# Utilization of Scrubber Waste in Dry Cast Concrete Products


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**Company:**

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# Presentation Outline

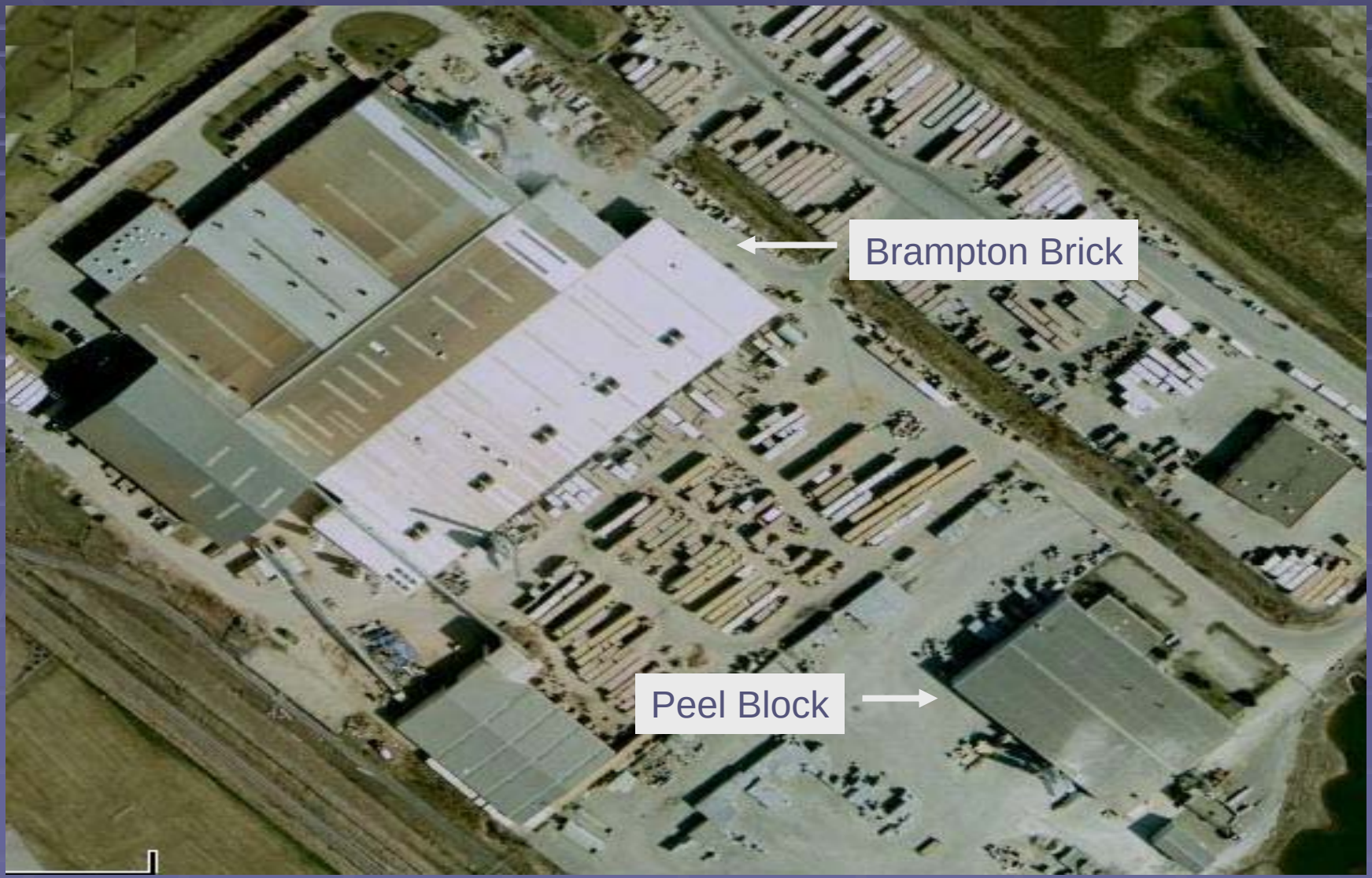
**Background**
**Purpose**
**Batch Design**

- Mix Design
- Materials
- Machinery

**Physical Properties Measured**

- Colorimeter
- Compression
- Absorptions

# Plant Locations



# Background

**Brampton Brick Scrubber Limestone Waste**

•100 Tons per Month

**Peel Block Concrete Plant Raw Materials**

•1280 Tons per Month

**Substituting Raw Material**

•7%-8%
•89.6 Tons- 102.4 Tons

# Purpose

To manufacture a durable concrete product using limestone waste from a scrubber, as a substitute for a portion of the aggregates.

