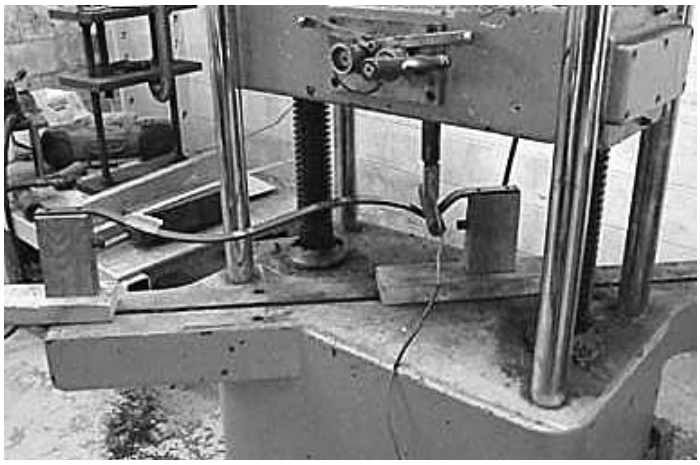
TESTING

Figure 1
Center Load Test



The parts are separated by 4.5″ and the plate is 12″x12″.

Some balusters and associated hardware were sent to Q. C. Metallurgical Laboratory, Inc. for testing. The purpose of the testing was to determine if the baluster samples and associated hardware would meet the load test requirements of Standard Building Code© 1999. The samples consisted of tubes that were painted black, tubes that were painted grey, tubes that were painted white and two samples that were shaped parts. The language of the code only describes conditions railing and guardrail systems must meet and does not include a well-defined test procedure. Also, the code is not specific to balusters. Since these balusters are to be used for decks, it was determined that the section of the code specific to guardrail systems (Section 1608.2.2) applies to this situation. The testing methods described in the sections that follow were devised ad hoc to determine if the use of these balusters and hardware in a railing would result in failure of the railing to meet the requirements of the code. A completely assembled railing was not available for testing, so the test results belowshould be interpreted in this context.

LOAD TEST AT THE CENTER (ref. STANDARD BUILDING CODE© 1999, Par. 1608.2.2.3 and Par. 1608.2.2.4)

The tubes and shaped part samples were installed onto wooden fixtures that suspended them in a horizontal position. Two of each sample was placed in the Riehle Universal Testing Machine that has been calibrated to be traceable to NIST standards. A 12" X 12" plate was placed on top of the samples to distribute the load over a 1 square foot area near the length center of the samples. It was determined that for the worst case in service, a 12" X 12" plate could be pressed against the balusters in a manner such that the plate would make contact with only two of the tubes simultaneously. The center of the loading plate was offset approximately ˇ" toward one of the samples so that one of the samples would experience roughly twice the load of the other to further simulate the worst case. A load cell was attached to the crosshead of the tester to measure force and a linear travel device was placed on the crosshead of the machine to measure crosshead travel. As the load was applied to the samples in a downward direction, readings of load vs crosshead deflection were recorded manually. The samples were loaded up to roughly 4% beyond 200 lbf to allow for measurement uncertainty and then the load was released. In all cases, the samples withstood the load without fracture. The load vs travel data was primarily linear up to 200 lbf. Side 1 of the shaped parts may have nearly reached yield load of the material as there was a slight indication of possible nonlinearity between 190 lbf and 200 lbf. This nonlinearity was not observed in the data from the test on Side 2.

