

RECYCLED GLASS MIX PHASE III

FAB Concrete Mix & Design

Feiyue Wang; Junior Advisor, CENE Student

Ahmad Ibrahim; Junior Advisor, CENE Student

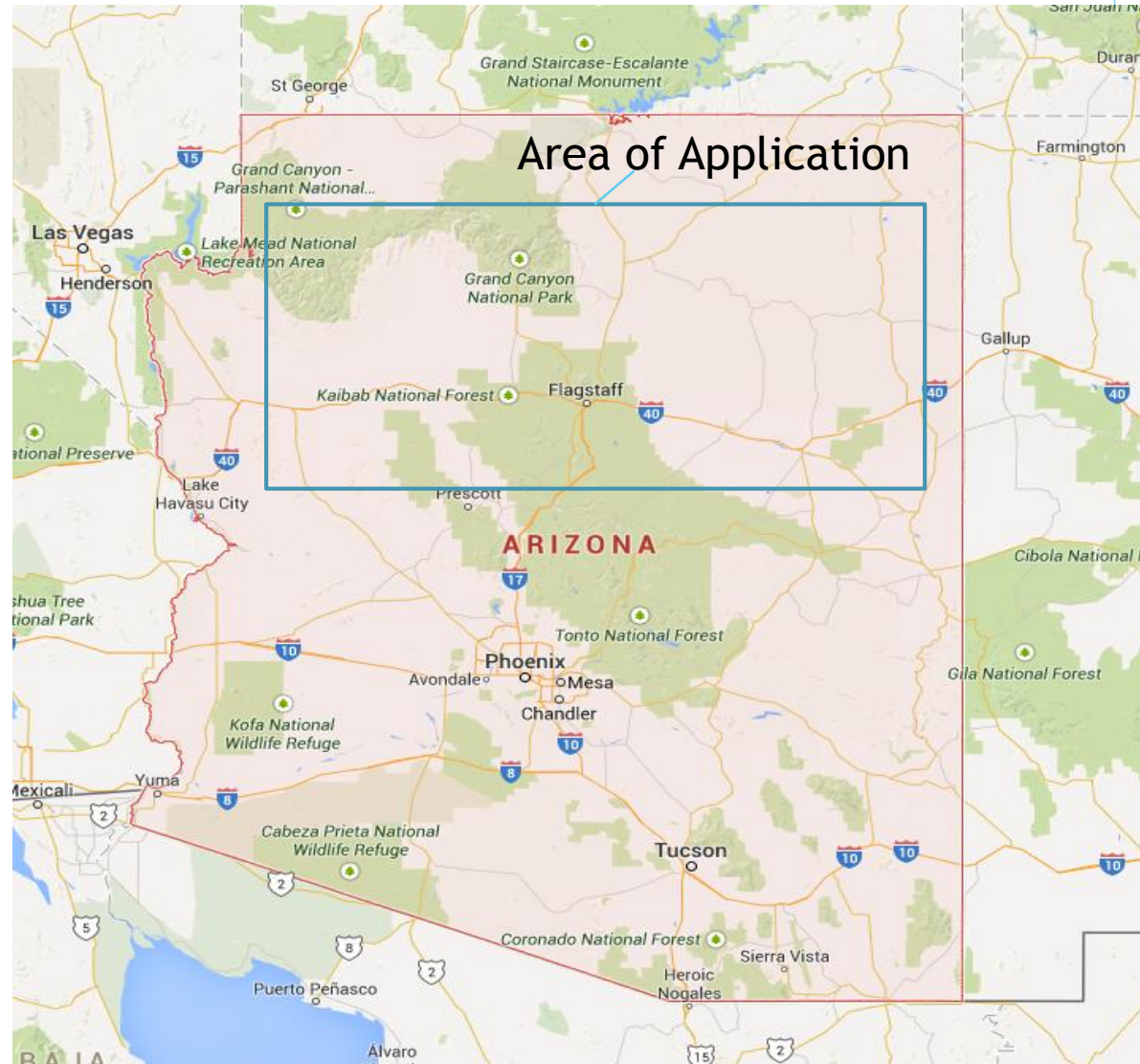
Tyler W. Brumit; Senior Advisor, CENE Student

Project Goal

To develop and implement a pervious concrete mix design that is cost effective and environmentally friendly for the Northern Arizona Area.

