2019 Chipboard Beam Rules

The objective of this project is to develop a beam made from chipboard with the highest strength-to-weight ratio (*SWR*):

$$SWR = \frac{\textbf{Design Load (lb.)}}{\textbf{Beam Weight (lb.)}}$$

Beam Construction Rules

1. Beams ***must*** be constructed using standard medium-weight chipboard panels. Cardboard consisting of a fluted corrugated sheet and one or two flat linerboards is not acceptable. The chipboard can be cut and glued together to develop any section required by the design team. Individual chipboard panels should have a thickness between 0.050 to 0.100 in. Figure 1 shows typical 12 in. x 12 in. x 0.05 in. chipboard panels.

Figure 1. Medium weight chipboard panels.

2. Any type of glue is allowable; however, it is recommended to use an inexpensive water-based glue.

3. The beam must be designed to fit on the support shown in Figure 2. Beams may be supported only off the top surfaces of the supports. Members may ***not*** brace off the sides or the horizontal bottom of the support.

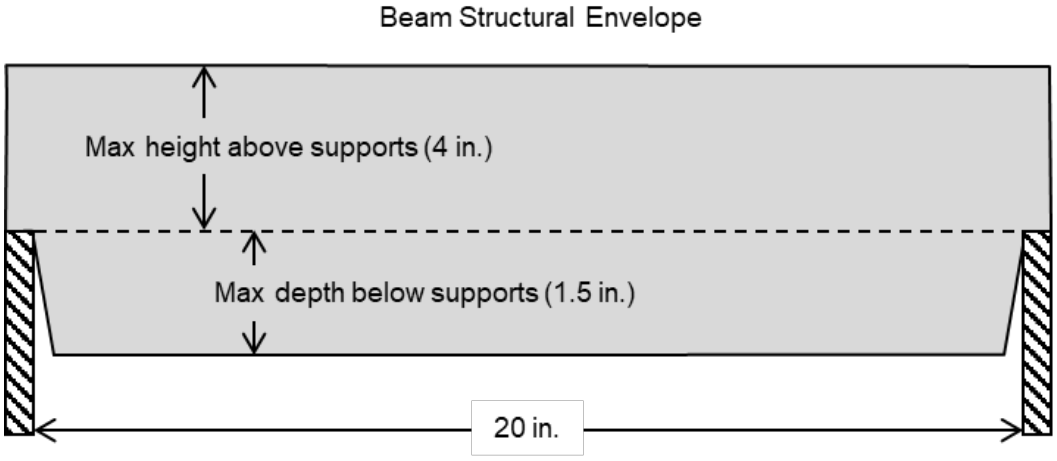

Figure 2. Bridge Supports and Geometrical Constraints

4. The beam must span an opening of 20 in. To ensure that the beam meets the span requirements and extends over the supports, it is recommended that the beam be at least 22 in. in length.

   At any point along the beam, the minimum width of the beam is 2 in. and the maximum width of the beam is 4 in.

   Once the beam is placed on the supports, no portion of the beam may extend more than 4 in. above the supports or 1.5 in. below the supports. The beam must fit into the gray-shaded structural envelope as shown in Figure 2.

5. The beam may be built-up for multiple layers of chipboard to form any thickness and shape required for the design within the tolerances stated in Item 4 and shown in Figure 2. Individual chipboard sheets cannot be coated or treated in any way except when glued together.

6. Each beam ***must*** support 240 lb. distributed over 6 in. at the center of the bridge (see Figure 3). Failure is defined as collapse or maximum deflection (> 1.5 in.) resulting in contact between the bridge and the horizontal base of the support. If your beam cannot support the 240 lb. design load, your beam is disqualified from the competition.

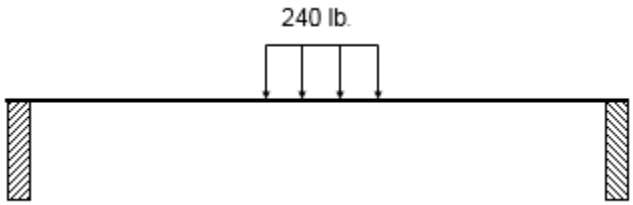

Figure 3. Uniformly Distributed Load

7. The shape and dimensions of cross-section of the beam may vary along the beam as long it fits in to the beam structural envelope shown in Figure 2.

8. If the beam supports the 240 lb. design load, then its performance will be measured by the *SWR*. The team with the highest *SRW* will win the competition.

Please send any questions to: Dr. Charles Camp at **cvcamp@memphis.edu**