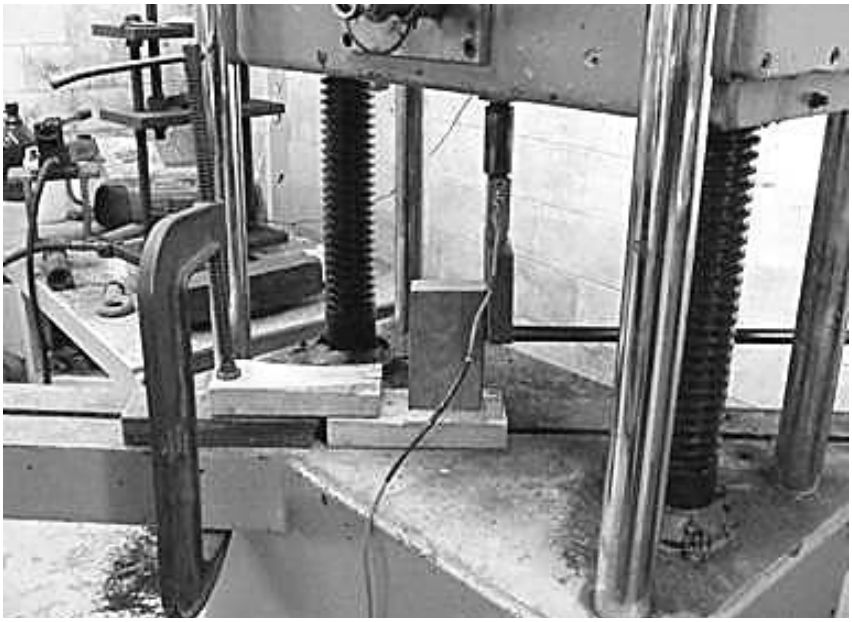
DATA

Load, lbf	Black Tubes	White Tubes	Grey Tubes	Shaped Parts Side 1	Shaped Parts Side 2
10	0.000	-----	0.032	0.089	0.077
20	0.096	0.079	0.048	0.119	0.112
40	0.162	0.111	0.080	0.157	0.180
60	0.229	0.148	0.117	0.197	0.250
80	0.294	0.192	0.151	0.237	0.317
100	0.362	0.216	0.185	0.274	0.380
120	0.432	0.253	0.222	0.310	0.445
140	0.501	0.290	0.256	0.348	0.503
160	0.572	0.323	0.293	0.388	0.560
170	0.608	0.343	0.309	0.409	0.593
180	0.644	0.361	0.326	0.430	0.621
190	0.684	0.400	0.345	0.453	0.650
200	0.720	0.411	0.363	0.500	0.685

LOAD TEST AT THE END (ref. STANDARD BUILDING CODE© 1999, Par. 1608.2.2.1 and Par. 1608.2.2.4)

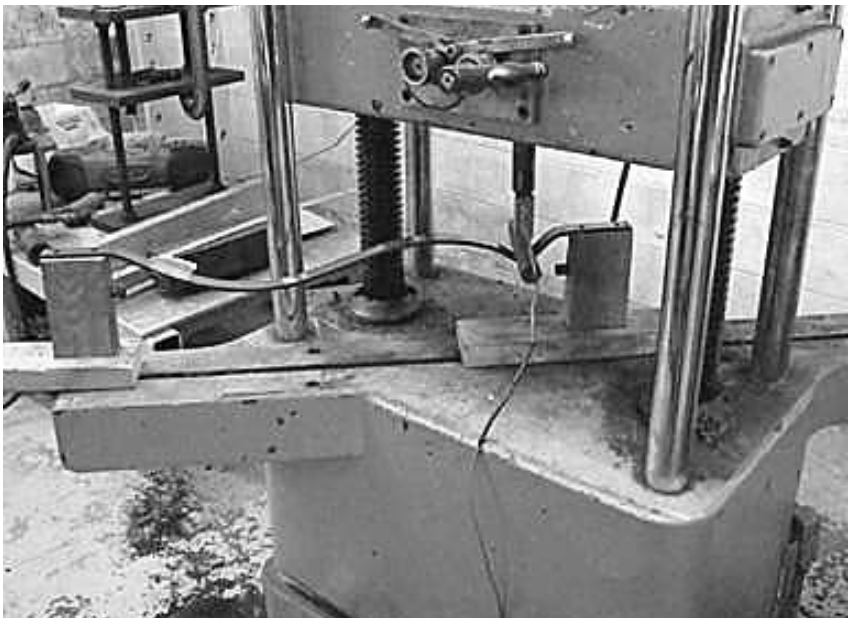
The tubes and shaped part samples were installed onto wooden fixtures that suspended them in a horizontal position. One of each sample was placed in the Riehle Universal Testing Machine that has been calibrated to be traceable to NIST standards. A 1" plate was placed against the sample near the end of the sample. A load cell was attached to the crosshead of the tester to measure force. Since loading in this manner was not likely to cause large deflections in the samples, there was no travel device installed for this test and no readings were taken. The samples were loaded in a downward direction up to roughly 4% beyond 200 lbf to allow for measurement uncertainty and then the load was released. In all cases, the samples withstood the load without fracture.

Figure 2
End Load Test



The load plate is roughly 1" thick.

Figure 3
End Load on Shaped Part



The shape of the part required the loading at this location.
The Center Load tests were performed at the longer raised portions of each face.