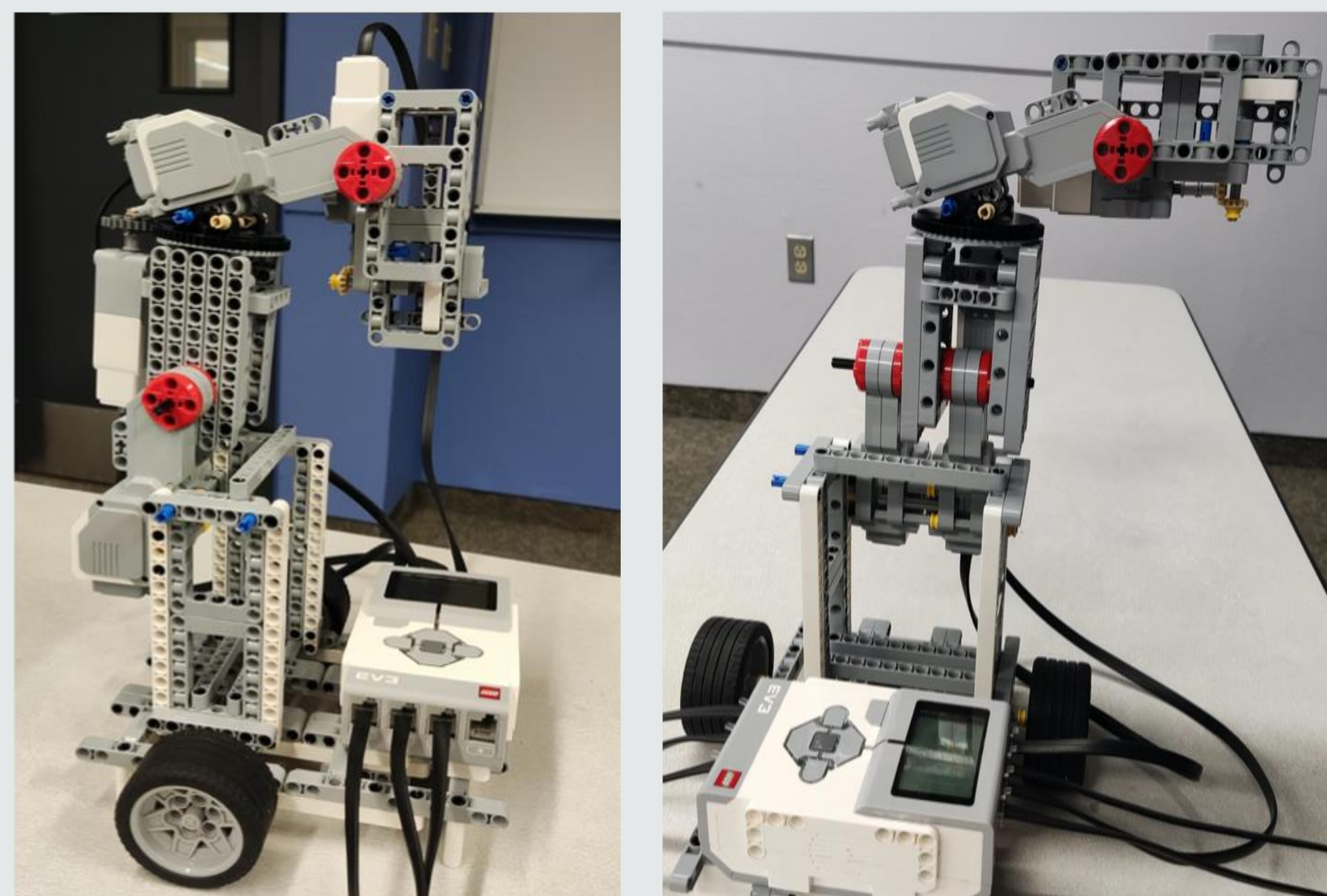
### Scope

To further expand Site 2020's product range, the scope of this project was to design and analyze a Portable Traffic Light (PTL) for Site 2020 that deployed and stowed automatically.