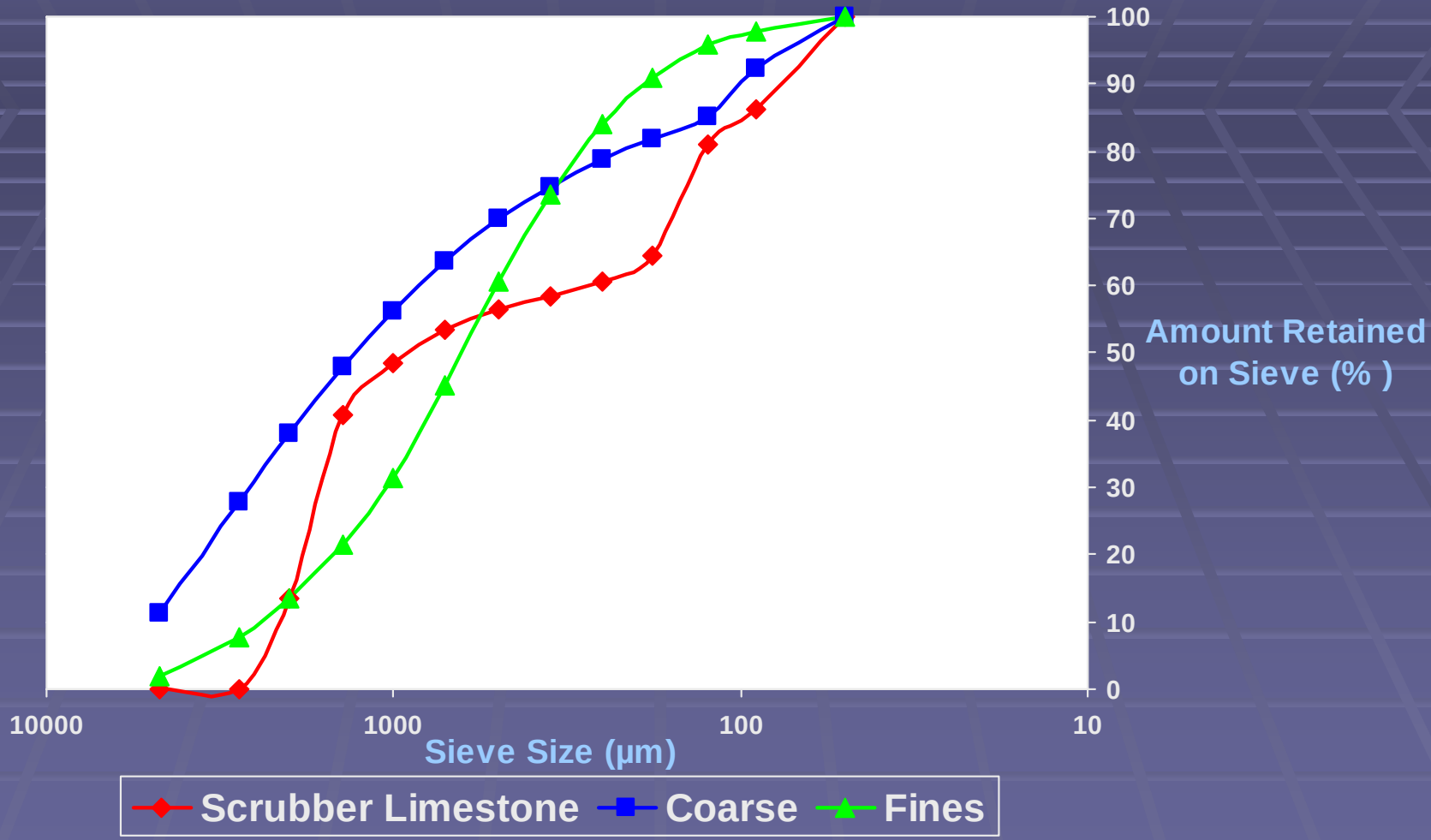
# Raw Material

**Fine Aggregate**

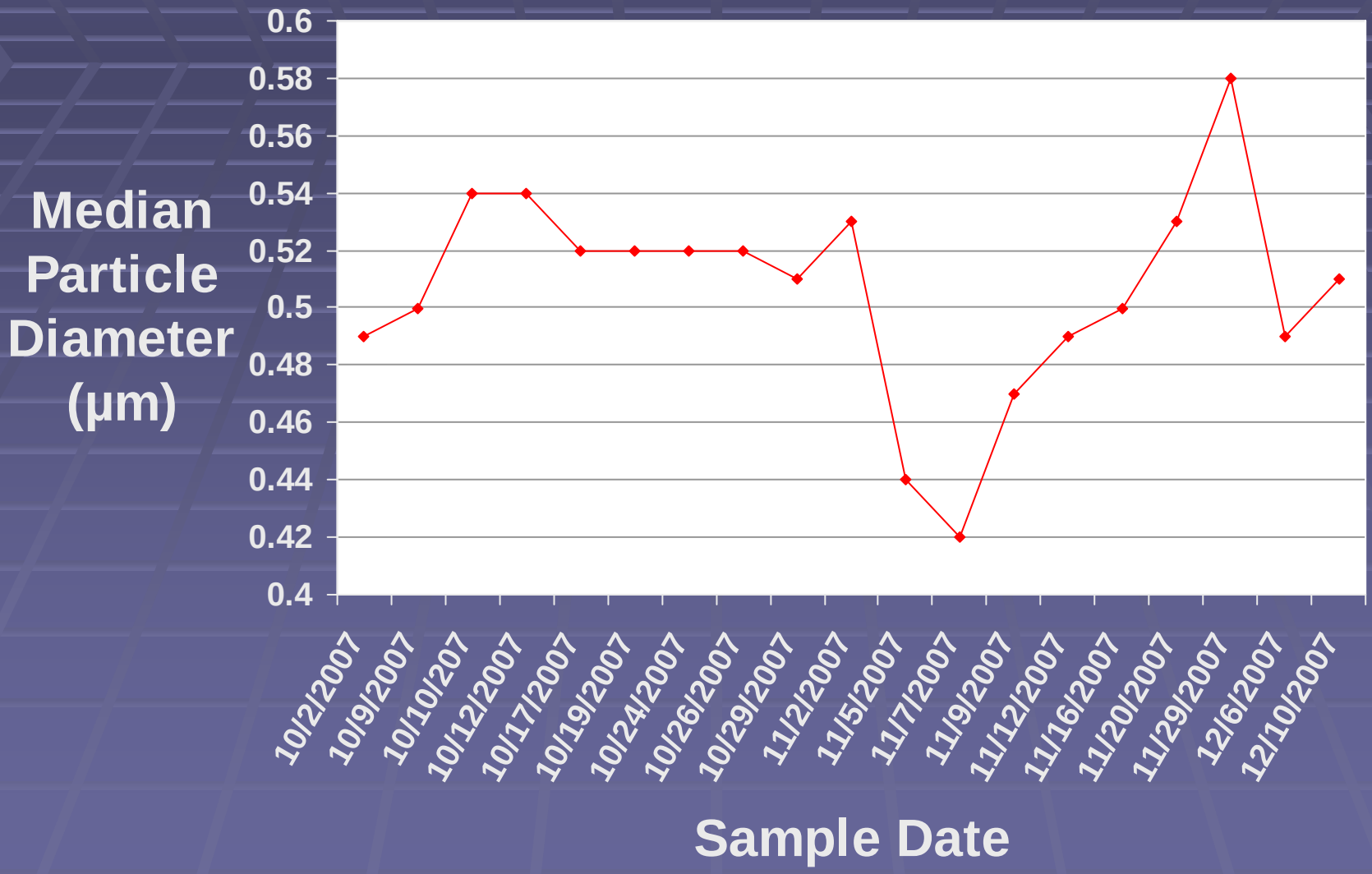
**Coarse Aggregate**

**Scrubber Waste**

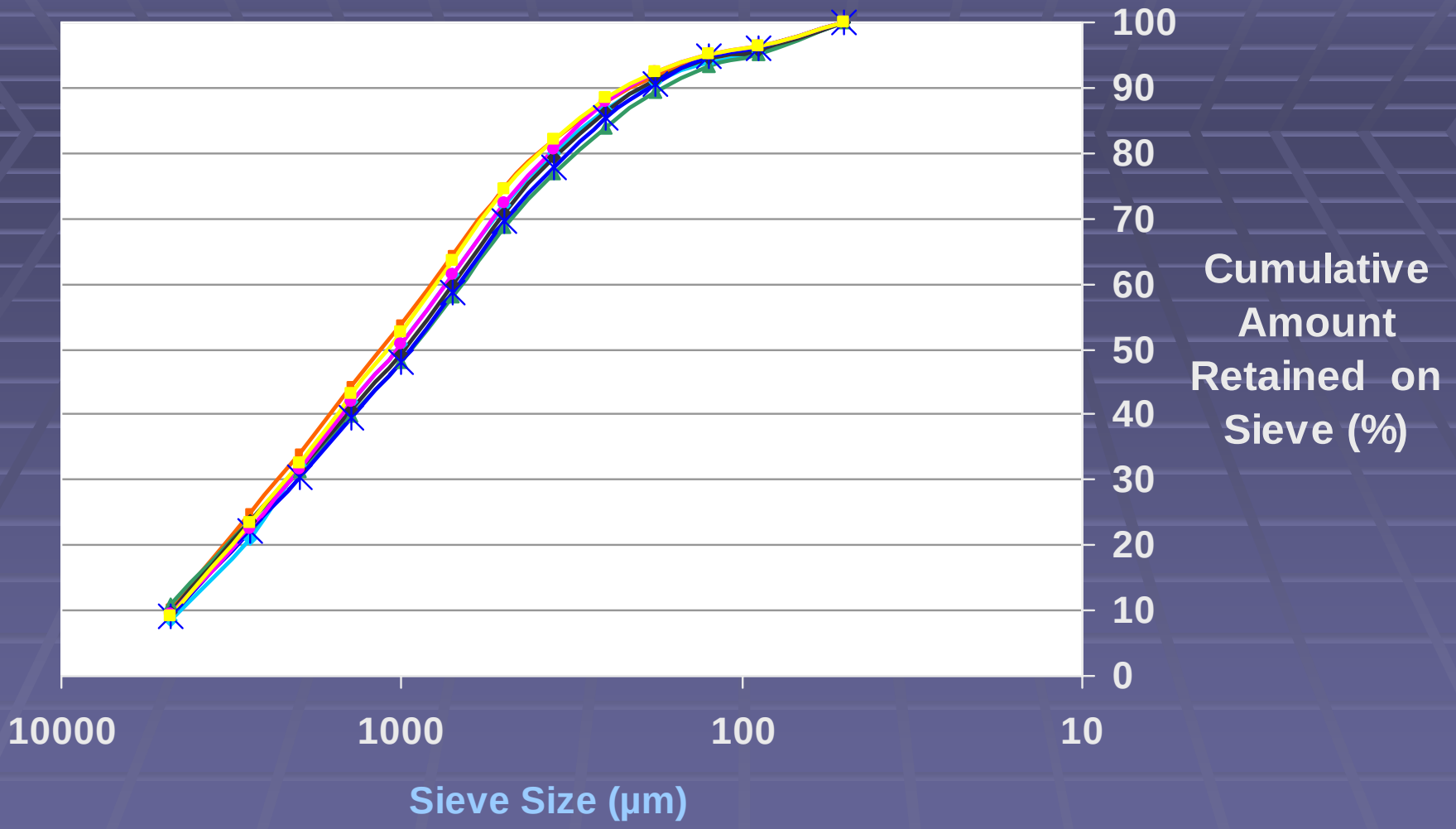
# Sieve Analysis Raw Material



# Median Particle Diameter



# Experimental Results of Scrubber Limestone Addition Sieve Analysis



# Laboratory Scale Batch Design

**Table 2: Laboratory Batch Design**

| Product | Total Cementitious Material (g) | Total Fines (g) | Total Coarse (g) | Total Aggregates (g) | Batch Total (g) |
|---|---|---|---|---|---|
| Masonry | 315 | 2100 | 2700 | 5000 | 5315 |

