



2008 MATE 100

“Composites for a Buck”

Dr. Richard Knight

Dept. of Materials Science and Engineering

LeBow, Room 335

Tel. 215-895-1844

E-mail: knightr@coe.drexel.edu

Goals & Objectives

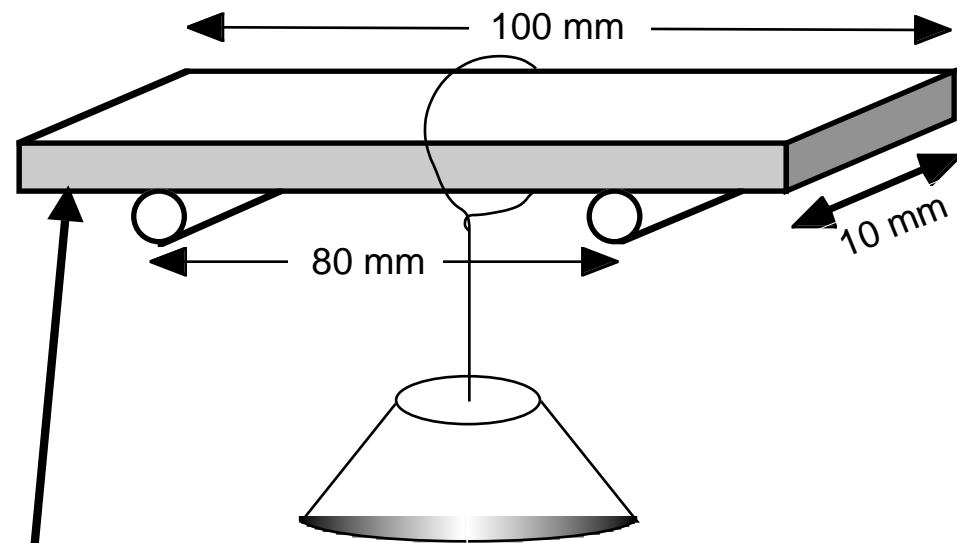
■ *What Is It?*

- Hands-on design and construction project
- Design & build *lightest* and *strongest* composite beam using materials provided

■ *How Do You Do It?*

- Work in teams of 3-4 over next 2-3 weeks
- Each team provided with same materials:
 - *Steel wire, copper wire, C-fiber, glass fiber, toothpicks, bamboo skewers, popsicle sticks, 5-minute Epoxy*

Specifications



Thickness must be less than 10 mm

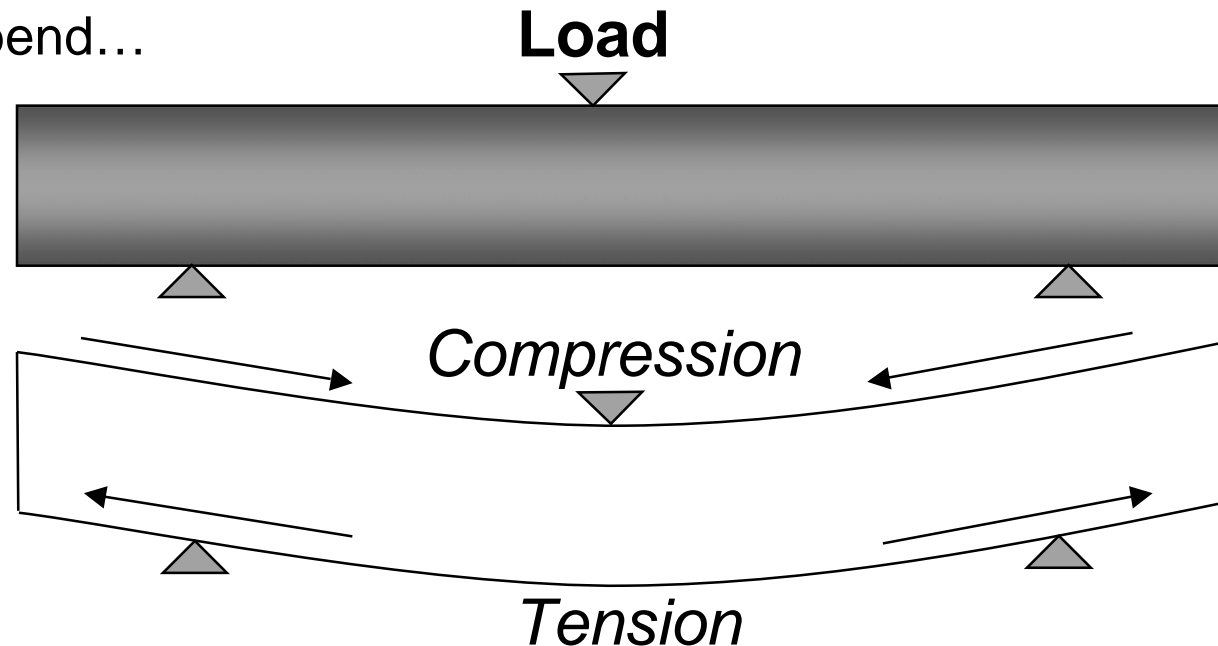
What Happens When Designers Get It Wrong...



