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Data of Tests on Window Panels Under In-Plane Forces

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and thanks.*

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DATA OF TESTS ON WINDOW PANELS
UNDER IN-PLANE FORCES

by

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Report to

Division of Architecture
Department of Public Works
State of California

Institute of Engineering Research
University of California
Berkeley, California

February 1960

TABLE OF CONTENTS

	Page
CONTENTS	1
INTRODUCTION	2
PART I	4
PART II	10
PART III	55
PART IV	99
PART V	127

A complete discussion of the tests described in this report is given in the report, entitled: "BEHAVIOR OF WINDOW PANELS UNDER IN-PLANE FORCES", February 1960.

DATA OF TESTS ON WINDOW PANELS
UNDER IN-PLANE FORCES

INTRODUCTION

This report describes the test set-up, the test data, and the final failure modes of thirty-five glazed window panels, tested at the University of California during the period April 1959 to December 1959. A complete discussion of these in-plane loading tests is given in a separate report, entitled: "BEHAVIOR OF WINDOW PANELS UNDER IN-PLANE FORCES".

The program was conducted in the Structural Engineering Materials Laboratory, Division of Structural Engineering and Structural Mechanics, Department of Civil Engineering, University of California, Berkeley, and was sponsored by the State of California, Department of Public Works, Division of Architecture.

Five groups of test data are presented in this report, namely:

Trial Test	- PART I
Tests from SERIES I	- PART II
Tests from SERIES II	- PART III
Tests from SERIES III	- PART IV
Deflection-reversal Tests	- PART V

Figure 1 shows the basic distances a_H , b_H , a_V , b_V and c for the three different types of window sash used in these tests. The actual distances identifying the location of the gages for each panel are recorded on the dial-gage-arrangement sketches.

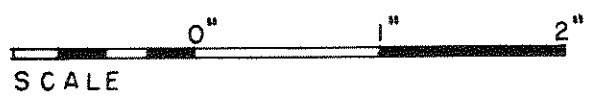
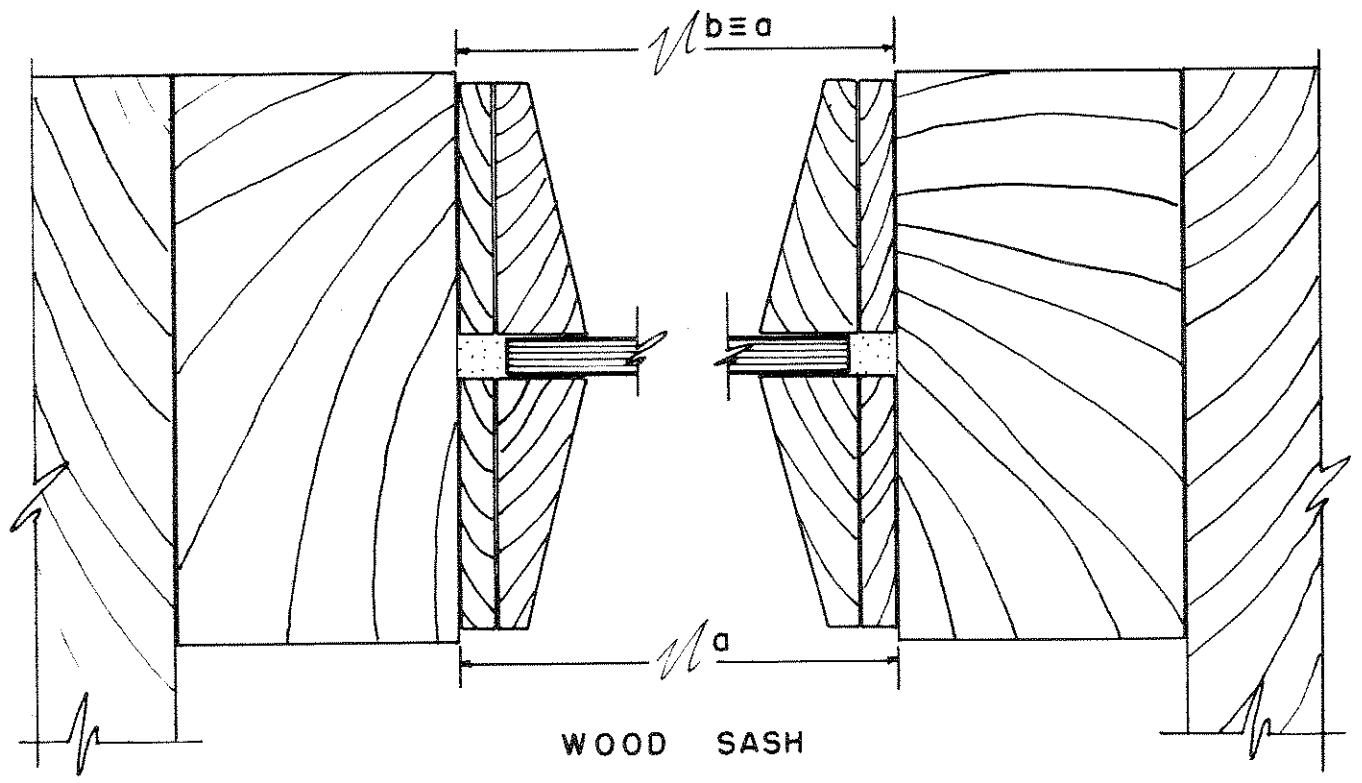
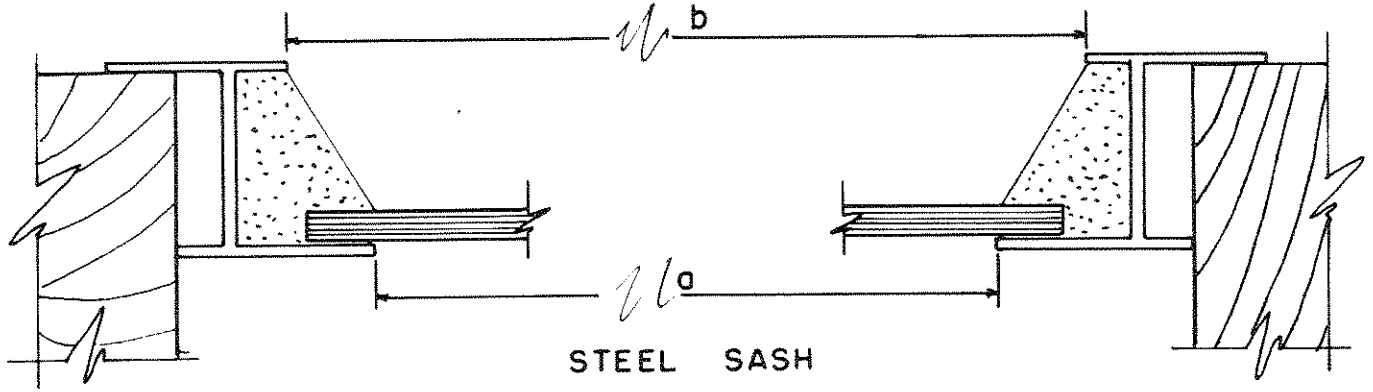
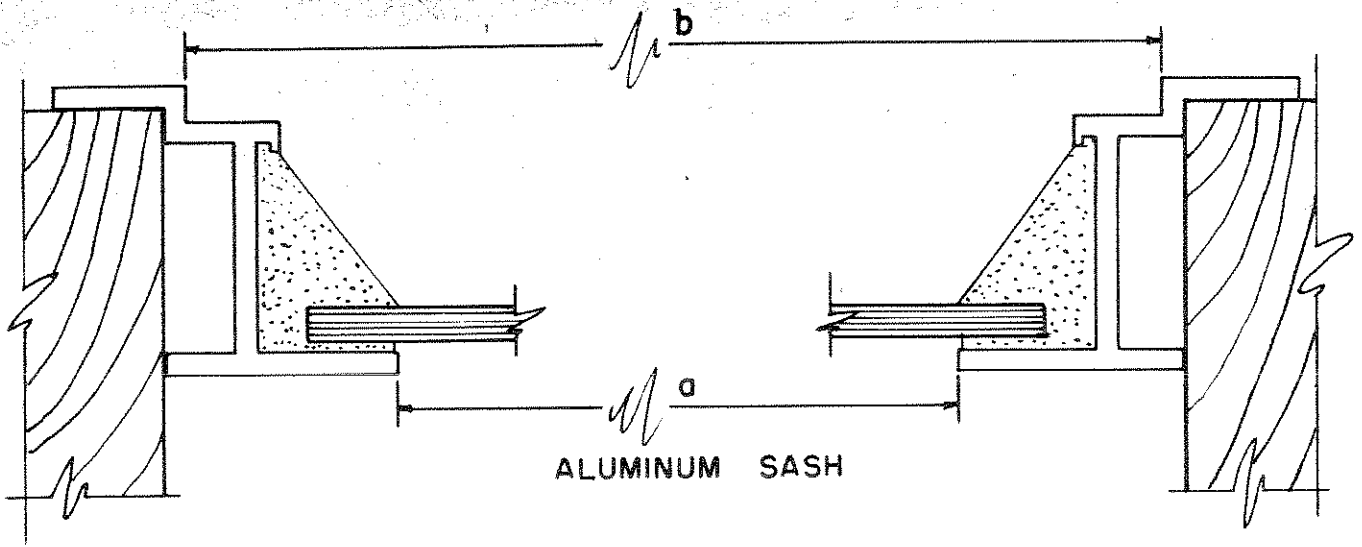


FIG. 1

In all tables the loads are expressed in terms of the oil pressure of the hydraulic system (psi) and the actual load (lbs). The psi values were used because they were the only and direct load indication of the hydraulic system.

ALL DEFLECTION READINGS ARE IN 1/1000 INCH.

P A R T ITrial Test

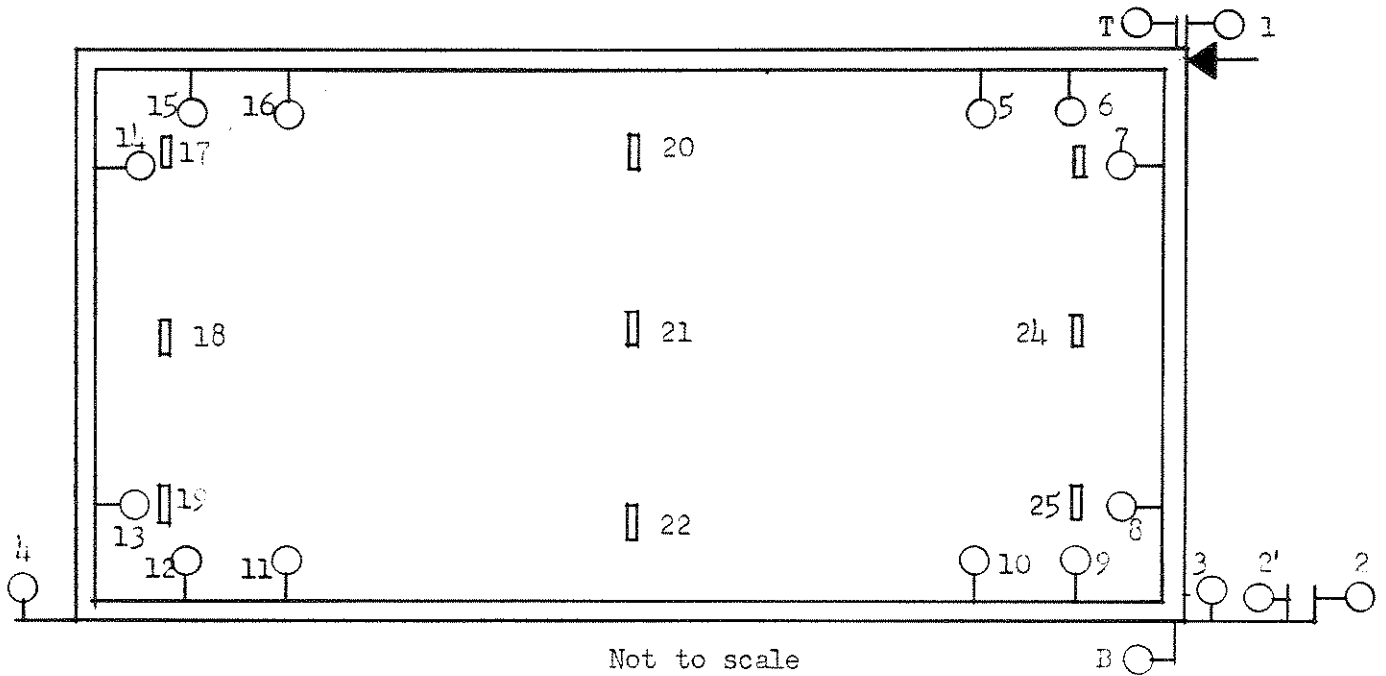
The glass panel-(A-1-b-1/2-s)-failed under a load of approximately 2580 lb., causing simultaneous glass failure of the right top- and left bottom corners.

No glass broke out.

PANEL: A-1-a- $\frac{1}{2}$ -s

DATE GLAZED: 6/1/1959
DATE TESTED: 6/4/1959

PART I



- T, B, 1, 2, 2', 3, 4 Measure movement of sash
- 5 - 16 Measure movement of glass with respect to sash
- 17 - 25 Measure movement of glass perpendicular to the window panel

Distances not measured

DIAL GAGE ARRANGEMENTS

PANEL: A-1-a- $\frac{1}{2}$ -s

PART I

LOAD	0 psi		50		100		150		200	
	0 lbs		85		170		260		345	
GAGE	READ		READ		READ		READ		READ	
1	1102		1101	- 1	994	- 108	805	- 297	733	- 369
2	364		364	0	363	- 1	363	- 1	363	- 1
3	567		567	0	568	+ 1	567	0	567	0
4	327		327	0	327	0	327	0	327	0
5	375		375	0	378	+ 3	393	+ 18	416	+ 41
6	270		270	0	272	+ 2	290	+ 20	315	+ 45
7	379		379	0	388	+ 9	421	+ 42	434	+ 55
8	366		366	0	348	- 18	298	- 68	298	- 68
9	283		283	0	276	- 7	249	- 24	216	- 67
10	1205		1205	0	1197	- 8	1166	- 39	1135	- 70
11	164		164	0	165	+ 1	164	0	162	- 2
12	375		375	0	377	+ 2	377	+ 2	379	+ 4
13	668		668	0	686	+ 18	734	+ 66	737	+ 69
14	679		679	0	670	- 9	636	- 43	622	- 57
15	330		330	0	327	- 3	319	- 11	312	- 18
16	221		221	0	217	- 4	206	- 15	199	- 22
17	118		118	0	124	+ 6	131	+ 13	132	+ 14
18	105		106	+ 1	109	+ 4	114	+ 9	116	+ 11
19	104		105	+ 1	102	- 2	103	- 1	105	+ 1
20	113		113	0	119	+ 6	121	+ 8	120	+ 7
21	108		109	+ 1	113	+ 5	113	+ 5	109	+ 1
22	102		102	0	102	0	100	- 2	98	- 4
23	111		112	+ 1	114	+ 3	113	+ 2	109	- 2
24	118		118	0	121	+ 3	116	- 2	109	- 9
2'	301		299	- 2	300	- 1	300	- 1	300	- 1
B	279		278	- 1	322	+ 43	356	+ 77	354	+ 75
T	259		260	+ 1	353	+ 94	504	+ 245	558	+ 299
25	103		103	0	103	0	99	- 4	94	- 9

