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STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

A REPORT ON COMPARATIVE TESTS ON NAILING CHANNELS AS USED IN DRY WALL CONSTRUCTION

September 28, 1956

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State of California
Department of Public Works
Division of Highways
Materials and Research Department

September 28, 1956

Lab. Order No. 6072

Mr. Anson Boyd
State Architect
Division of Architecture
Sacramento, California

Attention: Mr. Rolf T. Retz
Specification Writer III

Dear Sir:

Submitted for your consideration is:

A REPORT ON THE
COMPARATIVE TESTS ON
NAILING CHANNELS AS USED
IN DRY WALL CONSTRUCTION

Study made by . . . . . Structural Materials Section
Under general direction of . . . . . J. L. Beaton
Work supervised by . . . . . H. F. Kuhlman
Report prepared by . . . . . H. F. Kuhlman and
W. E. Faist

Very truly yours,

F. N. Hveem
Materials & Research Engineer

cc: R. T. Retz (10)
E. Withycombe
C. M. Herd
G. B. Vehn

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COMPARATIVE TESTS ON NAILING CHANNELS AS USED IN DRY WALL CONSTRUCTION

I. INTRODUCTION

The purpose of these tests is to determine the structural soundness of fabricated sections of metal stud wall panels. The tests were conducted for the Division of Architecture under your Work Order SA-1740. The procedure and type of tests conformed to requests by Mr. Retz, Specification Writer, for that Department, as per the letter dated 4-29-56 from the Division of Architecture signed by Mr. Retz.

The test material, consisting of metal nailing studs, metal channel tracks, nails or fasteners, gypsum wall board, tape, and spackle, were furnished entirely by the manufacturers. The assembled metal panels each consisted of three nailing studs, placed at 22 inch centers, with a channel track on each end. A 5/8" x 48" x 120" gypsum board was fastened to each face, with a representative longitudinal sheet rock joint being placed on one face along the center nailing stud. This splice was sealed, taped, and spackled. The completed panel was representative of a section of a wall in a building, ready for the finishing.

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II. TEST PROCEDURES

The panels were fabricated by the manufacturers personnel or under the direct supervision of a manufacturer's representative.

A completed panel, set up for testing, is shown in the photograph, Figure 1. The panels were tested as a beam, with center point loading with 8 feet 6 inch center to center. The loading was distributed by using a unistrut over a 4-1/2" x 48" area. The loading medium were 1" x 2" x 14" - steel bars.

The panel supported on a steel frame with the unistrut bar and dials in place ready for loading is shown in Figure 2.

The manner of loading and deflection reading are shown in Figures 3 and 4. Figure 5 shows a typical failure, the crushing or collapsing of flange and web of the nailing stud.

Figure 6 is a view of the end sections. Test of the individual members of the panel consisted of the following:

(1) Deflection tests on the nailing studs

(2) Nail pullout tests

The results of tests are tabulated and plotted on the attached sheets.

The tests were conducted by W. E. Faist and witnessed by:

Mr. Retz - Division of Architecture

Mr. Humphrey - Division of Architecture

Mr. McKellips - F. K. Pinney Company

Mr. Brinkman - Brinkman Steel Company

Mr. Longcor - Stran Steel Company

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APPENDIX

A. Charts

1. Description and Identification of the various nailing studs.
2. Assembled Panel Deflections.
3. Single stud deflections.
4. Nail holding power.

B. Graphs

1. Assembled Panel Load Deflection Curves.
2. Single Stud Load Deflection Curves.

C. Photos

Figure 1. Panels set up for testing.

Figure 2. Panel with unistrut loading.

Distribution Section

Figure 3. Application of load.

Figure 4. Application of load.

Figure 5. Typical Failure.

Figure 6. View of end sections.

