Crazy Creek Summer Camp Bridge Design Proposal

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Principles of Engineering

Introduction: For the upcoming 2025 Crazy Creek Summer Camp, the ACME Engineering Co. proposes a Pratt truss bridge to span the camp's iconic Crazy Creek Canyon. The bridge would support a two lane concrete roadway. A36 steel would be used for the bridge structure, due to its availability and durability. The resulting combination of modern steel, rustic timber, and utilitarian concrete would yield a useful, yet beautiful bridge, which would be enjoyed for many years to come.

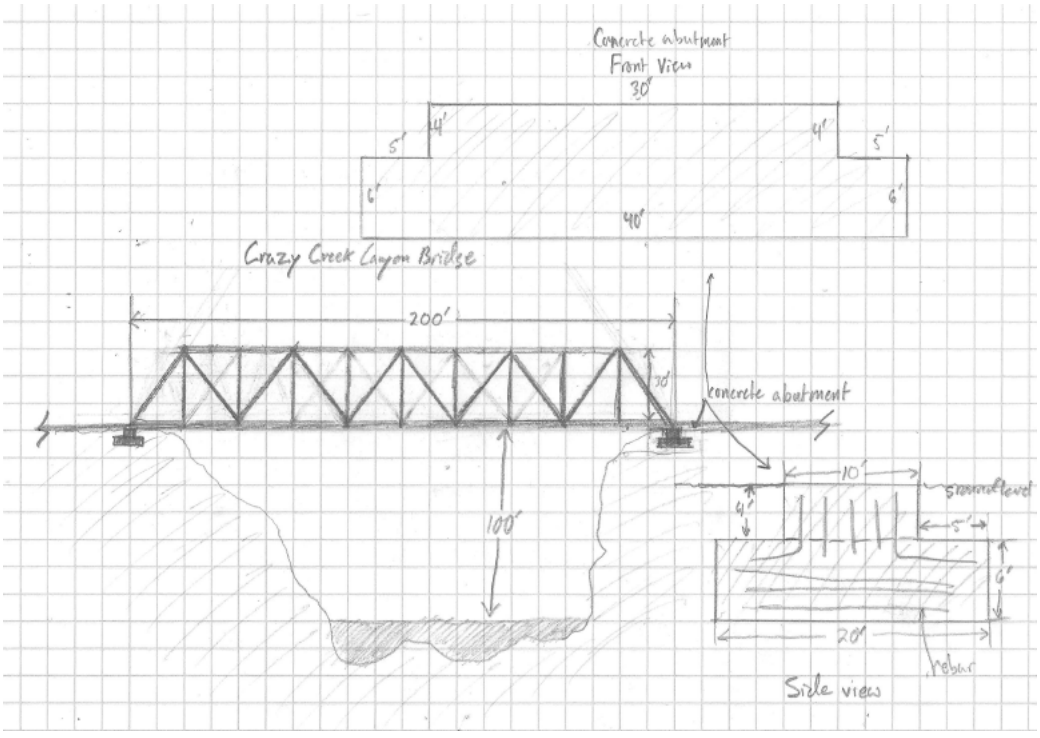
Roadway construction: The roadway would be 25 feet wide, with 5000 in^2 of concrete poured 4 inches thick over its entire expanse. The two lanes would be 11 feet wide each, with 1.5 feet of extra concrete on each side of the bridge. Further detail is shown in the drawing.

Calculations:

Density: 150 lb/ft^3

(5000 ft^2)(0.33 ft)(150 lb/ft^3) = 247,500 lb

Bridge construction: Constructed for A36 steel and, the Warren truss bridge with verticals would stand on two identical concrete abutments, embedded in the soil.