PANEL: A-1-a- $\frac{1}{2}$ -s

PART I

LOAD	250 psi 430 lbs		300 515		350 600		400 690		450 775	
	GAGE	READ	READ		READ		READ		READ	
1	662	- 440	607	- 495	572	- 530	526	- 576	497	- 505
2	363	- 1	363	- 1	363	- 1	362	- 2	362	- 2
3	567	0	567	0	567	0	567	0	567	0
4	327	0	327	0	327	0	327	0	327	0
5	467	+ 92	490	+ 115	497	+ 122	496	+ 121	510	+ 135
6	371	+ 101	373	+ 103	379	+ 109	378	+ 108	387	+ 107
7	445	+ 66	451	+ 72	454	+ 75	455	+ 76	461	+ 82
8	298	- 68	298	- 68	297	- 69	298	- 68	296	+ 70
9	153	- 130	122	- 161	110	- 173	105	- 178	081	- 202
10	1077	- 128	1048	- 157	1036	- 169	1029	- 176	1006	- 199
11	159	- 5	161	- 3	158	- 6	159	- 5	159	- 5
12	382	+ 7	394	+ 19	393	+ 18	393	+ 18	391	+ 16
13	738	+ 70	738	+ 70	739	+ 71	739	+ 71	741	+ 73
14	612	- 67	606	- 73	602	- 77	602	- 77	596	- 83
15	306	- 24	302	- 28	299	- 31	297	- 33	290	- 40
16	196	- 25	194	- 27	192	- 29	190	- 31	184	- 37
17	135	+ 17	140	+ 22	140	+ 22	140	+ 22	139	+ 21
18	118	+ 13	121	+ 16	122	+ 17	122	+ 17	121	+ 16
19	107	+ 3	108	+ 4	110	+ 6	110	+ 6	110	+ 6
20	120	+ 7	135	+ 22	133	+ 20	133	+ 20	130	+ 17
21	108	0	113	+ 5	111	+ 3	108	0	108	0
22	97	- 5	97	- 5	095	- 7	103	+ 1	90	- 12
23	112	+ 1	141	+ 30	133	+ 22	136	+ 25	143	+ 32
24	107	- 11	116	- 2	113	- 5	109	- 9	108	- 10
2'	300	- 1	300	- 1	300	- 1	300	- 1	300	- 1
B	364	+ 85	374	+ 95	383	+ 104	392	+ 113	402	+ 123
T	625	+ 366	689	+ 430	704	+ 445	723	+ 464	733	+ 474
25	91	- 12	90	- 13	088	- 15	084	- 19	080	- 23

PANEL: A-1-a- $\frac{1}{2}$ -s

PART I

LOAD	500 psi		550		600		700		810	
	860 lbs		945		1030		1200		1390	
GAGE	READ		READ		READ		READ		READ	
1	467	- 635	440	- 662	406	- 696	346	- 756	296	- 806
2	362	- 2	362	- 2	362	- 2	362	- 2	362	- 2
3	567	0	567	0	567	0	567	0	567	0
4	326	- 1	326	- 1	326	- 1	326	- 1	326	- 1
5	511	+ 136	510	+ 135	514	+ 139	511	+ 136	513	+ 138
6	387	+ 107	387	+ 107	387	+ 107	387	+ 107	387	+ 117
7	462	+ 83	463	+ 84	466	+ 87	467	+ 88	472	+ 93
8	297	- 69	297	- 69	297	- 69	296	- 70	296	- 70
9	078	- 205	076	- 207	067	- 216	062	- 221	054	- 229
10	1001	- 204	998	- 207	988	- 217	981	- 224	976	- 229
11	159	- 5	160	- 4	162	- 2	168	+ 4	172	+ 8
12	393	+ 18	394	+ 19	398	+ 23	404	+ 29	410	+ 35
13	742	+ 74	742	+ 74	742	+ 74	743	+ 75	743	+ 75
14	595	- 84	594	- 85	590	- 89	588	- 91	584	- 95
15	288	- 42	286	- 44	281	- 49	274	- 56	268	- 62
16	182	- 39	180	- 41	176	- 45	169	- 52	163	- 58
17	132	+ 14	135	+ 17	139	+ 21	145	+ 27	153	+ 35
18	123	+ 18	124	+ 19	125	+ 20	126	+ 21	129	+ 24
19	110	+ 6	110	+ 6	110	+ 6	110	+ 6	111	+ 7
20	129	+ 16	131	+ 18	134	+ 21	139	+ 26	146	+ 33
21	108	0	107	- 1	105	- 3	102	- 6	101	- 7
22	89	- 13	88	- 14	86	- 16	84	- 18	83	- 19
23	148	+ 37	151	+ 40	158	+ 47	164	+ 53	175	+ 64
24	107	- 11	105	- 13	105	- 13	103	- 15	166	+ 48
2'	300	- 1	300	- 1	300	- 1	300	- 1	300	- 1
B	412	+ 133	420	+ 141	428	+ 149	446	+ 167	460	+ 181
T	750	+ 491	766	+ 507	788	+ 529	823	+ 564	855	+ 596
25	079	- 24	077	- 26	075	- 28	072	- 31	070	- 33

PANEL: A-1-a- $\frac{1}{2}$ -s

PART I

LOAD	900 psi		1000		1200	
	1550 lbs		1720		2065	
GAGE	READ		READ		READ	
1	246	- 856	183	- 919	069	-1033
2	362	- 2	362	- 2	362	- 2
3	567	0	567	0	567	0
4	326	- 1	326	- 1	326	- 1
5	509	+ 134	510	+ 135	--	--
6	387	+ 117	out	--	--	--
7	473	+ 94	478	+ 99	--	--
8	295	- 71	294	- 72	--	--
9	051	- 232	045	- 238	--	--
10	976	- 229	976	- 229	--	--
11	174	+ 10	181	+ 17	--	--
12	413	+ 38	421	+ 46	--	--
13	744	+ 76	744	+ 76	--	--
14	582	- 97	577	- 102	--	--
15	266	- 64	256	- 74	--	--
16	161	- 60	153	- 58	--	--
17	159	+ 41	160	+ 42	--	--
18	130	+ 25	129	+ 24	--	--
19	111	+ 7	111	+ 7	--	--
20	150	+ 37	151	+ 38	--	--
21	97	- 11	90	- 18	--	--
22	81	- 21	79	- 23	--	--
23	181	+ 70	190	+ 79	--	--
24	163	+ 45	162	+ 44	--	--
2'	300	- 1	300	- 1	300	- 1
B	476	+ 197	494	+ 215	507	+ 228
T	883	+ 624	923	+ 664	983	+ 724
25	068	- 35	065	- 38	--	--

P A R T IISERIES IFailure Modes:

- A-1-a-1/2-s The right top corner of the glass panel failed under a load of 2100 lb.
Some glass flew over distances as far as 4 ft. outward and 6 ft. inward (outside is side of the putty).
- A-1-b-1/2-s The left bottom corner of the glass panel failed under a load of 1940 lb.
No glass broke out from the panel.
- A-3-a-1/2-s The right bottom corner of the glass panel failed under a load of 2150 lb.
Some glass flew outward over a distance as far as 7 ft. and inward as far as 4 ft.
- A-3-b-1/2-s An overall buckling of the glass panel, starting in the right bottom area (2 ft. by 4 ft.), occurred under a load of 1620 lb.
The glass flew outward only. The major portion fell within 4 ft. from the panel, while smaller parts bounced away over a distance of 16 ft.
- S-1-a-3/4-s An overall cracking of the glass panel, after crushing of the left bottom corner, occurred under a load of 2680 lb.
No glass broke out.
- S-1-b-3/4-s A two inch long crack appeared at the right top corner under a load of 1800 lb. A complete failure of the left bottom corner occurred under a load of 2770 lb.
No glass broke out.

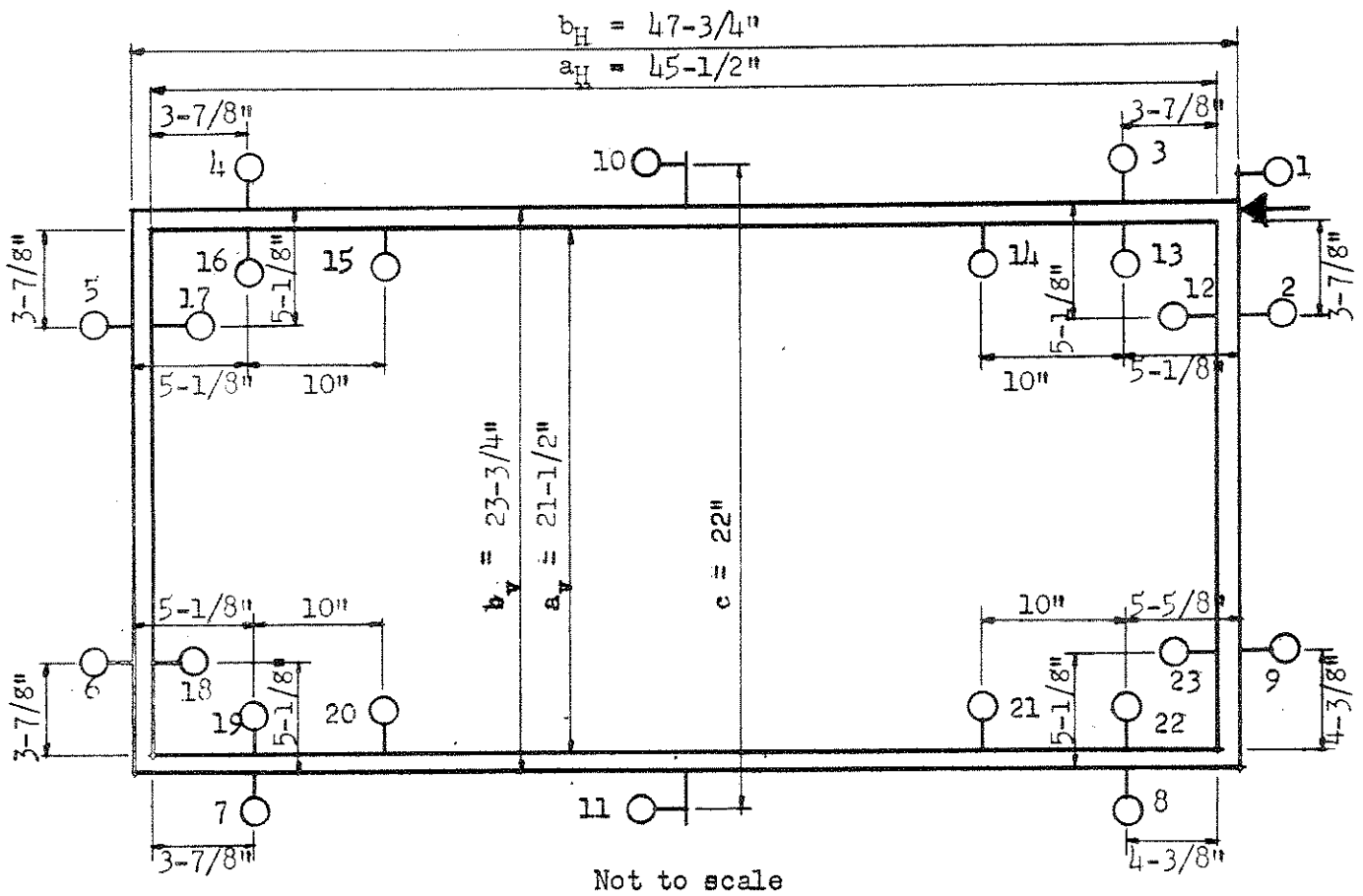
- S-3-a-3/4-s A simultaneous failure of the glass panel in the left top- and right bottom corner occurred under a load of 1720 lb. The panel had reacted this load for approximately 10 minutes before the failure took place.
No glass broke out.
- S-3-b-3/4-s The putty bedding was inadequate to prevent column-buckling of the whole panel. The vertical forces at top and bottom, causing an out-of-plane deflection of the panel of $1\frac{1}{2}$ in. at mid-height, were introduced by the hinged-frame deflections. Actual failure was not reached, because this would have endangered research personnel.
- W-1-a-1/2-s The glass panel failed due to an overall buckling under a load of 3440 lb.
Some glass flew outward over a distance as far as 7 ft. and some inward as far as 5 ft.
- W-1-b-1/2-s Complete buckling of the glass panel occurred under a load of 3900 lb.
No glass broke out.
- W-3-a-1/2-s The glass panel failed due to buckling under a load of 3340 lb.
The glass flew as far as 24 ft. outward.
- W-3-b-1/2-s The glass panel failed due to buckling under a load of 3430 lb.
No glass broke out.

PANEL: A-1-a- $\frac{1}{2}$ -s
 SERIES: I

DATE GLAZED: 6/19/1959
 DATE TESTED: 6/23/1959

PART II

Results at failure: $\Delta = 0.85''$
 $\phi h = 0.03''$
 $\Delta - \phi h = 0.82''$
 P = 2100 lbs



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-1-a- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	0 psi		150		250		300		350		400	
	0 lbs		260		430		515		600		690	
GAGE	READ		READ		READ		READ		READ		READ	
1	1454		1201	-253	814	-640	775	-679	736	-718	661	-793
2	164		374	+210	657*	+493	787	+623	806	+642	852	+688
3	230		230	0	280	+ 50	278	+ 48	275	+ 45	264	+ 34
4	533		530	- 3	511	- 22	511	- 22	513	- 20	517	- 16
5	1083		971	-112	552	-531	527	-556	506	-577	467	-616
6	458		404	- 54	316	-142	306	-152	294	-164	269	-189
7	262		267	+ 5	276	+ 14	275	+ 13	274	+ 12	272	+ 10
8	321		315	- 6	316	- 5	317	- 4	320	- 1	323	+ 2
9	348		404	+ 56	502	+154	513	+165	524	+176	550	+202
10	576		827	+251	990*	+414	1013	+437	1036	+460	1088	+512
11	194		211	+ 17	248	+ 54	253	+ 59	260	+ 66	278	+ 84
12	699		838	+139	853	+154	944	+245	959	+260	963	+264
13	009		028	+ 19	042	+ 33	073	+ 64	077	+ 68	085	+ 76
14	087		082	- 5	065	- 22	out	--	--	--	--	--
15	671		672	+ 1	708	+ 37	711	+ 40	709	+ 38	776	+105
16	883		885	+ 2	897	+ 14	891	+ 8	884	+ 1	833	- 50
17	720		690	- 30	588	-132	584	-136	576	-144	570	-150
18	697		736	+ 39	800	+103	900	+203	998	+301	999	+302
19	491		488	- 3	418	- 73	423	- 68	528	+ 37	581	+ 90
20	697		693	- 4	681	- 16	673	- 24	672	- 25	703	+ 6
21	672		670	- 2	583	- 89	558	-114	553	-119	561	-111
22	841		842	+ 1	742	- 99	706	-135	696	-145	690	-151
23	095		062	- 33	018	- 77	022	- 73	025	- 70	025	-70

* Questionable

PANEL: A-1-a- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	450 psi	500	550	600	650	700
	775 lbs	860	945	1030	1120	1200
GAGE	READ	READ	READ	READ	READ	READ
1	603 -851	570* -884	564 -890	514 -940	494 -960	474 -980
2	889 +725	906 +742	923 +759	936 +772	948 +784	959 +795
3	263 + 33	258 + 28	257 + 27	254 + 24	252 + 22	250 + 20
4	519 - 14	521 - 12	523 - 10	525 - 8	526 - 7	528 - 5
5	441 -642	397 -686	398 -685	364 -719	351 -732	341 -742
6	253 -205	243 -215	234 -224	225 -233	219 -239	213 -245
7	272 + 10	271 + 9	270 + 8	269 + 7	267 + 5	266 + 4
8	325 + 4	328 + 7	330 + 9	332 + 11	334 + 13	335 + 14
9	566 +218	576 +228	583 +235	591 +243	597 +249	603 +255
10	1133 +557	1162 +586	1170 +594	1184 +608	1197 +621	1210 +634
11	285 + 91	291 + 97	296 +102	302 +108	308 +114	312 +118
12	967 +268	970 +271	972 +273	975 +276	977 +278	980 +281
13	086 + 77	091 + 82	094 + 85	097 + 88	100 + 91	101 + 92
14	out --	--	--	--	--	--
15	635 - 36	632 - 39	631 - 40	628 - 43	626 - 45	622 - 49
16	774 -109	768 -115	763 -120	759 -124	755 -128	750 -133
17	566 -154	561 -159	557 -163	554 -166	551 -169	548 -172
18	996 +299	994 +297	992 +295	990 +293	990 +293	991 +294
19	649 +158	643 +152	657 +166	661 +170	665 +174	670 +179
20	755 + 58	758 + 61	760 + 63	762 + 65	764 + 67	768 + 71
21	577 - 95	574 - 98	572 -100	569 -103	568 -104	568 -104
22	690 -151	682 -159	676 -165	671 -170	667 -174	665 -176
23	029 - 66	030 - 65	032 - 63	032 - 63	032 - 63	031 - 64