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DESCRIPTION AND IDENTIFICATION OF

THE VARIOUS NAILING STUDS

	Manufacturers Description			Actual Description				
Test No.	Trade Name	Size	Ga.	Stud Width Inches	Stud Depth Inches	Thickness Inches	Wt/Ft. Lbs.	Ga.
1	Neslo	3-5/8	18	1-1/4	3-5/8	0.035	0.74	20
2	Neslo	2-1/2	18	1-3/16	2-5/8	0.048	0.84	18
3	Penn-Metal	2-1/2	16	2-1/8	2-1/2	0.061	1.73	16
4	Stran-Steel	2-5/16	16	2-1/16	2-3/8± 2-5/16- 2-1/2	0.064	1.59	16
5	Stran-Steel	2-5/16	18	2-1/16	2-3/8± 2-5/16- 2-1/2	0.058	1.60	16

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ASSEMBLED PANEL DEFLECTION TEST

DEFLECTION IN INCHES

Static Load Lbs.	1 Neslo* 3-5/8" Lt. Read	1 Neslo* 3-5/8" Rt. Read	2 Neslo* 2-1/2" Lt. Read	2 Neslo* 2-1/2" Rt. Read	3 Penn-Metal 2-1/2" Lt. Read	3 Penn-Metal 2-1/2" Rd. Read	4 Stran-Steel 16 ga. Lt. Read	4 Stran-Steel 16 ga. Rd. Read	5 Stran-Steel 18 ga. Lt. Read	5 Stran-Steel 18 ga. Rd. Read
0.0	0	0	0	0	0	0	0	0	0	0
43.6	0.015	0.015	0.028	0.021	0.013	0.012	0.022	0.028	0.019	0.021
115.1	0.052	0.047	0.079	0.072	0.037	0.037	0.060	0.076	0.060	0.062
176.6	0.081	0.072	0.131	0.110	0.066	0.058	0.097	0.107	0.104	0.094
238.1	0.123	0.110	0.172	0.160	0.090	0.086	0.128	0.148	0.137	0.134
299.6	0.157	0.134	0.230	0.192	0.125	0.110	0.170	0.181	0.183	0.165
361.1	0.194	0.179	0.267	0.256	0.154	0.137	0.198	0.225	0.225	0.201
422.6	0.237	0.209	0.319	0.294	0.178	0.169	0.237	0.261	0.263	0.238
484.1	0.269	0.246	0.363	0.343	0.201	0.197	0.271	0.299	0.296	0.282
545.6	0.309	0.282	0.421	0.382	0.237	0.222	0.318	0.329	0.339	0.315
607.1	0.347	0.314	0.464	0.437	0.260	0.258	0.348	0.370	0.376	0.352
668.6	0.384	0.359	0.514	0.485	0.287	0.283	0.384	0.408	0.424	0.381
730.1	0.433	0.403	0.565	0.538	0.315	0.313	0.420	0.444	0.460	0.443
791.6	0.480	0.452	0.628	0.584	0.345	0.337	0.462	0.475	0.490	0.470
853.1	0.536	0.510	0.685	0.648	0.366	0.368	0.496	0.516	0.518	0.511
914.6			0.766	0.698	0.400	0.393	0.541	0.549	0.561	0.544
975.1			0.838	0.768	0.425	0.425	0.568	0.592	0.589	0.588
1036.6			0.930	0.840	0.458	0.448	0.608	0.630	0.627	0.622
Read @ 5 Min.				0.877	0.462	0.458	0.611	0.633	0.633	0.627
0-Set				0.141	0.017	0.022	0.039	0.047	0.027	0.023

* The nails in the Neslo channel were pulled to an angle of approximately 15° from their initial position at nailing, therefore the gypsum board was unable to transmit any resistance to bending of the stud. All three Neslo studs failed by buckling in the web section and top flange. The entire section would have collapsed after approximately 2" def. if it had not been supported by the measuring device stands. The twisted type drive nail was used to nail the gypsum board to this type stud.

