

Semi-Trailer Collapsed Under the Load of a Forklift

By Erin Shipp P.E.

Throughout my career in design and development, I have used simple cardboard analogs to understand structures and how they fail. So when I got a case where a Semi-Trailer collapsed under the load of a forklift, I decided to use a cardboard analog to simulate the failure.

Before driving the forklift on to the truck, the driver noted 2 roof bows hanging. He decided that was minor and drove on. Upon nearing the center of the trailer, the trailer collapsed, injuring the driver. The sides of the trailer were buckled out and the roof collapsed. Nearly all the roof bows had fallen to the floor.



These Box trailers are very strong and semi-monocoque, but like an origami box, every part of the structure and skin is an important contributor. To show the roof bows and roof were important to this structure I decided to make a cardboard analog and break it. The analog was made with stiff poster board, construction paper, tongue depressors and small slats of wood. A block of wood was made to simulate the forklift, and a cable passed through the floor to apply the load.

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This simple box was able to hold over 300 pounds in load. The roof was then removed and things got interesting.

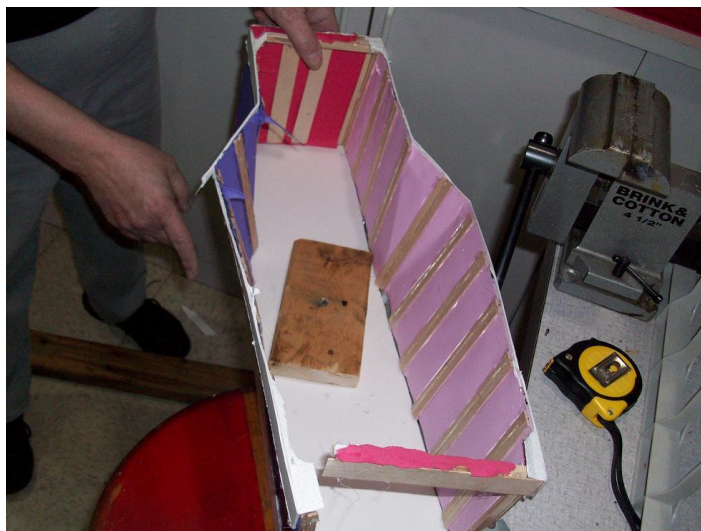
As load was applied the sides began to spread apart at a very low load.



After failure the side walls and floor were very similar to the incident vehicle.

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This test shows one way the trailer might have failed. If this case were to reach trial, a similar, more formal test could be done to demonstrate the principles to a jury.

As done, this test was very simple and shows complex engineering principles to a lay audience.

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