Design Project #1

Replacement of Vehicle Bridge over Spring Creek

Centre County, PA

Introduction to Engineering Design

EDGSN 100 Section 002

The Bleeding Frogs

Team 1

Joe Berg

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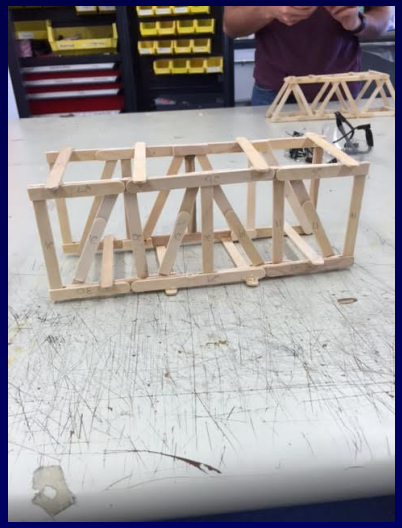
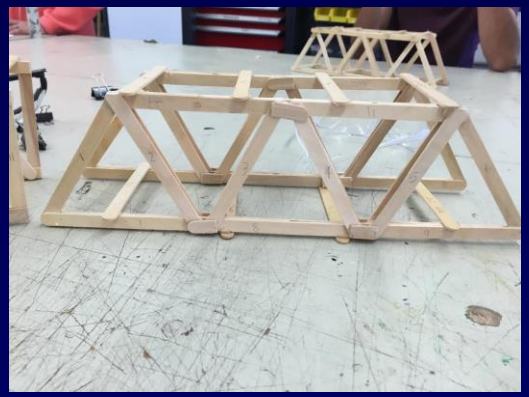
HOWE



WARREN



TEAM CHRISTMAS PHOTO

Presented to:

Prof. Berezniak

Fall 2015

Statement of Problem

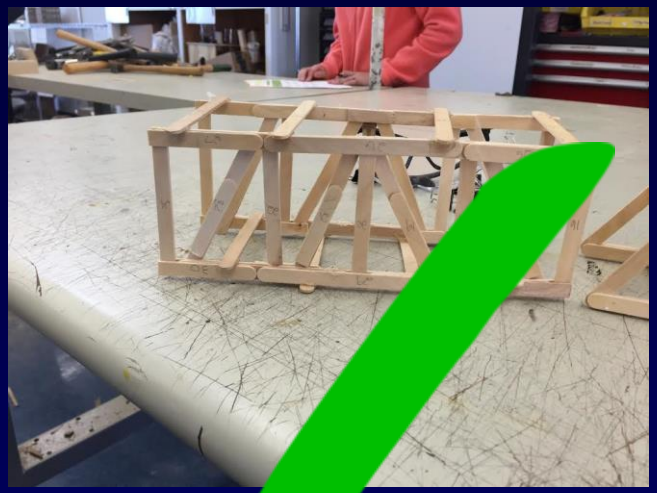
- **Due to a 100 year flood, a structurally deficient bridge allowing access to Mt. Nittany Medical Center imploded in Centre County, PA.**

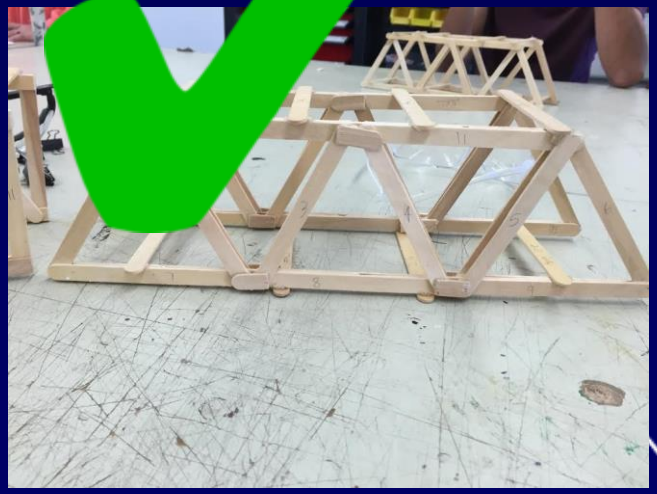
Objective

- **Build a new vehicle bridge which is both structurally and cost efficient in the designated area by comparing and load testing different Truss design models.**

NOT THIS!!

