University of South Alabama
Department of Civil, Coastal, & Environmental Engineering

# Flooded Wooden I-Joists: How Do They Perform?

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# Wood I-Joists

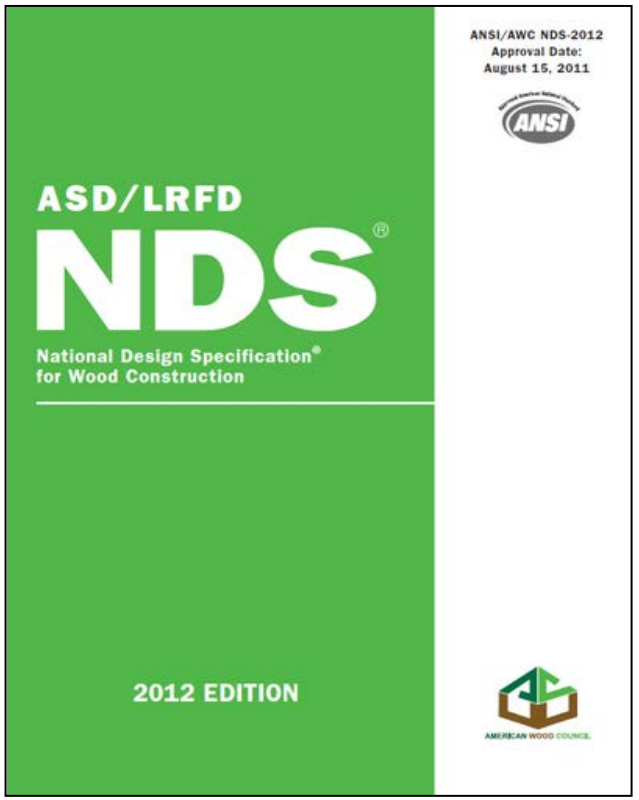
- Engineered Lumber Product
- “I” shaped member
- Flanges: Sawn Lumber or Structural Composite Lumber
- Web: OSB or Plywood
- Depths from 9 to 38 inches (9-16 inches typical)
- Lengths up to 50 feet (25 feet typical)

http://www.apawood.org/

# Drawbacks

- Must be used in Dry-Service Condition (Moisture Content <16%)

