Design Project #1

Replacement of Vehicle Bridge over Spring Creek

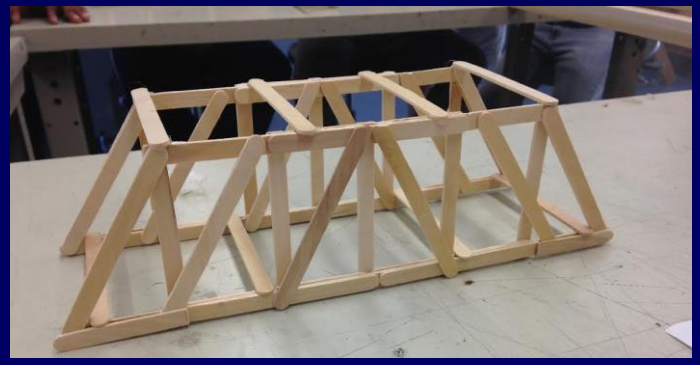
Centre County, PA

Introduction to Engineering Design

EDSGN 100 Section 001

Team Jack It Up

Logan Godtfring, Yanni Balouris, Cassidy Krier, Mary Papandreas



Presented to:

Prof. Berezniak

Fall 2015

Statement of Problem

Bridge Collapsed over Spring Creek

Crucial for ambulance transportation to Mount Nittany Medical Center; major inconvenience

Objective

A project has been initiated by PennDOT District 2-0 to design and build a new bridge spanning over Spring Creek to replace the bridge destroyed by the recent flood event.

pennsylvania
DEPARTMENT OF TRANSPORTATION

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Design Criteria

Design Requirements:

- Standard abutments
- Deck material shall be medium strength concrete (0.23 meters thick)
- No cable anchorages and designed for the load of two AASHTO H20-44 trucks (225kN) with one in each traffic lane
- The elevation of bridge deck shall be set at 20 meters and the deck span shall be exactly 40 meters

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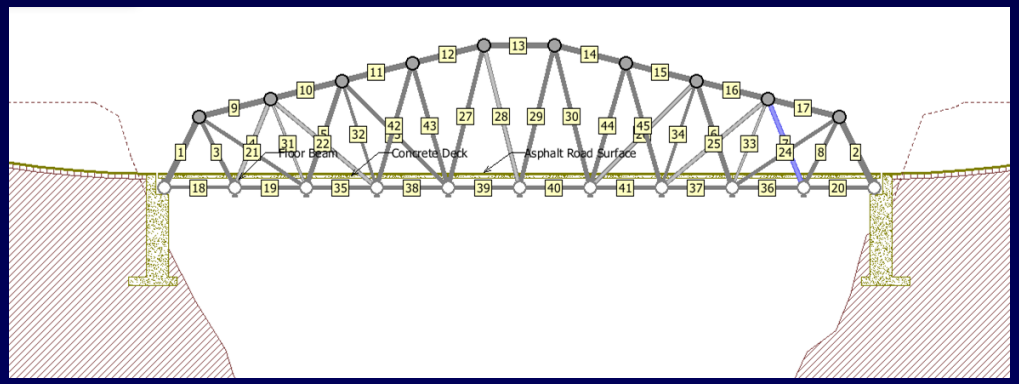
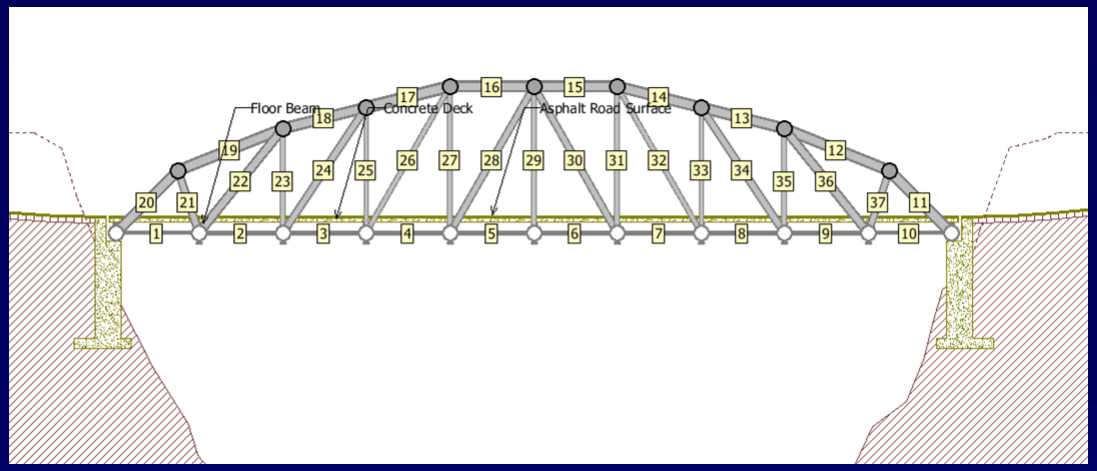
Technical Approach Phase 1: Economic Efficiency

