COMPARISON OF STABILITY OF THREE TYPES OF STEEL FENCE POST

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At the request of C. B. Laird, Chief Construction Engineer, the Research Laboratory Division conducted a comparative study of the stability of three types of line fence posts. Two of the three types tested, the "Hat" shape and the "Tee" shape with ground plate, are standard rolled sections and are presently acceptable for use as line fence posts according to MSHD standard specifications. Both of these posts are 7-ft long, with a constant cross section, and have a soil embedment length of 2 ft 6 in. The third post-type which has been suggested as an alternate is the "Lock Fast" post, manufactured by the Metal Plating Corp. of Connersville, Ind. This post is 6-ft long, has a tapered cross section, and a soil embedment length of 1 ft 6 in. Cross sections of each of the three types are shown in Figure 1.

To compare the stability of these three types of posts, a load deflection test was devised whereby three specimens of each type were driven into a sand soil, and three of each type driven into a clay soil. The soil sites were chosen to provide either uniform sand or uniform clay conditions throughout the depth of embedment for each post.

Loads were applied to each post at a point 3 in. below the top of the extended portion in a horizontal plane by means of weights attached to a cable strung over a pulley. These loads were measured by means of a tensiometer attached to a cable. Deflections were measured with scales at the tops of the posts and at the ground lines. A typical test set-up is depicted in Figure 2. Loads were applied to the posts in increments until excessive deflections occurred or some element of the post buckled suddenly. Photographs of some of the posts loaded to failure are shown in Figure 3.

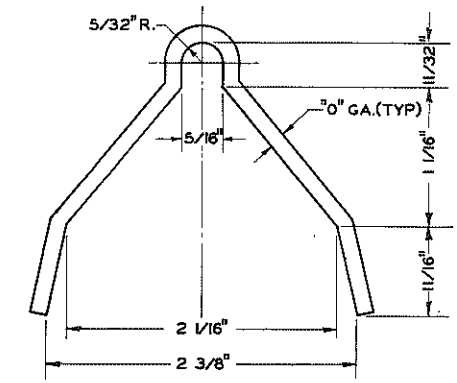
Load deflection curves in Figure 4 are for measurements at the post tops and the ground lines for tests conducted in clay soil, and similar curves for tests conducted in sand soil are shown in Figure 5. All of these curves are based on the average values of the three samples tested for each case. The average physical properties, along with the ultimate loads obtained from the testing are presented in Table 1.

TABLE 1
PHYSICAL PROPERTIES

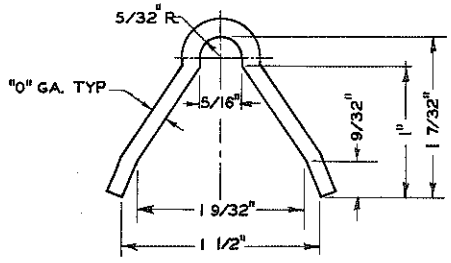
Section	Length	Weight/ft (lb)	Thickness (Inches)	Weight of Ground Plate (lb)	Length of Embedment	Soil	Critical Load (lb)
Hat	7'-0"	1.38	0.135	None	2'-6"	Sand	132
Tee	7'-0"	1.40	0.133	0.93	2'-6"	Sand	170
Tapered	6'-0"	1.29	0.101	None	1'-6"	Sand	53
Hat	7'-0"	1.38	0.135	None	2'-6"	Clay	176
Tee	7'-0"	1.40	0.133	0.93	2'-6"	Clay	242
Tapered	6'-0"	1,29	0.101	None	1'-6"	Clay	62

It is apparent from the results of these tests that all three post types have sufficient embedment lengths to provide adequate soil stability. This is evidenced by the fact that all test failures occurring in both sand and clay were post failures rather than soil failures. It may also be noted from the load deflection curves that for tests in either sand or clay, the tapered post exhibited less deflection at the top as well as at the ground surface than the other two types, until the loading was reached which caused this post to buckle. However, the ultimate loads resisted by the tapered post when tested in sand and clay respectively, were only 37 and 26 percent of those for the tee shape, and 40 and 35 percent of those for the hat shape.