* Questionable

PANEL: A-1-a- $\frac{1}{2}$ -s

SERIES: I

PART II

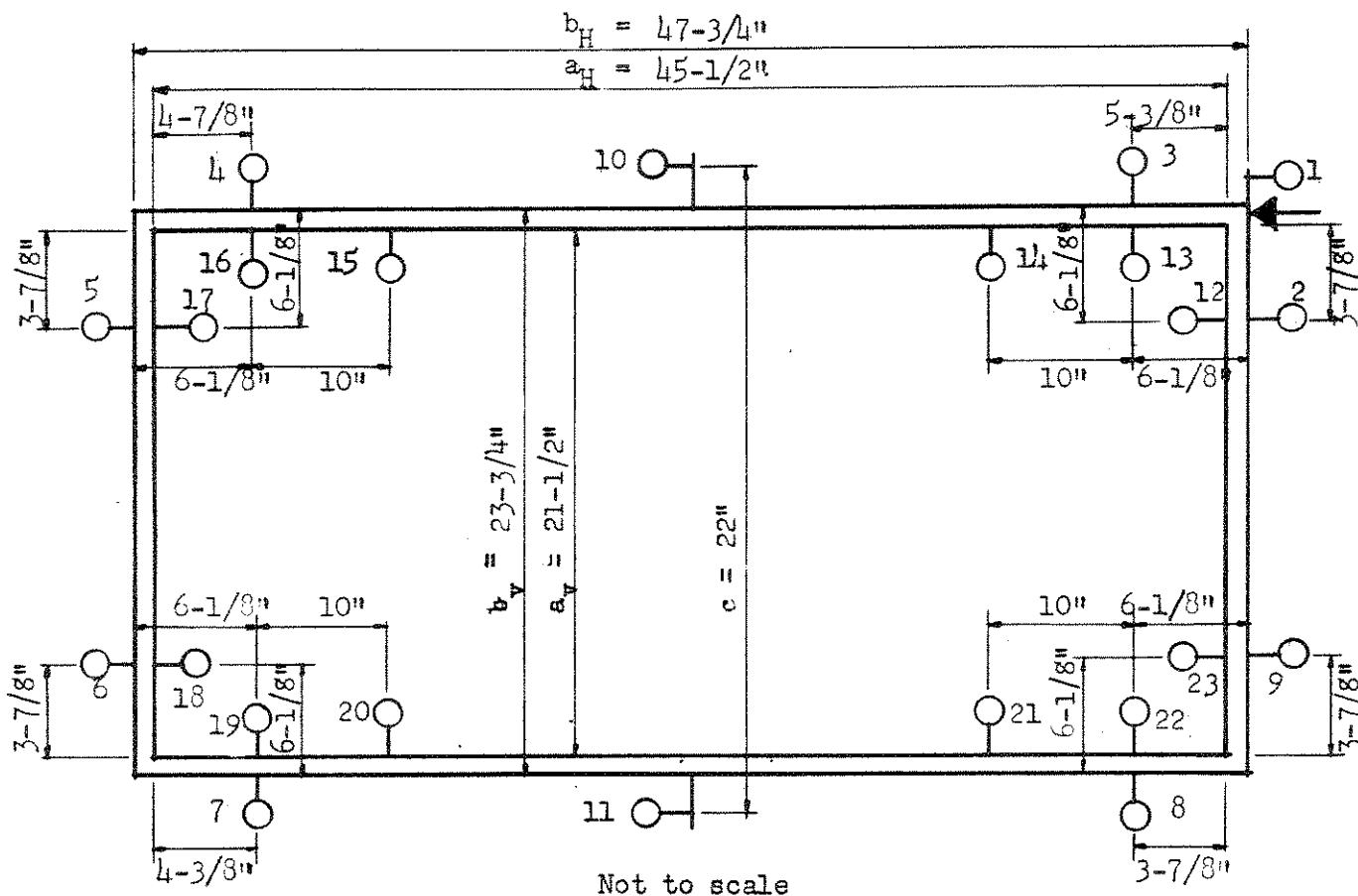
LOAD	750 psi		800		900		1000		1100		1220	
	1290 lbs		1375		1550		1720		1890		2100	
GAGE	READ		READ		READ		READ		READ		READ	
1	458	-996	441	-1013	412	-1042	384	-1070	358	-1096	Failure	
2	968	+804	977	+813	994	+830	1012	+848	1027	+863		
3	249	+ 19	248	+ 18	247	+ 17	245	+ 15	244	+ 14		
4	529	- 4	530	- 3	532	- 1	535	+ 2	538	+ 5		
5	332	-751	322	-761	312	-771	288	-795	273	-810		
6	208	-250	203	-255	193	-265	184	-274	177	-281		
7	265	+ 3	263	+ 1	260	- 2	257	- 5	254	- 8		
8	336	+ 15	337	+ 16	339	+ 18	341	+ 20	342	+ 21		
9	608	+260	614	+266	624	+274	633	+285	642	+294		
10	1219	+643	1229	+653	1248	+672	1266	+690	1283	+707		
11	316	+122	321	+127	330	+136	338	+144	345	+151		
12	982	+283	984	+285	987	+288	991	+292	994	+295		
13	103	+ 94	105	+ 96	108	+ 99	112	+103	114	+105		
14	out	---	---	---	---	---	---	---	---	---		
15	622	- 49	620	- 51	618	- 53	616	- 55	615	- 56		
16	748	-135	744	-139	740	-143	736	-147	732	-151		
17	547	-173	545	-175	543	-177	541	-179	540	-180		
18	992	+295	993	+296	997	+300	1000	+303	1005	+308		
19	673	+184	675	+184	677	+186	679	+188	682	+191		
20	770	+ 73	772	+ 75	773	+ 76	774	+ 77	775	+ 78		
21	568	-104	567	-105	566	-106	566	-106	567	-105		
22	662	-179	660	-181	656	-185	653	-188	651	-190		
23	031	- 64	030	- 65	028	- 67	026	- 69	024	- 71		

PANEL: A-1-b- $\frac{1}{2}$ -s
 SERIES: I

DATE GLAZED: 6/19/1959
 DATE TESTED: 6/25/1959

PART II

Results at failure: $\Delta = 0.82''$
 $\phi h = 0.07''$
 $\Delta - \phi h = 0.75''$
 P = 1940 lbs



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-1-b- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	0 psi	50		100		150		200		300	
	0 lbs	85		172		260		345		515	
GAGE	READ	READ		READ		READ		READ		READ	
1	1907	1859	- 48	1627	-280	1450	-457	1390	-517	1300	-607
2	972	1010	+ 38	1201	+229	1349	+377	1396	+424	1461	+489
3	506	507	+ 1	503	- 3	502	- 4	501	- 5	498	- 8
4	016	017	+ 1	019	+ 3	022	+ 6	025	+ 9	028	+ 12
5	1689	1651	- 38	1462	-227	1316	-373	1268	-421	1199	-490
6	590	581	- 9	534	- 56	496	- 94	478	-112	444	-146
7	096	095	- 1	103	+ 7	107	+ 11	107	+ 11	107	+ 11
8	080	080	0	082	+ 2	083	+ 3	085	+ 5	089	+ 9
9	1012	1020	+ 8	1061	+ 49	1094	+ 82	1108	+ 96	1138	+126
10	604	651	+ 47	881	+277	1057	+453	1114	+510	1191	+587
11	528	529	+ 1	532	+ 4	536	+ 8	541	+ 13	561	+ 33
12	392	414	+ 22	491	+ 99	505	+113	506	+114	507	+115
13	560	561	+ 1	581	+ 21	692	+132	725	+165	743	+183
14	485	486	+ 1	502	+ 17	578	+ 93	600	+115	605	+120
15	380	381	+ 1	391	+ 10	423	+ 43	428	+ 48	443	+ 33
16	440	431	- 9	444	+ 4	451	+ 11	445	+ 5	420	- 20
17	704	683	- 21	607	- 97	596	-108	591	-113	570	-134
18	809	812	+ 3	869	+ 60	928	+119	938	+129	970	+161
19	706	707	+ 1	712	+ 6	710	+ 4	710	+ 4	693	- 13
20	459	460	+ 1	458	- 1	428	- 31	419	- 40	402	- 57
21	712	712	0	678	- 34	588	-124	566	-146	558	-154
22	480	479	- 1	453	- 27	337	-143	304	-176	292	-188
23	473	458	- 15	399	- 74	341	-132	327	-146	314	-159

PANEL: A-1-b- $\frac{1}{2}$ -s

SERIES: I

PART II

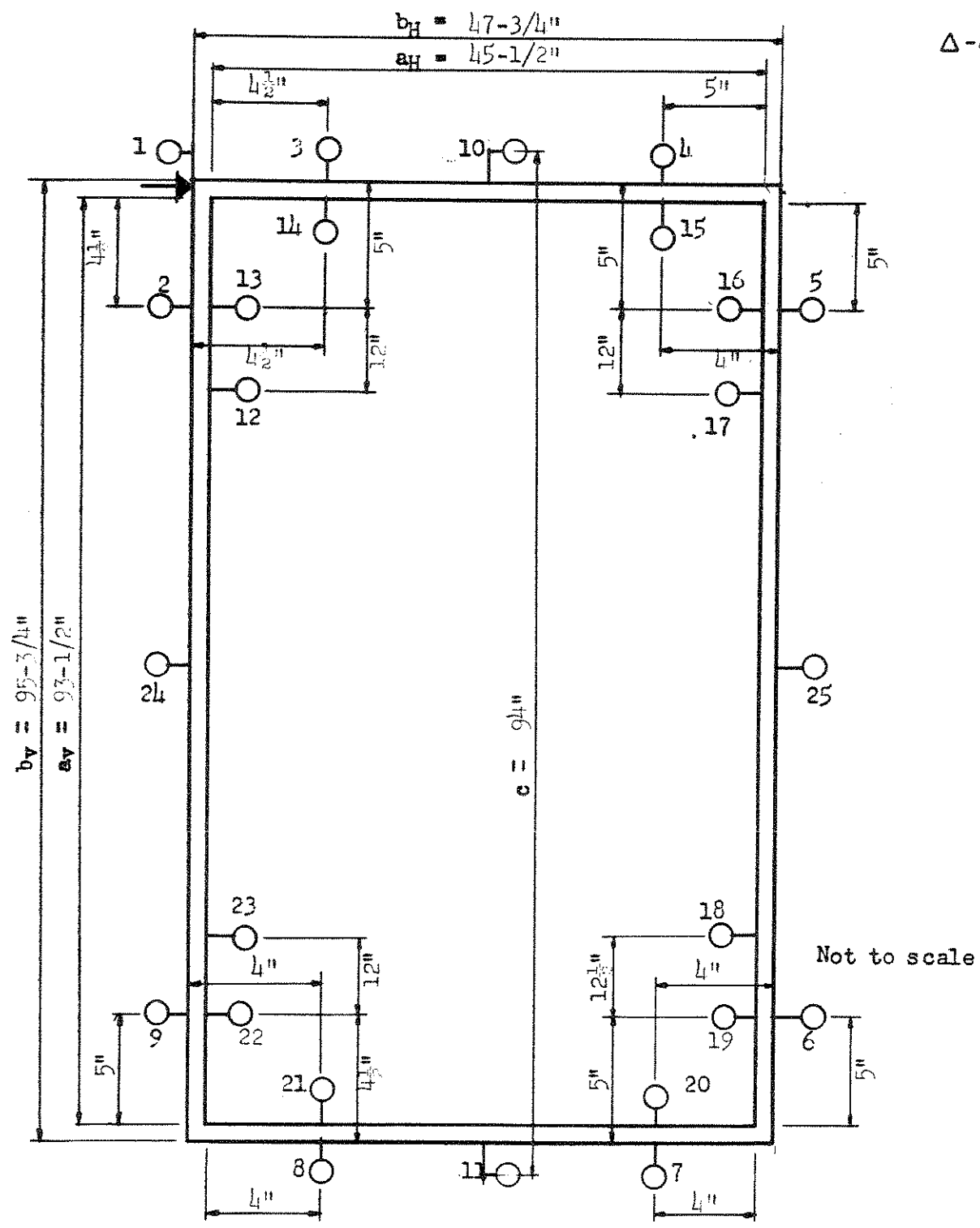
LOAD	400 psi		600		800		1000		1130	
	690 lbs		1030		1375		1720		1940	
GAGE	READ		READ		READ		READ		READ	
1	1201	-706	999	-908	842	-1065	686	-1221	Failure	
2	1504	+532	1501	+529	1612	+640	1787	+815		
3	495	- 11	501	- 5	490	- 16	458	- 48		
4	029	+ 13	044	+ 28	048	+ 32	040	+ 24		
5	1135	-554	1104	-585	1039	-650	934	-755		
6	401	-189	338	-252	304	-286	253	-337		
7	104	+ 8	095	- 1	082	- 14	071	- 25		
8	093	+ 13	098	+ 18	108	+ 28	130	+ 50		
9	1175	+163	1233	+221	1274	+262	1336	+324		
10	1261	+657	1412	+808	1482	+878	1583	+979		
11	593	+ 65	629	+101	664	+136	711	+183		
12	507	+115	509	+117	502	+110	456	+ 64		
13	754	+194	757	+197	762	+202	765	+205		
14	602	+117	564	+ 79	568	+ 83	572	+ 87		
15	390	+ 10	288	- 92	288	- 92	289	- 91		
16	384	- 56	238	-202	236	-204	235	-205		
17	560	-114	536	-168	523	-181	500	-204		
18	910	+101	892	+ 83	878	+ 69	856	+ 47		
19	718	+ 12	865	+159	877	+171	898	+192		
20	423	- 36	526	+ 67	533	+ 74	540	+ 81		
21	562	-150	601	-111	591	-121	580	-132		
22	283	-197	282	-198	259	-221	260	-220		
23	309	-162	300	-173	295	-178	267	-206		

PANEL: A-3-a- $\frac{1}{2}$ -s
SERIES: I

DATE GLAZED: 6/19/1959
DATE TESTED: 6/23/1959

PART II

Results at failure: $\Delta = 1.46''$
 $\phi h = -0.25''$
 $\Delta - \phi h = 1.71''$
P = 2150 l



Outside gages measure movement of sash
Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-3-a- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	0 psi		50		100		150		300	
	0 lbs		85		170		260		430	
GAGE	READ		READ		READ		READ		READ	
1	2804		2775	- 29	2294	- 510	1754	-1050	1306	-1498
2	735		762	+ 27	1009	+ 274	out	--	--	--
3	683		681	- 2	695	+ 12	714	+ 31	705	+ 22
4	593		593	0	593	0	492	- 101	443	- 150
5	1896		1875	- 21	1453	- 443	1519	- 377	1028	- 868
6	640		638	- 2	646	+ 6	604	- 36	583	- 57
7	664		665	+ 1	669	+ 5	832	+ 168	826	+ 162
8	776		777	+ 1	772	- 4	767	- 9	762	- 14
9	679		675	- 4	692	+ 13	721	+ 42	755	+ 76
10	270		341	+ 71	790	+ 520	1140	+ 870	1548	+1278
11	486		486	0	484	- 2	477	- 9	480	- 6
12	600		605	+ 5	678	+ 78	740	+ 140	749	+ 149
13	782		792	+ 10	909	+ 127	989	+ 207	995	+ 213
14	638		643	+ 5	665	+ 27	854	+ 216	860	+ 223
15	638		636	- 2	625	- 13	596	- 42	435	- 203
16	773		763	- 10	642	- 131	546	- 227	539	- 234
17	769		761	- 8	668	- 101	602	- 167	597	- 172
18	857		862	+ 5	914	+ 57	963	+ 106	964	+ 107
19	704		711	+ 7	810	+ 106	898	+ 194	897	+ 193
20	03		05	+ 2	14	+ 11	34	+ 31	57	+ 54
21	44		41	- 3	19	- 25	out	--	--	--
22	687		676	- 11	564	- 123	470	- 217	469	- 218
23	687		671	- 16	577	- 110	511	- 176	515	- 172
24	170		180	+ 10	388	+ 218	571	+ 401	785	+ 615
25	1381		1367	- 14	1110	- 271	882	- 499	675	- 706