OH YEAH BABY!!





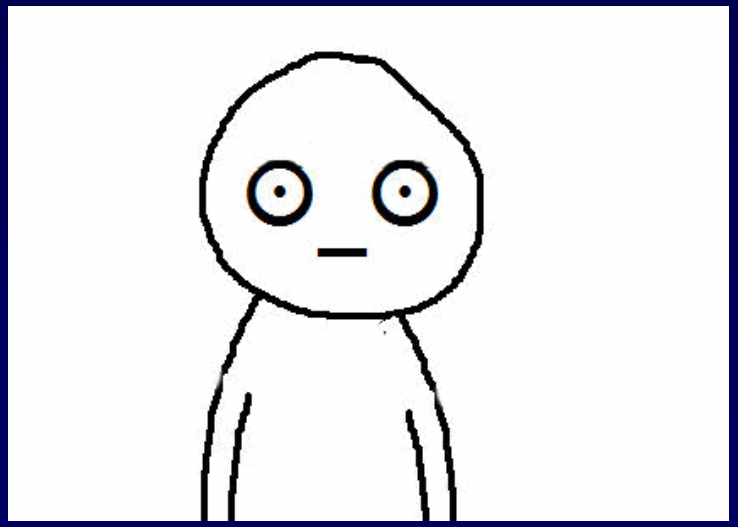
Design Criteria

- Standard abutments, no piers (one span), 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 bridge deck elevation shall be set at 20 meters and the deck span shall be exactly 40 meters. Both a Warren through truss bridge and a Howe through truss bridge shall be analyzed.

Technical Approach Phase 1: Economic Efficiency

- The bridge was put under intense evaluations in order to achieve the lowest cost possible. The bridges' members were tested with different member thicknesses as well as different materials. The most cost efficient method was to use members with similar thicknesses and materials. In this way, the bridge was able to dodge the costs of bringing in different sized members.

WOAH, LOOK OUT!!!



Technical Approach Phase 2: Structural Efficiency

- Where ever the bridge failed, the members that failed were substituted for thicker members. Different types of steel were also tried to achieve the strongest bridge (the compression ratio closest to 1.0). Tubes were stronger for compression and bars were stronger in tension. The different types of members were used in the correlating force.

WHO'S A GOOD LITTLE BOY?!?!

Results Phase 1: Economic Efficiency

	HOWE	WARREN
TOTAL COST	$268,947.72	$247,019.84
# OF MEMBERS	37	39
AVG COST MEMBERS	$7,268.86	$6,333.84
MOST COST EFFICIENT		✓

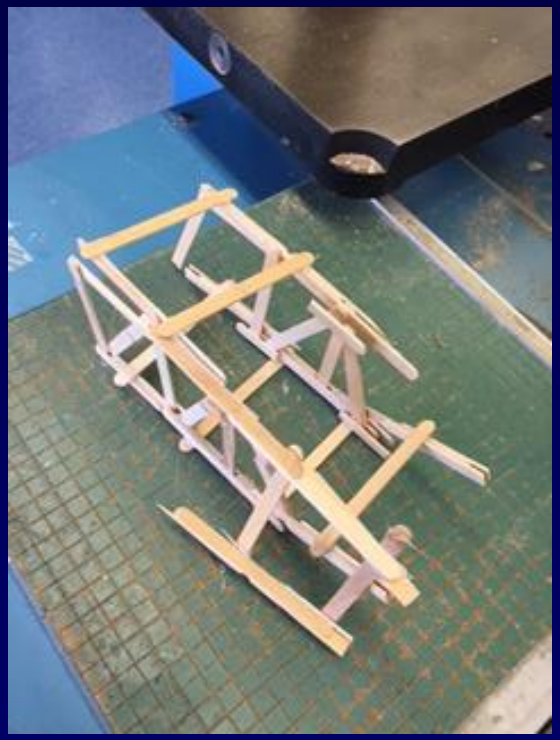
HEY KIDS!