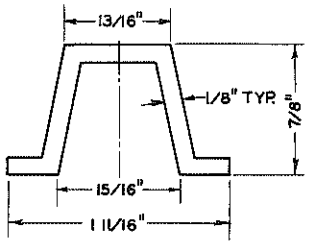
In comparing these three types of post for relative equivalence, there is a very significant difference in the ultimate load capacity of the tapered post. On the basis of the physical characteristics considered in these tests, it is concluded, therefore, that the "Lock Fast" post is not equivalent to either the Hat or Tee types.



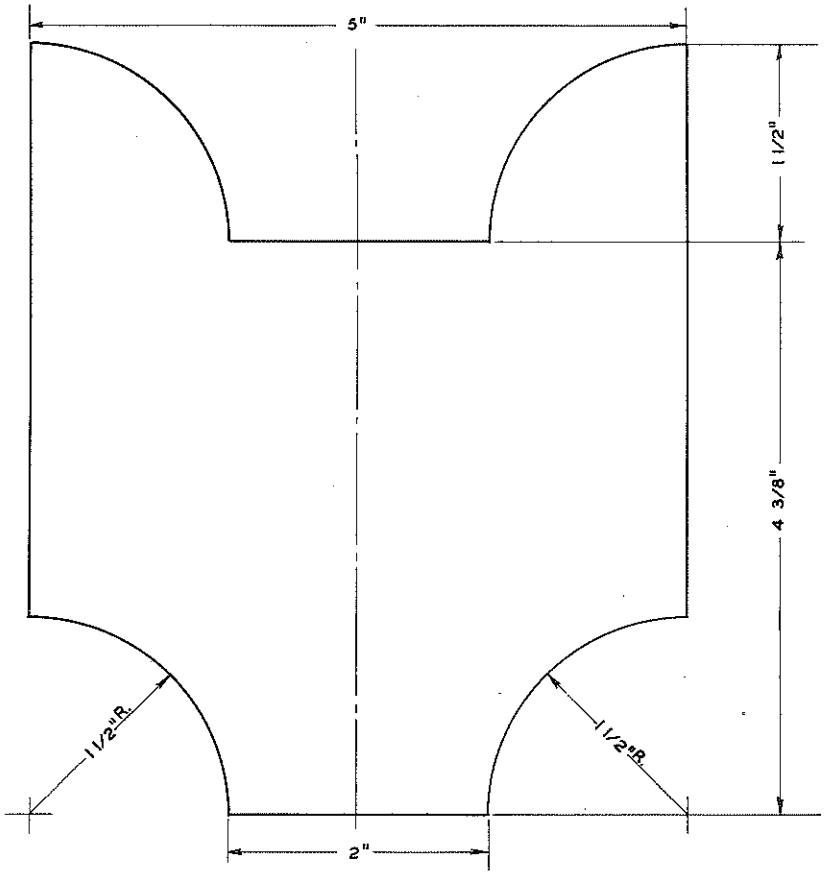
SECTION OF TAPERED POST
APPROX. 50 IN. FROM SMALL END



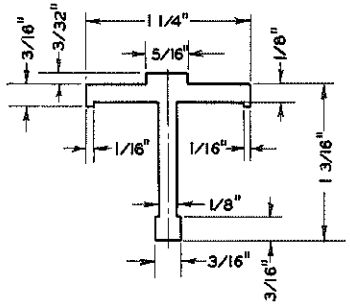
END VIEW AT SMALL END
OF TAPERED POST



CROSS SECTION OF HAT POST



GROUND PLATE ON T-SECTION POST



CROSS SECTION OF TEE POST

Figure 1. Post Details and Sections
Full Scale

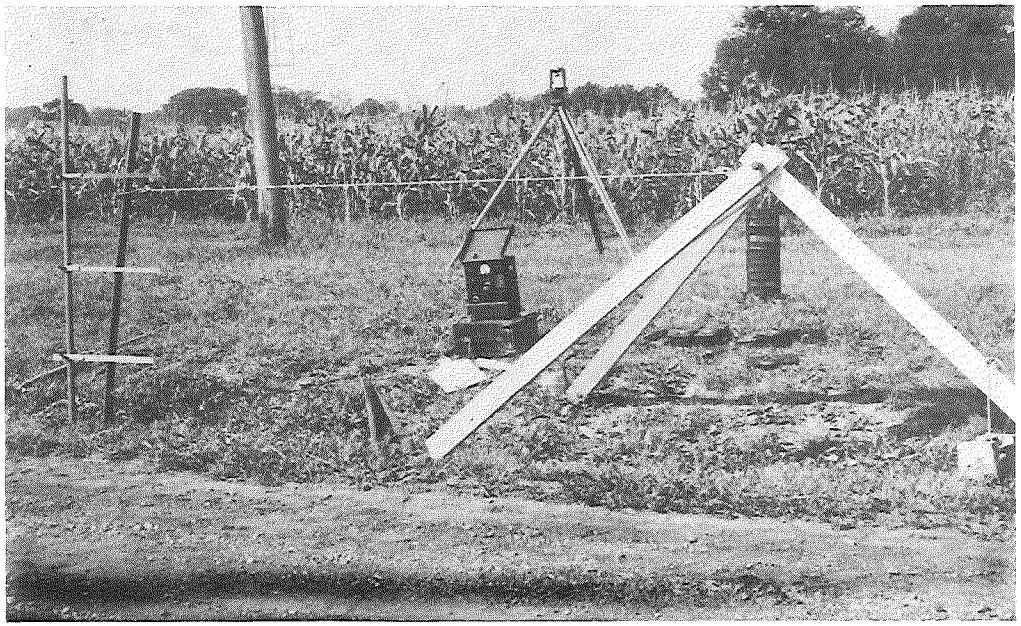


Figure 2. Typical Test Setup.