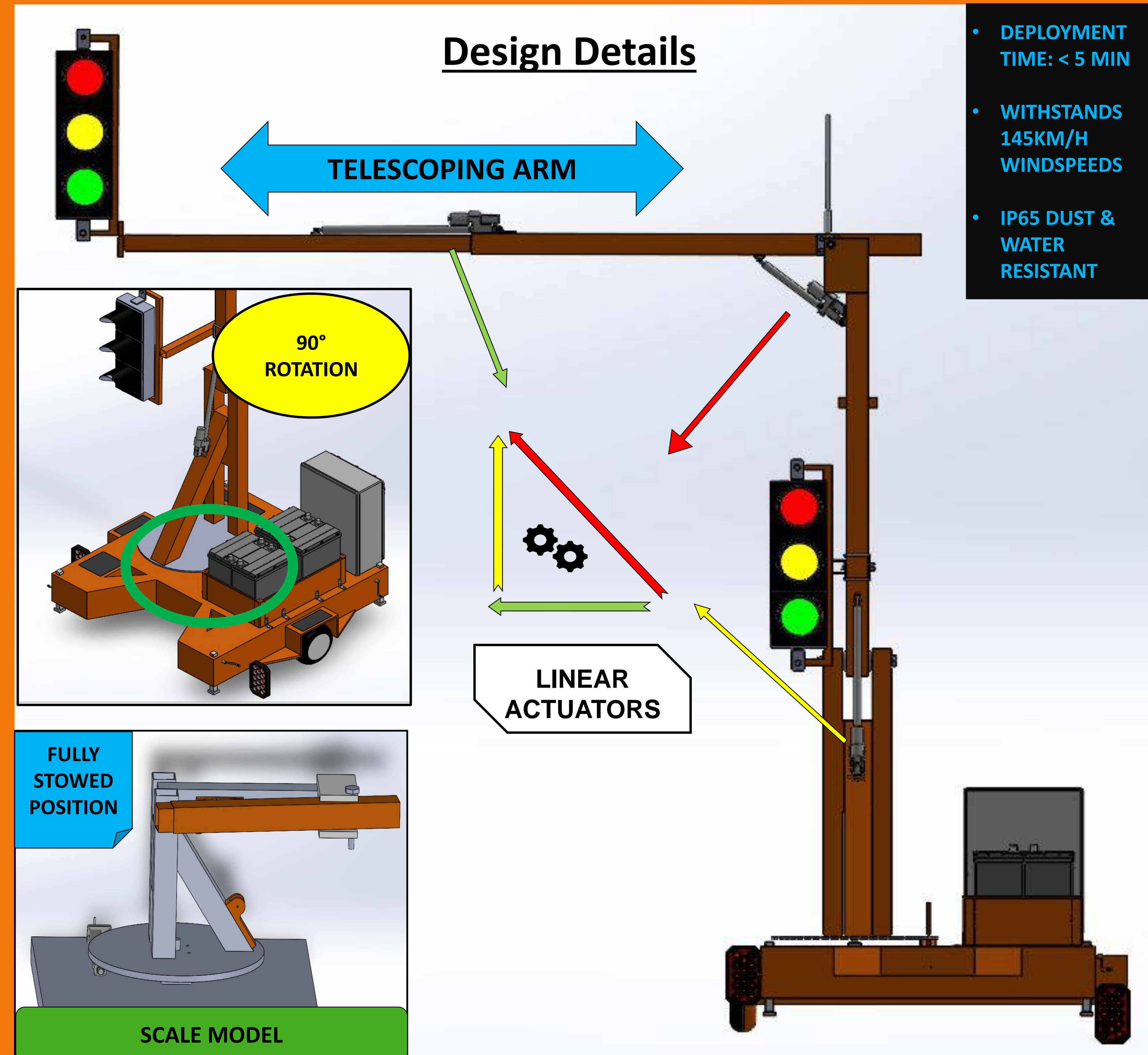
### Design Process

**Requirements:** To begin the design process, requirements regarding dimensions, weight, durability, functionality, and safety were defined.

**Preliminary Ideas and Prototyping:** Following the creation of requirements, initial ideas were sketched to determine dimensions and scale prototypes were made.



**Final Design Determined:** From prototyping the initial designs, it was determined that each design had valuable features. Therefore, a final design which included aspects of each prototype was created.



### Conclusion

After many iterations and prototypes, a functioning Portable Traffic Light design was made that fulfilled all of the requirements set out by our client, Site 2020. This design was modelled using computer-aided design software. Furthermore, finite element analyses were conducted to ensure its structural integrity.



An Arduino controlled scale model was constructed by Team 25 with aluminum used as the primary material. It successfully deploys and collapses in the same manner that the full-sized model will – using four linear actuators to enable the rotation of different sections of the PTL.

This scale model proved that our deployment process worked and met Site 2020's requirements. The scale model additionally demonstrated that this design could withstand the loads that it's subjected to by its weight and moving components. The Final Design was approved by the client as it met all the outlined requirements.