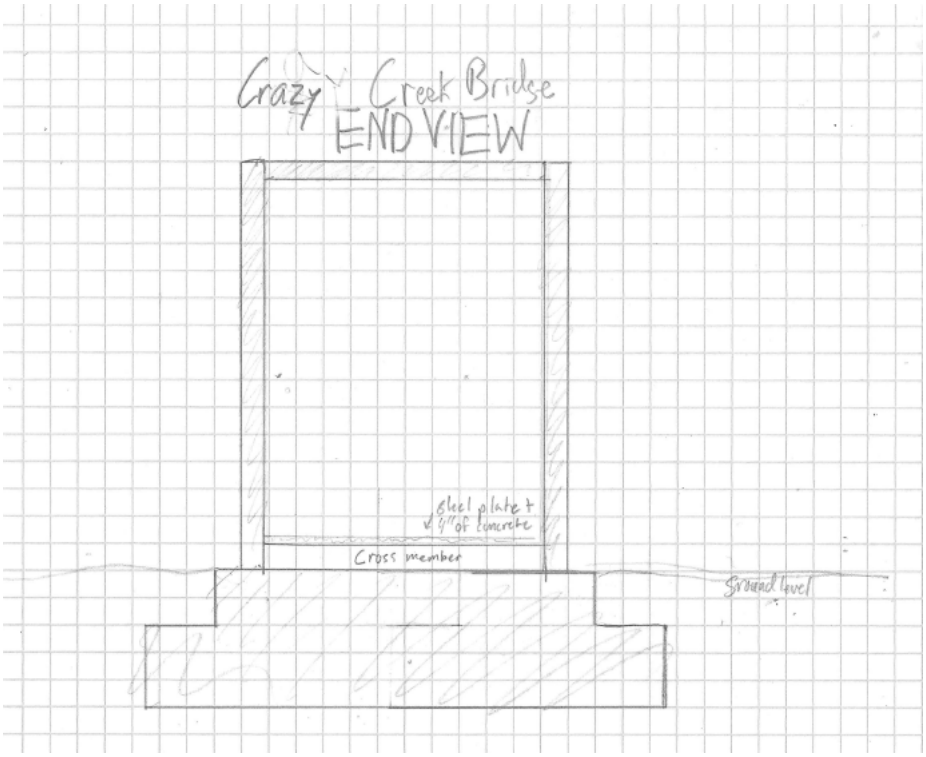
Loading: The bridge must be able to safely support the roadway, the bridge itself, and an average load of 4 cars, 3 pickup trucks, 500 people, and 4 horses.

