# Super Light Weight Bridge Building Contest

*by Dr. Howard S. Kliger*

The fourth annual Super Light Weight Bridge competition was held at SAMPE 2001 on May 8th. This year we had 45 teams registered, and 32 showed up for testing. This included two bridges shipped in from the University of Auckland, New Zealand.

The bridge "structure" was more challenging this year. Instead of a conventional support at each end of the two dimensional bridge span, this year's entry had to be supported on three posts, spaced 120 degrees apart on a 22 inch circle. The bridge was really an arch, or a circular plate. Awards were given for the highest ratio of ultimate load to bridge weight, or P/w, and also for the bridges which absorbed the largest energy before failure, i.e. the largest area under the load-deflection curve.

As usual, prizes consisted of an assortment of composite tennis racquets and fishing rods, a composites training course, and more than $1000 in cash, all donated by the sponsors.

The final results are shown in the attached table. Individual load-displacement plots are available by accessing the United website at www.tensiletest.com. First place in the student category were teams from Cerritos College and the University of Washington. In the professional category, the team of Childers, Clayton and Young from Charleston Air Force Base and Stan Stawski of Scaled Composites were first place winners.

Lance Smith of Hexcel was the hands down winner of the energy category, by an order of magnitude. He devised a very beefy base plate with a plug of z-oriented aluminum honeycomb on top. The crushing honeycomb absorbed the load without the base moving.

Stan Stawski's bridge weighed 71 grams and held 2165 pounds. It was a composite tubular tripod held together with a very light ring at the top. The tubes were fitted to the three reaction posts in such a way that they went into direct compression when the load was applied. No other bridge reacted against the posts in this way. The tubes were a stock size of .75 in ID with a .026 in wall. Carbon fabric was used to build up the ends to distribute the concentrated forces on the end.

Stawski also submitted a second entry that satisfied all the rules but was of questionable structural merit. The bridge consisted of a few grams of balsa rods arched between the support posts. Contained within the arch were three small helium balloons that provided the negative buoyancy to effectively produce a bridge of zero weight. So P/w was infinite by definition. That was fortuitous because the United Tensile Tester, with a 30,000 pound load cell, couldn't even detect the bridge when we tried to apply load!

Although the contest is open to both professional and student teams, it seems that most of the participants are students (the student teams can be individuals or entire classes). The competition is fun, but the learning experience is what makes the contest valuable.


**We want to thank our sponsors** *Thank you*

They provided the materials for the kits and the prizes. Without their support, we can't run this contest. Finally, special thanks to Terry Price, Damian Gregory and the others at Cerritos College who packaged and shipped the kits for the contest.

*Thank you*

## Sponsors for SAMPE 2001 Bridge Building Contest

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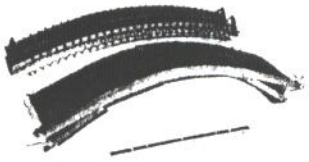
# Light Weight Bridge Building Contest



## Final Results - SAMPE 2001

### STUDENT CLASS, GRADE 1 (KIT) MATERIAL

| | Weight (gms) | P/w (Kg/gm) | Peak Force (Kg) | Defl @ Peak (in.) | Energy (Kg-mm) |
|---|---|---|---|---|---|
| Univ. Washington (Larson) | 292 | 2.30 | 670 | 1.10 | 7343 |
| Cal Poly SLO (Defranco, Maldonaldo, Bolosan) | 466 | 1.94 | 904 | 0.37 | 14863 |
| Cal Poly SLO (Defranco, Maldonaldo, Bolosan) | 472 | 1.45 | 684 | 1.19 | 30883 |
| Univ. Dayton (Puthoff) | 1570 | 1.29 | 2028 | 0.29 | 32800 |
| Cal Poly SLO (Johansen) | 231 | 1.26 | 291 | 0.26 | 2547 |
| Cal Poly SLO (Defranco, Maldonaldo, Bolosan) | 245 | 0.99 | 241 | 0.10 | 1367 |
| Univ. Auckland (UAO2) | 1193 | 0.86 | 1025 | 0.47 | 17054 |
| Univ. Auckland (UAO1) | 1311 | 0.86 | 1124 | 0.36 | 20798 |
| Univ. Maryland (Ulect) | 218 | 0.77 | 168 | 0.73 | 2343 |
| Cerritos College (Gregory) | 619 | 0.63 | 388 | 0.53 | 7363 |

### STUDENT CLASS, GRADE 2 (NON-KIT) MATERIAL

| | | | | | |
|---|---|---|---|---|---|
| Cerritos College (Duarte) | 1232 | 6.92 | 8530 | 0.37 | 60238 |
| Winona State (Bell, Boras) | 287 | 4.26 | 1222 | 0.23 | 15546 |
| West. Wash. Univ. (Lambert) | 240 | 3.55 | 851 | 0.18 | 7561 |
| Winona State (Bell) | 304 | 2.80 | 853 | 0.24 | 8210 |
| West. Wash. Univ. (Richards) | 338 | 2.63 | 890 | 0.37 | 14589 |
| U. Cal. Santa Barbara (Manning) | 1304 | 2.55 | 3320 | 0.14 | 9969 |
| West. Wash. Univ. (Thompson) | 407 | 1.39 | 563 | 0.15 | 1217 |
| Univ. Washington | 384 | 1.03 | 397 | 0.99 | 6973 |
| Univ. Washington | 7 | 0.48 | 3 | 0.88 | 35 |
| Univ. Dayton (Fink) | 1250 | 0.46 | 571 | 0.32 | 8003 |
| Winona State (Johnson) | 996 | 0.24 | 240 | 1.11 | 4732 |

### PROFESSIONAL CLASS, GRADE 1 (KIT) MATERIAL

| | | | | | |
|---|---|---|---|---|---|
| Childers, Clayton, Young (Chas AFB) | 343 | 3.46 | 1187 | 0.26 | 15566 |
| B. Flinn (Univ. Wash) | 236 | 2.09 | 493 | 1.07 | 6376 |
| T. Huang | 597 | 2.07 | 1238 | 0.53 | 15226 |
| J. Tighe (Scaled Composites) | 55 | 1.92 | 106 | 0.26 | 998 |
| M. Bryant | 162 | 0.36 | 59 | 0.41 | 466 |

### PROFESSIONAL CLASS, GRADE 2 (NON-KIT) MATERIAL

| | | | | | |
|---|---|---|---|---|---|
| S. Stawski (Scaled Composites) | 71 | 13.84 | 981 | 0.84 | 17016 |
| Childers, Clayton, Young (Chas AFB) | 640 | 6.31 | 4034 | 0.17 | 16988 |
| Childers, Clayton, Young (Chas AFB) | 459 | 5.12 | 2352 | 0.25 | 18443 |
| J. Jones (Diab Group) | 1052 | 4.47 | 4700 | 0.22 | 18211 |
| H. Neubert (Prog Composites) | 450 | 4.39 | 1975 | 0.12 | 4025 |
| L. Smith (Hexcel) | 2247 | 4.31 | 9676 | 2.35 | 481524 |
| L. Smith (Hexcel) | 1906 | 1.67 | 3182 | 0.12 | 11052 |
| M. Ailstock (Texas Composites) | 1125 | 1.31 | 1472 | 0.34 | 28649 |