Determined by designing and testing a bridge using the Engineering Encounters Bridge Design 2015 software



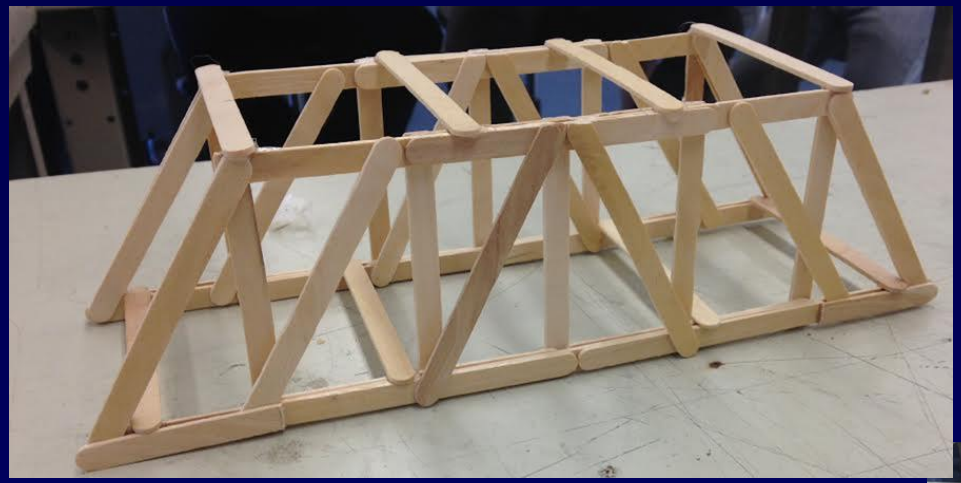


Test for cost-effectiveness vs the bridge's dead and live load

Technical Approach Phase 2: Structural Efficiency

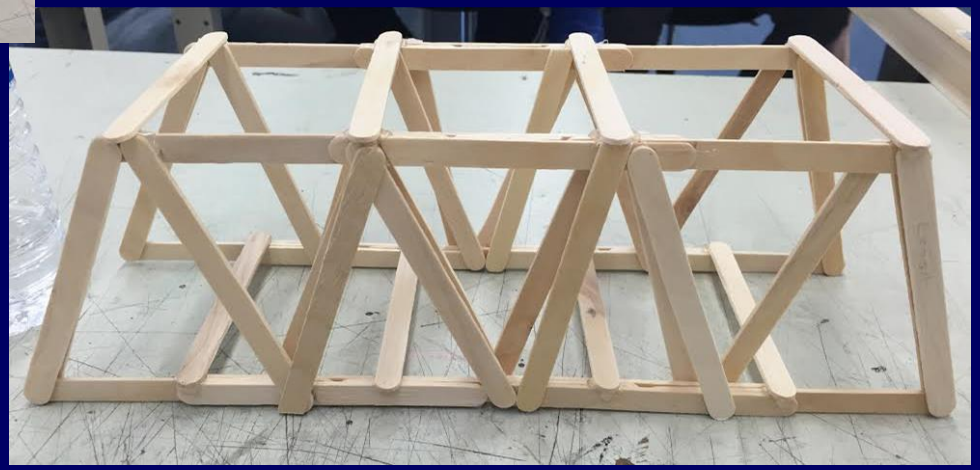
Build a prototype for both models

Test to catastrophic failure



Howe Truss

Warren Truss



Structural efficiency =

Load at Failure (lbs) / Actual Bridge Weight (lbs)

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Results Phase 1: Economic Efficiency

- The Howe Truss Bridge
  - 37 members; all carbon steel
  - Majority hollow tubes

Total Cost | M+C+P+S | $116,357.74 + $20,000.00 + $9,000.00 + $77,400.00 | $222,757.74

- The Warren Truss Bridge
  - 45 members
  - All carbon steel hollow tubes or bars

Total Cost | M+C+P+S | $114,195.93 + $21,000.00 + $13,000.00 + $77,400.00 | $225,595.93

