

900 MHz NMR Probe Cryogenic Supply System GROUP 2: Rebecca Altman, Jason Kitchen, Jessica Vanterpool, Zachary Stevenson



September 9, 2008 Team Activity Report

This report summarizes the efforts of our group to design and construct a spaghetti bridge as a team-building deliverable for the 2008-2009 Mechanical Engineering Senior Design course. We were told to construct a minimum 24 inch long bridge capable of withstanding as much downward loading as possible. No other constraints were given. A secondary and important purpose of the team-building exercise was to allow group members to get to know one another in a fun setting, and to begin drafting a code of ethics for the project. Photographs of our bridge construction can be viewed at http://www.flickr.com/photos/seniordesigngroup2/show/.

We met on Friday, September 5th to decide on the most appropriate bridge design and begin initial construction. It was suggested that we could talk about our ideas for a code of ethics while glue was drying on the first assemblages of the bridge. After a brainstorming session, we decided to construct a basic truss element bridge, since bending strength was the most important factor. The overall bridge length was set at 25 inches, with nine equilateral triangles dividing the length, making two truss elements. The cross-sectional width of the bridge was chosen to be 4 inches. Our design represents a scaled-down version of a typical truss bridge, with one novel exception. When viewed axially, the cross-section of the upright truss elements lean together to form a triangle shape, rather than the standard parallelogram. We felt that this creation of five pyramidal shapes with quadrilateral bases from the upright equilateral triangles would better distribute the compressive and tensile forces of the loading.

In order to form beams for the bridge, we took bundles of approximately 20 spaghetti noodles and bound them together with rubber bands at their middle and ends. We then liberally coated each bundle with white Elmer's glue and wiped the glue along the bundle to spread it into the noodle matrix and form a composite structure. We fashioned 10 bundles in this way, which would become the sides of the equilateral triangles after the glue dried and the noodle bundles were cut in half into 5 inch lengths. For the 25 inch base and 20 inch top span of the truss assemblies, we staggered the ends of two handfuls of spaghetti noodles so that the joint would have a maximum amount of surface area for the glue to bond the noodles into a longer beam. While these pieces were drying our team members began to formulate our team code of conduct. We also compared our schedules and decided on a day to set up a meeting with our Sponsor for the following week.

On Sunday, September 7th, Becca and Jessica cut the dried bundles into 5 inch lengths and glued them to the base spans in order to create the truss assemblies. Small sprinkles of broken pasta noodles were added to these glued joints in order to reinforce them. On Monday, September 8th our entire team met to finalize our code of conduct and finish bridge assembly. We began by reinforcing the glue joints with a coat of 5-minute 2-part epoxy, then glued the top span to each of the two truss assemblies. Next we set these assemblies together at an approximately 70 degree angle and liberally coated the two top spans with epoxy to create a single common top span, since it would be subject to the most compressive stress from bending under a transverse load. The 4 inch cross-pieces were added on either side of each truss span to create a support for a bridge road-bed and to increase the tensile strength of the structure under loading. Upon completion of our bridge construction, we typed and reviewed our code of conduct and all members signed their agreement to abide by its mandates.