



BEAM DREAMERS

EST. 2024



PCI Big Beam

Final Proposal Presentation

CENE 476 - December 06, 2024

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Project Introduction

Purpose

- Design an 18' prestressed concrete beam ^{[1][2]}

Client

- Precast/Prestressed Concrete Institute (PCI)



Sponsor

- Tpac



Intro to Prestressed Beams

Figure 1: Prestressing Concrete [3]

What is Prestressed Concrete?

- Concrete in which internal stresses are introduced to counteract tensile stresses caused by applied loads

Key Advantages

- Higher load capacity
- Allows for longer spans
- Enhanced durability
- Reduced material usage

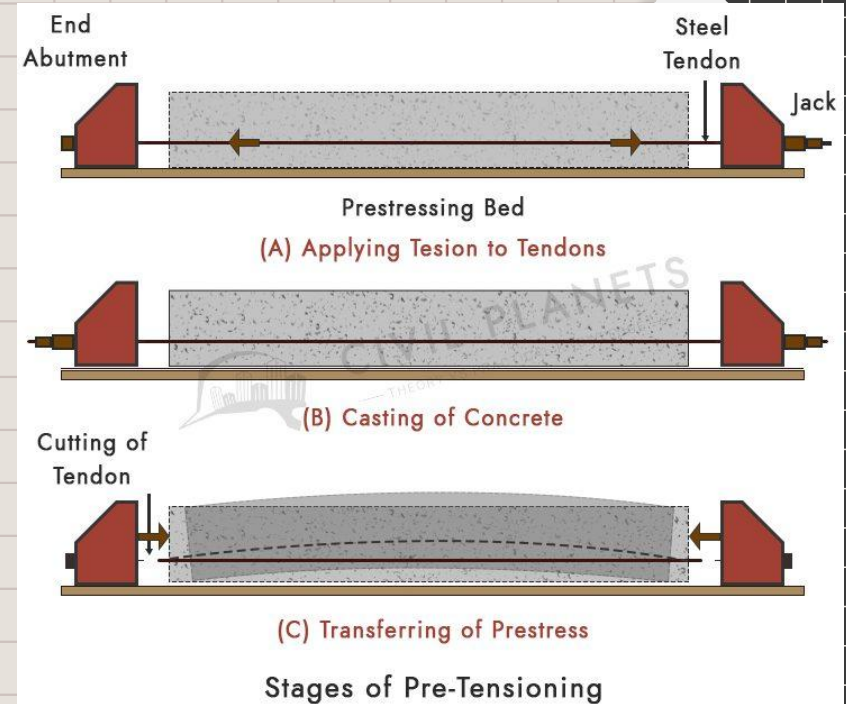
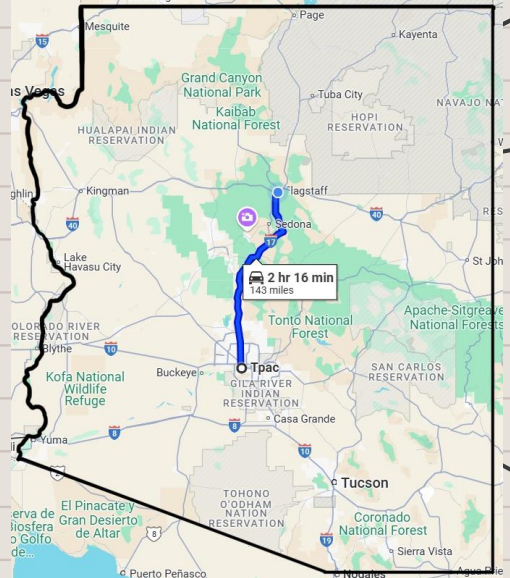
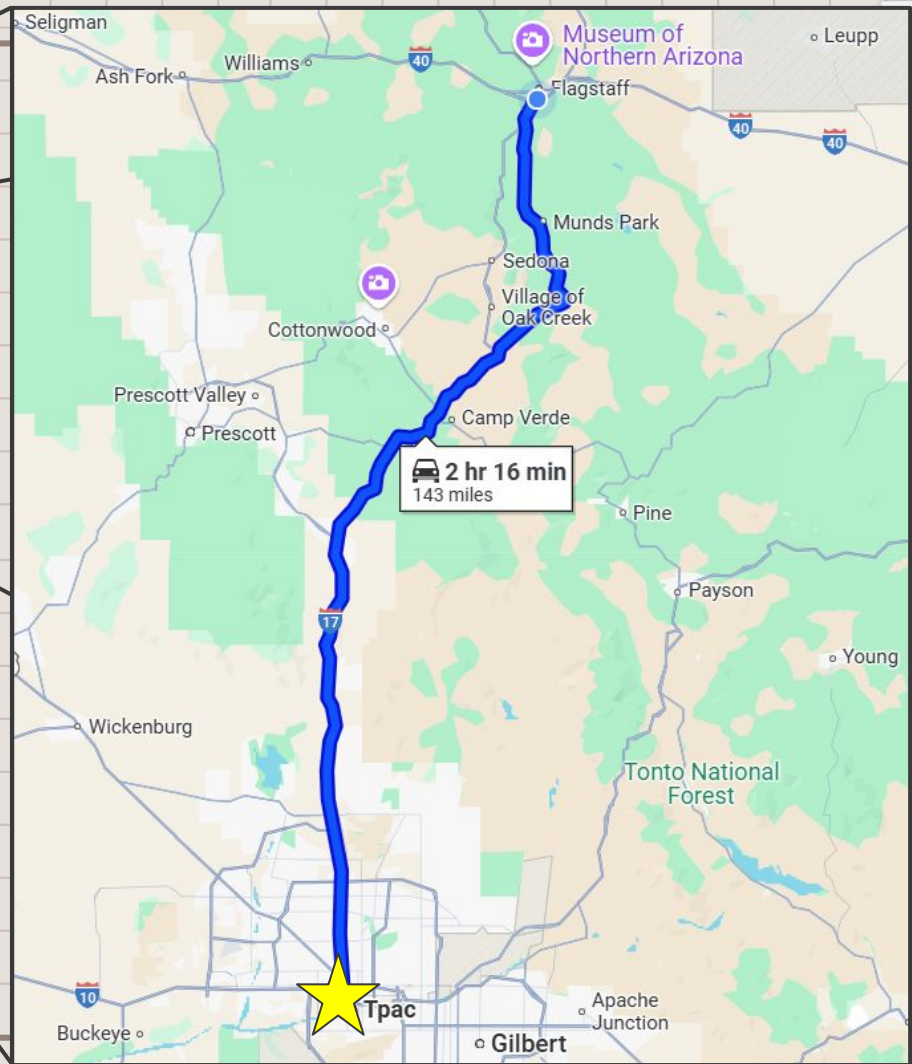


