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STRENGTH COMPARISON OF STEEL SIGN POSTS
Second Progress Report

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STRENGTH COMPARISON OF STEEL SIGN POSTS

In June 1961, a strength comparison of five types of steel sign post was conducted and reported in Research Report No. R-360. The purpose of these tests was to determine if sign posts placed back-to-back and bolted together forming 6- and 8-lb per ft assemblies were equivalent in strength and stiffness to 3- and 4-in. diam steel pipe sign posts, respectively, since such assemblies were currently accepted as alternates to the pipe posts in the MSHD specifications. The five types of sign post were 3- and 4-in. diam pipes, 6- and 8-lb per ft Pollak "Piggy-bak" assemblies, and two 3-lb per ft Missouri Rolling Mill posts bolted together.

The Buffalo Steel Corporation of Tonawanda, New York, informed the Research Laboratory at that time that it was developing a new post which would be available for testing as both 6- and 8-lb per ft back-to-back assemblies. These Buffalo assemblies have now been received and tested. For purposes of comparison, pertinent characteristics and test results for the posts reported in Research Report No. R-360 are repeated here along with data on the Buffalo posts.

Average cross-sections of the 6- and 8-lb per ft Buffalo assemblies are shown in Fig. 1. The average physical properties and theoretical

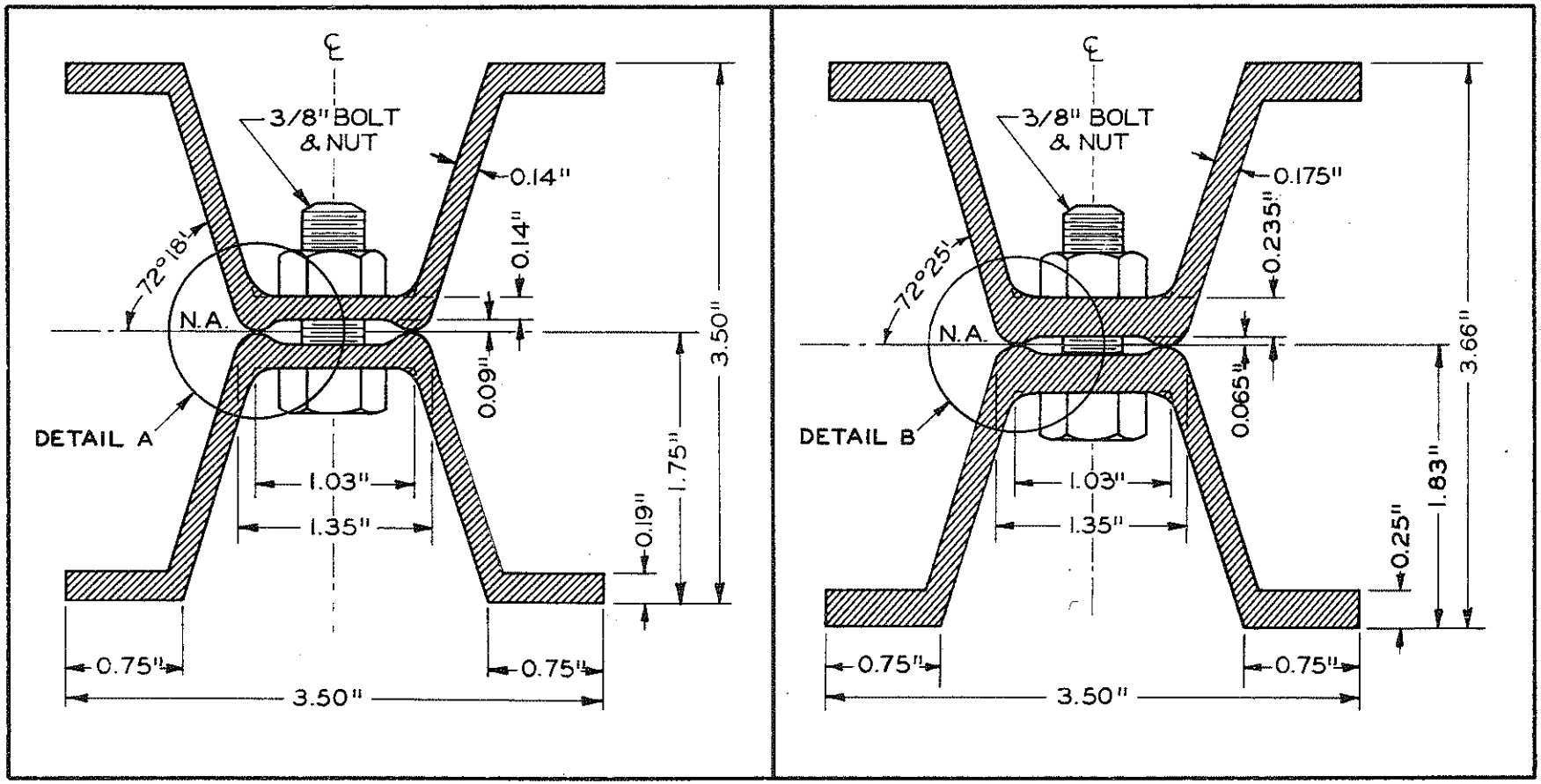

Figure 1. Cross-sections of 6- and 8-lb Buffalo back-to-back posts.

and test performance data for all seven types of post are presented in Tables 1 and 2.

TABLE 1
PHYSICAL PROPERTIES

Section Type	Area, sq in.	Weight, lb per ft	I_{x-x}, in.^{4}	S_{x-x}, in.^{3}
4-in. Steel Pipe	2.96	10.8	6.84	3.03
8 lb per ft Pollak	2.38	8.0	3.11	1.78