https://upload.wikimedia.org/Nashville_Flood.jpg



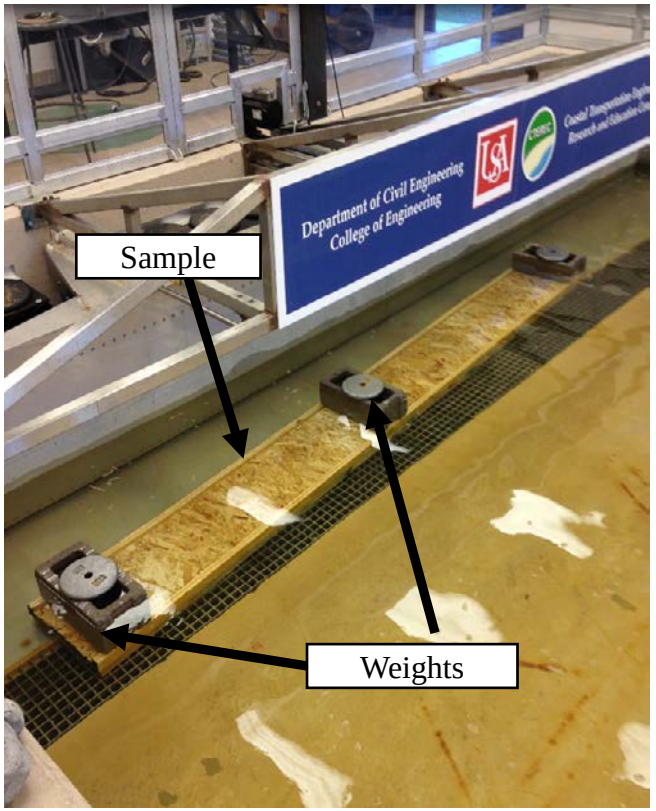

http://www.awc.org/

# Objective

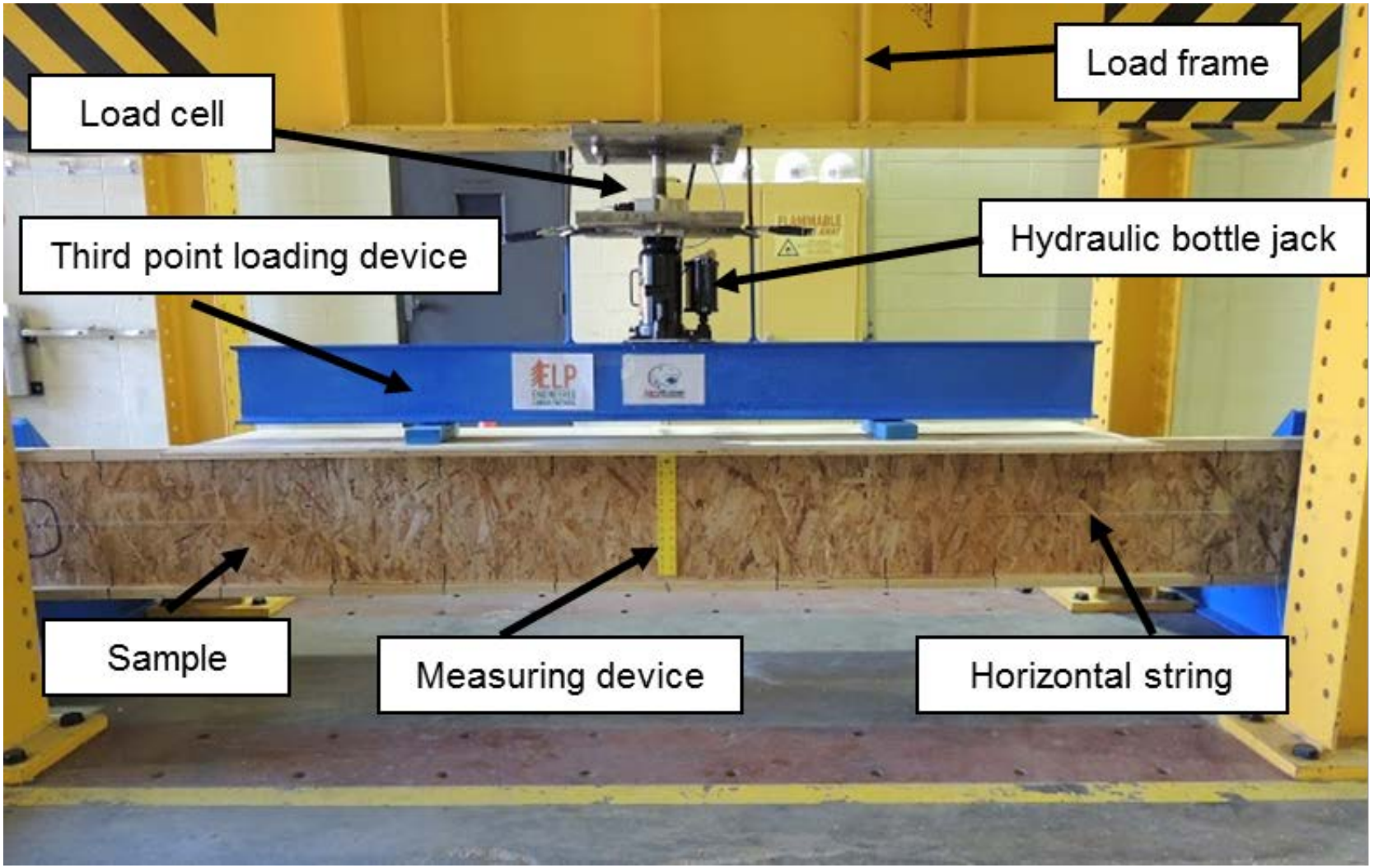
- Begin to investigate the effects on strength and stiffness from submerging I-joists in water for extended periods of time

Boise Cascade BCI 6000s 1.8 series I-Joists:
16 inches deep – 12 feet long

| Time of Saturation | Number of Samples |
|---|---|
| None (Dry Samples) | 2 |
| 1-Day | 2 |
| 2-Day | 2 |
| 3-Day | 2 |
| 5-Day | 2 |
| 7-Day | 2 |