PANEL: A-3-a- $\frac{1}{2}$ -s

SERIES: I

PART II

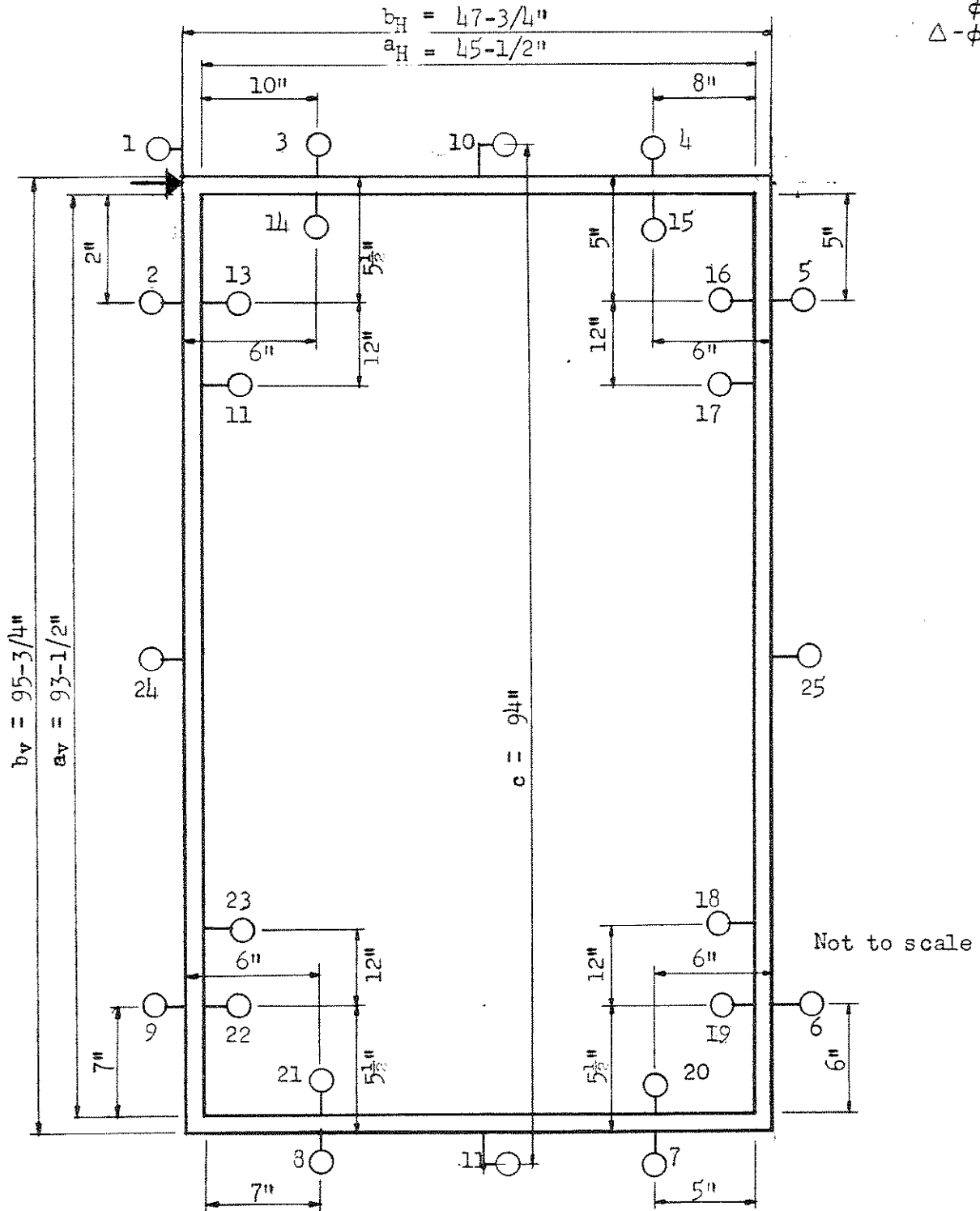
LOAD	400 psi		500		600		800		1000		1250	
	690 lbs		860		1030		1375		1720		2150	
GAGE	READ		READ		READ		READ		READ		READ	
1	1126	-1678	1004	-1800	915	-1889	7391	-2073	515	-2289	Failure	
2	out	--	--	--	--	--	--	--	--	--		
3	665	- 18	643	- 40	599	- 84	out	--	--	--		
4	413	- 180	398	- 195	388	- 205	out	--	--	--		
5	1010	- 886	937	- 959	890	-1006	out	--	--	--		
6	569	- 71	552	- 88	539	- 101	506	- 134	464	- 176		
7	837	+ 173	838	+ 174	839	+ 175	846	+ 182	842	+ 178		
8	769	- 7	779	+ 3	786	+ 10	803	+ 27	820	+ 44		
9	779	+ 100	794	+ 115	806	+ 127	836	+ 157	872	+ 193		
10	1660	+1390	1726	+1456	1779	+1509	out	--	--	--		
11	487	+ 1	500	+ 14	508	+ 22	540	+ 54	561	+ 75		
12	out	--	--	--	--	--	--	--	--	--		
13	1001	+ 219	1002	+ 220	1003	+ 221	1006	+ 224	1007	+ 225		
14	860	+ 222	860	+ 222	861	+ 223	861	+ 223	868	+ 230		
15	456	- 182	448	- 190	441	- 197	427	- 211	414	- 224		
16	534	- 239	530	- 243	531	- 244	533	- 246	533	- 246		
17	591	- 178	586	- 183	584	- 185	584	- 185	583	- 186		
18	966	+ 109	970	+ 113	972	+ 115	977	+ 120	977	+ 120		
19	896	+ 192	896	+ 192	out	--	--	--	--	--		
20	061	+ 58	068	+ 65	073	+ 70	089	+ 86	106	+ 103		
21	out	--	--	--	--	--	--	--	--	--		
22	478	- 209	480	- 207	481	- 206	484	- 203	485	- 202		
23	543	- 144	543	- 144	545	- 142	549	- 138	549	- 138		
24	870	+ 700	910	+ 740	941	+ 771	1063	+ 893	1143	+ 973		
25	632	- 749	594	- 795	267	- 828	160	- 935	357	-1024		

PANEL: A-3-b- $\frac{1}{2}$ -s
 SERIES: I

DATE GLAZED: 6/19/1959
 DATE TESTED: 6/25/1959

PART II

Results at failure: $\Delta = 2.36''$
 $\phi h = 0.51''$
 $\Delta - \phi h = 1.85''$
 $P = 1620 \text{ lb}$



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-3-b- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	0 psi	50	100	150	200	300
	0 lbs	85	172	260	345	515
GAGE	READ	READ	READ	READ	READ	READ
1	2845	2811 - 34	2505 - 340	2084 - 761	1965 - 880	1478 - 1367
2	128	154 + 26	418 + 290	757 + 629	983 + 855	1289 + 1161
3	168	168 0	146 - 22	125 - 43	138 - 30	83 - 85
4	290	292 + 2	295 + 5	300 + 10	316 + 26	out --
5	2337	2301 - 36	2003 - 334	1635 - 702	1379 - 958	1030 - 1307
6	698	695 - 3	668 - 30	648 - 50	639 - 59	616 - 82
7	366	365 - 1	365 - 1	364 - 2	365 - 1	364 - 2
8	040	041 + 1	048 + 8	044 + 4	054 + 14	071 + 31
9	165	168 + 3	190 + 25	213 + 48	203 + 38	242 + 77
10	193	233 + 40	536 + 343	934 + 741	1190 + 997	1560 + 1367
11	575	575 0	575 0	577 + 2	577 + 2	579 + 4
12	570	575 + 5	616 + 46	677 + 107	691 + 121	707 + 137
13	583	599 + 16	673 + 90	758 + 175	777 + 194	703 + 120
14	491	494 + 3	521 + 30	602 + 111	620 + 129	643 + 152
15	379	377 - 2	366 - 13	353 - 26	273 - 106	227 - 152
16	393	376 - 17	302 - 91	202 - 191	160 - 233	129 - 264
17	270	264 - 6	194 - 76	101 - 169	019 - 251	002 - 268
18	284	284 0	301 + 17	312 + 28	318 + 34	317 + 33
19	259	263 + 4	313 + 54	334 + 75	341 + 82	345 + 86
20	133	135 + 2	142 + 9	254 + 121	243 + 110	286 + 153
21	490	490 0	449 - 41	365 - 125	356 - 134	310 - 180
22	848	844 - 4	786 - 62	766 - 82	742 - 106	745 - 103
23	538	537 - 1	500 - 38	487 - 51	418 - 120	433 - 105
24	081	095 + 6	243 + 162	400 + 319	459 + 378	631 + 550
25	1915	1913 - 2	1755 - 160	1541 - 374	1311 - 604	1126 - 789

PANEL: A-3-b- $\frac{1}{2}$ -s

SERIES: I

PART II

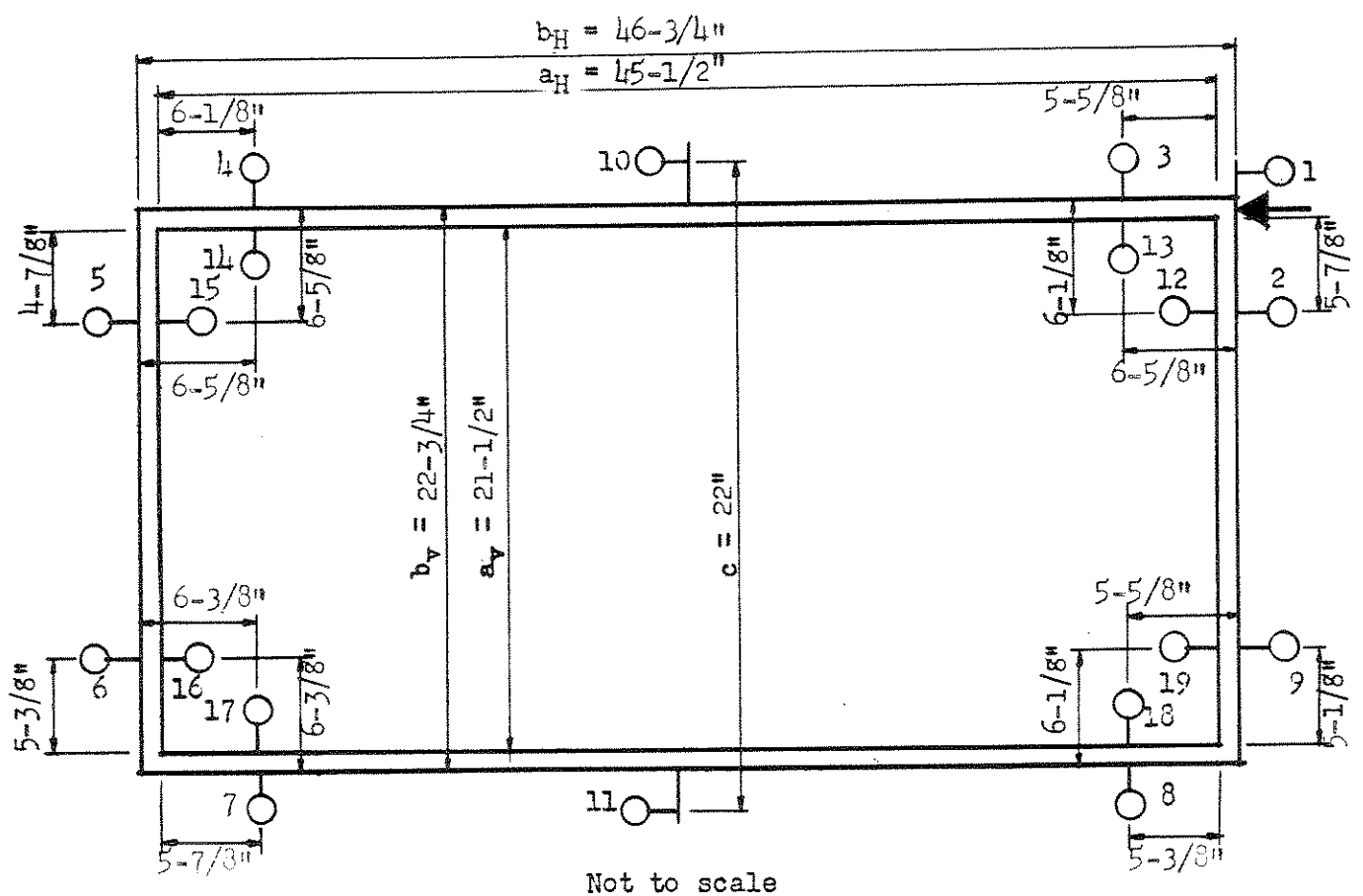
LOAD	400 psi		500		600		800		910	
	690 lbs		860		1030		1375		1620	
GAGE	READ		READ		READ		READ		READ	
1	1275	-1570	892	-1953	763	-2082	458	-2387	Failure	
2	1475	+1347	1723	+1595	1843	+1715	out	--		
3	45	-123	out	--	--	--	--	--		
4	out	--	--	--	--	--	--	--		
5	829	-1508	565	-1772	471	-1866	out	--		
6	589	-99	552	-136	538	-149	528	-170		
7	364	-2	359	-7	349	-17	330	-36		
8	086	+46	108	+68	118	+78	143	+103		
9	272	+107	320	+157	343	+178	388	+223		
10	1805	+1612	2068	+1875	2174	+1981	2415	+2222		
11	582	+7	590	+15	595	+20	603	+28		
12	714	+144	719	+149	727	+157	731	+161		
13	813	+230	819	+236	821	+238	821	+238		
14	655	+164	665	+174	668	+177	690	+199		
15	209	-170	163	-216	149	-230	124	-255		
16	120	-273	130	-263	140	-253	164	-229		
17	006	-264	031	-239	155	-115	109	-161		
18	316	+32	308	+24	304	+20	298	+14		
19	345	+86	341	+82	337	+78	330	+71		
20	297	+164	334	+201	349	+216	376	+243		
21	283	-207	247	-243	235	-255	210	-280		
22	752	-96	757	-91	766	-82	784	-64		
23	450	-88	475	-63	596	+58	535	-3		
24	743	+662	900	+819	out	--	--	--		
25	1022	-893	875	-1040	804	-1111	out	--		

PANEL: S-1-a-3/4-s
SERIES: I

DATE GLAZED: 6/19/1959
DATE TESTED: 6/30/1959

PART II

Results at failure: $\Delta = 1.19''$
 $\phi h = 0.00''$
 $\Delta - \phi h = 1.19''$
P = 2680 lbs



Outside gages measure movement of sash
Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: S-1-a-3/4-s

SERIES: I

PART II

LOAD	0 psi	50	100	150	200	250
	0 lbs	85	170	260	345	430
GAGE	READ	READ	READ	READ	READ	READ
1	1919	1914 - 5	1885 - 34	1825 - 94	1751 -168	1688 -231
2	042	045 + 3	069 + 27	110 + 68	163 +121	210 +168
3	181	183 + 2	185 + 4	191 + 10	198 + 17	202 + 21
4	447	447 0	443 - 4	440 - 7	441 - 6	435 - 12
5	1785	1781 - 4	1755 - 30	1710 - 75	1653 -122	1602 -183
6	611	610 - 1	601 - 10	587 - 24	569 - 42	553 - 58
7	491	491 0	494 + 3	495 + 4	494 + 3	495 + 4
8	478	478 0	474 - 4	468 - 10	461 - 17	455 - 23
9	063	063 0	071 + 8	083 + 20	099 + 36	114 + 51
10	058	060 + 2	095 + 37	150 + 92	224 +166	288 +230
11	077	077 0	078 + 1	078 + 1	080 + 3	081 + 4
12	381	381 0	390 + 9	411 + 30	440 + 59	464 + 83
13	335	336 + 1	340 + 5	348 + 13	356 + 21	362 + 27
14	492	492 0	494 + 2	494 + 2	493 + 1	491 - 1
15	264	264 0	255 - 9	235 - 29	210 - 54	190 - 74
16	453	456 + 3	466 + 13	476 + 23	487 + 34	501 + 48
17	398	398 0	398 0	398 0	400 + 2	402 + 4
18	420	420 0	418 - 2	416 - 4	414 - 6	412 - 8
19	304	302 - 2	292 - 12	284 - 20	272 - 32	260 - 44

PANEL: S-1-a-3/4-s

SERIES: I

PART II

LOAD	300 psi		350		400		500		600		800	
	515 lbs		600		690		860		1030		1375	
GAGE	READ		READ		READ		READ		READ		READ	
1	1585	-334	1485	-434	1358	-561	1137	-782	979	-940	743	-1176
2	280	+238	350	+308	436	+394	584	+542	688	+646	830	+788
3	210	+ 29	207	+ 26	208	+ 27	206	+ 25	190	+ 9	180	- 1
4	429	- 18	425	- 22	420	- 27	413	- 34	410	- 37	414	- 33
5	1528	-257	1453	-332	1360	-425	1206	-579	1094	-691	934	-851
6	524	- 87	495	-116	459	-152	394	-217	340	-271	256	-355
7	500	+ 9	504	+ 13	505	+ 14	503	+ 12	502	+ 11	493	+ 2
8	449	- 29	444	- 34	438	- 40	432	- 46	430	- 48	431	- 47
9	139	+ 76	165	+102	200	+137	260	+197	307	+244	378	+315
10	380	+322	472	+414	588	+530	782	+724	915	+857	1102	+1044
11	084	+ 7	090	+ 13	099	+ 22	120	+ 43	144	+ 67	182	+105
12	491	+110	505	+124	516	+135	560	+179	593	+212	614	+233
13	371	+ 36	379	+ 44	389	+ 54	427	+ 92	559	+224	597	+262
14	496	+ 4	500	+ 8	504	+ 12	508	+ 16	511	+ 19	366	-126
15	166	- 98	157	-107	153	-111	152	-112	151	-113	113	-151
16	526	+ 73	562	+109	613	+160	662	+209	665	+212	682	+229
17	406	+ 8	411	+ 13	418	+ 20	430	+ 32	434	+ 36	593	+195
18	415	- 5	414	- 6	409	- 11	390	- 30	267	-153	236	-184
19	238	- 66	205	- 99	159	-145	121	-183	131	-173	132	-172