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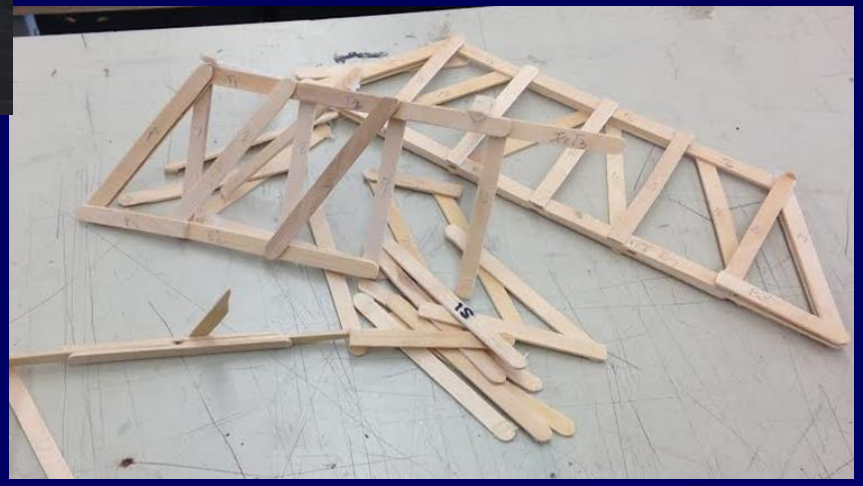
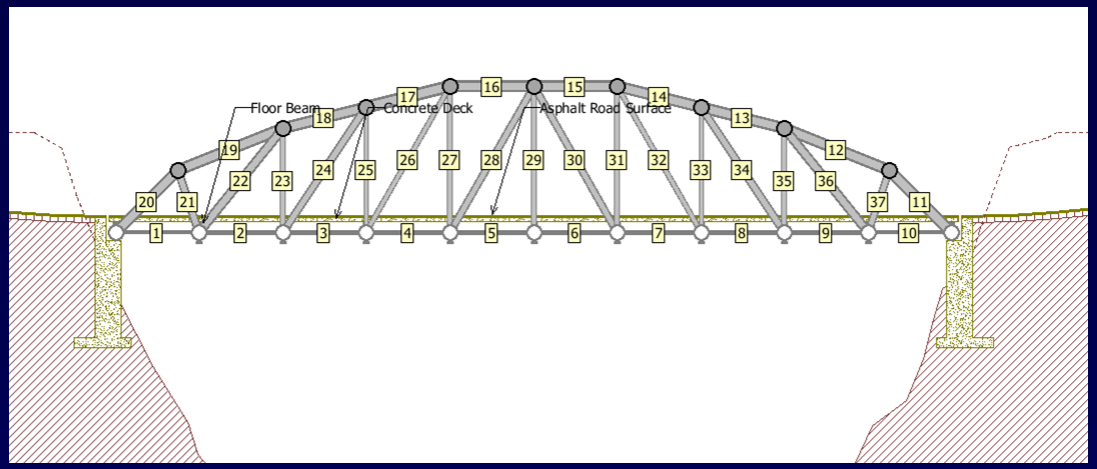
Results Phase 2: Structural Efficiency

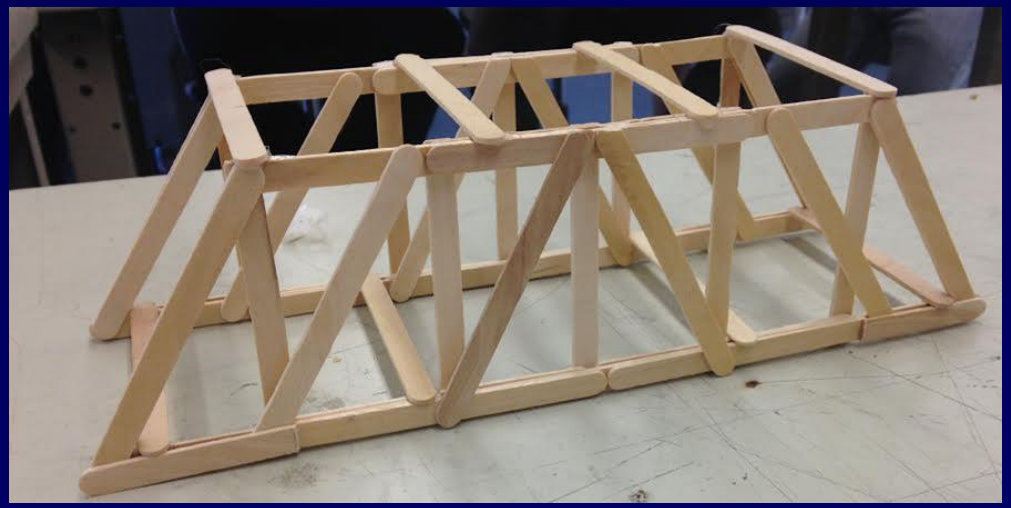
- The dimensions for each bridge design is to be approximately 13.5 inches in length, 4 inches in height, and 4.5 inches in width.