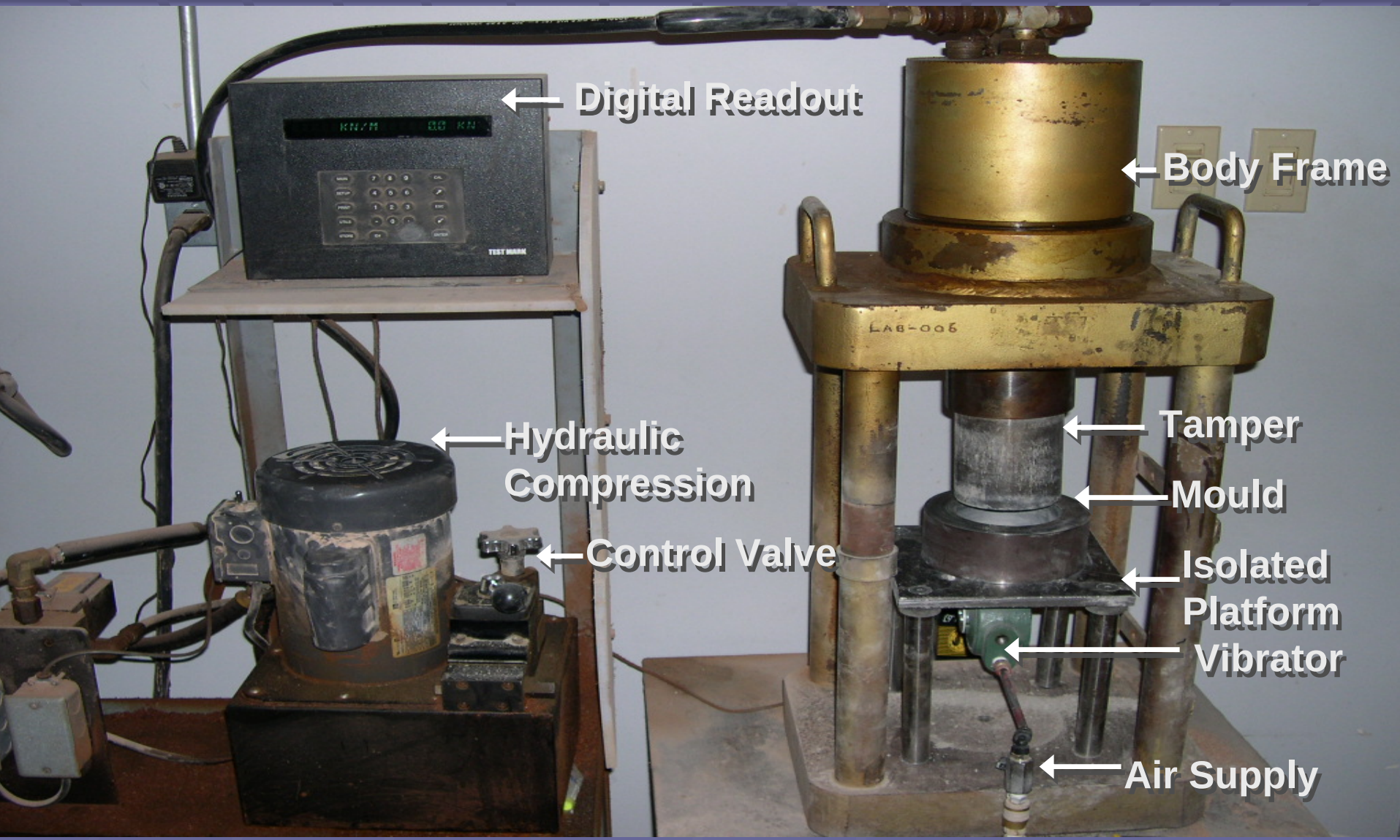
# Batch Design

**Table 1: Peel Block Aggregate Percentages**

| Product | Fines in Batch (%) | Coarse in Batch (%) | Cementations Material in Batch (%) |
|---|---|---|---|
| Masonry | 54.6 | 39.1 | 6.3 |