Food for Thought (1)

■ How are beams used in buildings, bridges etc?

- When a load or force (mass) is applied, how will the beam deflect?
- 3-point bend...



■ Think carefully about *where* the different materials should be placed...

- Which materials are likely to be strongest in tension or compression?

Food for Thought (2)

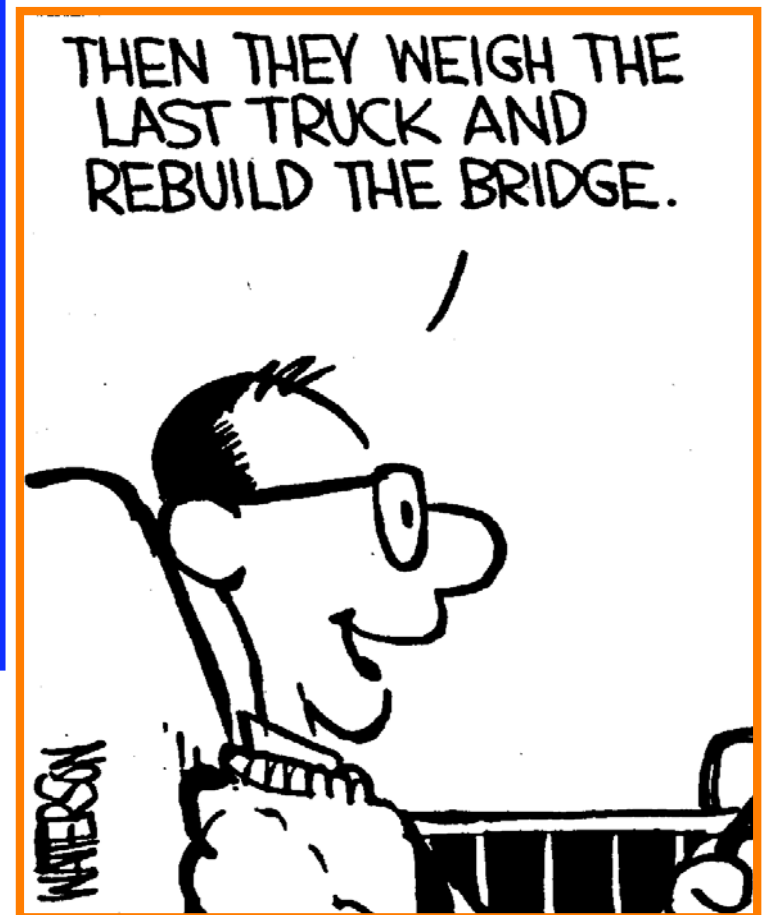
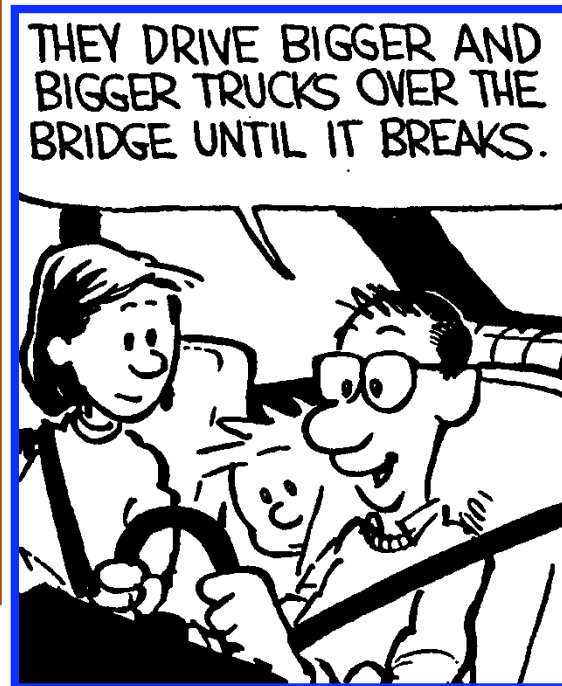
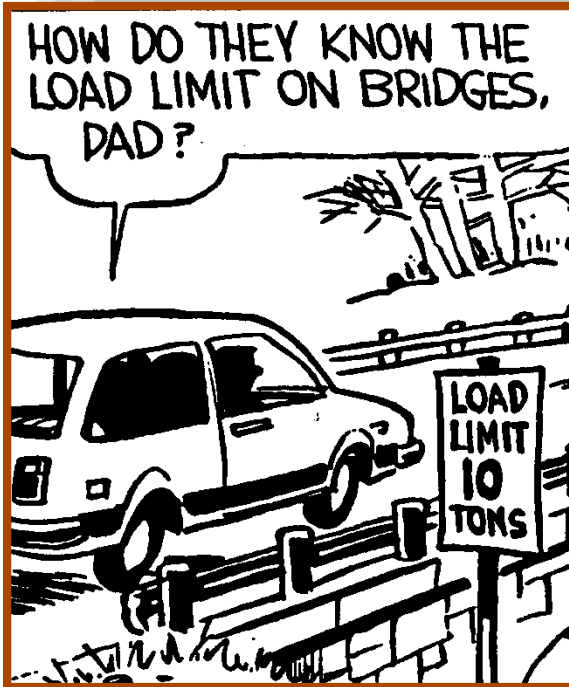
■ What cross-sectional shape do beams used in buildings, bridges etc. have?