8 lb per ft Buffalo	2.44	8.0	3.16	1.73
3-in. Steel Pipe	2.28	7.6	3.12	1.77
6 lb per ft Pollak	1.77	6.0	2.20	1.26
6 lb per ft Buffalo	1.82	6.0	2.27	1.30
6 lb per ft Missouri	1.88	6.0	1.67	1.11

TABLE 2
THEORETICAL AND TEST PERFORMANCE DATA

Post Type	Theoretical Performance at Yield		Test Performance	
	Load, lb	Stress, psi	Load, lb*	Stress, psi
4-in. Steel Pipe	630	30,000	545	23,305
8 lb per ft Pollak	630	50,000	255	22,200
8 lb per ft Buffalo	655	50,000	180	13,740
3-in. Steel Pipe	360	30,000	335	28,070
6 lb per ft Pollak	445	50,000	295	34,445
6 lb per ft Buffalo	490	50,000	195	19,800
6 lb per ft Missouri	390	50,000	60	11,010

* Load at 0.1-in. residual deflection

The Buffalo assemblies were assembled with high strength bolts, like the previous assemblies, before testing in a modified cantilever set-up. Specimens were supported 4.5 and 34.5 in. from one end, and loaded normally with weights 1.5 in. from the other end. Initial and residual deflection versus load are plotted for each of the seven sections in Figs. 2 and 3. As in Report No. 360, each curve represents the average of two tests. For comparison, theoretical load-deflection curves are also shown as dashed lines.

As shown in Figs. 2 and 3, the loads are practically equal where load-deflection curves deviate from a straight line and at 0.1-in. residual deflection. Therefore, as was the case for the other post types, loads at 0.1-in. residual deflection were used as criteria for failure of the Buffalo assemblies.

The bolts were removed from the Buffalo assemblies and examined after each test, with thread deformation found to be present in all cases. Since a primary function of the fastener is to resist shear caused by bending, without bolt deformation, the type of bolt used was not adequate to make the two individual sections perform as an integral unit.

