Design Project #1
Replacement of Vehicle Bridge over Spring Creek
Centre County, PA
Introduction to Engineering Design
EDGSN 100 Section 001

Sean’s Favorite Team

06
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Presented to:
Prof. Berezniak
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Statement of Problem

Local flooding has eventually destroyed a structurally deficient bridge over Spring Creek

The bridge was heavily travelled and a main entrance road to get to the Mount Nittany Medical Center in State College, PA.

All traffic must now be re-routed more than 10 miles around the destroyed bridge, thereby disrupting residential traffic flow, local commerce, and exposing State College residents to considerable risk.
Objective

Quickly design a new bridge

Create an economically efficient bridge that is also structurally efficient
Design Criteria

Standard abutments

No piers (one span), deck material shall be medium strength concrete (0.23 meters thick)

No cable anchorages

Load of two trucks (225kN) with one in each traffic lane

The deck of the bridge needs to be 20 meters high and the deck will span 40 meters
Technical Approach  Phase 1: Economic Efficiency
The design criteria that the bridges needed to follow was to hold two 225kN trucks.

In the EEBD 2015 program, each bridge was set to hold that weight.

As we limited costs we also kept in mind the weight that needed to be supported.

Member type, size, material
Technical Approach  Phase 2: Structural Efficiency

Howe

Warren
Results  Phase 1: Economic Efficiency

Tested different member materials, types and sizes
Went through member by member limiting costs

The cost of the Warren Bridge $245,317.43
The cost of the Howe Bridge $243,361.04
## Results  Phase 2: Structural Efficiency

**WARREN Truss Bridge**

<table>
<thead>
<tr>
<th>Design Team No.</th>
<th>Actual Bridge Weight (grams)</th>
<th>Actual Bridge Weight (lbs)</th>
<th>LOAD at Failure (lbs)</th>
<th>Structural Efficiency</th>
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**HOWE Truss Bridge**

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**Warren Structural Efficiency:** 381.1

**Howe Structural Efficiency:** 383.9
Best Solution

The Howe bridge was the best solution based on structural efficiency and economic efficiency.

Warren bridge came in at 381.1 and the Howe at 383.9.

This highlights how the group dedicated equal amounts of time and effort into each bridge.
Conclusions

The better bridge out of the two was the Howe

It proved better from the technical approach and also the design

It had a lower cost and had a higher structural efficiency

Construction Techniques
Recommendations

When designing the prototype...

Ensure both sides are built the same

Given proper glue time

Parallel to each other