

## Testing of Freeport Steel and Framing Steel Trusses

This document summarizes the test results conducted on steel trusses manufactured by Freeport Steel and Framing of Freeport, Florida.

### Description of Truss Systems

Freeport Steel and Framing assembled and shipped to the Georgia Institute of Technology Structural Engineering and Materials Laboratory a total of four steel truss systems. Each truss system consisted of two steel trusses that are 2-ft apart. The dimensions of each truss system are given in the following table:

Truss System/Test	Depth	Length
35-U	24 inches	35 ft
35-P	24 inches	35 ft
25-U	16 inches	25 ft
25-P	16 inches	25 ft
U: Truss System was subjected to uniform loads P: Truss System was subjected to a concentrated load distributed to a steel plate measuring 8 in x 24 in. x 1 in.		

### Objective

The objective of testing Truss Systems 35-U and 25-U is ensure that such truss systems are capable of carrying a specified uniform load. The specified (by Freeport Steel and Framing) uniform load for Truss system 35-A was 55 psf and the specified uniform load for Truss System 25-U was 67 psf.

The objective of testing Truss Systems 35-P and 25-P is to obtain the ultimate load of the truss system under a strip load applied over the entire width of each truss systems by means of a spreader beam.

### **Test 35-U (35-ft Truss System under uniform loading)**

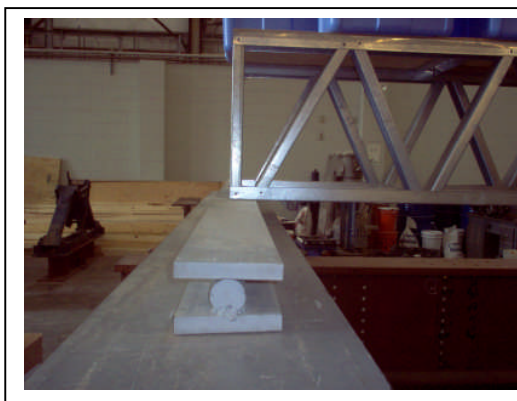
Truss system 35-U rested on end supports consisting of bearing plates and steel rods that allowed only rotation (Figure 1).

Uniform load was achieved by using 24 plastic containers filled with water. Each container measured approximately 24 x12 x 17 in. Prior to loading, three containers were filled with water and weighed and then marked at various levels corresponding to a specific uniform load at which deflection measurement were to be taken. The truss system was loaded at increments corresponding to 10 psf, 20 psf, 30 psf, 40 psf, 50 psf, and 55 psf. At each loading increment, the midspan deflections of each of the two side trusses forming the truss system were recorded. In addition, a dial gage for measuring the midspan deflection of the cross member connecting the bottom chords of the two trusses was also used to examine the deflection of the cross bracing member as a result of bending the entire truss system.

After loading the truss system to the target load of 55 psf, the load was kept on the truss system for 2 hours.

Load-deflection graph resulting from Testing Truss System 35-U is shown in Figure 2. It can be concluded that:

- 1- The 35 ft Truss System 35-U was capable of carrying 55 psf.
- 2- When the truss system was loaded to 55 psf, one of the side trusses deflected 0.55 in. while the other side truss deflected 0.49 in.
- 3- The midspan of the bottom bracing member connecting the bottom chords of the two side trusses deflected 0.69 in. when the truss system was loaded at 55 psf.