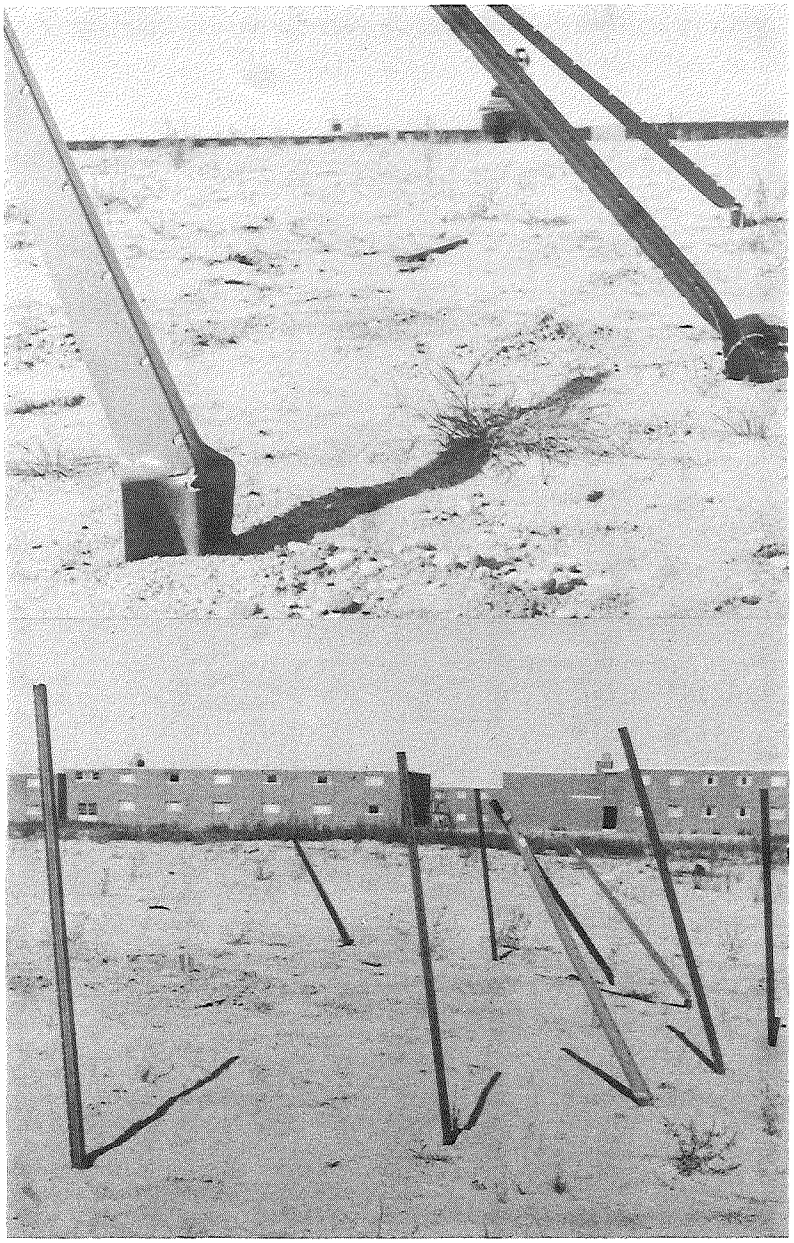


Figure 3. Fence Posts Loaded to Failure.