PENNSTATE

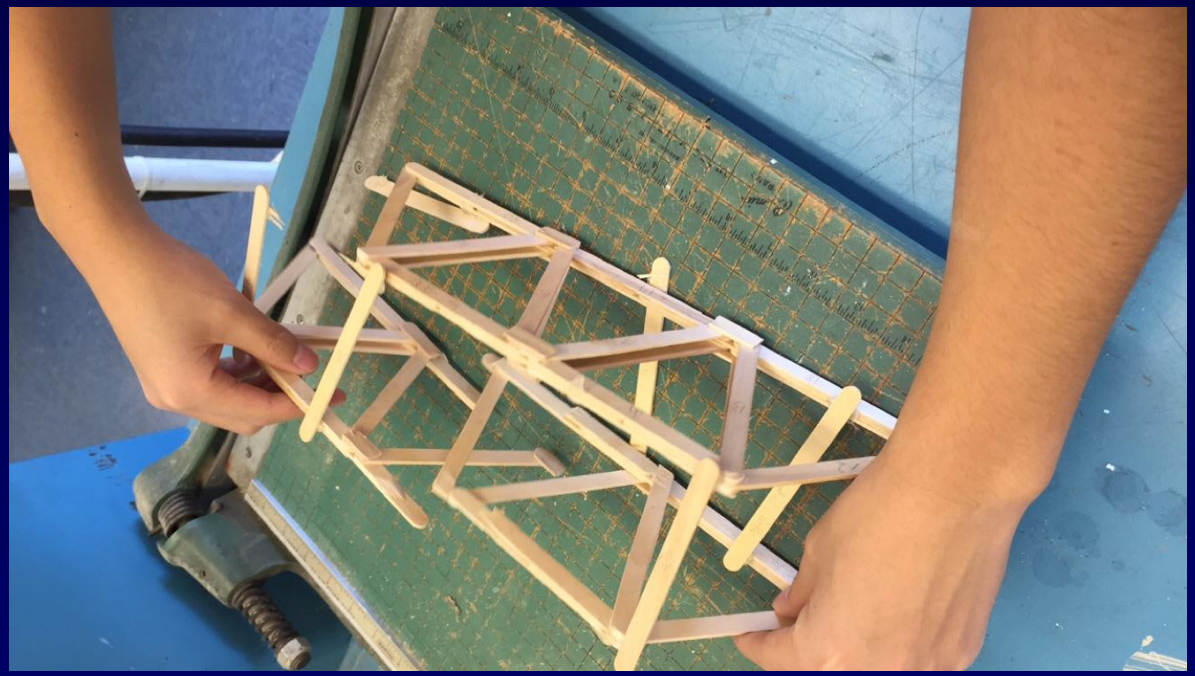
Results Phase 2: Structural Efficiency

- Structural Efficiency is defined as the ratio of the load at which the bridge fails to the weight of the bridge.
- Structural efficiency of Warren = 579.3
- Structural efficiency of Howe = 388.87