**Figure 1- End Support**



**Figure 2. Simulated Uniform loading**

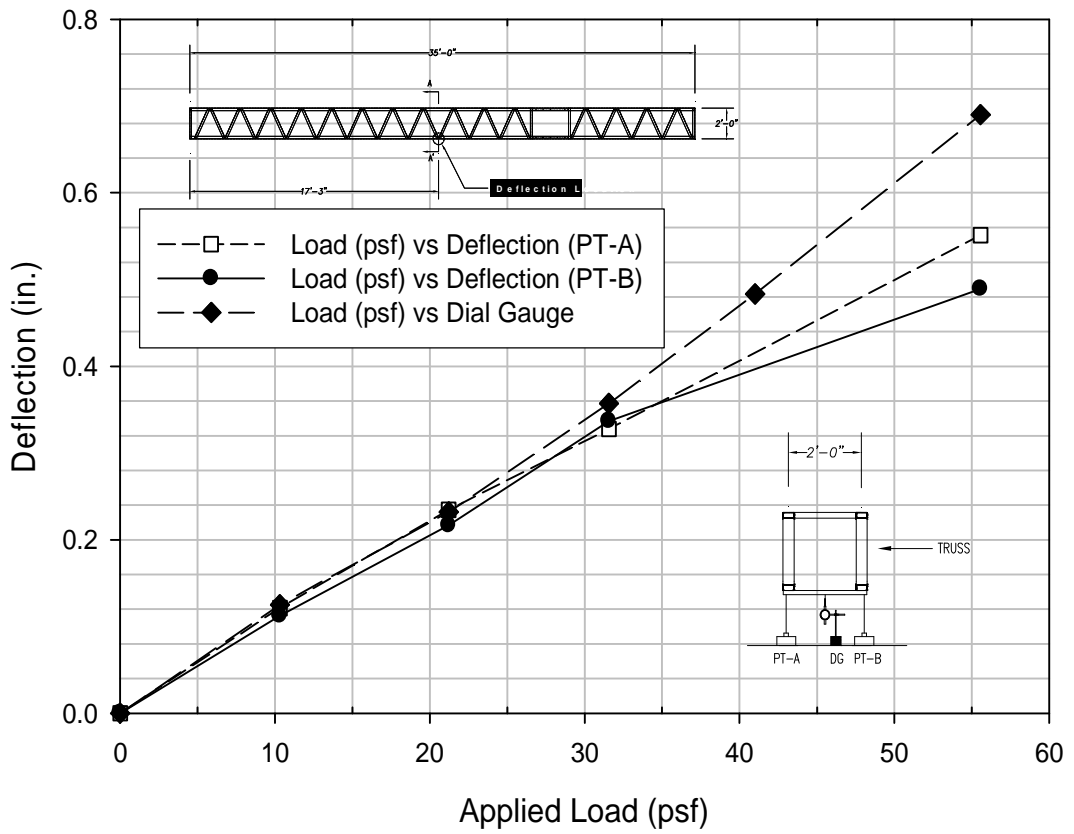
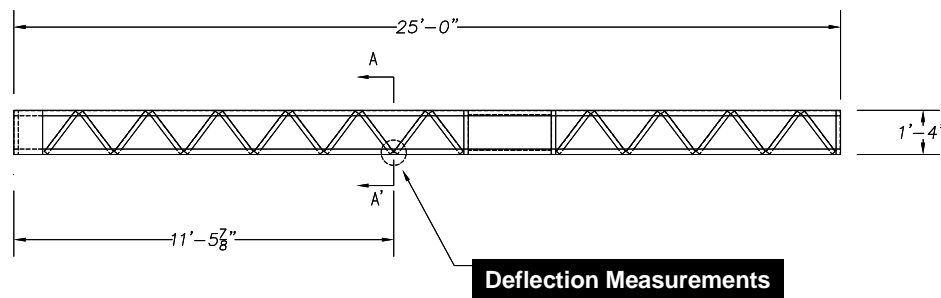


Figure 3. Load-deflection curves for Truss System/Test 35-U

### Test 25-U (25-ft Truss System under uniform loading)

Test set-up for Truss System 25-U was similar to that of Truss System 35-U. Deflection measurements were taken at the joints closest to the midspan of the trusses, as shown below. Truss System 25-U was loaded to a maximum uniform load of 67 psf, as requested by Freeport Steel and Framing.



**Figure 4. Truss System 25-U**

After loading the truss system to the target load of 67 psf, the load was kept on the truss system for 2 hours.

Load-deflection graph resulting from Testing Truss System 25-U is shown in Figure 5. It can be concluded that:

- 4- The 25 ft Truss System 25-U was capable of carrying a uniformly distributed load of 67 psf.
- 5- When the truss system was loaded to 67psf, trusses at both sides deflected 0.4 in. at the locations of measuring deflection devices.