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STUD DEFLECTION IN INCHES
SIMPLE BEAM SUPPORT, 5' SPAN, CONCENTRATED
LOAD AT CENTER OF SPAN

Load-Lbs.	* 1 Neslo 3-5/8	2 Neslo 2-1/2	3 Penn-Metal	4 Stran-Steel 16 ga.	5 Stran-Steel 18 ga.
	0	0	0	0	0
20	0.016	0.022	0.013	0.029	0.009
40	0.030	0.040	0.025	0.049	0.017
60	0.044	0.056	0.038	0.066	0.026
80	0.061	0.073	0.048	0.079	0.037
100	0.074	0.091	0.059	0.093	0.048
20	0.085	0.109	0.068	0.106	0.058
40	0.097	0.127	0.078	0.118	0.069
60	0.109	0.146	0.087	0.131	0.080
80	0.123	0.165	0.098	0.142	0.091
200	Max. @ 0.184	Max. @ 0.192	0.107	0.155	0.102
20			0.117	0.166	0.114
40			0.125	0.178	0.124
60			0.134	0.189	0.135
80			0.143	0.201	0.146
300			0.153	0.213	0.157
20			0.163	0.225	0.168
40			0.172	0.236	0.179
60			0.181	0.248	0.190
80			0.191	0.258	0.200
400			0.201	0.270	0.212
0-Set	0.025"	0.015"	0.004	0.007	0.005

* The span length used was 52 inches. This shorter span length was required to avoid a buckled area which had failed during the assembled panel test of this 3-5/8" Neslo.

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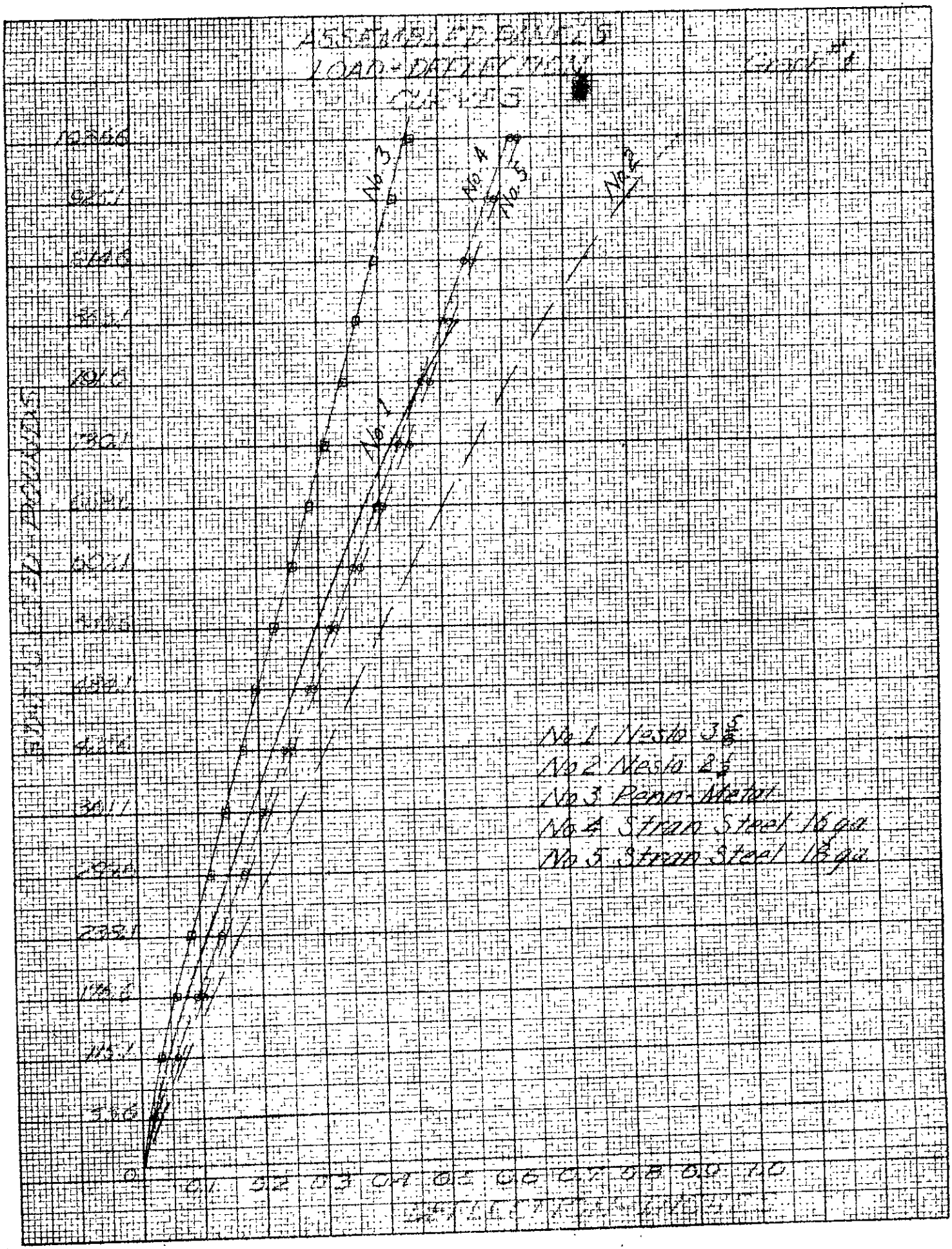
NAIL HOLDING POWER - Lbs.