### Recommendations

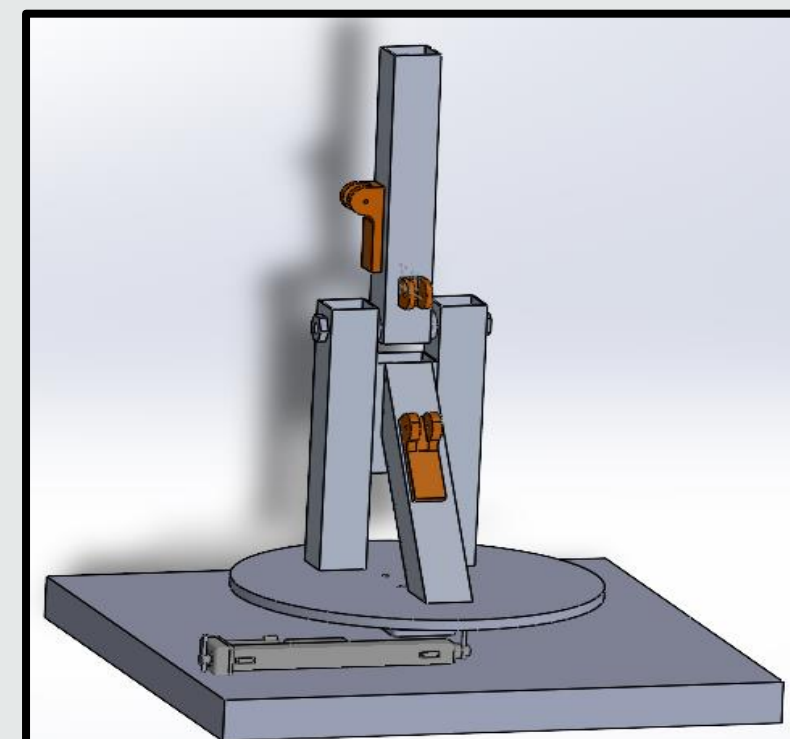
- Use of robust wiring and microprocessor
- Selection of a compatible base
- Ensuring compatibility in replacement of parts
- Programming of emergency shut down command procedures
- Installation of sensors for performance evaluation

### References

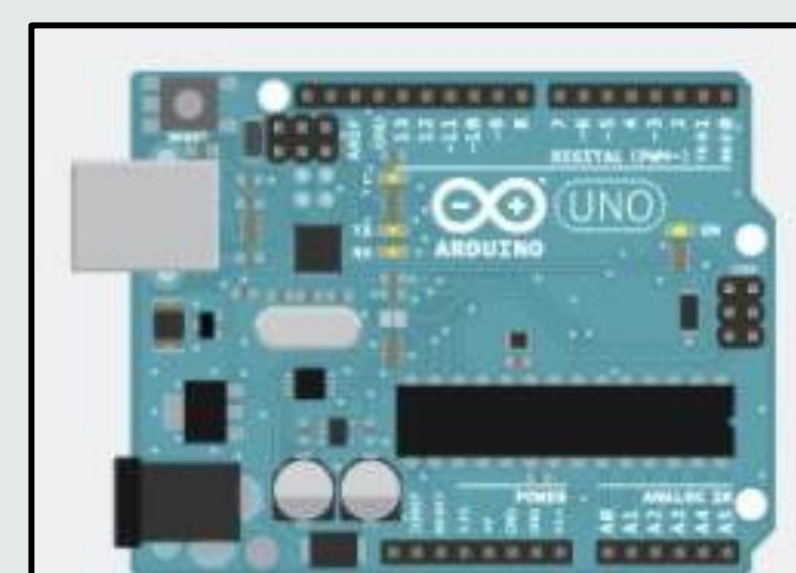
Site 2020: Traffic control just got smarter. Site 2020 | Traffic Control Just Got Smarter. (2021, October 19). Retrieved November 6, 2021, from <https://site2020.com/>.

### Scale Model Functionality/Features

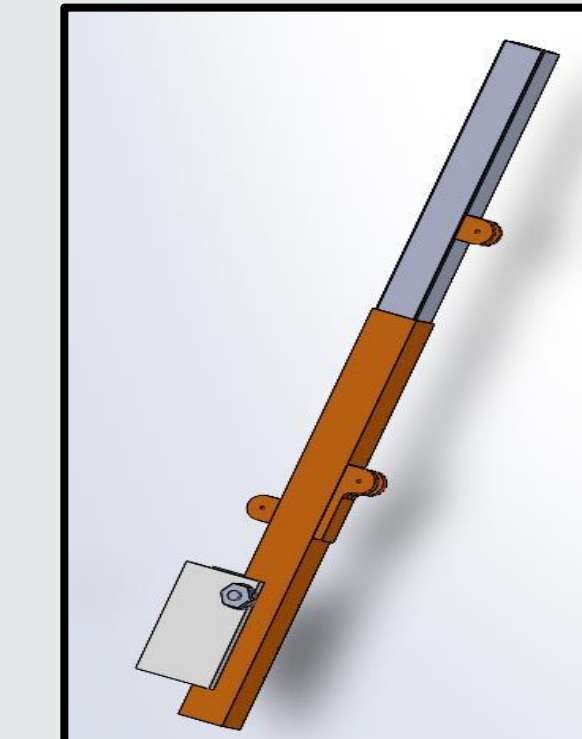
**Arduino based hardware** controls all automated equipment. Programmed using Arduino UNO microprocessor



**Rotating Base** provides 90° rotational motion to avoid interference with traffic during deployment



**Linear Actuators** convert electrical energy into linear motion, provide heavy-duty performance, and require minimal maintenance



**Cantilever Beam** extends to a maximum length of 3.5' to simulate extending over two lanes of traffic