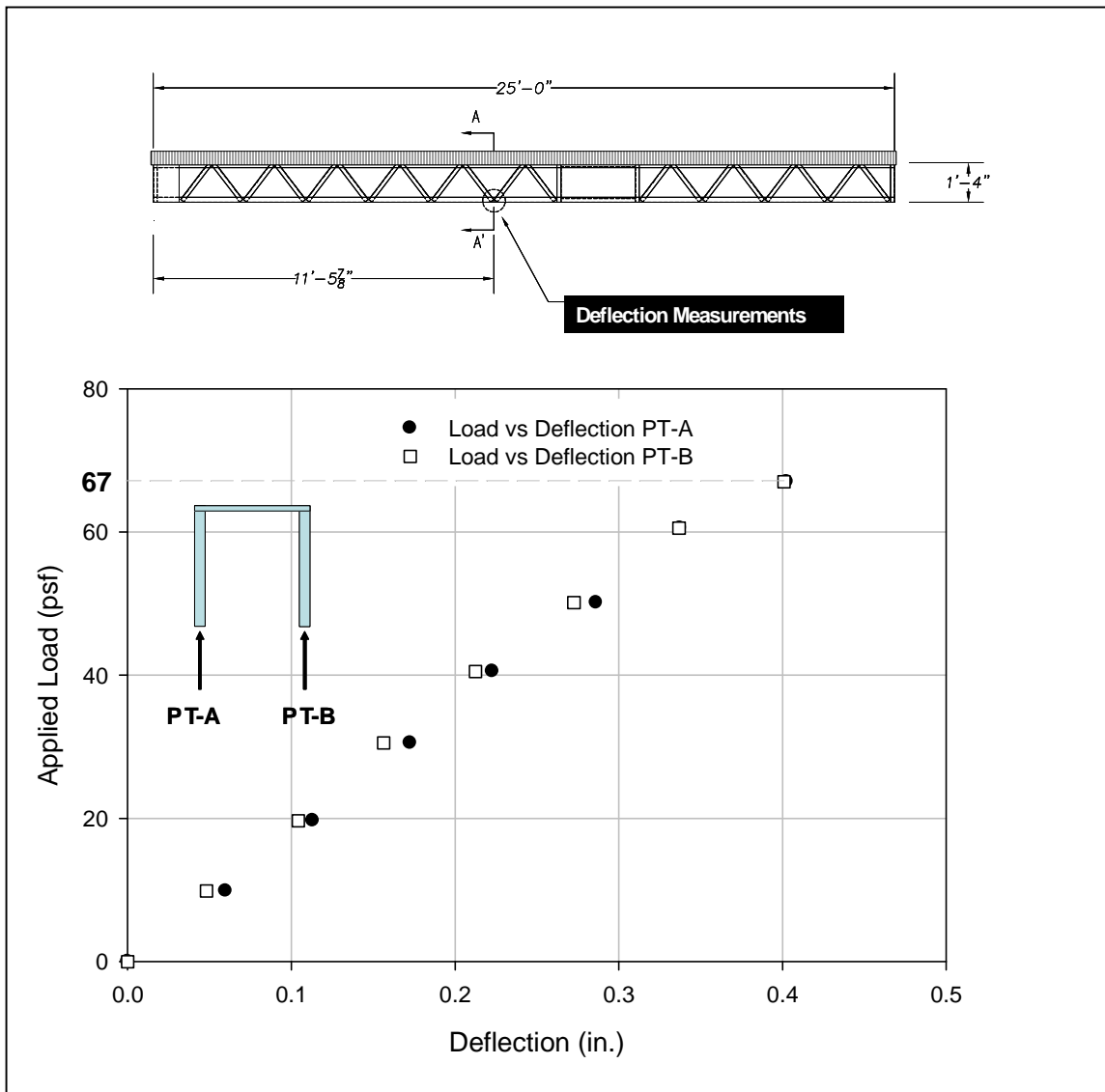
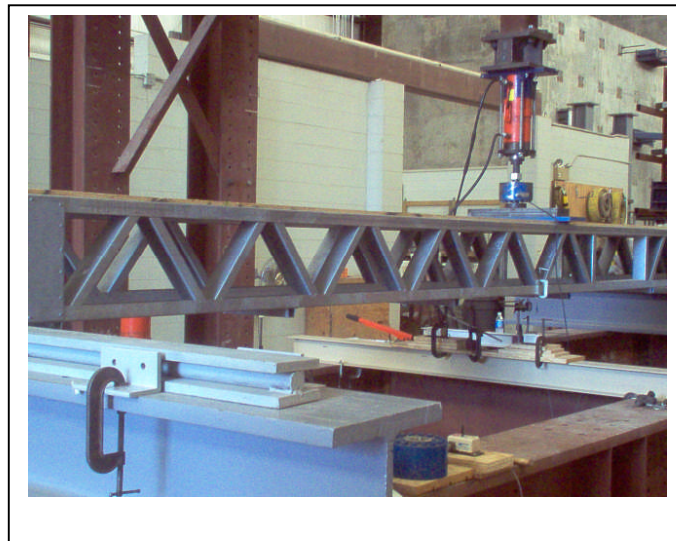


Figure 5. Load-deflection curves for Truss System/Test 25-U

### **Test 25-P (25-ft Truss System under a concentrated load)**

Truss System 25-P, shown in Figure 6, was identical in geometry to that tested under a simulated uniformly distributed load. In this case, the truss system was subjected to a midspan concentrated load distributed by means of a steel plate measuring 8 in x 24 in x 1 in. The truss was loaded gradually. When the load reached approximately 5000 lbs, the deflection at the joints nearest to the midspan of the side trusses were 1.43 in. and 1.42 in. At that load (5000 lbs) the deflections increase while the load remained almost unchanged. When the deflections reached approximately 2.4 in. the load began to increase until it reached a point where the load was about 6000 lbs and the deflections were slightly over 3 in. When the deflection reached about 3.5 in. the truss system was unloaded gradually. When the truss system was completely unloaded, the measured residual deflections of the truss system were about 1.8 in. The complete load-deflection curves for each side truss are shown in Figure 7.