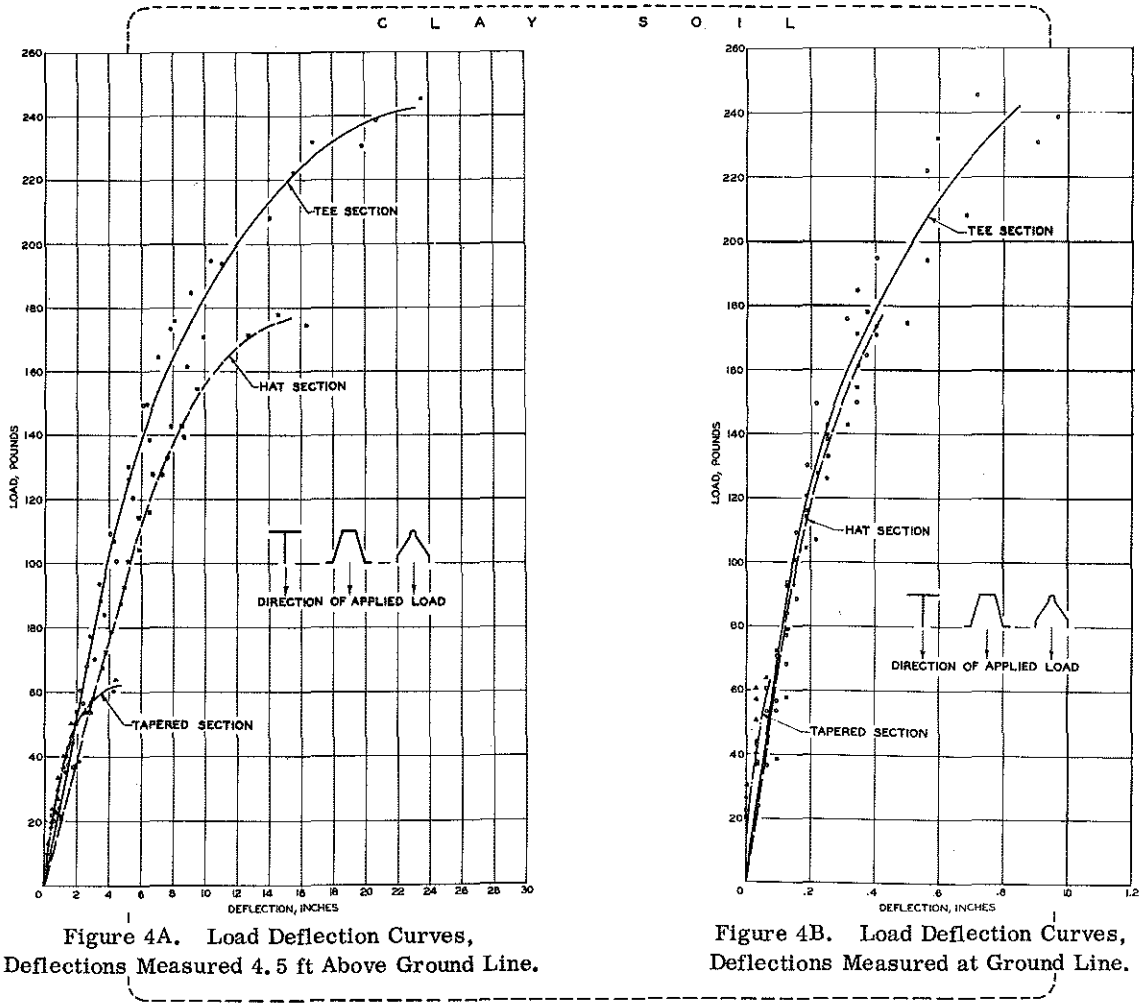


Figure 4A. Load Deflection Curves, Deflections Measured 4.5 ft Above Ground Line.

Figure 4B. Load Deflection Curves, Deflections Measured at Ground Line.

