Engineers: When to Call and How to Communicate

Travis Kinney
Overview

• When do you need an Engineer?

• Where do Engineers come from?

• What does running the numbers really mean?

• What’s the bridge crew’s role in the Engineering process?
Bridge Hit?

Yes!
Large Deck Patch?

No
Temporary Shoring?

Yes
Joint Failure?

No

?
Pin and Hanger Damage?

Yes
Scour

![Image of a bridge with water flowing beneath and the word "Yes" superimposed]

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Bridge Maintenance Training
Deck Replacement?

Yes
Overlay Damage?

No
Crushing Cap?

Yes
Hole in Deck?

Maybe
Bearing Failure?

Yes!
ODOT Policy

• In 2013 a ODOT issued a Statewide Operational Notice that provided guidance on when Engineered plans are required.

• Issued to comply with ORS 672
  – Temporary Shoring is Required
  – Change in load path (Jump stringers)
  – Change in material or size of member.
Where Do Engineers Come From?

• Lots and lots of school:

- 211  STATICS
- 254  VECTOR CALCULUS
- 213  *GENERAL PHYSICAL CALCULUS
- 201  ENGINEERING DESIGN
- 212  DYNAMICS
- 256  APPL DIFF EQNS
- LDT  *MA: PROBAB...
More School

311 FLUID MECHANICS I
321 CIVIL ENGINEERING MATERIALS
361 SURVEYING THEORY
381 STRUCTURAL THEORY I
313 HYDRAULIC ENGINEERING
372 GEOTECHNICAL ENGINEERING I
382 STRUCTURAL THEORY II
392 INTRO TO HIGHWAY ENGINEERING

OSU
Oregon State University
What’s Missing???
Maintenance Engineering is Unique
So what do engineers do?

• A typical shoring or maintenance structural repair consists of:
  – Estimating the weight of the bridge, including the weight of railing, and wearing surfaces. (Dead Loads)
  – Estimate the weight traffic and construction loads. (Live Loads)
  – Estimate how much weight the members can hold. (Capacity)
Dead Loads

• Can be determined pretty close.
• Estimates are used to shorten work.
• When all the weights are added up. Increase the weight by 25% to make sure the results are conservative.
Live Loads
Single Trip Permits
Short Haul Vehicles (SHV’s)
Construction Equipment
Live Loads

• A lot more variability than DLs so we use a bigger load factor (35% increase).
• Trucks are moving across the bridge causing impact loads (another 25% increase).
• LL’s are the biggest impact on the shoring and repair design. (2-3 times heavier than the bridge weight)
Shoring w/ Traffic Control
Shoring w/o Traffic Control
How Can the Crew Help?

• Provide LOTs of feedback and guidance to the bridge engineer.
• How would you tackle the problem?
• Can traffic be restricted?
• Review the draft plans and provide HONEST feedback.
What’s ODOT doing?

- Developing Standardized Repair Details
- Documenting Engineering Calculations to Support Repair Designs
- Developing Bridge Maintenance Design Manual.
Thank You!

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