# Laboratory Testing



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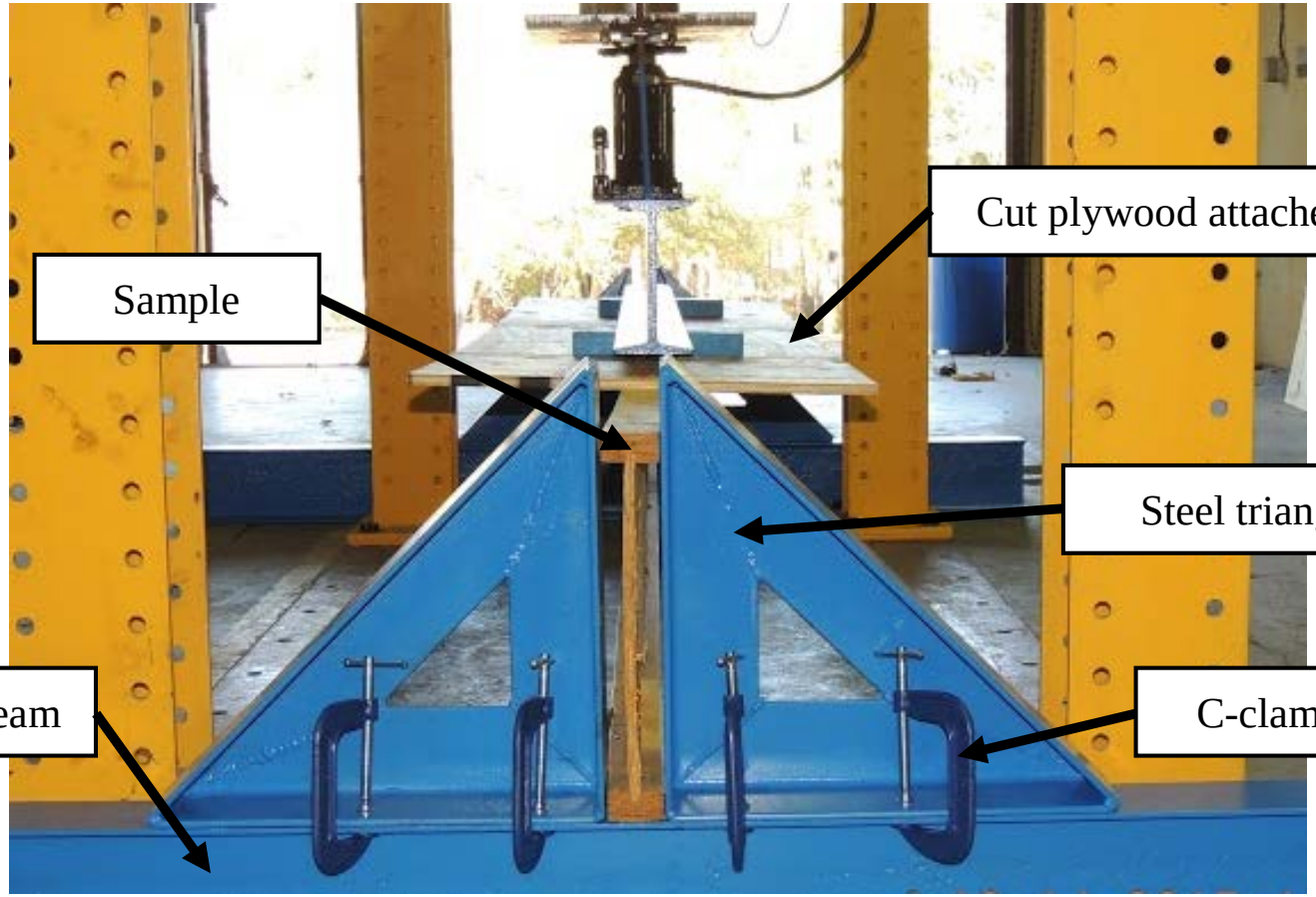
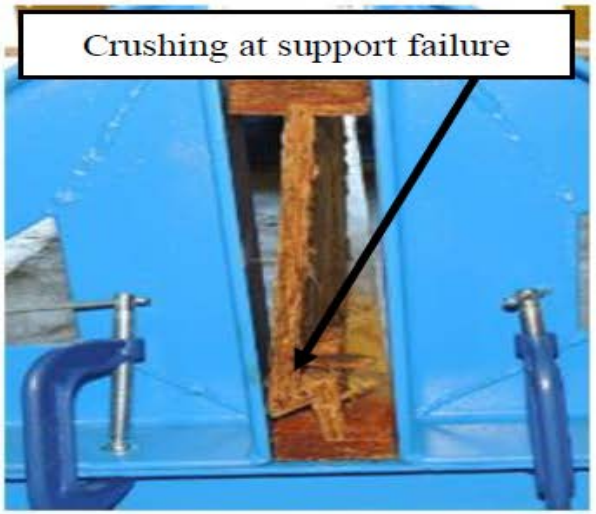