PANEL: S-1-a-3/4-s

SERIES: I

PART II

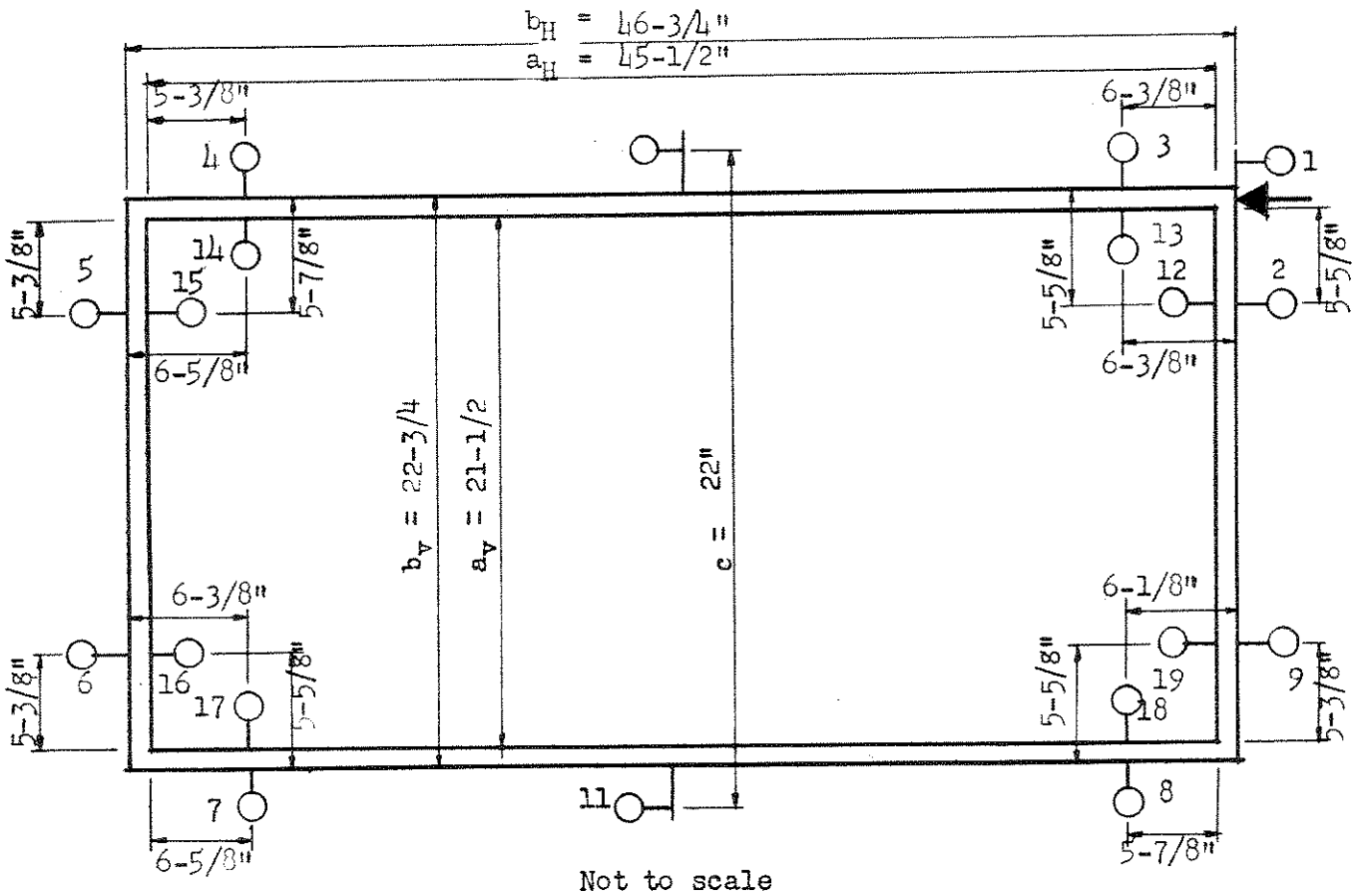
LOAD	1000 psi		1200		1400		1450-1550					
	1720 lbs		2065		2410		2680					
GAGE	READ		READ		READ		READ					
1	647	-1272	555	-1364	475	-1444	Failure					
2	871	+829	910	+868	947	+905						
3	164	- 17	149	- 32	133	- 48						
4	416	- 31	413	- 34	410	- 37						
5	888	-897	844	-941	804	-981						
6	228	-383	200	-411	175	-436						
7	485	- 6	477	- 14	469	- 22						
8	436	- 42	440	- 38	447	- 31						
9	416	+353	433	+370	459	+396						
10	1149	+1091	1215	+1157	1240	+1182						
11	205	+128	225	+148	247	+170						
12	624	+243	645	+264	645	+264						
13	597	+262	612	+277	612	+277						
14	354	-138	344	-148	344	-148						
15	106	-158	093	-171	093	-171						
16	685	+232	691	+238	691	+238						
17	684	+286	619	+221	619	+221						
18	231	-189	218	-202	218	-202						
19	135	-169	137	-167	137	-167						

PANEL: S-1-b-3/4-s
 SERIES: I

DATE GLAZED: 6/19/1959
 DATE TESTED: 6/31/1959

PART II

Results at failure: $\Delta = 1.19''$
 $\phi h = 0.06''$
 $\Delta - \phi h = 1.13''$
 P = 2770 lbs



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: S-1-b-3/4-s

SERIES: I

PART II

LOAD	0 psi		50		100		150		200	
	0 lbs		85		170		260		345	
GAGE	READ		READ		READ		READ		READ	
1	1912		1901	- 11	1852	- 60	1682	- 230	1542	- 370
2	565		573	+ 8	615	+ 50	744	+ 179	850	+ 285
3	582		582	0	583	+ 1	582	0	583	+ 1
4	502		502	0	502	0	503	+ 1	503	+ 1
5	907		905	- 2	864	- 43	738	- 169	634	- 273
6	841		838	- 3	833	- 8	764	- 77	719	- 122
7	091		090	- 1	090	- 1	091	0	092	+ 1
8	061		061	0	060	- 1	058	- 3	058	- 3
9	218		221	+ 3	236	+ 18	294	+ 76	337	+ 119
10	000		012	+ 12	067	+ 67	229	+ 229	371	+ 371
11	520		521	+ 1	520	0	539	+ 19	549	+ 29
12	305		309	+ 4	328	+ 23	382	+ 77	411	+ 106
13	337		341	+ 4	347	+ 10	366	+ 29	381	+ 44
14	480		479	- 1	479	- 1	480	0	483	+ 3
15	363		358	- 5	339	- 24	285	- 78	256	- 107
16	549		551	+ 2	563	+ 14	589	+ 40	632	+ 83
17	646		647	+ 1	647	+ 1	647	+ 1	650	+ 4
18	349		347	- 2	338	- 11	320	- 29	310	- 39
19	1110		1107	- 3	1096	- 4	Gage Stuck		--	--

PANEL: S-1-b-3/4-s

SERIES: I

PART II

LOAD	250 psi		300		350		400		500	
	430 lbs		515		600		690		860	
GAGE	READ		READ		READ		READ		READ	
1	1372	- 540	1269	- 643	1116	- 796	1077	- 835	924	- 988
2	975	+ 410	1053	+ 488	1164	+ 599	1192	+ 627	1302	+ 737
3	589	+ 7	593	+ 11	593	+ 11	592	+ 10	587	+ 5
4	503	+ 1	503	+ 1	505	+ 3	507	+ 5	514	+ 12
5	511	- 396	535	- 372	430	- 477	302	- 605	294	- 613
6	661	- 180	638	- 203	388	- 453	373	- 468	322	- 519
7	094	+ 3	094	+ 3	093	+ 2	091	0	082	- 9
8	057	- 4	057	- 4	058	- 3	058	- 3	059	- 2
9	384	+ 166	413	+ 195	454	+ 236	467	+ 249	516	+ 298
10	539	+ 539	640	+ 640	780	+ 780	857	+ 857	955	+ 955
11	553	+ 33	555	+ 35	560	+ 40	565	+ 45	581	+ 61
12	426	+ 121	424	+ 119	419	+ 114	424	+ 119	436	+ 131
13	397	+ 60	408	+ 71	430	+ 93	458	+ 121	577	+ 240
14	487	+ 7	491	+ 11	494	+ 14	492	+ 12	455	- 25
15	240	- 123	242	- 121	348	- 115	343	- 120	336	- 127
16	709	+ 160	768	+ 219	851	+ 302	853	+ 304	860	+ 311
17	651	+ 5	645	- 1	out	--	--	--	--	--
18	303	- 46	301	- 48	284	- 65	259	- 90	148	- 201
19	Gage	Stuck	900	- 210	1980	- 290	819	- 291	921	- 289

PANEL: S-1-b-3/4-s

SERIES: I

PART II

LOAD	600 psi		800		1000		1050		1600	
	1030 lbs		1375		1720		1800		2770	
GAGE	READ		READ		READ		READ		READ	
1	877	-1035	742	-1270	572	-1440			First Failure	Final Failure
2	1343	+ 778	1444	+ 879	1504	+ 939				
3	579	- 3	571	- 11	565	- 17				
4	517	+ 15	531	+ 29	540	+ 38				
5	254	- 653	151	- 756	81	- 826				
6	297	- 544	223	- 618	173	- 668				
7	076	- 15	069	- 22	060	- 31				
8	063	+ 2	074	+ 13	079	+ 18				
9	540	+ 322	608	+ 390	665	+ 447				
10	1006	+1006	1127	+1127	1205	+1205				
11	590	+ 70	636	+ 116	686	+ 166				
12	440	+ 135	443	+ 138	447	+ 142				
13	589	+ 252	600	+ 263	606	+ 269				
14	426	- 54	349	- 131	335	- 145				
15	336	- 127	338	- 125	336	- 127				
16	862	+ 313	862	+ 313	862	+ 313				
17	out	--	--	--	--	--				
18	132	- 217	123	- 226	120	- 229				
19	822	- 288	821	- 289	820	- 290				

PANEL: S-3-a-3/4-s
 SERIES: 1

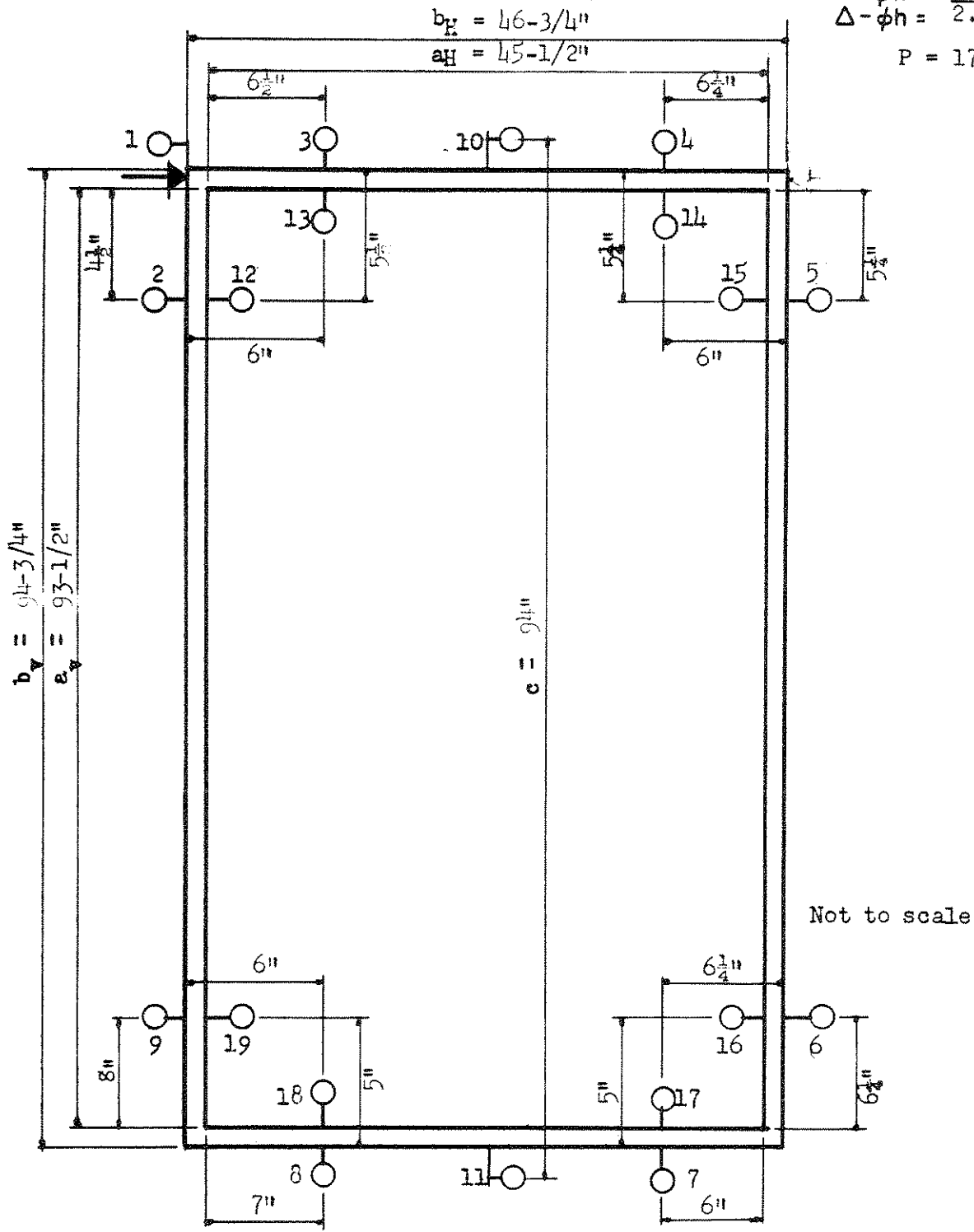
DATE GLAZED: 6/19/1959
 DATE TESTED: 6/30/1959

PART II

Results at failure: $\Delta = 2.26''$

$\phi h = 0.10''$
 $\Delta - \phi h = 2.16''$

P = 1720 lbs



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: S-3-a-3/4-s

SERIES: I

PART II

LOAD	0 psi	50	100	150	200	250					
	0 lbs	85	170	260	345	430					
GAGE	READ	READ	READ	READ	READ	READ					
1	3002	2981	- 21	2665	-337	1774	-1228	1143	-1559	1278	-1724
2	150	160	+ 10	407	+257	1157	+1007	1524	+1374	1667	+1517
3	328	346	+ 18	345	+ 17	338	+ 10	322	- 6	315	- 13
4	651	650	- 1	645	- 6	610	- 41	574	- 5	out	--
5	2672	2656	- 16	2392	-280	1607	-1065	1245	-1427	1102	-1570
6	1246	1249	+ 3	1225	- 21	1152	- 94	1113	-153	1094	-152
7	375	375	0	382	+ 7	400	+ 25	403	+ 28	402	+ 27
8	286	286	0	285	- 1	285	- 1	287	+ 1	287	+ 1
9	182	181	- 1	200	+ 18	289	+107	327	+145	347	+165
10	529	545	+ 16	751	+222	1641	+1112	2029	+1500	2183	+1654
11	074	075	+ 1	075	+ 1	092	+ 18	103	+ 29	111	+ 37
12	368	372	+ 4	471	+103	644	+276	696	+328	712	+344
13	609	613	+ 4	662	+ 53	796	+187	802	+193	804	+195
14	282	280	- 2	261	- 21	208	- 74	182	-100	168	-114
15	431	428	- 3	328	-103	158	-273	108	-323	93	-338
16	659	664	+ 5	711	+ 52	905	+246	1045	+386	1094	+435
17	534	595	+ 61	550	+ 16	593	+ 59	620	+ 86	630	+ 96
18	453	449	- 4	404	- 49	268	-185	257	-196	248	-205
19	1150	1146	- 4	1096	- 54	918	-232	776	-374	724	-426