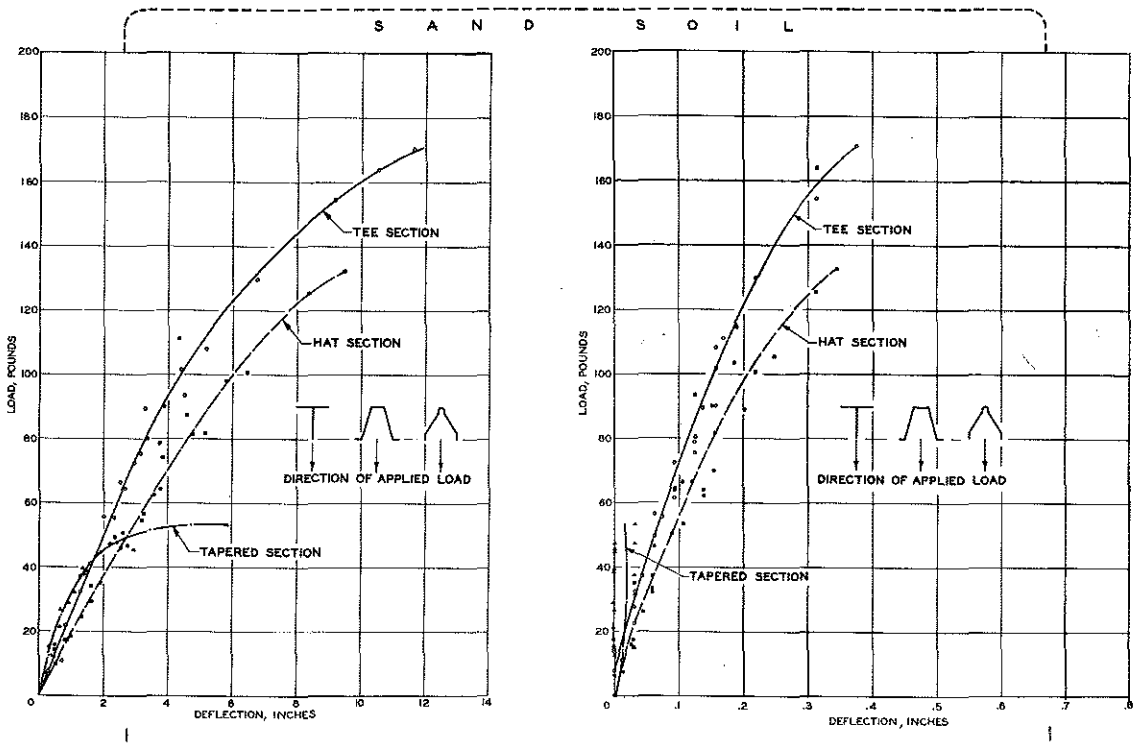


Figure 5A. Load Deflection Curves, Deflections Measured 4.5 ft Above Ground Line.

Figure 5B. Load Deflection Curves, Deflections Measured at Ground Line.