

# ADOBE BRICK DESIGN



“Civil Engineering Kuwaiti Women”

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# Introduction

## **Project Understanding:**

- ❖ Adobe Brick is define as a brick that contains cement, soil, and water.
- ❖ Suitable adobe bricks will be developed for Northern Arizona through multiple brick testing methods.
- ❖ The adobe brick's developed codes and qualifications will be compatible with Northern Arizona's environment.

## **Adobe Brick Characteristics:**

- ❖ Decrease negative impact on the area.
- ❖ Provide recreational, educational, and aesthetic benefits.



# Stake Holders

- ❖ Private rental marketers.
- ❖ House consumers.
- ❖ Clients: Mark Lamer, Thomas Nelson.
- ❖ Coconino County.
- ❖ Structural Engineering Institute (SEI).
- ❖ City of Flagstaff.



Figure1: Structural Engineering Institute  
[www.asce.org](http://www.asce.org)



Figure2: City of Flagstaff  
[www.flagstaff.az.gov](http://www.flagstaff.az.gov)



Figure3: Coconino County  
[www.CoconinoCounty.org](http://www.CoconinoCounty.org)



Figure4: Mr. Thomas Nelson  
[www.nau.edu](http://www.nau.edu)



Figure5: Mr. Mark Lamer  
[www.nau.edu](http://www.nau.edu)



# Design Constraints and Criteria

- ❖ Soil should be local
- ❖ 100% natural soil
- ❖ Strong enough to carry certain amount of load
- ❖ Within budget
- ❖ Withstand earthquakes, hurricanes, and rain
- ❖ Soil will contain clay, sand, and silt
- ❖ Follow International Building Code requirements (IBS)



# Task 1: Soil Analysis

- A good amount of local soil will be obtained.
- Large particles or impurities (rocks, plant, etc.) will be taken out of the soil.
- The percentage of soil in the mixture will be determined after trying different percentages randomly.

## Task 1.1 Atterberg limit test

### *Task 1.1.1 Liquid Limit Test*

## Task 1.2 Efflorescence test

## Task 1.3 Sieve Analysis



## Task 2: Cement Analysis

- ❖ The type of cement that is going to be used will be chosen depending on constraints and criteria.
- ❖ Cement will be mixed with water and poured into a mold to have a specific shape for the adobe brick.
- ❖ The percentage of cement in the mixture will be obtained after trying different percentages.



Figure 1: Dry Cement

[www.feminiya.com](http://www.feminiya.com)

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Figure 2: Water

[www.greenlivingideas.com](http://www.greenlivingideas.com)

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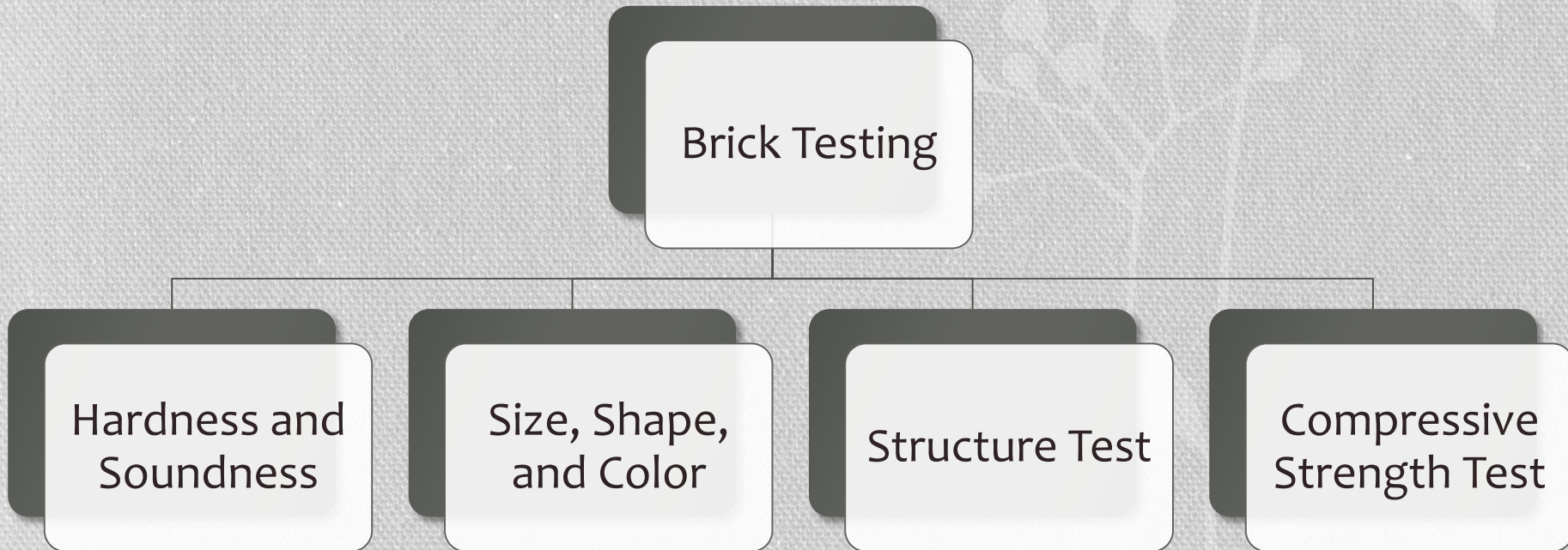


Figure 3: Wet Cement

[www.thumbs.dreamstime.com](http://www.thumbs.dreamstime.com)