PANEL: S-3-a-3/4-s

SERIES: I

PART II

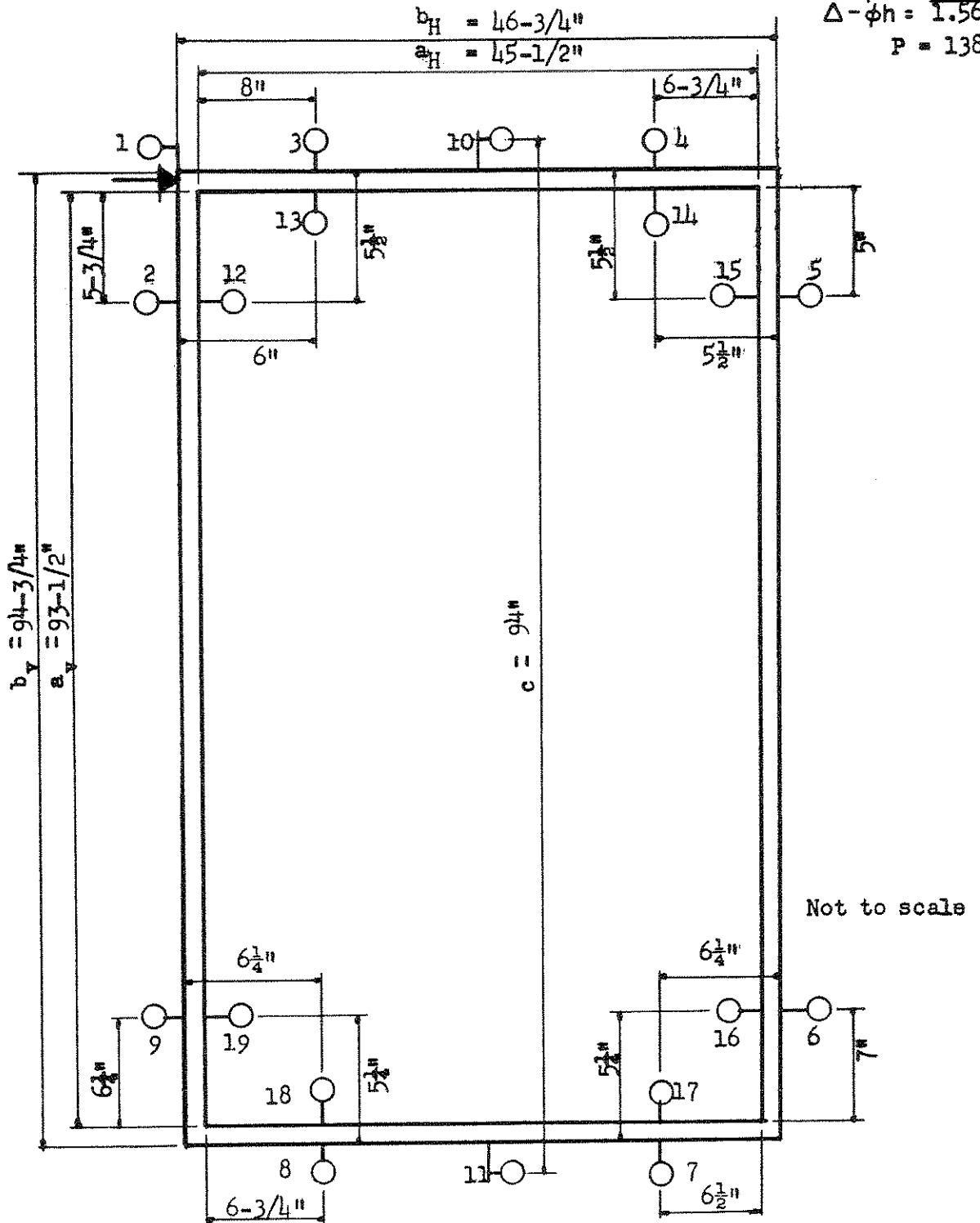
LOAD	300 psi		350		400		600		800		1000		1000
	515 lbs		600		690		1030		1375		1720		1720
GAGE	READ		READ		READ		READ		READ		READ		READ
1	1207	-1795	1131	-1871	1082	-1920	732	-2270	544	-2458	387	-2615	Failure
2	1824	+1674	1850	+1710	1895	+1755	out	--	--	--	--	--	
3	307	- 21	297	- 31	290	- 38	259	- 69	231	- 97	217	-111	
4	out	--	--	--	--	--	--	--	--	--	--	--	
5	939	-1733	886	-1786	829	-1843	691	-1981	546	-2126	410	-2262	
6	1083	-163	1074	-179	1065	-181	1022	-224	994	-252	965	-281	
7	397	+ 22	394	+ 19	391	+ 16	382	+ 7	382	+ 7	385	+ 10	
8	286	0	286	0	287	+ 1	297	+ 11	306	+ 20	321	+ 35	
9	361	+179	372	+190	381	+199	424	+242	463	+281	491	+309	
10	2249	+1720	2311	+1782	2334	+1805	2561	+2032	2733	+2204	3059	+2530	
11	116	+ 42	122	+ 48	127	+ 53	154	+ 80	174	+100	194	+120	
12	717	+349	720	+352	720	+352	730	+362	745	+377	746	+378	
13	805	+196	806	+197	806	+197	806	+197	804	+195	804	+195	
14	164	-118	161	-121	158	-124	150	-132	127	-155	122	-160	
15	089	-342	086	-345	085	-346	077	-354	070	-361	068	-363	
16	1097	+438	1097	+438	1097	+438	1095	+436	1093	+434	1093	+434	
17	632	+ 98	632	+ 98	632	+ 98	638	+104	633	+ 99	628	+ 94	
18	241	-212	230	-223	226	-227	211	-242	199	-254	197	-256	
19	719	-431	718	-432	717	-433	712	-438	720	-430	721	-429	

PANEL: S-3-b-3/4-s
 SERIES: I

DATE GLAZED: 6/19/1959
 DATE TESTED: 6/31/1959

36
 PART II

Results at failure: $\Delta = 1.84''$
 $\phi h = 0.28''$
 $\Delta - \phi h = 1.56''$
 $P = 1380 \text{ lbs}$



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: S-3-b-3/4-s

SERIES: I

PART II

LOAD	0 psi	50		100		150		200		250	
	0 lbs	85		170		260		345		430	
GAGE	READ	READ		READ		READ		READ		READ	
1	1857	1776	- 81	1106	-751	709	-1148	552	-1305	421	-1436
2	345	409	+ 64	1039	+694	1401	+1056	1546	+1201	1639	+1294
3	301	304	+ 3	308	+ 7	291	- 10	270	- 31	264	- 37
4	004	007	+ 3	022	+ 18	018	+ 14	017	+ 13	015	+ 11
5	1787	1719	- 68	1091	-696	741	-1046	594	-1193	501	-1286
6	834	835	+ 1	800	- 34	778	- 56	765	- 69	754	- 80
7	673	673	0	674	+ 1	677	+ 4	678	+ 5	679	+ 6
8	529	534	+ 5	540	+ 11	556	+ 27	568	+ 39	578	+ 49
9	1000	1003	+ 3	1035	+ 35	1068	+ 68	1088	+ 88	1102	+102
10	983	1048	+ 65	1700	+717	2090	+1107	2259	+1276	2359	+1376
11	024	024	0	026	+ 2	029	+ 5	031	+ 7	034	+ 10
12	133	165	+ 32	288	+155	362	+229	369	+236	370	+237
13	453	459	+ 6	584	+131	598	+145	596	+143	596	+143
14	334	331	- 3	318	- 16	287	- 47	258	- 76	243	- 91
15	356	321	- 35	203	-153	129	-227	124	-232	115	-241
16	491	506	+ 15	635	+144	728	+237	743	+252	749	+258
17	1091	1092	+ 1	1097	+ 6	1117	+ 26	1137	+ 46	1144	+ 53
18	1204	1203	- 1	1073	-131	1043	-161	1032	-172	1024	-180
19	1050	1034	- 16	900	-150	821	-229	813	-237	813	-237

PANEL: S-3-b-3/4-s

SERIES: I

PART II

LOAD	300 psi		400		500		600		800	
	515 lbs		690		860		1030		1380	
GAGE	READ		READ		READ		READ		READ	
1	397	-1160	298	-1559	163	-1694	48	-1809	Failure	
2	1654	+1309	1738	+1393	1848	+1503	1942	+1597		
3	263	- 38	260	- 41	257	- 44	255	- 46		
4	018	+ 14	028	+ 24	037	+ 33	045	+ 41		
5	482	-1305	396	-1391	272	-1515	168	-1619		
6	752	- 82	731	-103	701	-133	677	-157		
7	679	+ 6	681	+ 8	687	+ 14	691	+ 18		
8	581	+ 52	591	+ 62	607	+ 78	620	+ 91		
9	1107	+107	1131	+131	1163	+163	1191	+191		
10	2379	+1396	2479	+1496	2604	+1621	2708	+1725		
11	037	+ 13	050	+ 26	067	+ 43	081	+ 57		
12	370	+237	370	+237	372	+239	373	+240		
13	595	+142	598	+145	598	+145	594	+141		
14	242	- 92	232	-102	220	-114	212	-122		
15	116	-240	119	-237	122	-234	125	-231		
16	749	+258	751	+260	754	+263	755	+264		
17	1144	+ 53	1144	+ 53	1143	+ 52	1143	+ 52		
18	1022	-182	1012	-192	999	-205	989	-215		
19	813	-237	817	-233	822	-228	826	-224		

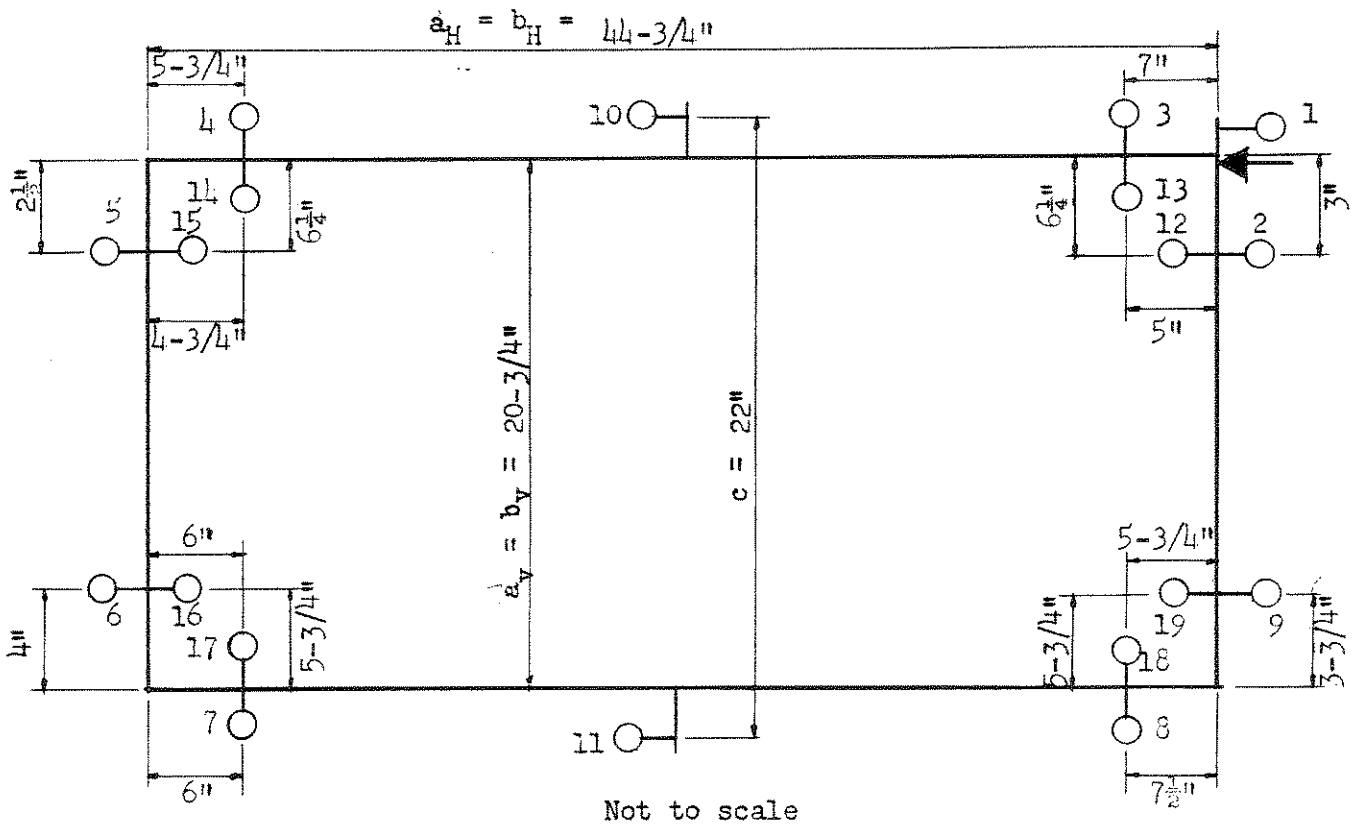
PANEL: W-1-a- $\frac{1}{2}$ -s
 SERIES: I

DATE GLAZED: 6/19/1959
 DATE TESTED: 7/2 /1959

PART II

Results at failure:

$\Delta = 1.41''$
 $\phi h = 0.06''$
 $\Delta - \phi h = 1.35''$
 $P = 3440 \text{ lbs}$



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: W-1-a- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	0 psi	50	100	150	200	250					
	0 lbs	85	170	260	345	430					
GAGE	READ	READ	READ	READ	READ	READ					
1	1983	1972	- 11	1874	-109	1785	-198	1736	-247	1693	-290
2	114	131	+ 17	212	+ 98	283	+169	320	+206	349	+235
3	256	257	+ 1	258	+ 2	258	+ 2	256	0	253	- 3
4	119	120	+ 1	125	+ 6	129	+ 10	129	+ 10	129	+ 10
5	1905	1888	- 17	1807	- 98	1732	-173	1689	-216	1651	-254
6	748	743	- 5	721	- 27	697	- 51	680	- 68	664	- 84
7	188	188	0	187	- 1	186	- 2	186	- 2	186	- 2
8	468	468	0	468	0	469	+ 1	469	+ 1	469	+ 1
9	538	543	+ 5	566	+ 28	587	+ 49	607	+ 59	607	+ 69
10	129	151	+ 26	246	+117	333	+204	418	+249	418	+289
11	142	142	0	154	+ 12	148	+ 6	150	+ 7	150	+ 8
12	821	829	+ 8	853	+ 32	868	+ 47	875	+ 52	875	+ 54
13	459	459	0	459	0	464	+ 5	471	+ 9	471	+ 12
14	300	300	0	299	- 1	297	- 3	286	- 8	286	- 14
15	759	749	- 10	721	- 38	702	- 57	681	- 67	681	- 78
16	737	736	- 1	745	+ 8	754	+ 17	756	+ 19	756	+ 19
17	305	305	0	305	0	306	+ 1	312	+ 5	312	+ 7
18	383	382	- 1	383	0	381	- 2	370	- 7	370	- 13
19	648	648	0	638	- 10	626	- 22	615	- 29	615	- 33

PANEL: W-1-a- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	300 psi		350		400		500		600		800	
	515 lbs		600		690		860		1030		1375	
GAGE	READ		READ		READ		READ		READ		READ	
1	1651	-332	1596	-387	1528	-455	1398	-585	1259	-724	1044	-939
2	377	+263	412	+298	459	+345	551	+437	644	+530	790	+676
3	251	- 5	258	+ 2	249	- 7	247	- 9	243	- 13	238	- 18
4	128	+ 9	128	+ 9	127	+ 8	129	+ 10	130	+ 11	133	+ 14
5	1613	-292	1565	-340	1502	-403	1383	-522	1257	-648	1061	-844
6	650	- 98	632	-116	608	-140	559	-189	502	-246	411	-337
7	185	- 3	185	- 3	184	- 4	184	- 4	183	- 5	181	- 7
8	470	+ 2	470	+ 2	470	+ 2	471	+ 3	472	+ 4	472	+ 4
9	617	+ 79	628	+ 90	643	+105	676	+138	703	+165	747	+209
10	461	+332	513	+384	581	+452	707	+578	840	+711	1046	+917
11	152	+ 10	155	+ 13	157	+ 15	162	+ 20	168	+ 26	180	+ 38
12	878	+ 57	882	+ 61	886	+ 65	895	+ 74	907	+ 86	919	+ 98
13	479	+ 20	490	+ 31	500	+ 41	518	+ 59	544	+ 85	580	+121
14	281	- 19	273	- 27	252	- 48	240	- 60	239	- 61	238	- 62
15	670	- 89	659	-100	647	-112	629	-130	612	-147	594	-165
16	754	+ 17	752	+ 15	754	+ 17	762	+ 25	774	+ 37	800	+ 63
17	314	+ 9	319	+ 14	336	+ 31	353	+ 48	372	+ 67	412	+107
18	361	- 22	347	- 36	335	- 48	310	- 73	280	-103	241	-142
19	610	-38	606	-42	598	- 50	580	- 68	563	- 85	530	-118