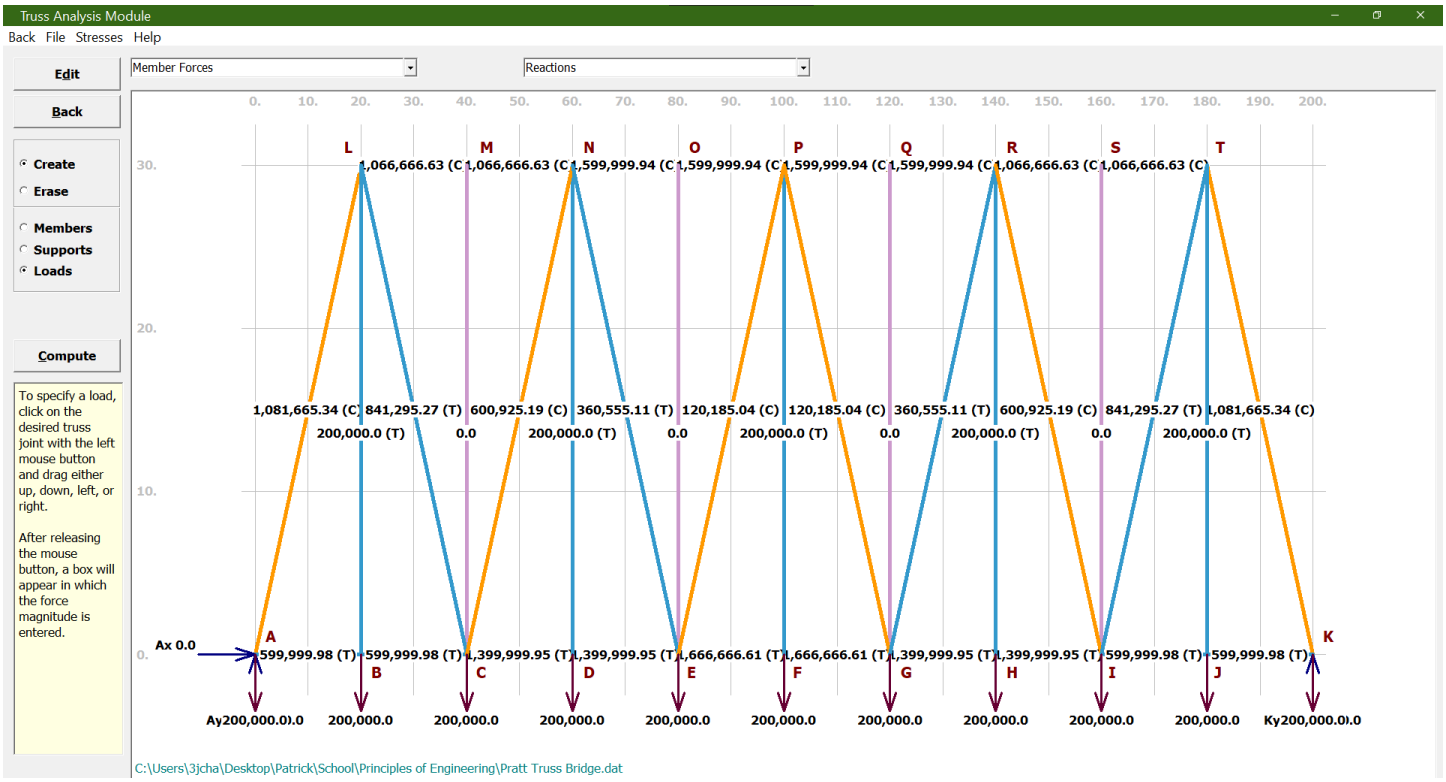
- Roadway: 247500 lb

- Bridge $\approx$ 250,000 lb
- Cars: 4 × 4000 lb = 16,000 lb
- Trucks: 3 × 5500 lb = 16,500
- People: 500 × 200 lb = 100,000 lb
- Horses: 4 × 1500 lb = 6000 lb

Total: 247500 lb + 250,000 lb + 16,000 lb + 16,500 lb + 100,000 lb + 6000 lb = 636,000 lb

Safety factor = 7 → 7 × 636,000 lb = 4,452,000 lb → 4,452,000 lb/2 → <u>2,226,000 lb per truss</u>





Member Forces

AB = 599,999.979 Tension
AL = 1,081,665.345 Compression
BC = 599,999.979 Tension
BL = 200,000.000 Tension
CD = 1,399,999.950 Tension
CL = 841,295.268 Tension
CM = 0.000 Compression
EP = 120,185.038 Compression
FG = 1,666,666.607 Tension
FP = 200,000.000 Tension
GH = 1,399,999.950 Tension
GP = 120,185.038 Compression
GQ = 0.000 Compression
GR = 360,555.115 Tension
JT = 200,000.000 Tension
KT = 1,081,665.345 Compression
LM = 1,066,666.628 Compression
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OP = 1,599,999.943 Compression
PQ = 1,599,999.943 Compression
CN = 600,925.192 Compression
DE = 1,399,999.950 Tension
DN = 200,000.000 Tension
EF = 1,666,666.607 Tension
EN = 360,555.115 Tension
EO = 0.000 Compression
HI = 1,399,999.950 Tension
HR = 200,000.000 Tension
IJ = 599,999.979 Tension
IR = 600,925.192 Compression
IS = 0.000 Compression
IT = 841,295.268 Tension
JK = 599,999.979 Tension
QR = 1,599,999.943 Compression
RS = 1,066,666.628 Compression
ST = 1,066,666.628 Compression