- Square?
- Circular?
- I or H shaped?
- Why do you think this is the case?
- Shape matters...

■ **Think about your design(s):**

- Design it - sketch out some ideas *before* you start building
- Material Selection - decide which of the materials provided you will use
- Think about *where* you will place each material
- Remember that each team can build up to 3 beams
- Shape matters...

Food for Thought (3)



Food for Thought (4)

■ Finally...remember:

- You do *not* need to use ALL of the materials provided...successful designs will likely result from a smart design rather than a heavyweight approach
- Making a mold may help in assembly/construction of your beams
- Read the instructions for the Epoxy carefully...if it's mixed wrongly then it won't cure properly...*sticky beam syndrome!*
- Wear your latex gloves when working with these materials
- Work on some plastic sheeting...avoid getting Epoxy on your desk etc.

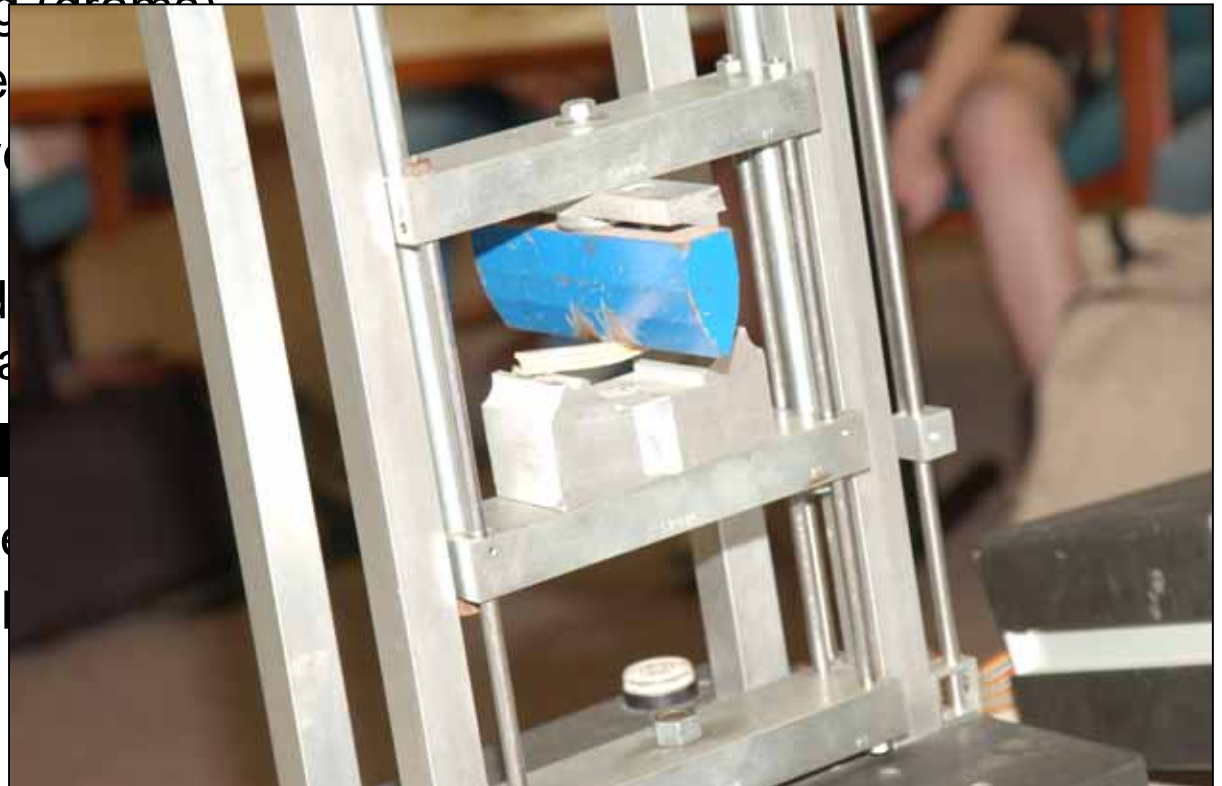
How Will We Test Them?

■ Beams will be tested as follows:

- Dimension check (10 mm thickness) using Vernier caliper...
 - Beams > 10 mm thick will not be eligible for prizes :-)
- Weighing & recording (grams)
- 3-point bend test...re
- Calculation of load/w
- Each team may build scoring beam from ea

■ Testing Schedule

- *When:* Friday, October
- *Where:* Hill Seminar



Writing Your Reports

■ Basic Requirements:

- Individual 2-3 page written reports

■ Do:

- Give your report a title
- Include the names of all team members, MSE faculty advisor, etc.
- Organize your report into sections:
 - *Introduction*
 - *Design concept...a summary of your thinking & approach*
 - *Results...including numerical data, photos*
 - *Discussion...how your beam failed; what you would do differently if doing it again...*

■ Don't:

- Write it “diary style”
- Write in the first person