Project Location and Background

- ▶ Location: Northern Arizona
- ▶ Stakeholders: Northern Arizona University and High Freeze-Thaw Cycle Areas
- ▶ Advance Previous Phase II Work



Technical Considerations

▶ Phase II advancement

▶ Required Materials:

- Cement
- Aggregate
- Admixtures
- Water
- Sand
- Recycled Glass



Potential Problems

- ▶ Freeze-Thaw Cycle.
- ▶ Alkali Silica Reaction (ASR)
- ▶ Fugitive Runoff and Infiltration

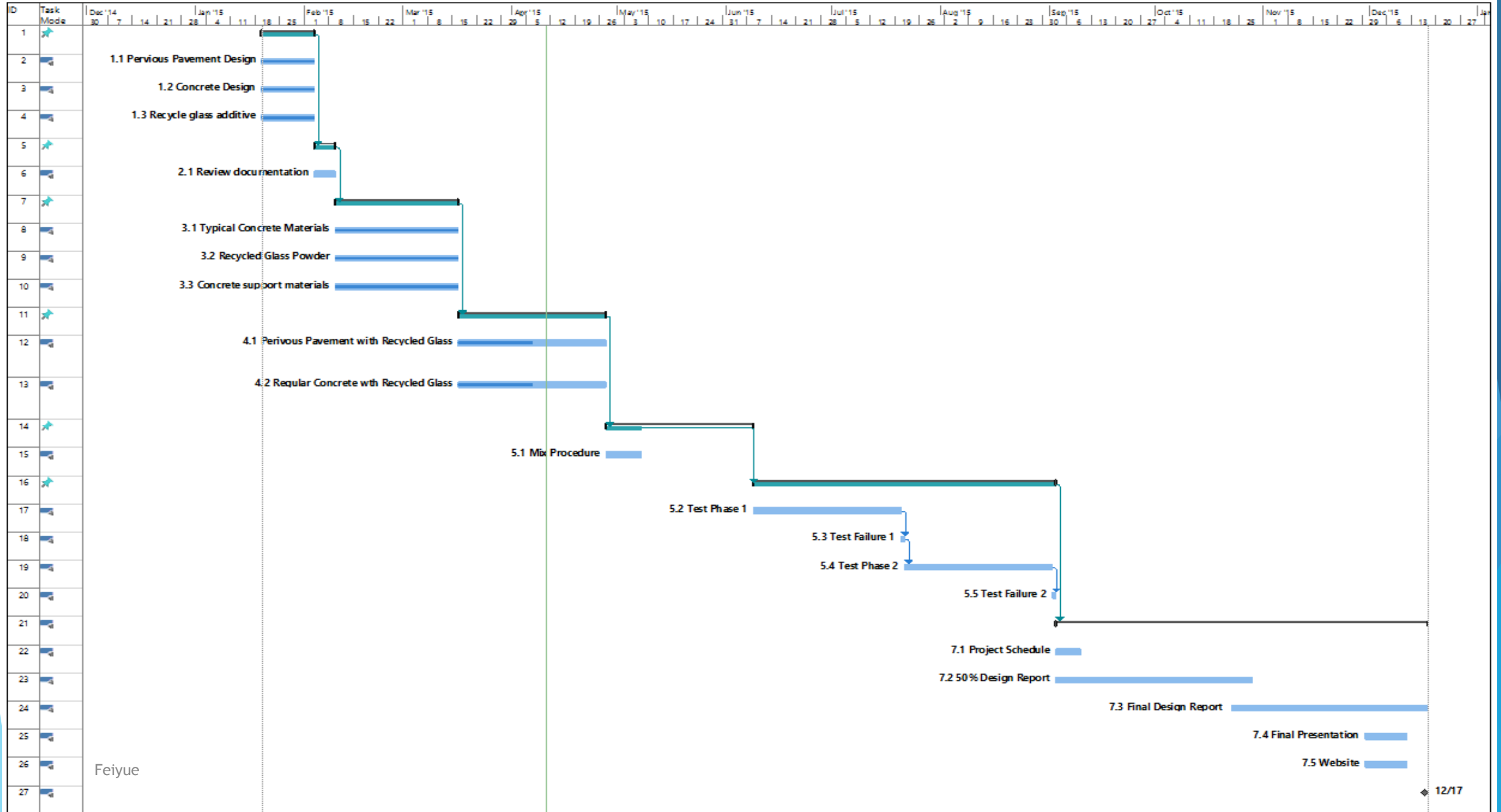


Tasks

- ▶ Research
- ▶ Standards and Codes
- ▶ Material Acquisition
- ▶ Design
- ▶ Mix Procedure
- ▶ Test Program
- ▶ Project Management



Schedule



Feiyue

Material and Staffing Cost

Staff Titles and Hourly Rate

Code	Classification	Rate\$/hour
SENG	Senior Engineer	114
ENG	Engineer	58
LAB	Lab Technician	44
INT	Engineering Intern	21
AA	Administrative Assistant	38

Material Breakdown

Total Cost of Materials			
Description	Unit Cost	Quantity	Total Cost
Sieve Machine/ Sieves	700	1	700.00
Mixer	170	1	170.00
Compressive Strength Machine	\$60 /hr	8	480.00
Void Ratio Machine	\$20 /hr	7	140.00
Freeze-Thaw Machine	\$100 /day	20	2,000.00
Molds	\$80.95 /36 molds	2	161.90
Cement	\$9.45 /bag	3	28.35
Aggregate	\$60 /cubic yard	1.5	90.00
Sand	\$4.17 /bag	2	8.34
Recycled Glass	\$4.98 /bag	2	9.96
Total			\$3,788.55

Material and Staffing Cost continue