## Task 3: Brick Testing



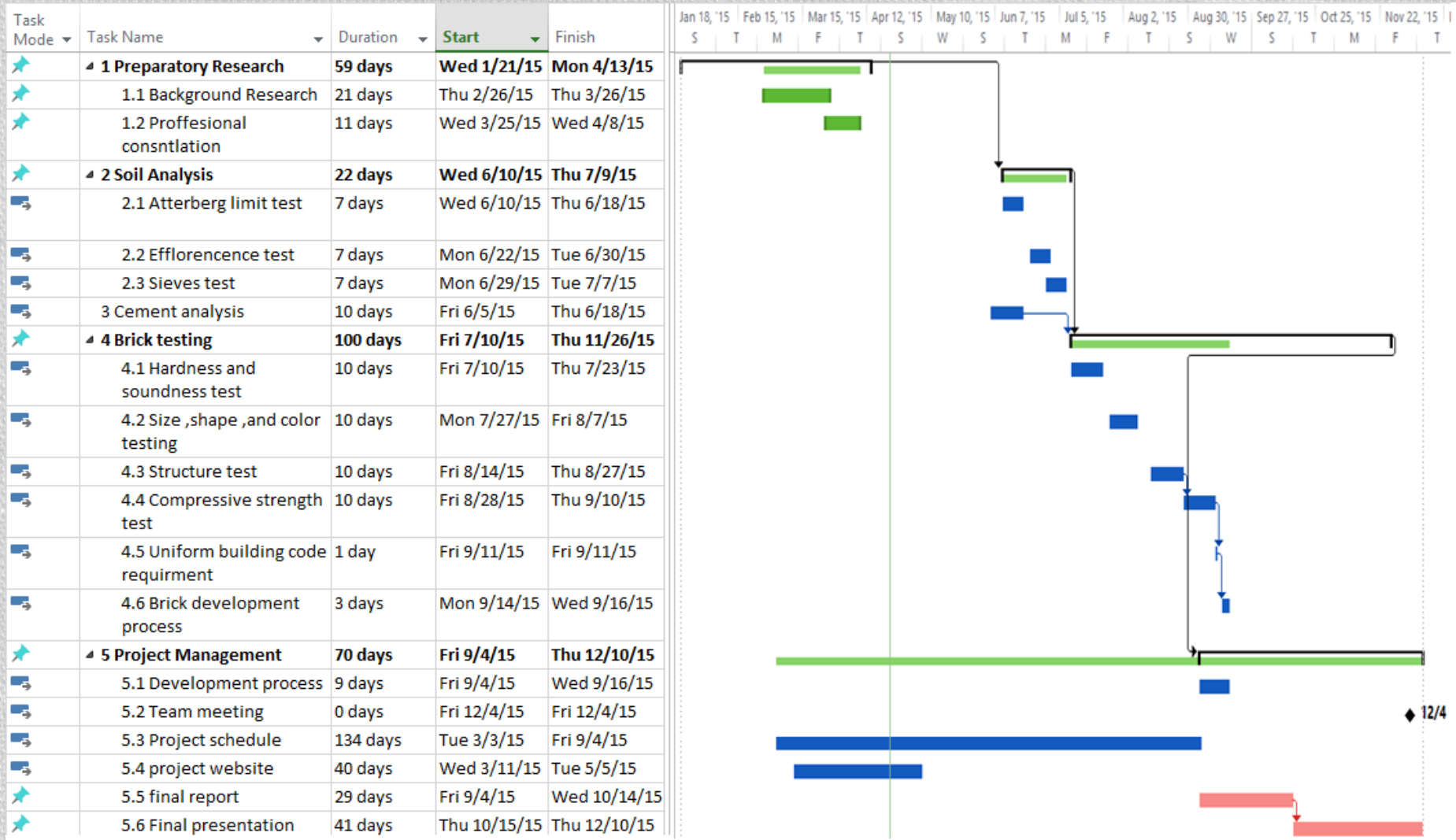


# Exclusions

- ❖ Multiple sites for soil content
- ❖ Load Path
- ❖ Earthquake Testing
- ❖ Constructing a building out of the designed adobe brick



# Gantt Chart





# Staff Hourly Budget

<b>Classification</b>	<b>Code</b>
Senior Engineer	SE
Engineer	E
Lab Technician	I.T
Administrative Assistance	A.A

<b>Task No.</b>	<b>Task</b>	<b>S.E Hours</b>	<b>E Hours</b>	<b>L.T Hours</b>	<b>A.A Hours</b>	<b>Total Staff Hours</b>
<b>1</b>	Preparatory Research	20	20	0	0	40
<b>1.1</b>	Background Research	20	20	0	0	40
<b>2</b>	Professional Consultation	16	10	7	0	33
<b>3</b>	Soil analysis	16	20	45	17	98
<b>4</b>	Cement Analysis	10	20	17	20	67
<b>5</b>	Soil And Brick Testing	14	15	45	32	106
<b>6</b>	Project Management	30	35	32	35	132
<b>6.1</b>	Construction Process	20	25	26	30	101
<b>6.2</b>	Team Meetings	10	10	6	5	31
	<b>Total Hours</b>	<b>106</b>	<b>120</b>	<b>146</b>	<b>104</b>	



# Total Cost For The Project

<b>Table 3: Equipment Cost</b>	
<b>Equipment</b>	<b>Total Cost</b>
<b>Wood Forms</b>	2800
<b>Soil Series</b>	490
<b>Mixing Tool</b>	1680
<b>Lab Rent</b>	9800
<b>Soil Testing</b>	1610
<b>Total</b>	16380

<b>Table 4: Adobe Brick Project Cost</b>	
<b>Project Requirements</b>	<b>Cost</b>
<b>Staff</b>	\$45,656
<b>Equipment</b>	\$16,380
<b>Total</b>	\$62,036