NAILS

Test No.	Type of Nail	Manufacturer	One inch apart #1	One inch apart #2	½ inch from end	Random	Comments
1	Drive Nail	Neslo 3-5/8	106	98	95		
2	#7 self tapping sheet metal screw	Neslo 2-1/2	567	509	509		
3	6d annular 1-3/4"	Penn-Metal 16 ga.	161	280	186		
	#7 self tapping sheet metal screw	"				1445 1385	Screw broke. Screw driven in with hammer.
4	8d annular - 2"	Stran-Steel 16 ga.	290	412	262		
	#7 self tapping sheet metal screw	"				1435	Screw broke.
5	8d annular - 2"	Stran-Steel 18 ga.	171	550	78		
	#7 self tapping sheet metal screw	"				1000	Screw broke.



KEUFFEL & ESSER CO., N. Y. NO. 359-12G
10 X 10 to the half inch.
MADE IN U.S.A.

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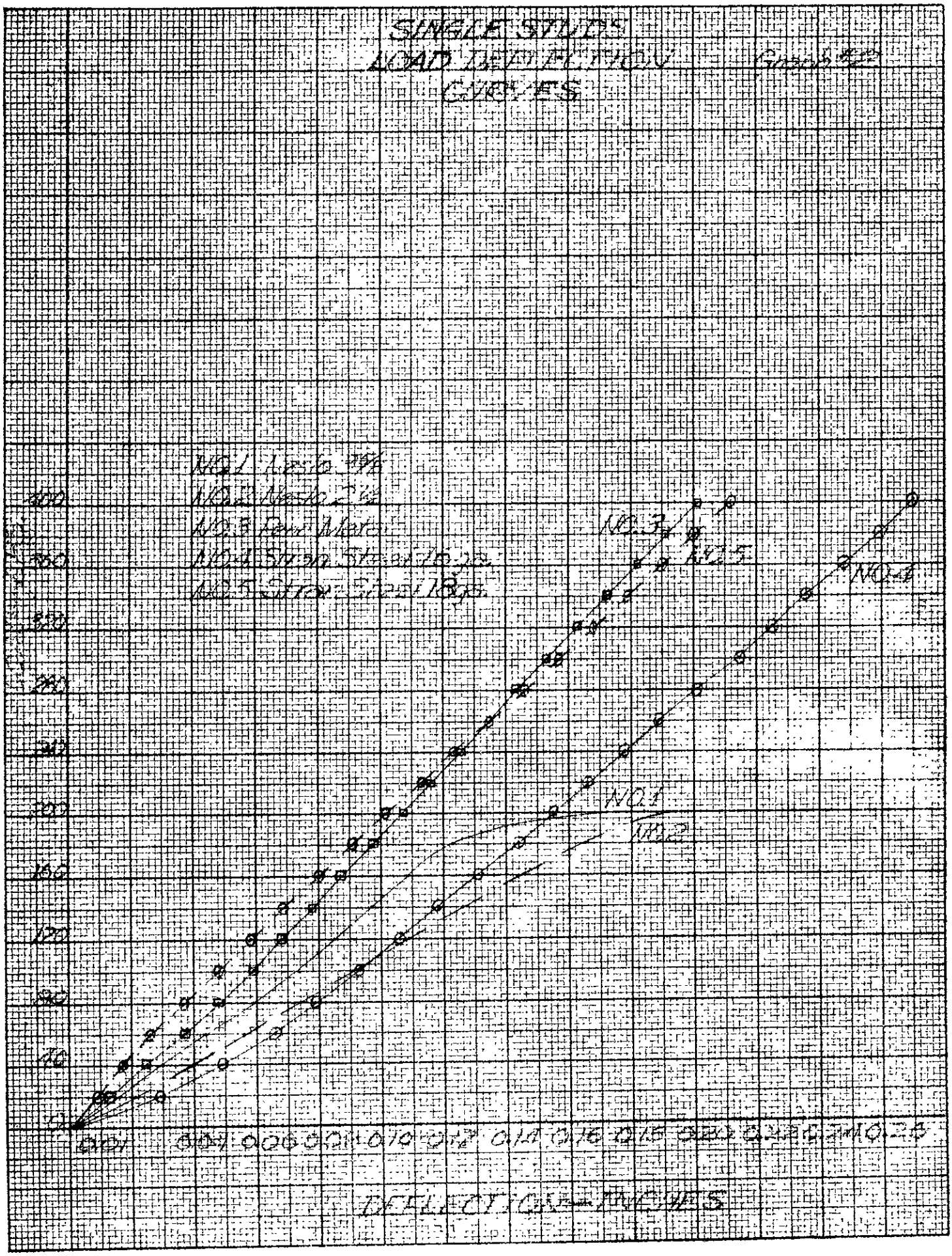

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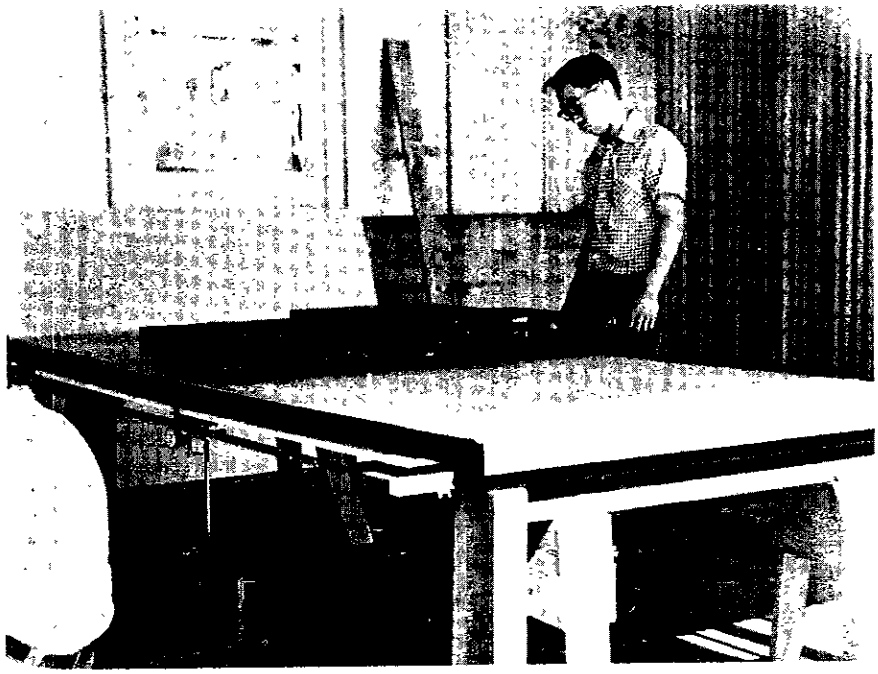