In addition to thread deformation, there was also slippage of one section with respect to the other, thus causing more residual deflection than would be expected. This slippage was probably the result of the limited contact area between the abutting surfaces of the two posts, per-

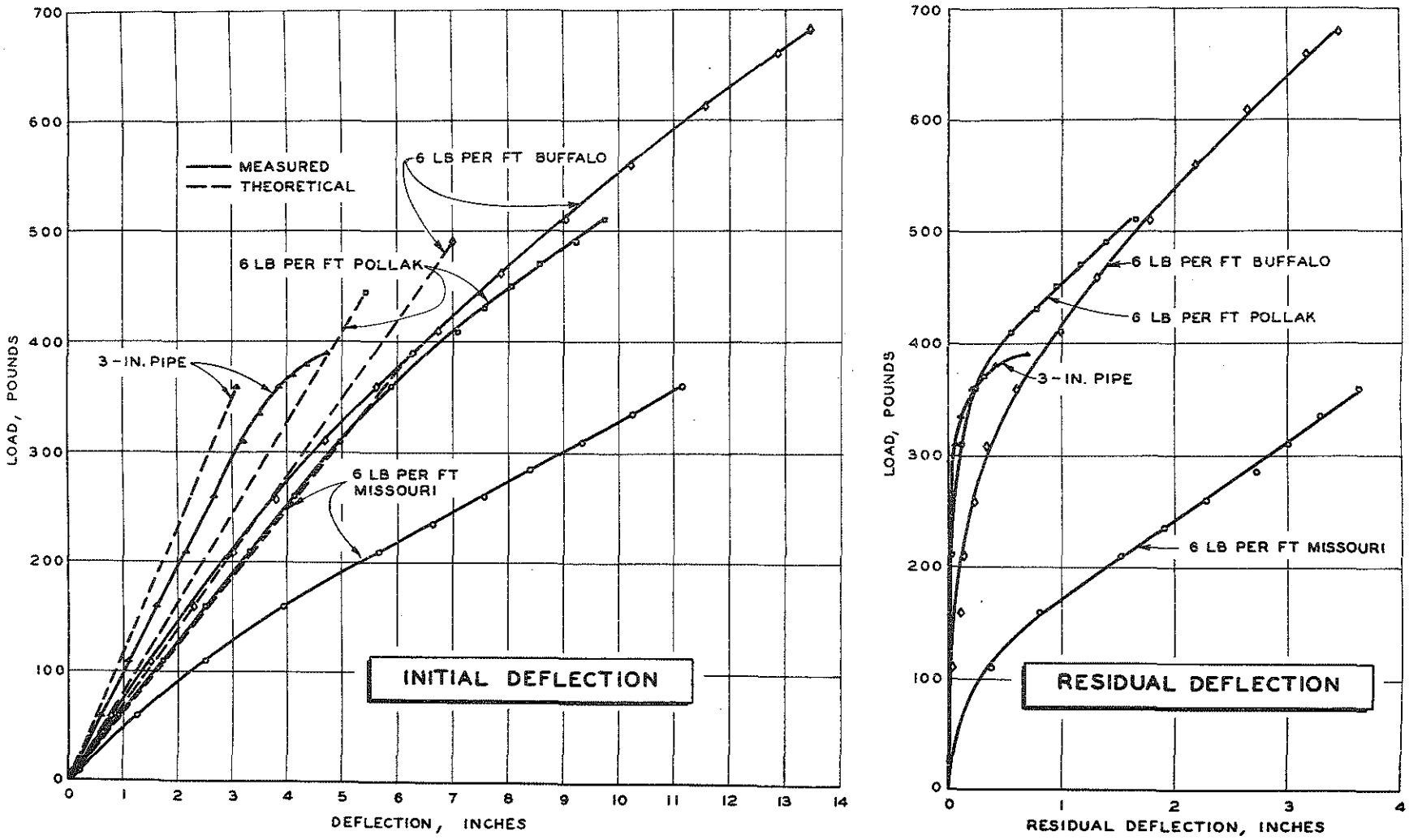

Figure 2. Load-deflection curves (first group).