# Failure Modes

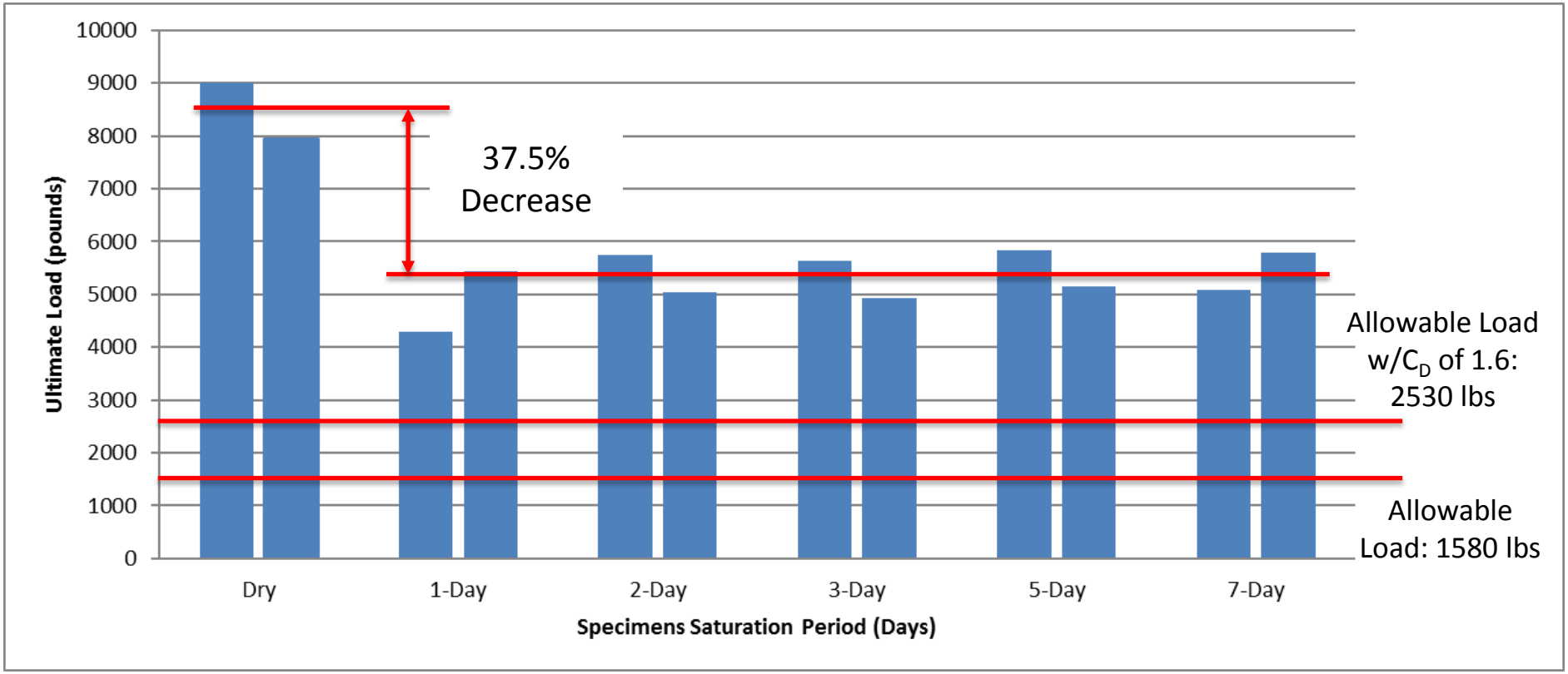


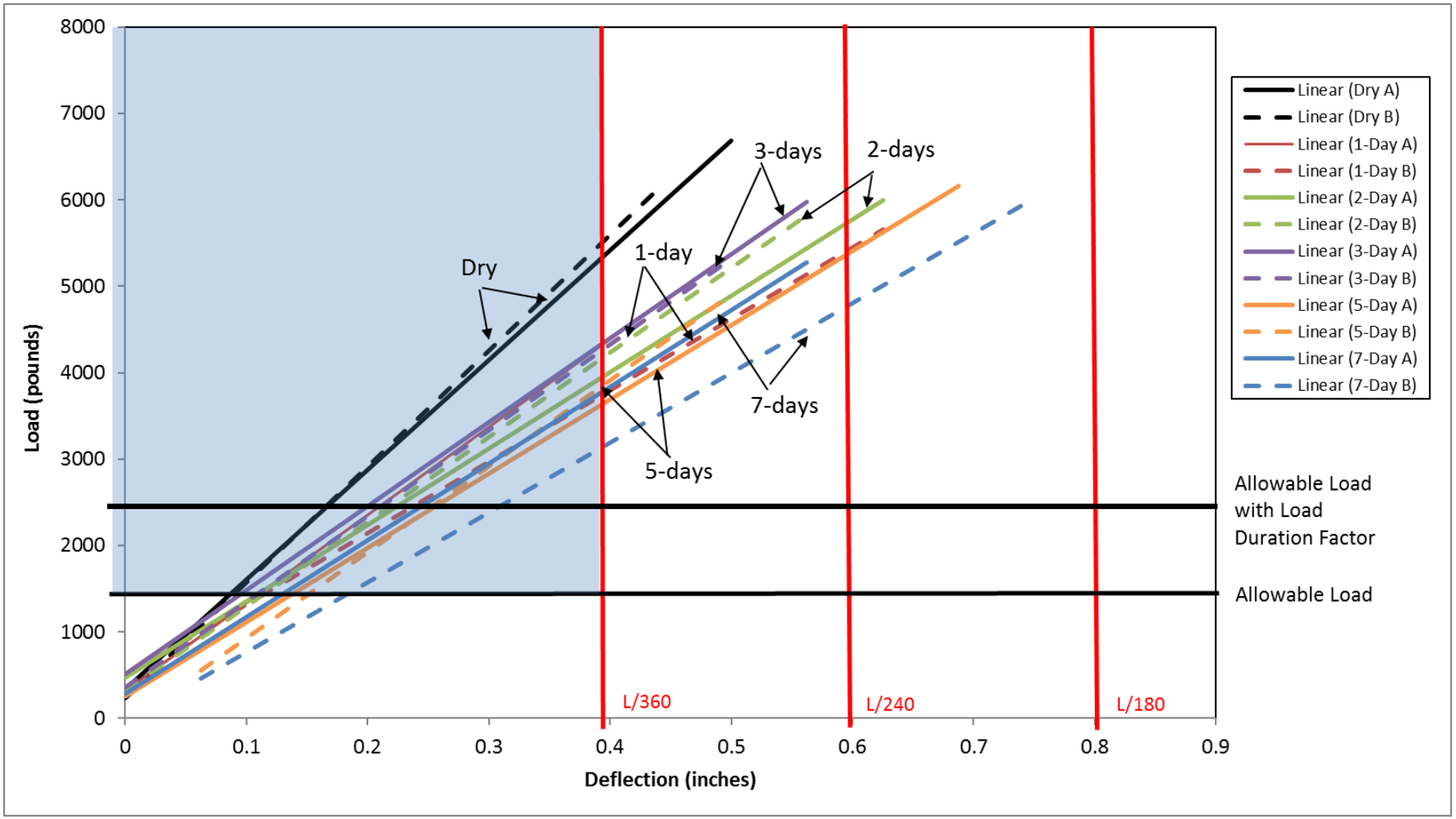
# Failure Modes

| Specimens | Mode of Failure |
|---|---|
| Dry-A<br>Dry-B | Lateral Torsional Buckling<br>Lateral Torsional Buckling |
| 1-Day-A<br>1-Day-B | Lateral Torsional Buckling<br>Shear Failure at Joint |
| 2-Day-A<br>2-Day-B | Flexural<br>Lateral Torsional Buckling |
| 3-Day-A<br>3-Day-B | Lateral Torsional Buckling<br>Lateral Torsional Buckling |
| 5-Day-A<br>5-Day-B | Flexural<br>Crushing at Support |
| 7-Day-A<br>7-Day-B | Crushing at Support<br>Crushing at Support |