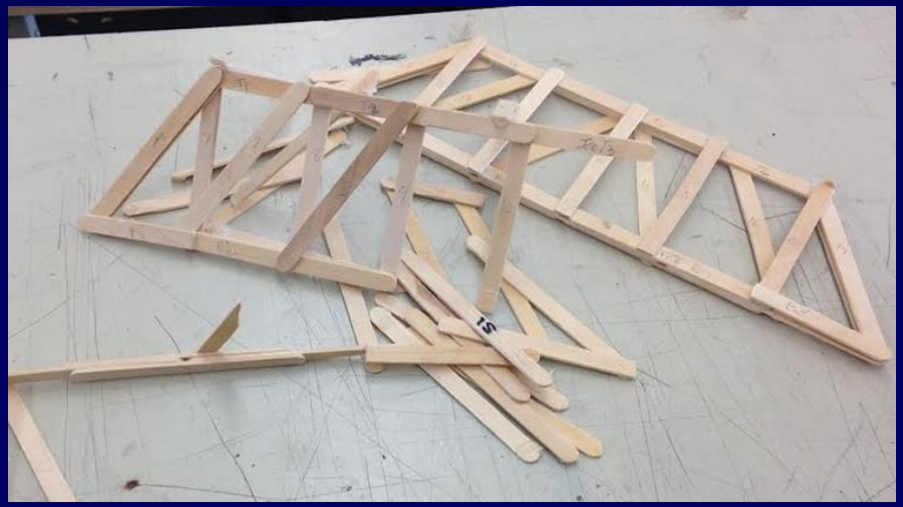


Best Solution

The Howe Truss Bridge

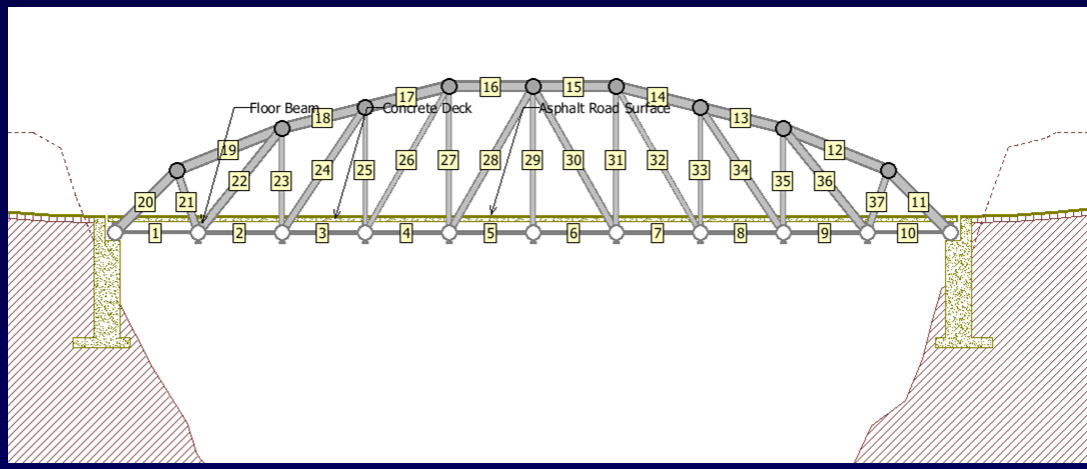




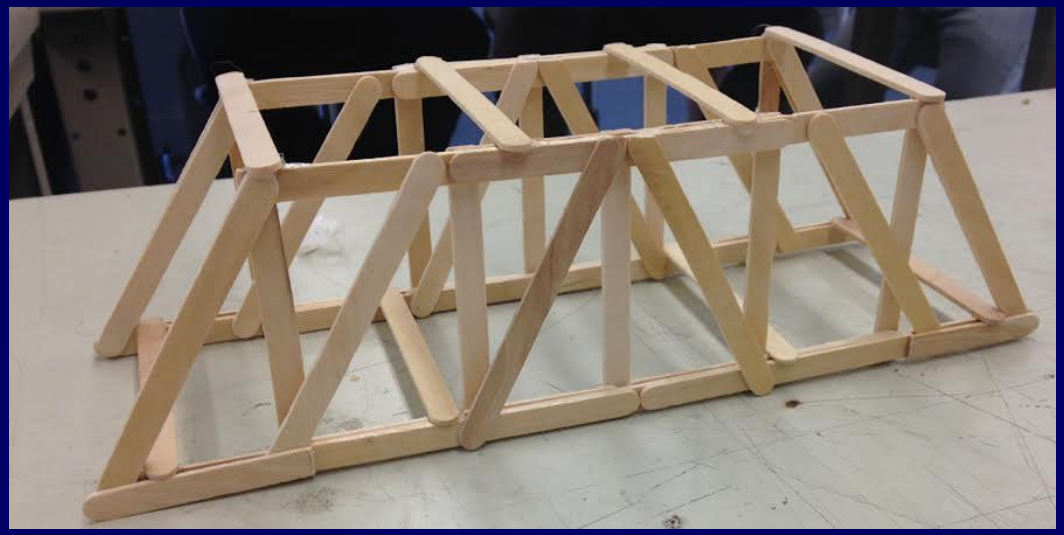


Conclusions

- Look over Howe Truss design and prototypes searching for areas of improvements
- Can be less expensive?