Figure 2: Project Location [4]



Manufacturing
at Tpac in
Phoenix, AZ

Testing at NAU
Concrete Labs
in Flagstaff, AZ



Task 1: Prestressed Concrete Education

- Task 1.1: Prestressed Concrete Background
- Task 1.2: Competition Research

Task 2: Concrete Mix Selection

- Task 2.1: Concrete Mix Research
- Task 2.2: Concrete Mix Analysis
- Task 2.3: Final Concrete Mix Selection

Task 3: Preliminary Beam Design

Iterative design process until there are 3 designs considering :

- Cross Section
- Reinforcement
- Concrete Mix (lightweight or normal weight)

Task 4: Final Design

- Task 4.1: Design Decision Matrix
- Task 4.2: Final Design Selection
- Task 4.3: Final Design Calculations

Task 5: Shop Drawings

- Task 5.1: NAU AutoCAD Drawings
- Task 5.2: Coordination with Tpac for Shop Drawings

Task 6: Beam Manufacture

- Task 6.1: Test Cylinder Fabrication
- Task 6.2: Beam Fabrication
- Task 6.3: Shipment of Beam
- Task 6.4: Transportation of Beam Inside Lab Facilities

Task 7: Testing

- Task 7.1: Lab Access
- Task 7.2: Setup of Beam and Instrumentation
- Task 7.3: Cylinder Testing and Failure Predictions
- Task 7.4: Testing the Big Beam and Documenting Behavior

Task 8: Analysis of Results and Comparison to Predicted Failure

Task 9: Cost of Implementation

Task 10: Project Impacts

Task 11: Deliverables

- Task 11.1: 30% Submittal
- Task 11.2: 60% Submittal
- Task 11.3: 90% Submittal
- Task 11.4: Final Submittal
- Task 11.5: PCI Big Beam Competition Submittal

Task 12: Project Management

- Task 12.1: Resource Management
- Task 12.2: Schedule Management

Exclusions

- Tpac Tasks
 - Designing specific proportions of concrete mix
 - Beam and test cylinder manufacturing
 - Transportation of Beam
 - Disposal of beam