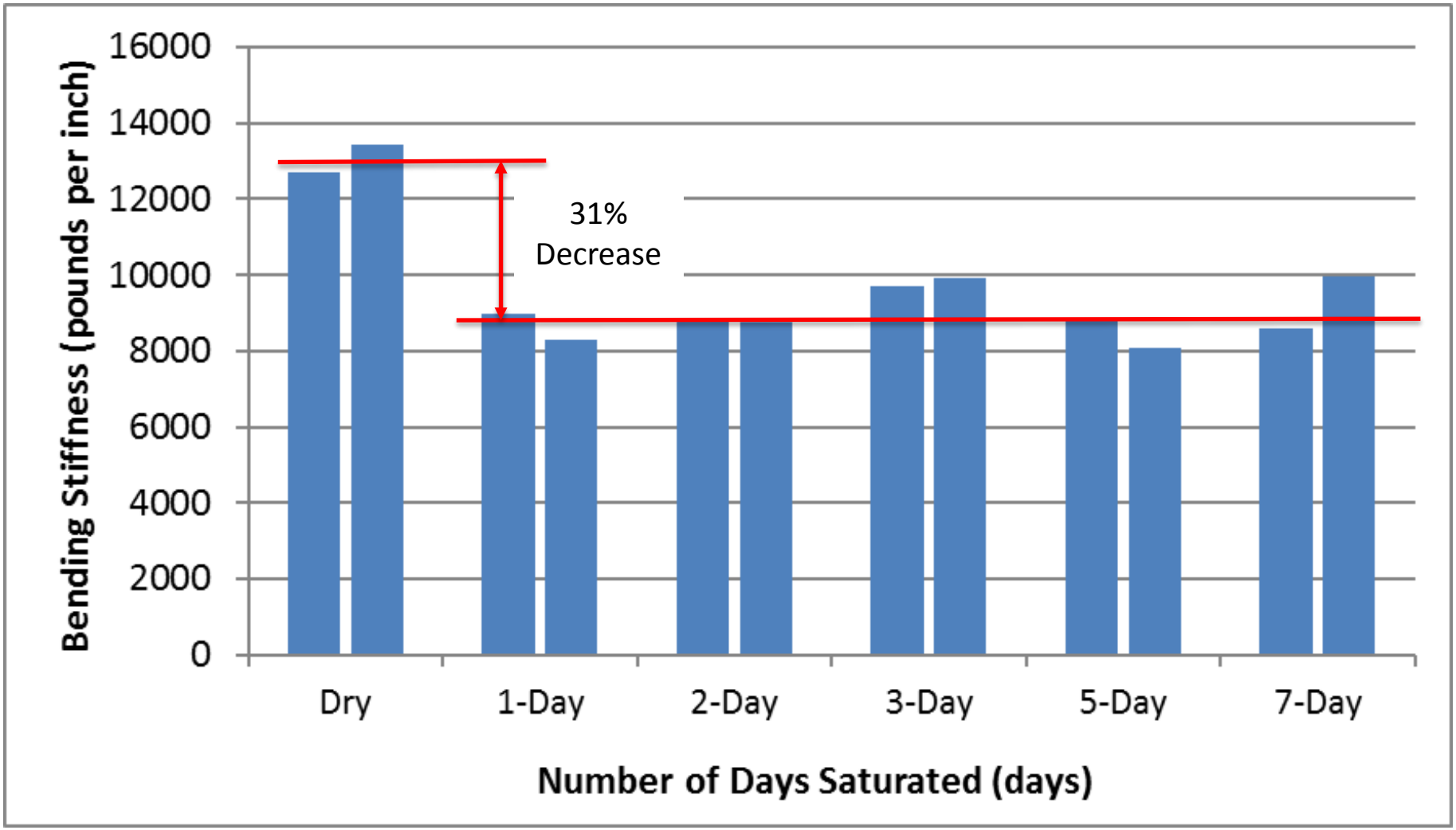
# Ultimate Load



# Load-Deflection Behavior



# Bending Stiffness



# Conclusions

- Significant decrease in strength and stiffness
  - 37.5% for Strength
  - 31.0% for Bending Stiffness
- Time of submergence had little effect
- Strength and deflection were within published allowable limits
- Limitations – Need for future work
  - Samples (number and “variety”)
  - Effects of wetting and drying
  - Behavior between “dry” and 1-Day (actual moisture content)
  - Sustained loading (creep)
  - Other conditions?

# Other Conditions?




# Questions


## University of South Alabama

### Department of Civil, Coastal, and Environmental Engineering

- Bachelor of Science in Civil Engineering
- Master of Science in Civil Engineering
- Starting in 2017-18: Graduate Certificates in Civil Engineering (4 Courses)