**Figure 6. Truss System 25-P**

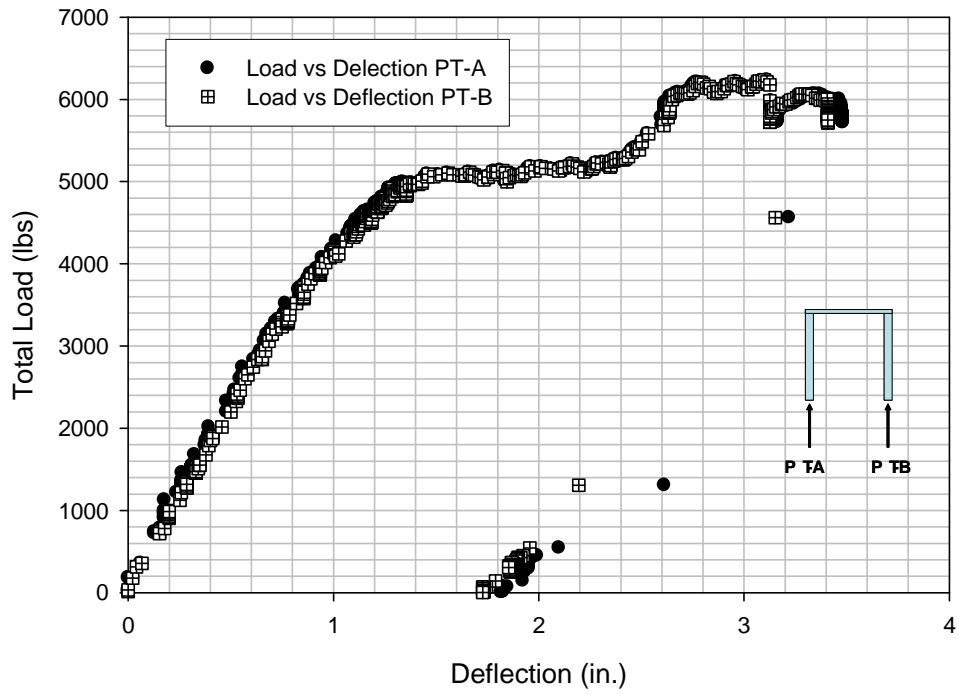
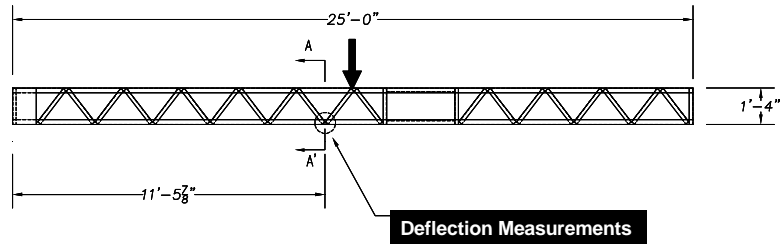
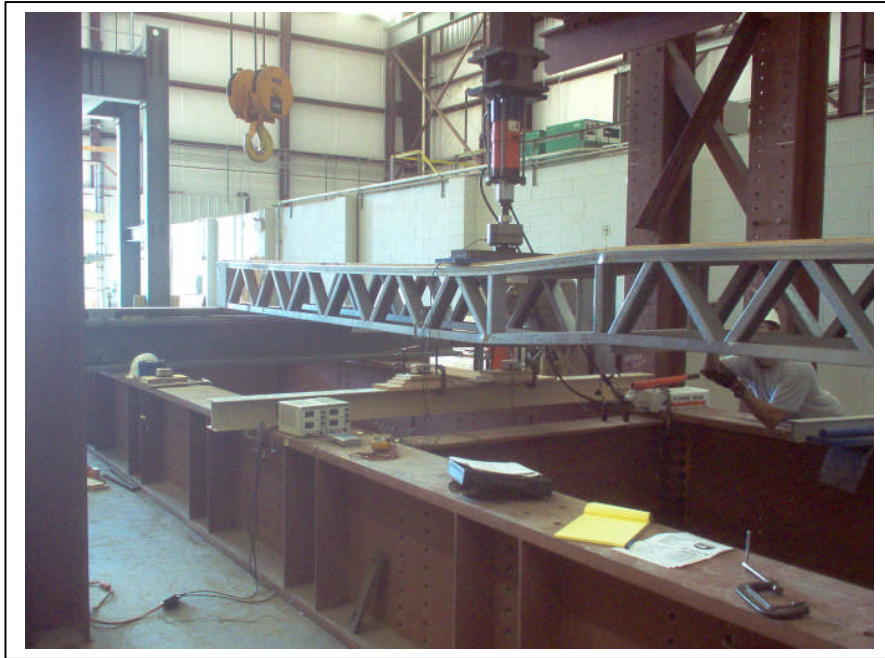