Figure 1: Schedule

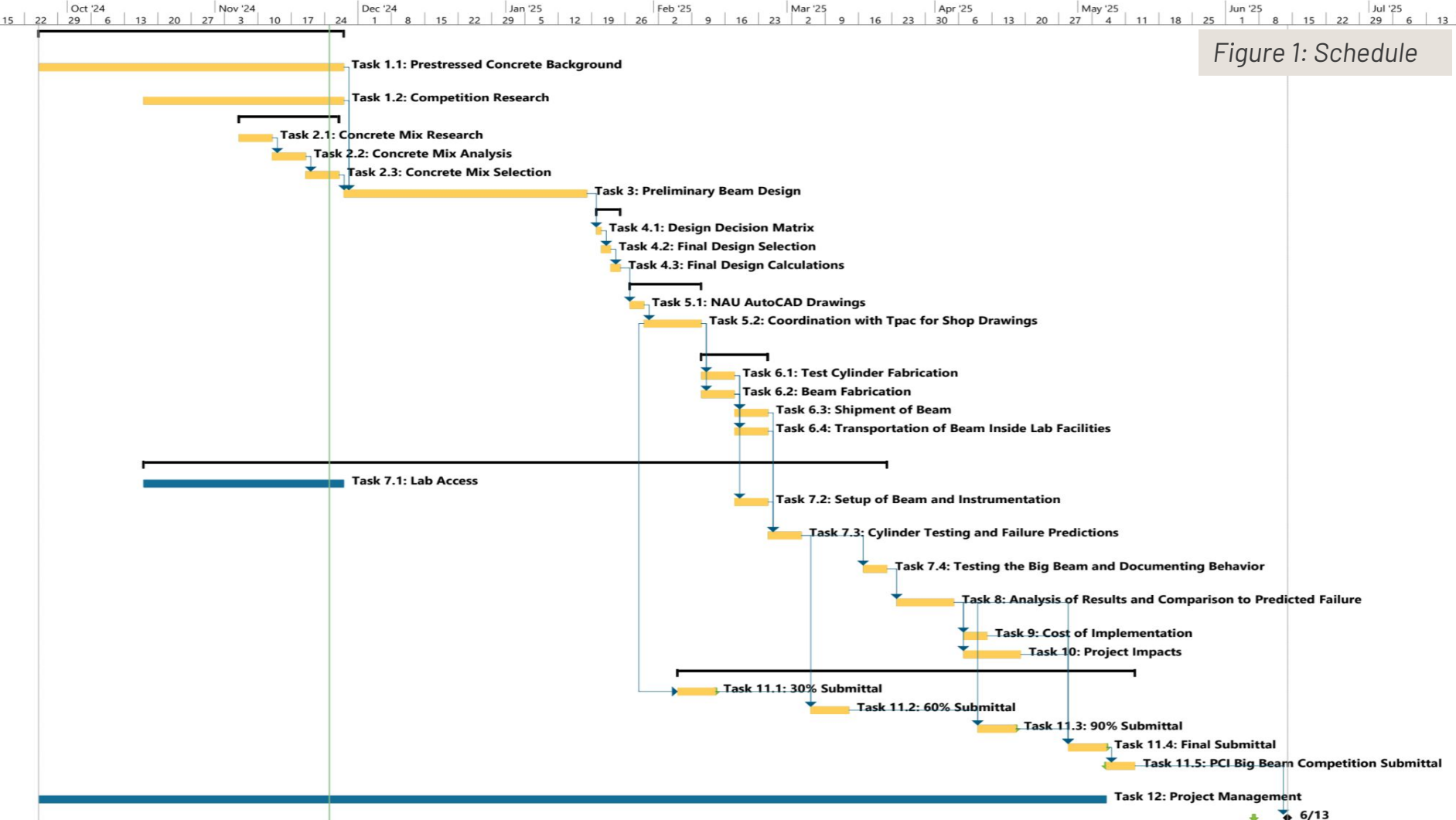


Table 1: Staffing

Task No.	Task Name	Senior Engineer	Intern	Structural Engineer	Lab Technician	Total
Task 1	Prestressed Concrete Education	—	133.5	—	—	133.5
Task 2	Concrete Mixture Design	4	63	74	—	141
Task 3	Preliminary Beam Design	—	37	74	—	111
Task 4	Final Design	14	14	28	—	56
Task 5	Shop Drawings	6	32	—	—	38
Task 6	Beam Manufacture	—	—	24	4	28
Task 7	Testing	14	28	—	14	56
Task 8	Analysis of Results and Comparison to Prediction Failure	4	8	—	—	12
Task 9	Cost of Implementation	4	—	—	—	4
Task 10	Project Impacts	4	—	—	—	4
Task 11	Deliverables	40	120	—	—	160
Task 12	Project Management	19	19	19	19	76
Total Hours		109	417.5	145	37	708.5

Table 2: Cost Proposal

1.0 Personnel		Classification	Rate/Hour (\$)	Hours	Cost (\$)	
		Senior Engineer	247	109	26,923	
		Engineering Intern	59	418	24,662	
		Structural Engineer	130	145	18,850	
		Lab Technician	63	37	2,331	
		Total Personnel Cost			72,766	
2.0 Travel		Classification	Billing Rate	Units	Miles	Cost (\$)
		1-day Car Rental for Tpac Visit	77	\$	--	77
		Miles	0.4	\$/mile	288	115
		Total Travel Cost				192
3.0 Supplies		Classification	Rate/Day (\$)	Days	Cost (\$)	
		Lab Rental	100	5	500	
		Total Supplies Cost			500	
4.0 Subcontractors		Classification	Rate/Hour (\$)	Hours	Cost (\$)	
		Beam Materials & Fabrication	--	--	9,000	
		Dr. Dymond Lessons and Advising	200	20	4,000	
		Total Subcontractors Cost			10,500	
Total Cost of Engineering Services					86,458	

Thank You



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Works Cited

- [1] PCI, "PCI Big Beam Competition," [Online]. Available:
https://www.pci.org/PCI/PCI/Education/Student_Competitions.aspx.
- [2] PCI, "2023-2024 Big Beam Rules," 2023-2024. [Online]. Available:
https://www.pci.org/PCI/PCI/Education/Student_Competitions.aspx.
- [4] Google Maps
- [3] Prestressing Concrete Image
<https://williams-works.com/wp-content/uploads/2020/07/Prestress-Concrete-101-03.png>