HOWE



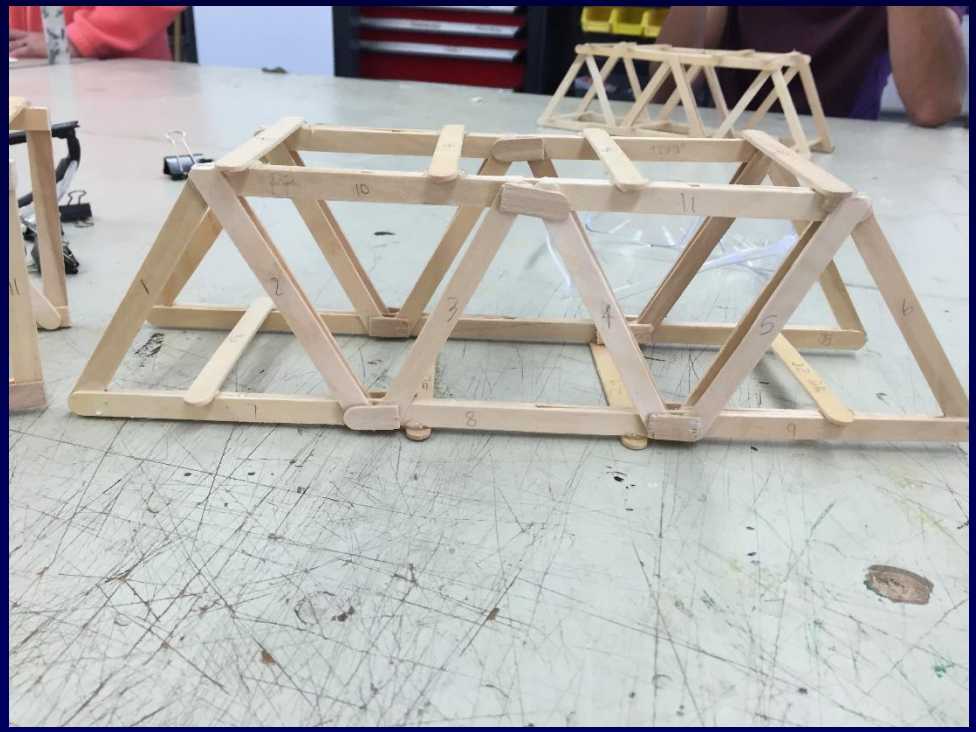
WARREN



Note: Gussets.

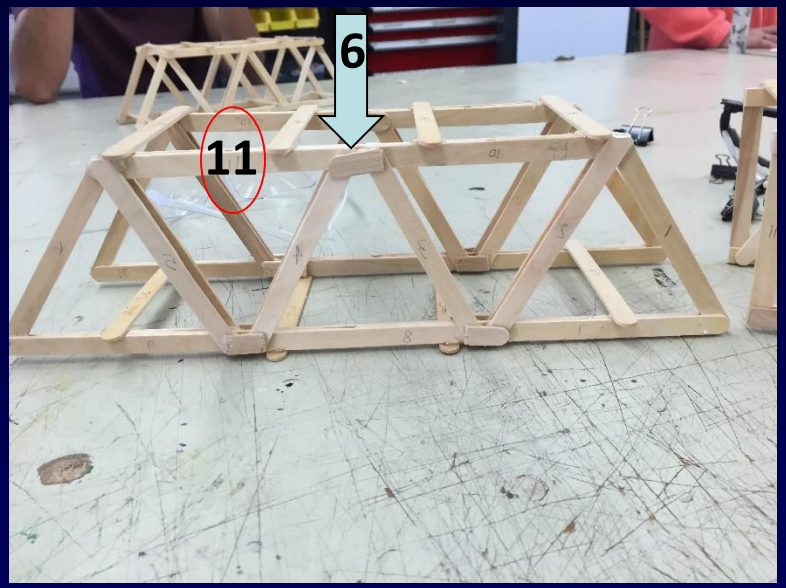
Best Solution

- **The best solution for the PennDot proposal is to use the Warren Truss Bridge Design because it has the higher structural efficiency of the two bridges and it withstood more force.**