PANEL: W-1-a- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	1000 psi		1100		1200		1400		1600		1800		2000
	1720 lbs		1890		2065		2410		2770		3117		3440
GAGE	READ		READ		READ		READ		READ		READ		READ
1	871	-1112	784	-1199	678	-1305	514	-2469	404	-1579	295	-1688	Failure
2	906	+792	964	+850	1038	+924	1154	+1040	1228	+1114	1302	+1188	
3	236	- 20	232	- 24	230	- 26	224	- 32	224	- 32	220	- 36	
4	134	+ 15	135	+ 16	138	+ 19	139	+ 20	144	+ 25	153	+ 34	
5	908	-997	832	-1073	743	-1162	599	-1306	502	-1403	411	-1494	
6	343	-405	310	-438	270	-478	203	-545	159	-589	116	-632	
7	180	- 8	180	- 8	180	- 8	169	- 19	166	- 22	158	- 30	
8	472	+ 4	473	+ 5	473	+ 5	468	0	468	0	467	- 1	
9	781	+243	797	+259	817	+279	846	+308	868	+330	890	+352	
10	1208	+1079	1289	+1160	1387	+1258	1534	+1405	1634	+1505	1730	+1601	
11	187	+ 45	189	+ 47	192	+ 50	193	+ 51	198	+ 56	204	+ 62	
12	927	+106	931	+110	935	+114	935	+114	932	+111	926	+105	
13	605	+146	621	+162	637	+178	654	+195	656	+197	637	+178	
14	239	- 61	238	- 62	cut	--	--	--	--	--	--	--	
15	580	-179	574	-185	565	-194	551	-208	542	-217	536	-223	
16	826	+ 89	839	+102	854	+117	881	+144	896	+159	907	+170	
17	429	+124	436	+131	441	+136	448	+143	447	+142	439	+134	
18	216	-167	200	-183	182	-201	152	-231	136	-247	110	-273	
19	498	-150	480	-168	459	-189	421	-227	396	-252	370	-278	

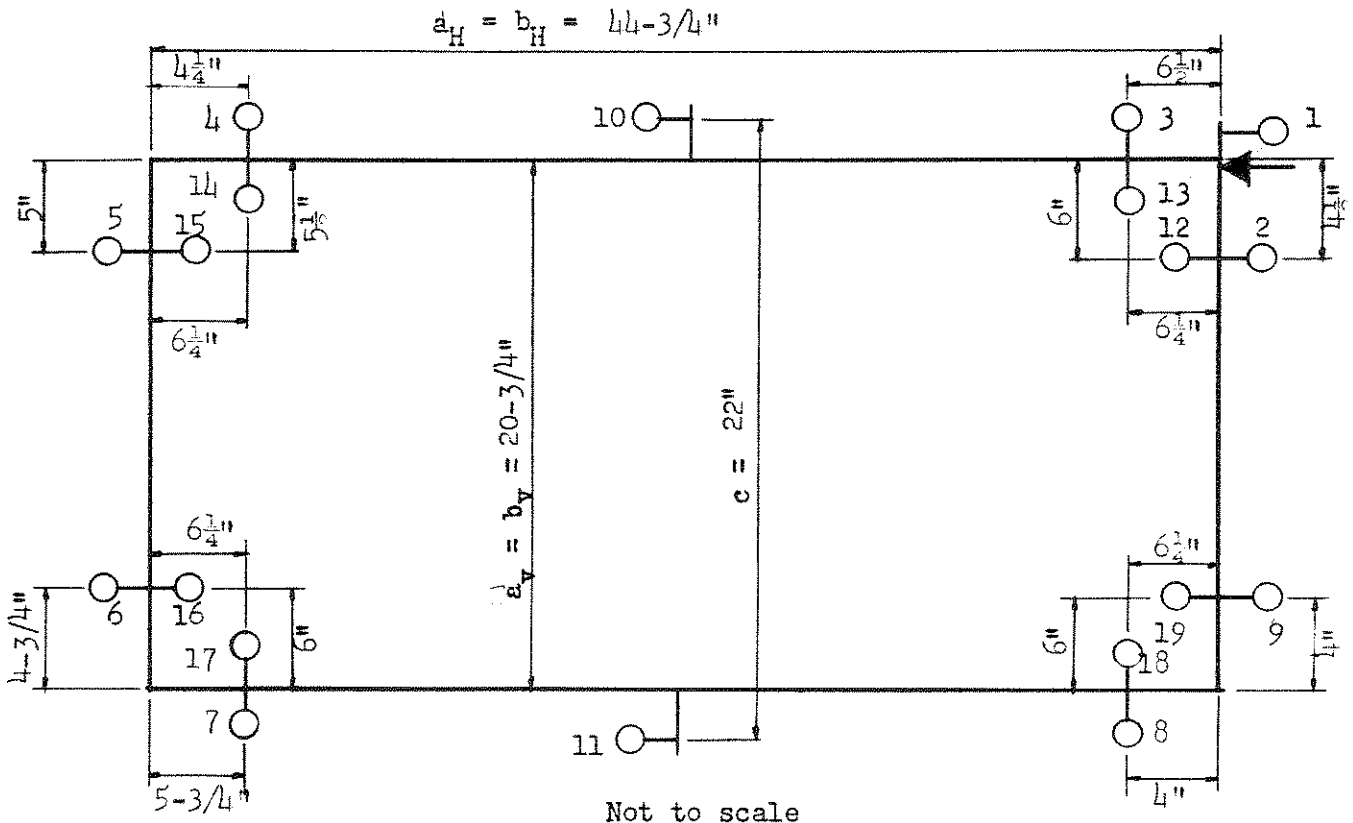
PANEL: W-1-b- $\frac{1}{2}$ -s
 SERIES: I

DATE GLAZED: 6/19/1959
 DATE TESTED: 7/6/1959

PART II

Results at failure:

$\Delta = 2.00''$
 $\phi h = 0.05''$
 $\Delta - \phi h = 1.95''$
 P = 3900 lbs



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: W-1-b- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	0 psi		50		100		150		200	
	0 lbs		85		170		260		345	
GAGE	READ		READ		READ		READ		READ	
1	2950		2940	- 10	2875	- 75	2792	- 158	2500	- 450
2	279		279	0	340	+ 61	401	+ 132	613	+ 334
3	706		700	- 6	698	- 8	697	- 9	698	- 8
4	711		709	- 2	712	+ 1	715	+ 4	721	+ 10
5	1804		1802	- 2	1738	- 66	1676	- 128	1449	- 355
6	802		799	- 3	776	- 26	752	- 50	659	- 143
7	290		290	0	288	- 2	286	- 4	282	- 8
8	636		637	+ 1	639	+ 3	640	+ 4	642	+ 6
9	326		326	0	344	+ 18	364	+ 38	421	+ 95
10	000		4	+ 4	88	+ 88	170	+ 170	462	+ 462
11	20		21	+ 1	23	+ 3	26	+ 6	28	+ 8
12	240		240	0	288	+ 44	318	+ 78	296	+ 56
13	405		405	0	406	+ 1	410	+ 5	434	+ 29
14	410		410	0	406	- 4	402	- 8	391	- 19
15	1100		1100	0	1045	- 55	1005	- 95	985	- 115
16	315		315	0	295	- 20	284	- 31	359	+ 44
17	460		460	0	461	+ 1	463	+ 3	469	+ 9
18	295		295	0	292	- 3	285	- 10	256	- 39
19	1085		1080	0	1102	+ 17	1105	+ 20	989	- 96

PANEL: W-1-b- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	300 psi		400		500		600		800	
	515 lbs		690		860		1030		1375	
GAGE	READ		READ		READ		READ		READ	
1	2191	- 759	1994	- 956	1861	-1089	1749	-1201	1499	-1451
2	766	+ 487	370	+ 649	454	+ 733	525	+ 804	693	+ 972
3	693	- 13	693	- 13	697	- 9	700	- 6	708	+ 2
4	726	+ 15	737	+ 23	739	+ 28	740	+ 29	772	+ 61
5	1210	- 594	1046	- 758	941	- 863	854	- 950	660	-1144
6	550	- 252	468	- 334	416	- 386	373	- 429	276	- 526
7	280	- 10	280	- 10	277	- 13	276	- 14	273	- 17
8	645	+ 9	646	+ 10	646	+ 10	645	+ 9	641	+ 5
9	462	+ 136	499	+ 173	524	+ 198	546	+ 220	600	+ 274
10	756	+ 756	952	+ 952	1075	+1075	1178	+1178	1411	+1411
11	28	+ 8	34	+ 14	40	+ 20	47	+ 27	64	+ 44
12	276	+ 36	269	+ 29	269	+ 29	265	+ 25	251	+ 11
13	468	+ 63	495	+ 90	513	+ 108	527	+ 122	551	+ 146
14	366	- 44	340	- 70	327	- 83	319	- 91	311	- 99
15	911	- 189	858	- 242	830	- 270	809	- 291	783	- 317
16	365	+ 50	370	+ 55	379	+ 64	389	+ 74	426	+ 111
17	491	+ 31	517	+ 57	531	+ 71	539	+ 79	549	+ 89
18	220	- 75	192	- 103	176	- 119	166	- 129	150	- 145
19	910	- 175	861	- 224	829	- 256	807	- 288	708	- 377

PANEL: W-1-b- $\frac{1}{2}$ -s

SERIES: I

PART II

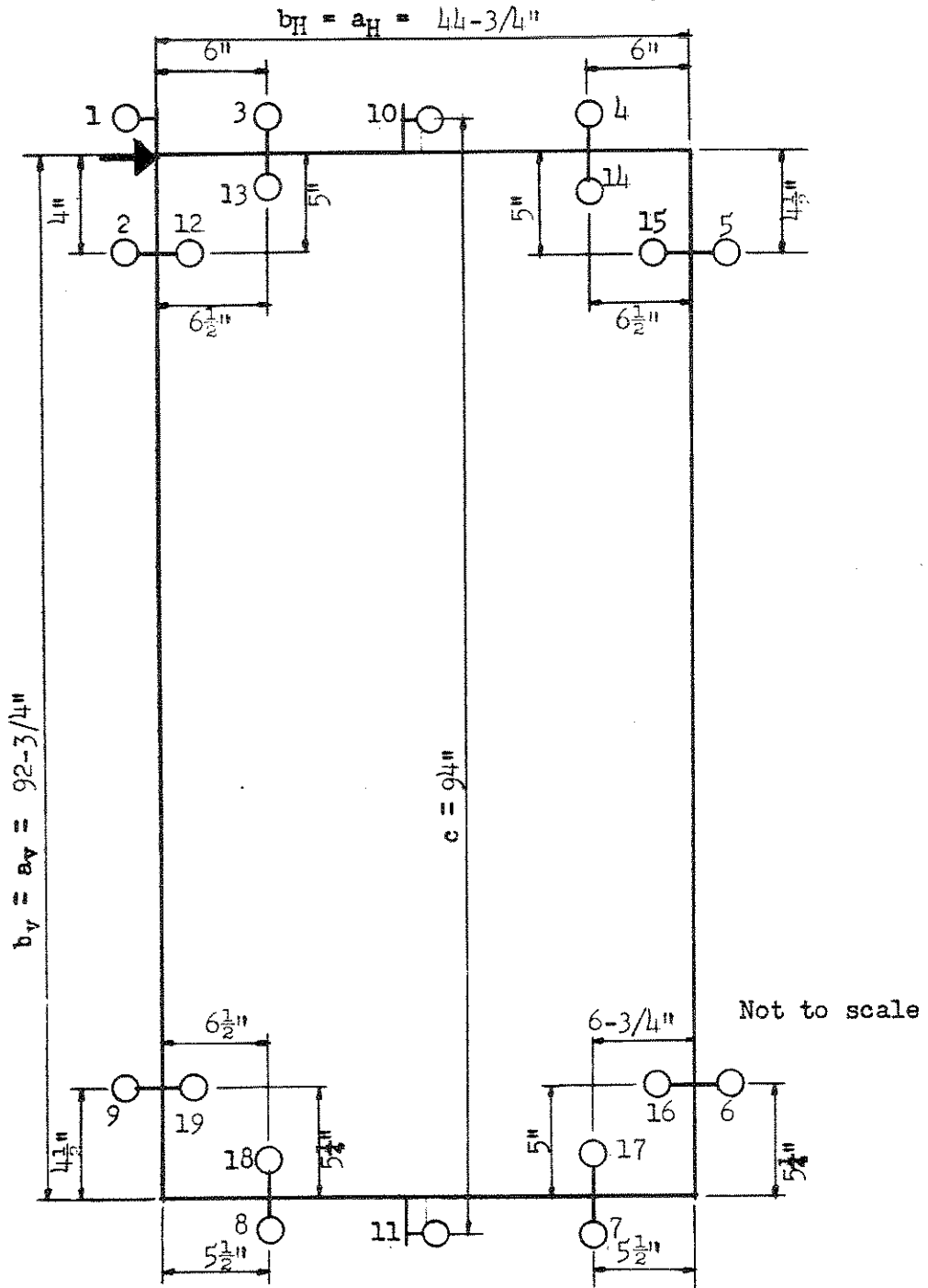
LOAD	1000 psi		1200		1800		2200			
	1720 lbs		2065		3117		3900			
GAGE	READ		READ		READ		READ		READ	
1	1289	-1661	1018	-1932	731	-2219	Failure			
2	835	+1114	995	+1274						
3	719	+ 13	727	+ 21						
4	780	+ 69	721	+ 80						
5	498	-1306	315	-1489						
6	193	- 609	105	- 697						
7	266	- 24	268	- 22						
8	639	+ 3	640	+ 4						
9	647	+ 321	702	+ 376						
10	1609	+1609	1830	+1830						
11	82	+ 62	103	+ 83						
12	244	+ 4	232	- 8						
13	565	+ 160	579	+ 174						
14	310	- 100	314	- 96						
15	749	- 351	717	- 383						
16	460	+ 145	502	+ 187						
17	554	+ 94	559	+ 99						
18	167	- 128	165	- 130						
19	632	- 453	544	- 541						

PANEL: W-3-a- $\frac{1}{2}$ -s
 SERIES: I

DATE GLAZED: 6/19/1959
 DATE TESTED: 7/2/1959

PART II

Results at failure: $\Delta = 3.52''$
 $\phi h = 0.34''$
 $\Delta - \phi h = 3.18''$
 P = 3340 lbs



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: W-3-a- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	0 psi		50		100		150		200		250	
	0 lbs		85		170		260		345		430	
GAGE	READ		READ		READ		READ		READ		READ	
1	3863		3849	- 14	3630	-233	3452	-411	3112	-751	2915	-948
2	140		144	+ 4	447	+307	506	+366	805	+665	975	+835
3	742		742	0	737	- 5	726	- 16	715	- 27	695	- 47
4	584		584	0	580	- 4	577	- 7	569	- 15	563	- 21
5	3458		3448	- 10	3244	-214	3078	-380	2766	-692	2583	-875
6	729		728	- 1	712	- 17	694	- 35	662	- 67	641	- 88
7	733		733	0	730	- 3	729	- 4	726	- 7	725	- 8
8	391		392	+ 1	390	- 1	393	+ 2	395	+ 4	396	+ 5
9	988		988	0	998	+ 10	1010	+ 22	1028	+ 40	1040	+ 52
10	11		24	+ 13	239	+228	413	+402	745	+734	939	+928
11	870		870	0	870	0	871	+ 1	874	+ 4	875	+ 5
12	919		922	+ 3	977	+ 58	986	+ 67	995	+ 76	1005	+ 86
13	581		581	0	590	+ 9	597	+ 16	624	+ 43	641	+ 60
14	388		386	- 2	375	- 13	358	- 30	326	- 62	307	- 81
15	724		722	- 2	665	- 59	648	- 76	625	- 99	612	-112
16	647		647	0	714	+ 67	742	+ 95	785	+138	802	+155
17	642		640	- 2	647	+ 5	658	+ 16	682	+ 40	695	+ 53
18	1403		1402	- 1	1387	- 16	1362	- 41	1307	- 96	1272	-131
19	679		678	- 1	610	- 69	572	-107	516	-163	491	-188