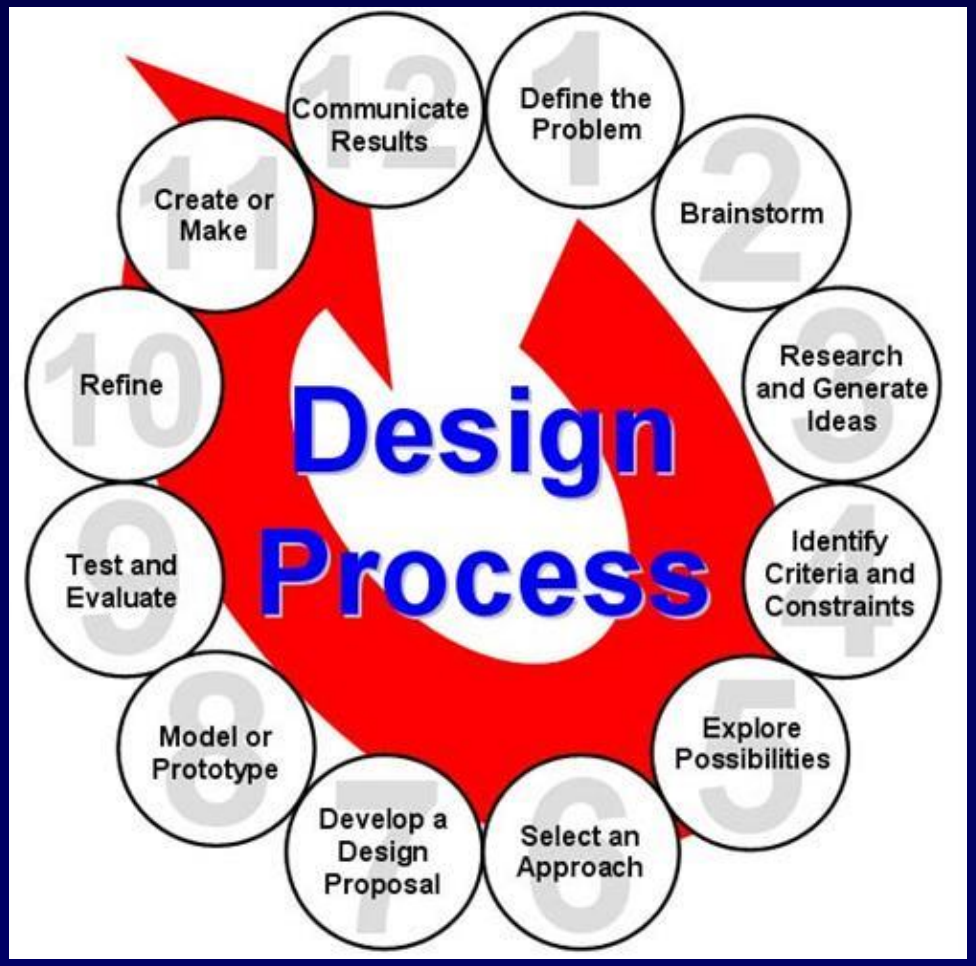


- Can it be more structurally efficient?



Recommendations

Redesign and rebuild an improved Howe Truss Bridge that will serve as the replacement bridge over Spring Creek



Finalize the best possible Howe Truss design and prototype