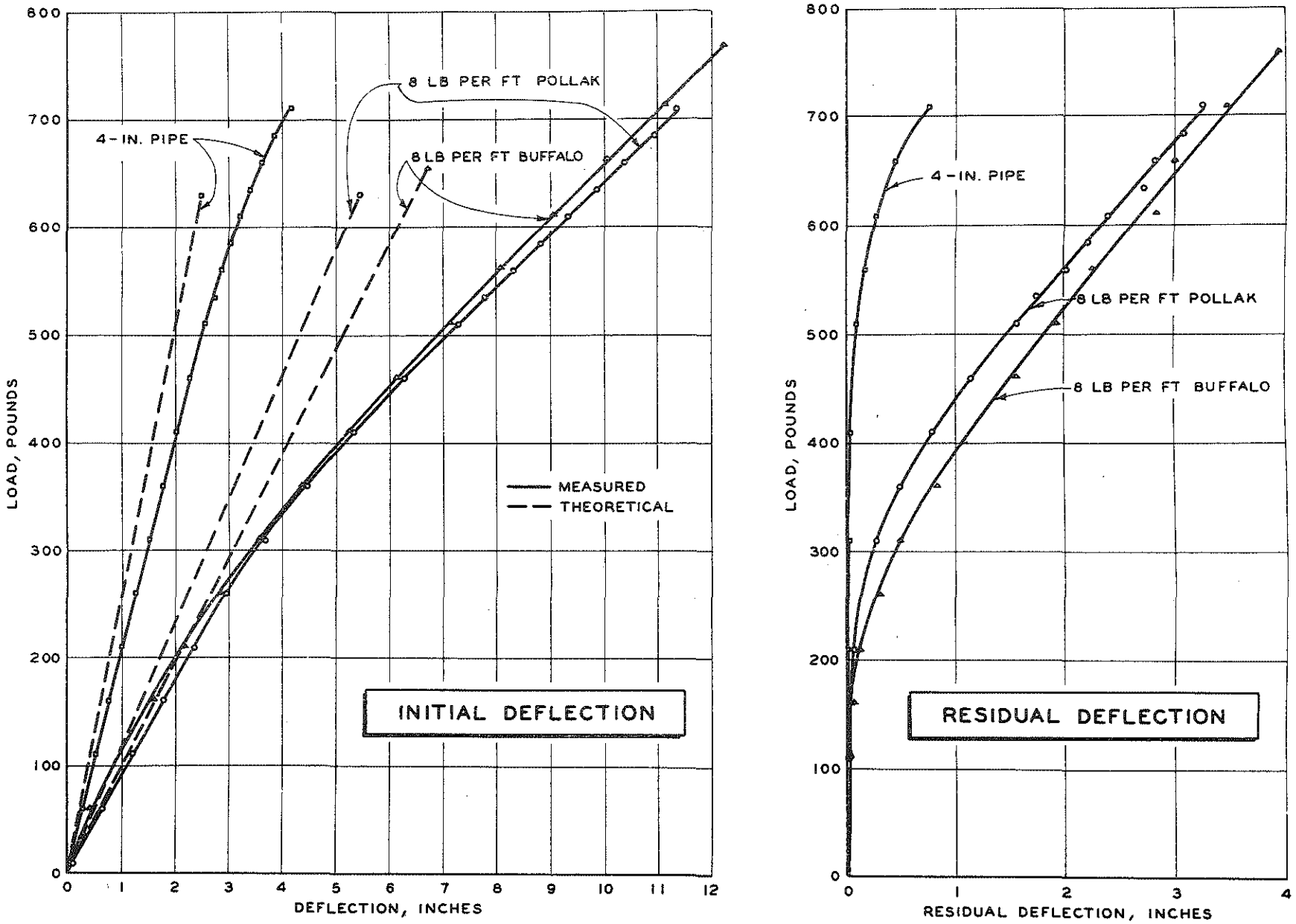

Figure 3. Load-deflection curves (second group).

section meeting the other at the point loading, as shown in Details A and B of Fig. 1.

On the basis of these tests, the 6- and 8-lb per ft Buffalo assemblies are not equivalent to the 3- and 4-in. diam steel pipes in either strength or stiffness. Further, while the 6- and 8-lb per ft Buffalo assemblies are equivalent to the 6- and 8-lb per ft Pollak assemblies in stiffness, they are not equivalent in strength.

The tests to date have indicated that none of the 6- and 8-lb per ft back-to-back assemblies so far furnished and tested are equivalent in strength or stiffness to the 3- and 4-in. diam pipe posts, respectively.