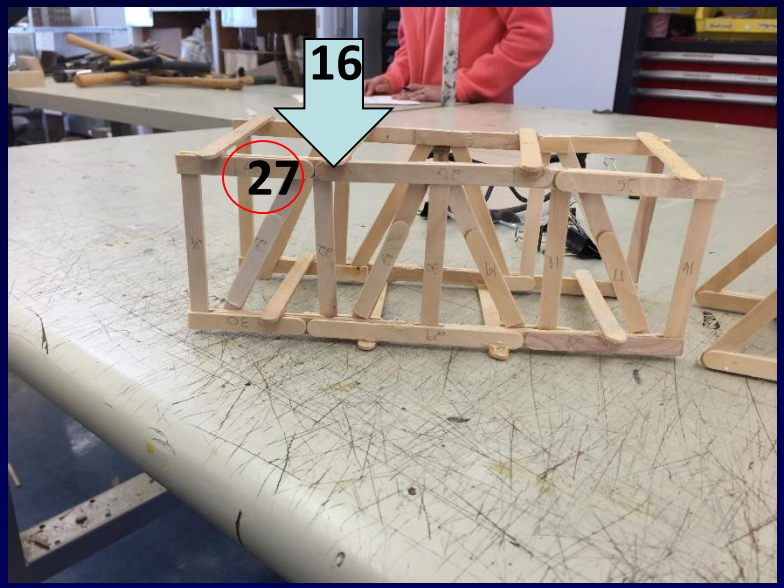
Conclusions

WARREN



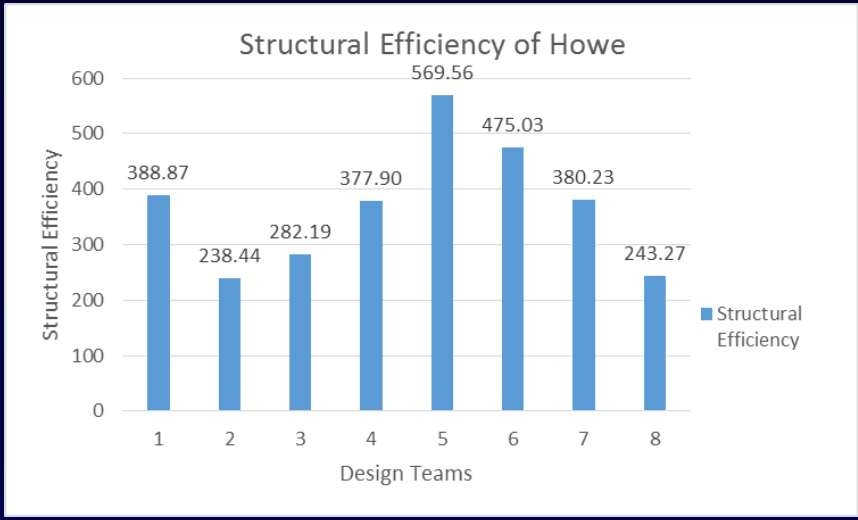
- **BROKE AT MEMBER 11 AND JOINT 6.**

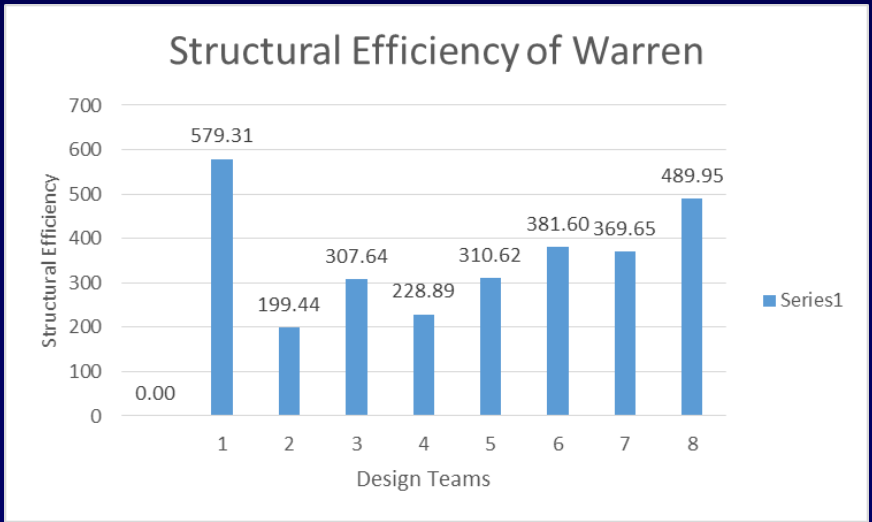
HOWE



- **BROKE AT MEMBER 27 AND JOINT 4.**

Recommendations





SPECIAL THANKS TO XAVIER!!