# Machinery

## Diagram 1: Laboratory Compression and Vibration Machine



# Final Product

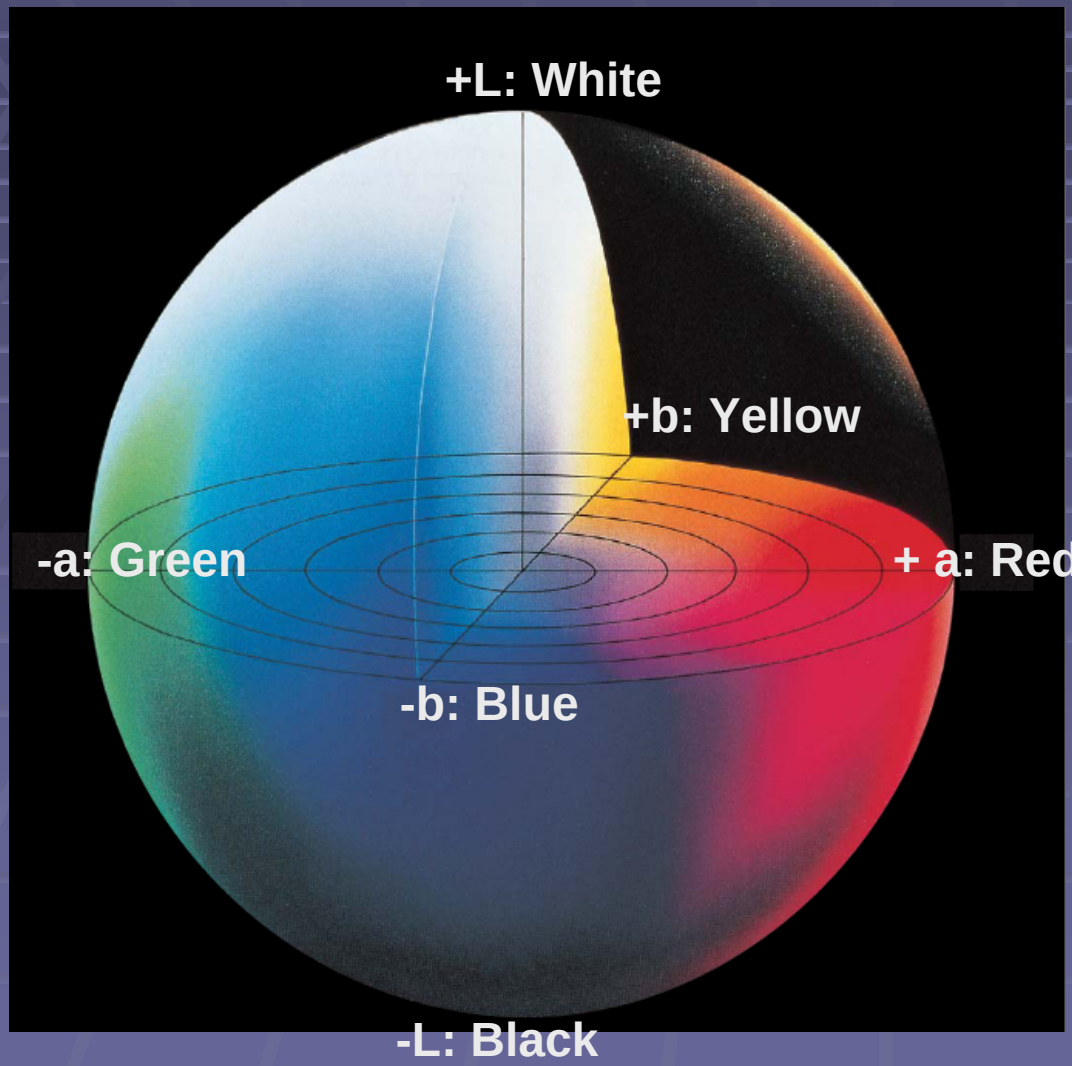
**Concrete Puck**

# *Physical Properties of the Final Product*

- *Colorimeter Data*
- *Compressive Strengths*
- *Water Absorptions*

# Colorimeter Data

Diagram 1: 3-D Colorimeter Wheel




## Lightness

- Measure of brightness.
- Represented as “L”.

## Hue

- Measure of colour.
- Represented as “a”.

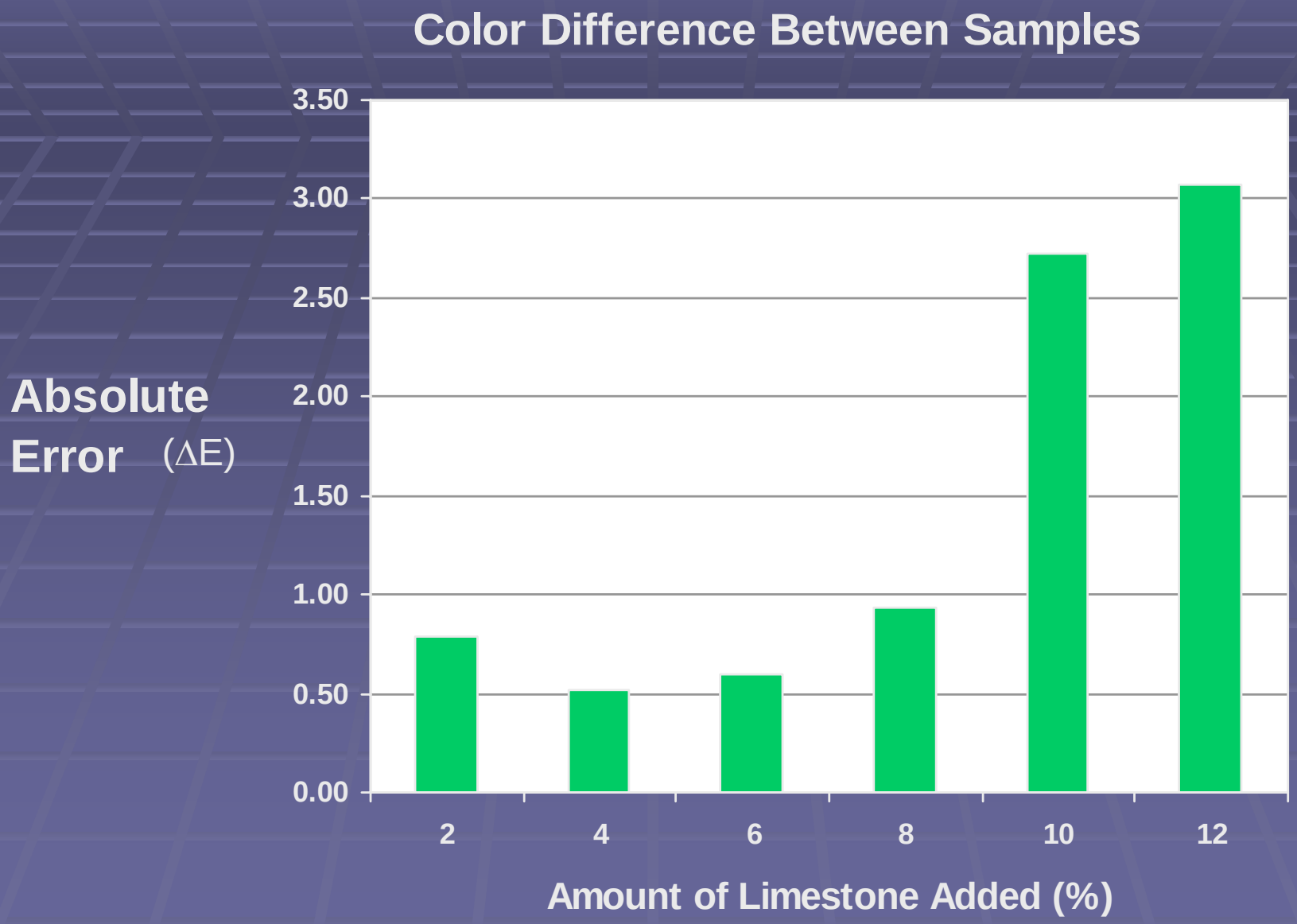
## Chroma

- Measure of intensity or charity.
- Represented as “b”.