Major Task	Subtask	Hours				
		SENG	ENG	LAB	INT	AA
2.1 Research	2.1.1 Pervious Pavement Design	2	9	0	16	2
	1.2 Concrete Design	2	9	0	16	2
	2.1.3 Recycle Glass Additive	2	9	0	16	2
2.2 Standards and Codes	2.2.1 Review Documentation	5	22	0	5	0
3.0 Acquire Materials	2.3.1 Typical Concrete Materials	0	10	0	10	5
	2.3.2 Recycled Glass Powder	0	10	0	10	5
	2.3.3 Concrete Support Materials	0	10	0	10	5
2.4 Design	2.4.1 Pervious Concrete with Recycled Glass	40	80	0	0	0
	2.4.2 Regular Concrete with Recycled Glass	40	80	0	0	0
2.5 Mix Procedure	2.5.1 Mix Procedure	0	0	60	2	2
2.6 Test Procedure	2.6 Test	0	0	210	35	10
2.7 Project Management	2.7.1 Project Schedule	15	10	0	0	15
	2.7.2 50% Design Report	80	120	0	0	120
	2.7.3 Final Design Report	120	80	0	0	120
	2.7.4 Final Presentation	60	20	0	0	0
	2.7.5 Website	0	0	0	40	40
Hours per Worker		366	469	270	160	328
Rate \$/hour		114.00	58.00	44.00	21.00	38.00
Worker Labor Cost		41,724.00	27,202.00	11,880.00	3,360.00	12,464.00
Total Labor Cost		\$96,630.00				
Total Equipment Cost		\$3,788.55				
Project Contingency @ 15%		\$15,062.78				
Total Project Price		\$115,481.33				

Conclusion

- ▶ High Strength Environmentally Friendly Concrete Mix Designs
- ▶ Comply with ASTM Standards and Codes
- ▶ Meets all State and Federal Design Requirements
- ▶ Cost Effective