Fig. 3

Application of load on Panel

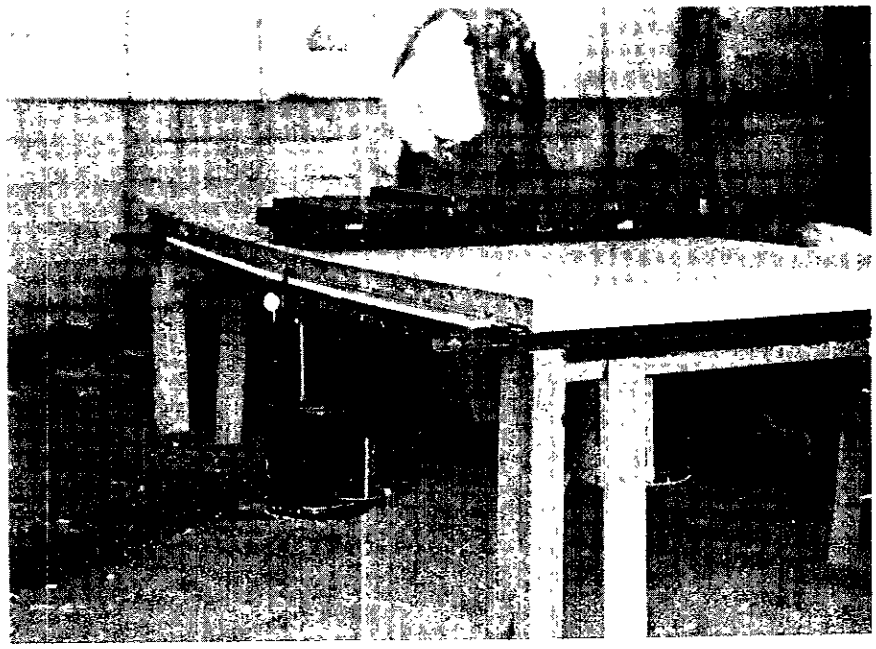

Fig. 4

Application of load on Panel

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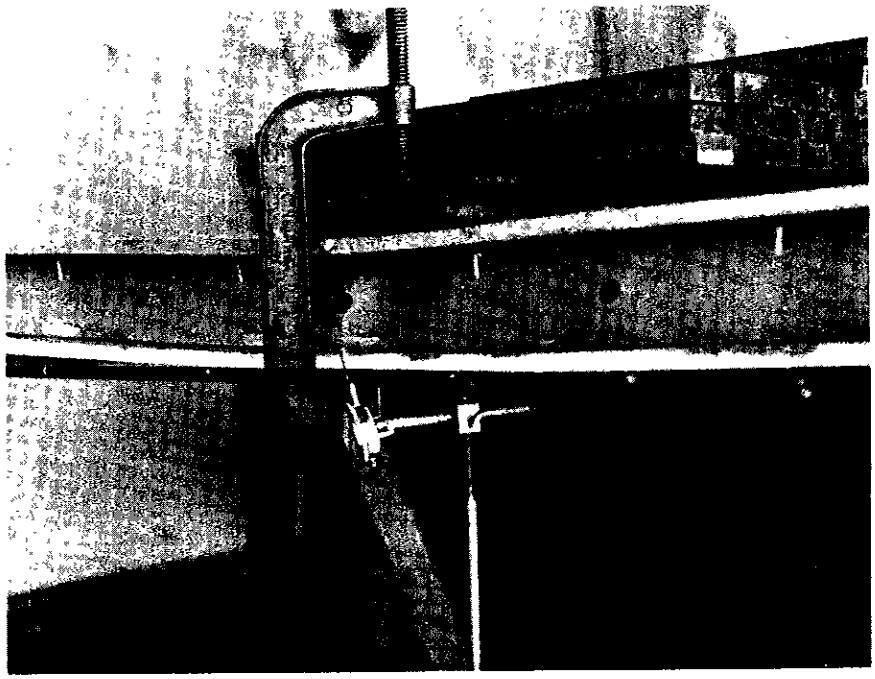