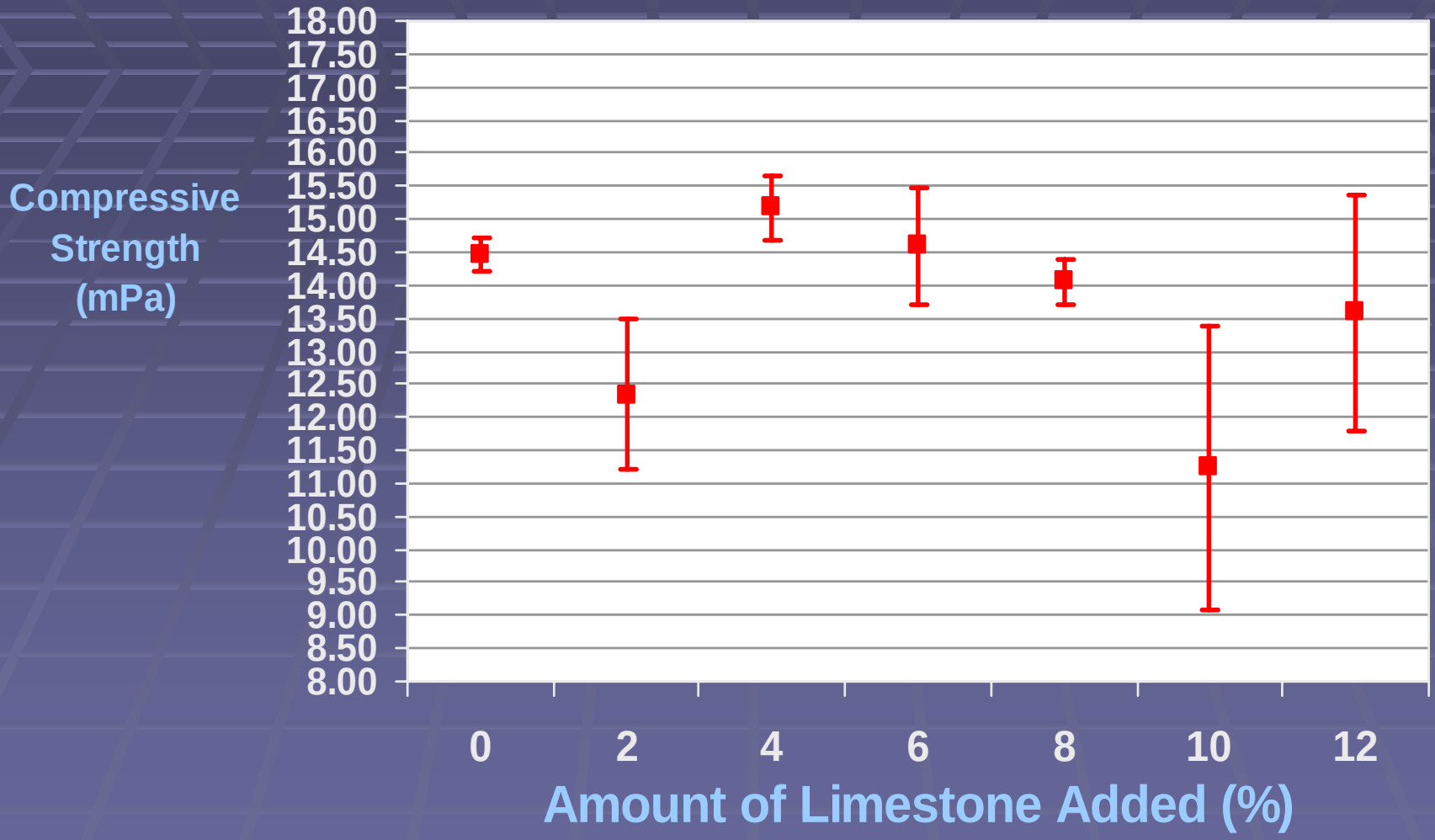
# Color Difference

**Absolute Error =** $\Delta E$

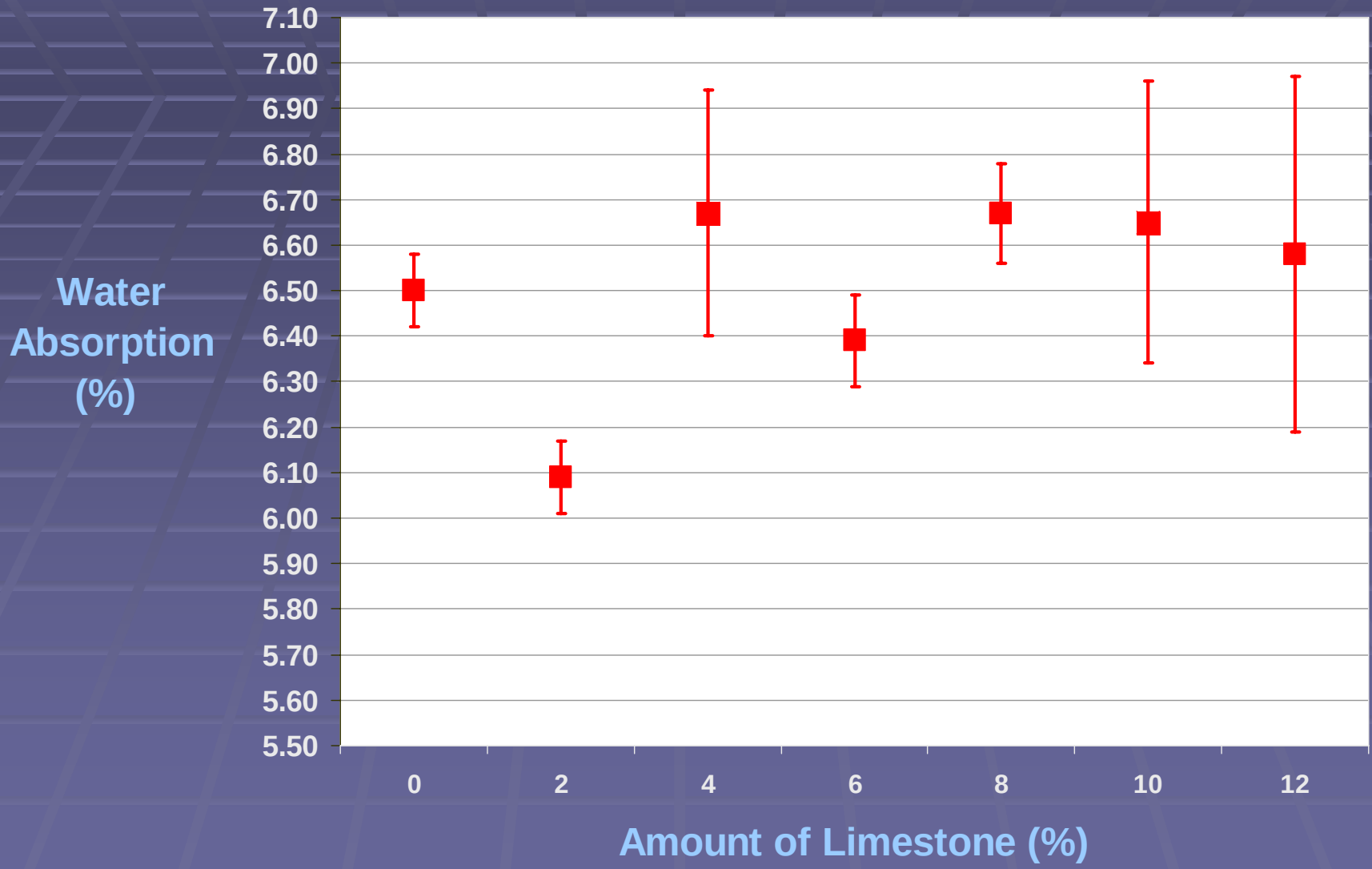
$$\Delta E = \sqrt{(\Delta L)^2 + (\Delta a)^2 + (\Delta b)^2}$$