Figure 7. Load-Deflection Curves for Truss System 25-P

### Test 35-P (35-ft Truss System under a concentrated load)

Test 35-P was performed in a way similar to Test 25-P. A photo of the test in progress is shown below



**Figure 8. Truss System 35-P**

During the test, cracking sounds started when the total load on the truss system was about 1,500 lbs. A separation of a diagonal member from the joint area in one of the two side trusses occurred when the load reached 2,200 lbs and the deflection of both side trusses were 0.8 in. Upon further loading, the truss system resisted the increase of load until 3,600 lbs. At that time, the measured deflections of one side truss was 1.6 in. and for the other side truss was 2.6 in. The truss system at that stage was incapable of carrying any additional load that began to decrease while deflections increased. The test was terminated when the deflections of both trusses reached approximately 5 inches. Upon unloading the truss system the measured residual deflections were 2 in. for one side truss and 2.6 in. for the other side truss. The load-deflection curves of both side trusses are shown in Figure 9.



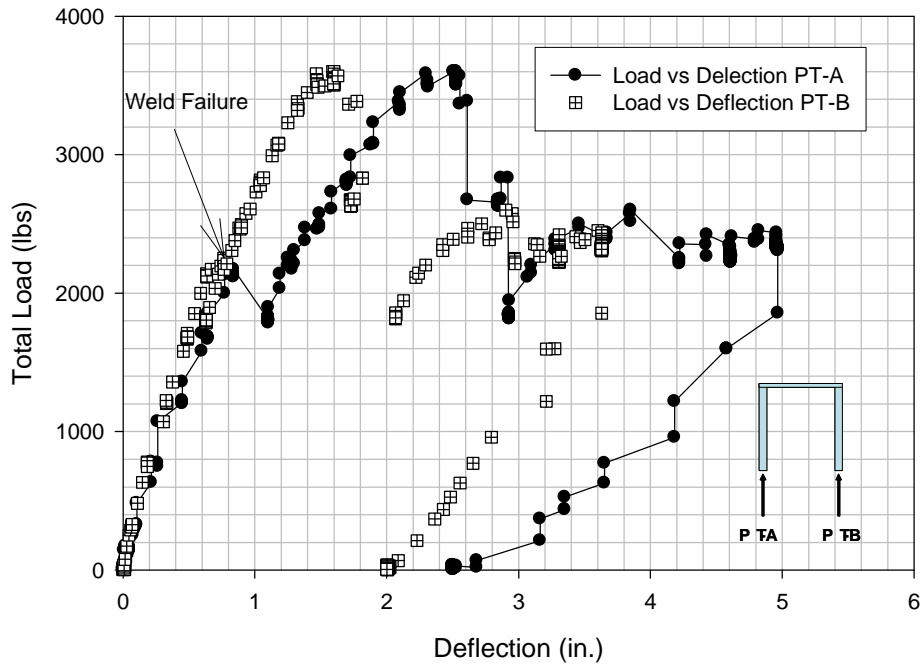
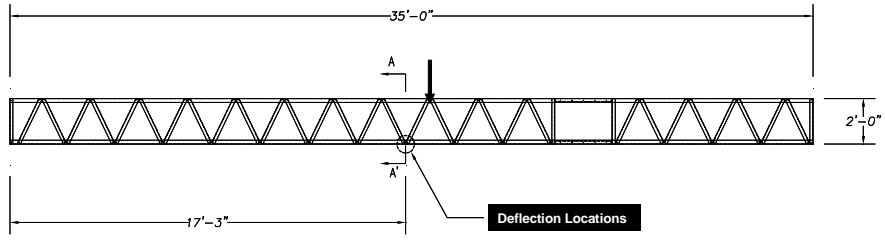


Figure 9. Load-Deflection Curves for Truss System 35-P