Fig. 5

Typical failure of nailing channel under load

Fig. 6

View of end sections

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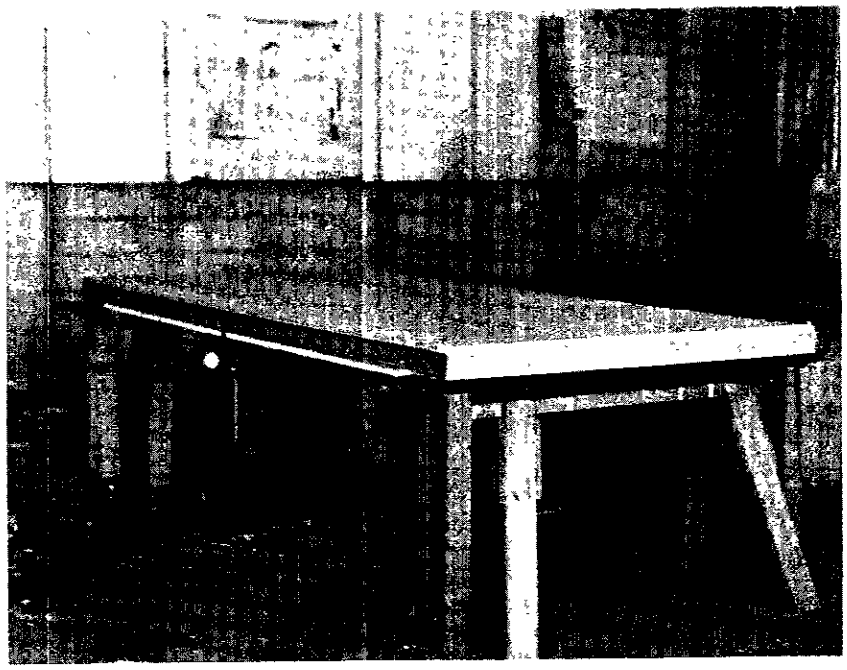

Fig. 1

Panel arranged for Testing

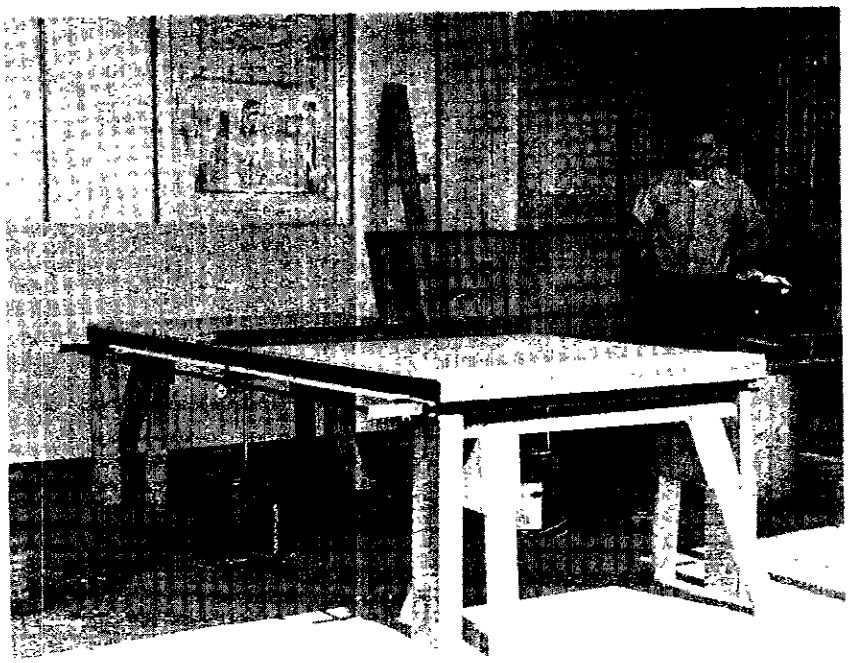

Fig. 2
Panel with unistrut loading
Distribution Section

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