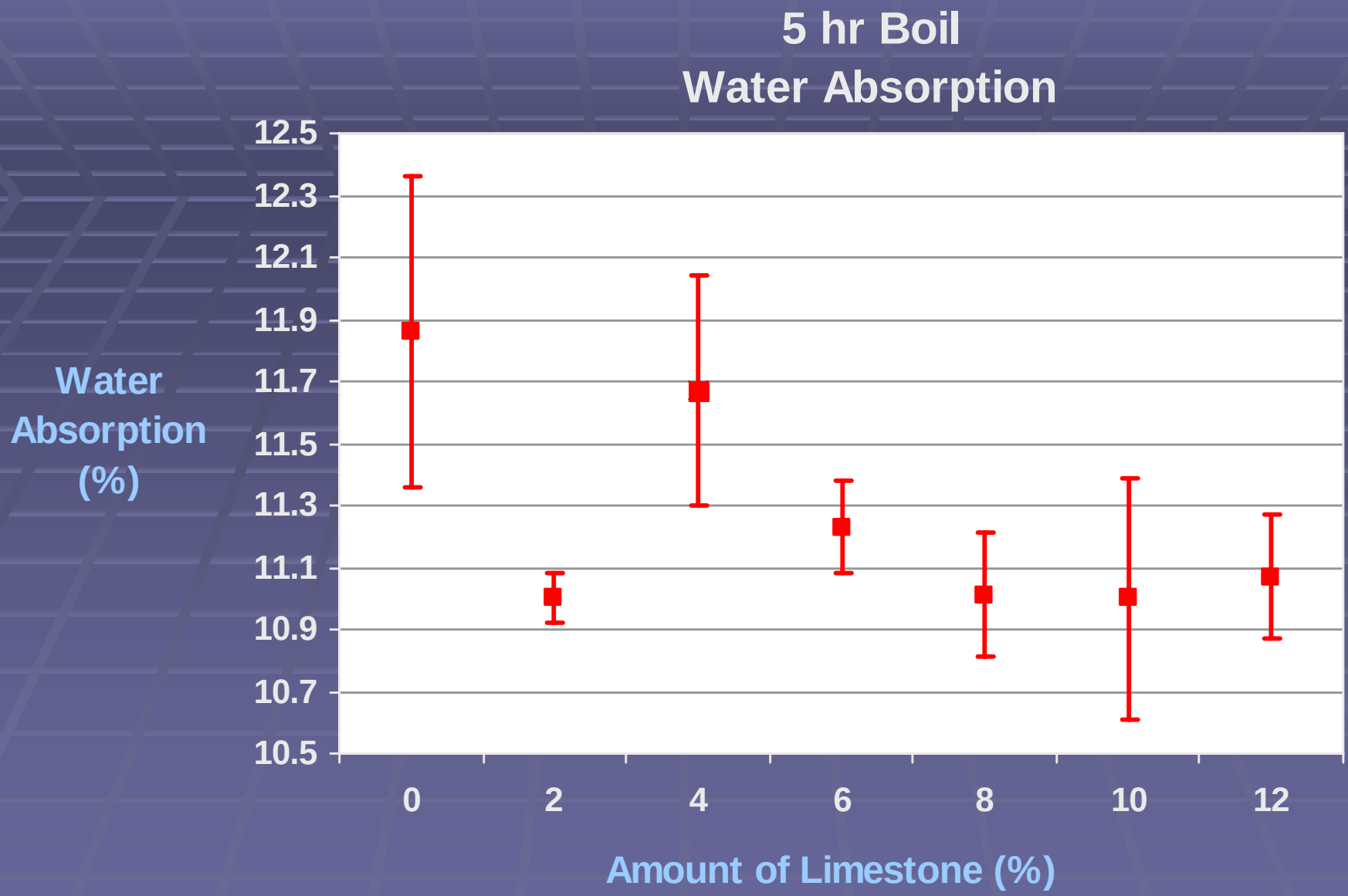

Color Difference Between Samples
Absolute Error (ΔE)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2
4
6
8
10
12
Amount of Limestone Added (%)

# Compressive Strength vs Limestone Addition

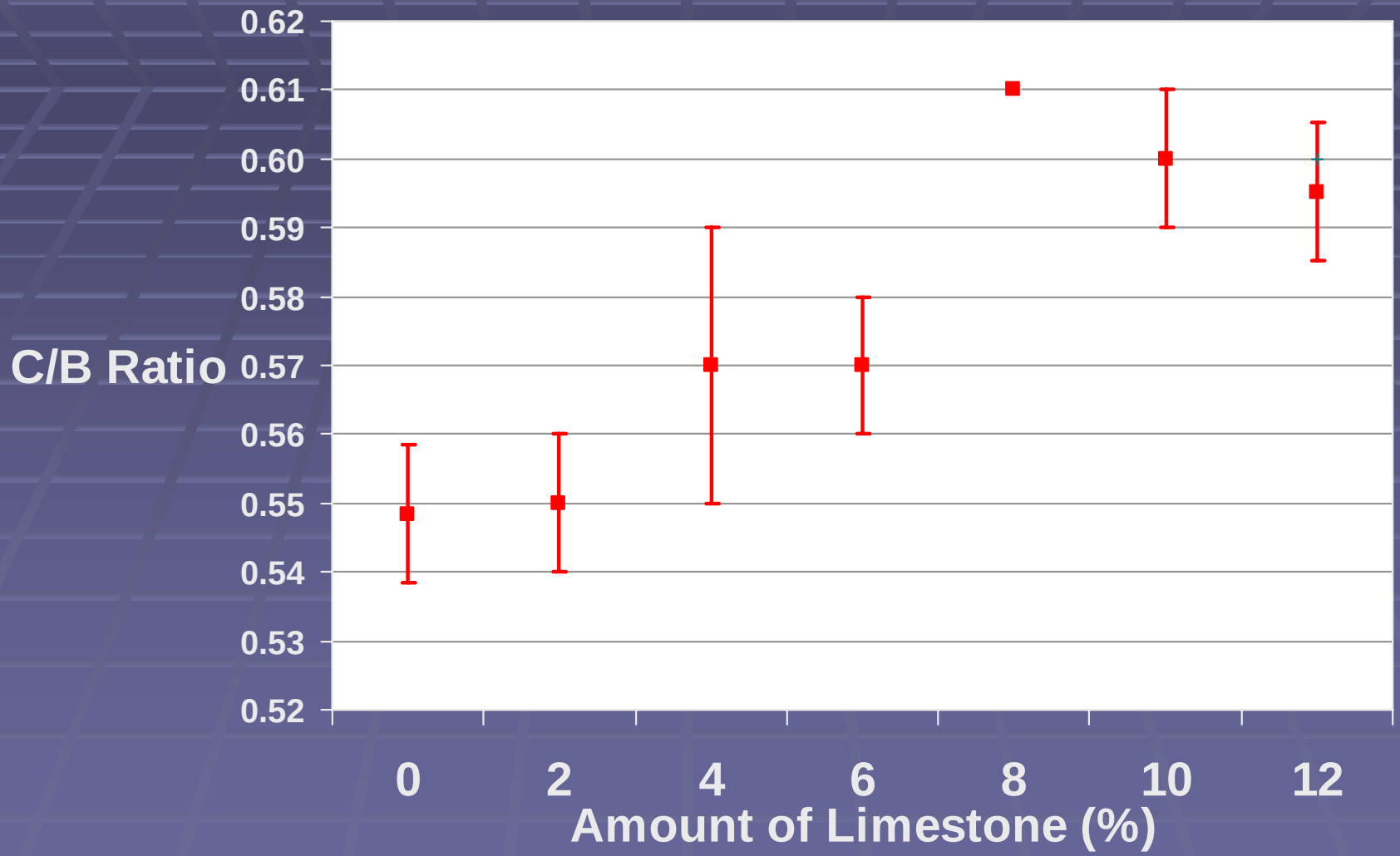


# 24 hr Cold Water Absorption




5 hr Boil
Water Absorption
Water Absorption (%)
12.5
12.3
12.1
11.9
11.7
11.5
11.3
11.1
10.9
10.7
10.5
0
2
4
6
8
10
12
Amount of Limestone (%)

# Saturation Coefficient



# Future Trials

- Replace Screening with the Sand
- Freeze -Thaw
- Plant Trial

# *Acknowledgements*

*To Paul-Francis D'Arcey and Brad Cobbledick for their assistance and suggestions throughout the process.*

# Questions

# Comments