PANEL: W-3-a- $\frac{1}{2}$ -s

SERIES: I

PART II

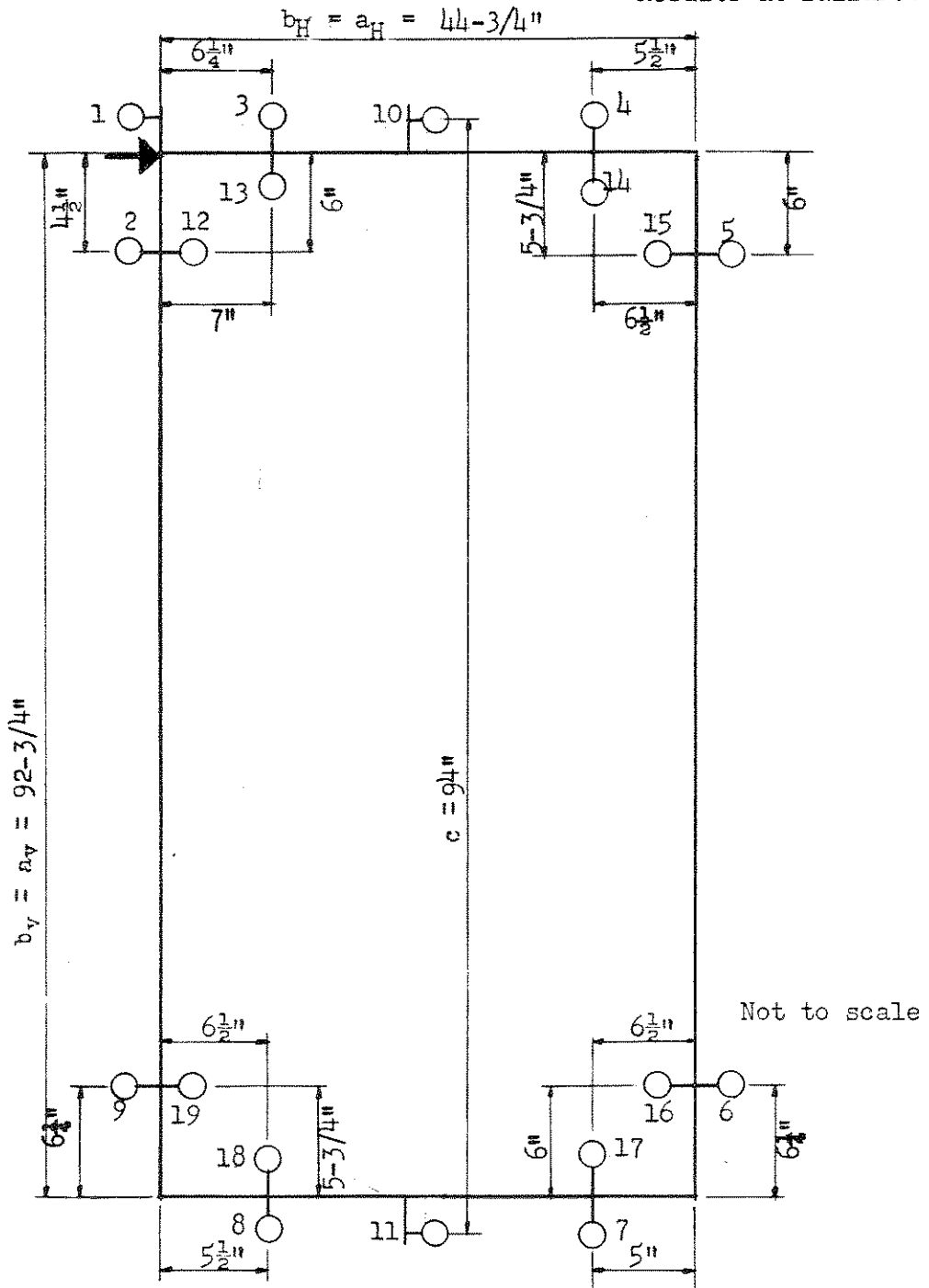
LOAD	300 psi		350		400		500		600		800	
	515 lbs		600		690		860		1030		1375	
GAGE	READ		READ		READ		READ		READ		READ	
1	2710	-1153	2401	-1162	2308	-1555	2097	-1766	1879	-1984	1345	-2518
2	1165	+1025	1437	+1297	1514	+1374	1745	+1605	1939	+1799	2337	+2197
3	675	- 67	645	- 97	636	-106	607	-135	583	-159	541	-201
4	557	- 27	552	- 32	548	- 36	538	- 46	527	- 57	504	- 80
5	2391	-1067	2145	-1313	2063	-1395	1908	-1550	1626	-1832	1282	-2176
6	612	-117	563	-166	546	-183	493	-236	439	-290	360	-369
7	723	- 10	723	- 10	722	- 11	724	- 9	725	- 8	729	- 4
8	397	+ 6	401	- 10	401	+ 10	440	+ 49	399	+ 8	396	+ 5
9	1054	+ 66	1083	+ 95	1089	+101	1107	+119	1124	+136	1155	+167
10	1144	+1133	1444	+1433	1535	+1524	1786	+1775	1999	+1988	2333	+2322
11	877	+ 7	883	+ 13	884	+ 14	886	+ 16	890	+ 20	896	+ 26
12	1019	+100	1051	+132	1057	+138	1073	+154	1084	+165	1110	+191
13	661	+ 80	689	+108	693	+112	717	+136	738	+157	772	+191
14	286	-102	260	-128	248	-140	221	-167	199	-189	155	-233
15	597	-127	572	-152	563	-161	544	-180	538	-186	538	-186
16	818	+171	833	+186	833	+186	825	+178	854	+207	845	+198
17	710	+ 68	728	+ 86	735	+ 93	755	+113	770	+128	800	+158
18	1297	-106	1195	-208	1182	-221	1149	-254	1121	-282	1069	-334
19	465	-214	421	-258	405	-274	360	-319	290	-389	204	-475

PANEL: W-3-b- $\frac{1}{2}$ -s
 SERIES: I

DATE GLAZED: 6/19/1959
 DATE TESTED: 7/6/1959

PART II

Results at failure: $\Delta = 3.83''$
 $\phi h = 0.47''$
 $\Delta - \phi h = 3.36''$
 $P = 3430 \text{ lbs}$



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: W-3-b- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	0 psi		50		100		150		200	
	0 lbs		85		170		260		430	
GAGE	READ		READ		READ		READ		READ	
1	4019		4015	- 4	3988	- 31	3877	-142	3500	-519
2	607		608	+ 1	629	+ 22	730	+123	1056	+449
3	337		336	- 1	334	- 3	321	- 16	288	- 49
4	378		378	0	379	+ 1	377	- 1	373	- 5
5	2700		2699	- 1	2677	- 23	2580	-120	2239	-461
6	790		790	0	787	- 3	774	- 16	742	- 48
7	226		226	0	226	0	225	- 1	217	- 9
8	096		097	+ 1	099	+ 3	100	+ 4	105	+ 9
9	113		113	0	116	+ 3	126	+ 13	154	+ 41
10	943		944	+ 1	967	+ 24	1073	+130	1438	+495
11	499		499	0	500	+ 1	500	+ 1	504	+ 5
12	130		131	+ 1	131	+ 1	133	+ 3	142	+ 12
13	195		195	0	196	+ 1	217	+ 22	279	+ 84
14	340		340	0	338	- 2	338	- 2	316	- 24
15	1165		1165	0	1164	- 1	1161	- 4	1140	- 25
16	331		331	0	333	+ 2	342	+ 11	347	+ 16
17	150		150	0	152	+ 2	150	+ 0	162	+ 12
18	1194		1194	0	1191	- 3	1159	- 35	1068	-126
19	333		333	0	330	0	320	- 13	309	- 24

PANEL: W-3-b- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	300 psi		400		600		800		1000	
	515 lbs		690		1030		1375		1720	
GAGE	READ		READ		READ		READ		READ	
1	3118	-901	2694	-1325	2125	-1894	1879	-2140	1526	-2493
2	1392	+785	1758	+1151	2271	+1664	2485	+1878	2789	+2132
3	250	- 87	205	-132	144	-193	120	-217	098	-239
4	374	- 4	374	- 4	370	- 8	369	- 9	370	- 8
5	1892	-808	1406	-1294	951	-1749	726	-1974	403	-2297
6	695	- 95	637	-153	551	-239	509	-281	448	-342
7	208	- 18	202	- 24	193	- 33	190	- 36	186	- 40
8	116	+ 20	131	+ 35	148	+ 52	151	+ 55	159	+ 63
9	179	+ 66	206	+ 93	242	+129	256	+143	275	+162
10	1798	+855	2197	+1254	2654	+1711	2888	+1945	3222	+2279
11	509	+ 10	514	+ 15	518	+ 19	519	+ 20	522	+ 23
12	163	+ 33	185	+ 55	215	+ 85	226	+ 96	239	+109
13	310	+115	332	+137	372	+177	389	+194	410	+215
14	279	- 61	236	-104	169	-171	137	-203	85	-255
15	1102	- 63	1062	-103	1000	-165	971	-194	934	-231
16	365	+ 34	404	+ 73	465	+134	481	+150	503	+172
17	194	+ 44	231	+ 81	288	+138	314	+164	357	+207
18	1011	-183	949	-245	880	-314	857	-337	843	-351
19	275	- 58	216	-117	127	-206	93	-240	46	-287

PANEL: W-3-b- $\frac{1}{2}$ -s

SERIES: I

PART II

LOAD	1200 psi		1400		1600		1950	
	2065 lbs		2410		2770		3430	
GAGE	READ		READ		READ		READ	
1	1170	-2849	823	-3196	610	-3409	Failure	
2	3110	+2503						
3	081	-256						
4	370	- 8						
5	065	-2635						
6	377	-413						
7	181	- 45						
8	167	+ 71						
9	298	+185						
10	3566	+2623						
11	524	+ 25						
12	252	+122						
13	430	+235						
14	24	-316						
15	800	-365						
16	527	+196						
17	408	+258						
18	807	-387						
19	002	-331						

P A R T IIISERIES IIFailure Modes:

- A-1-a-1/2-s The right top- and left bottom corners failed simultaneously under a load of 945 lb.
No glass broke out.
- A-1-a-1-s The left bottom corner failed under a load of 1720 lb.
No glass broke out.
- A-2-a-1/2-s The glass panel failed due to an overall buckling under a load of 4660 lb.
Some glass flew outward over a distance of 6 ft. and some inward over a distance of 15 ft.
- A-2-a-1-s First cracks appeared in the right top corner under a load of 2400 lb. Additional cracks were recorded in the same corner under a load of 3700 lb. Final failure occurred under a load of 4560 lb.
No glass broke out.
- A-3-a-1/2-s The glass panel failed due to an overall buckling under a load of 2030 lb.
Some glass flew 8 ft. outward and some 6 ft. inward.
- A-3-a-1-s Under a load of 690 lb. the glass panel started to move out of the sash at the left top corner. The panel finally failed while moving out of the sash at the right side over the full height. The failure load was 860 lb.
Some glass flew outward over a distance of 20 ft. and some inward over a distance of 5 ft.

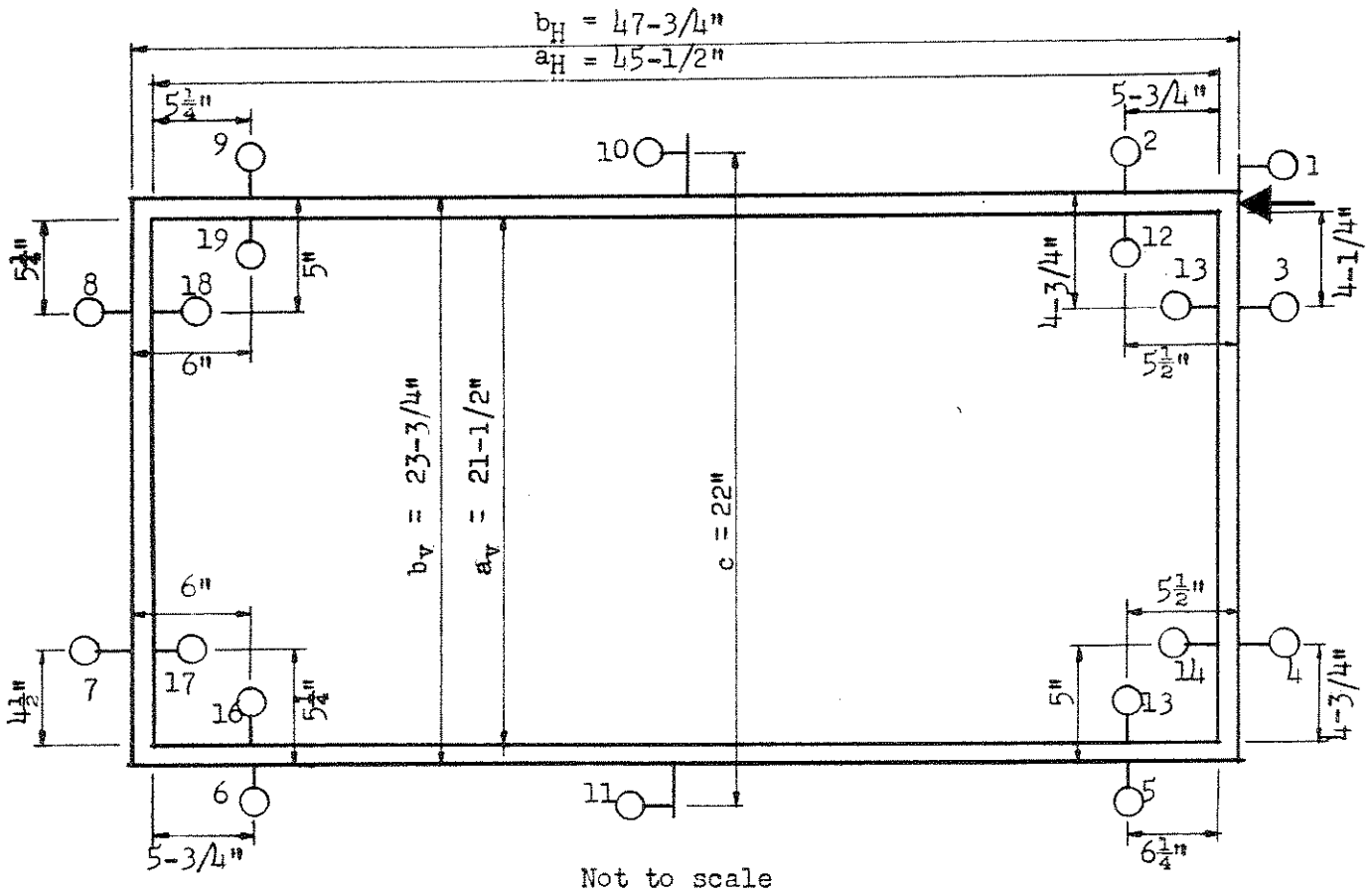
- A-1-a-1/2-h The glass panel failed due to an overall buckling under a load of 3850 lb.
The glass flew over a distance of 10 ft in both directions.
- A-1-a-1-h The glass panel failed due to an overall buckling under a load of 5700 lb.
Some glass flew outward over a distance of 15 ft and some inward over a distance of 10 ft.
- A-2-a-1/2-h The glass panel failed due to an overall buckling of the panel under a load of 6420 lb.
Some glass flew over a distance as far as 10 ft in both directions.
- A-2-a-1-h The glass panel failed due to an overall buckling of the panel under a load of 6660 lb.
The glass flew over a distance as far as 8 ft in both directions.
- A-3-a-1/2-h The glass panel failed due to a complete failure of the upper half of the panel under a load of 3550 lb. The failure started due to cracks at the left top corner of the glass panel.
Some glass flew as far as 12 ft outward and 6 ft inward.
- A-3-a-1-h The glass panel failed due to a complete buckling of the panel under a load of 6750 lb.
Some glass flew as far as 25 ft outward and 8 ft inward.

PANEL: A-1-a- $\frac{1}{2}$ -s
 SERIES: II

DATE GLAZED: 7/15/1959
 DATE TESTED: 7/17/1959

PART III

Results at failure: $\Delta = 0.81''$
 $\phi h = -0.02''$
 $\Delta - \phi h = 0.83''$
 $P = 945 \text{ lbs}$



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-1-a- $\frac{1}{2}$ -s

SERIES: II

PART III

LOAD	0 psi		100		200		300		400		550	
	0 lbs		172		345		515		690		945	
GAGE	READ		READ		READ		READ		READ		READ	
1	861		803	- 58	494	- 367	369	- 492	215	- 646	Failure	
2	442		444	+ 2	460	+ 18	462	+ 20	462	+ 20		
3	160		209	+ 49	463	+ 303	565	+ 405	684	+ 524		
4	396		405	+ 9	462	+ 66	493	+ 97	536	+ 140		
5	030		030	0	027	- 3	029	- 1	026	- 4		
6	519		523	+ 4	530	+ 11	528	+ 9	546	+ 27		
7	965		957	- 8	903	- 62	868	- 97	814	- 151		
8	621		575	- 46	334	- 287	238	- 383	126	- 495		
9	273		271	- 2	272	- 1	265	- 8	269	- 4		
10	205		264	+ 59	571	+ 366	695	+ 490	840	+ 635		
11	738		738	0	738	0	742	+ 4	756	+ 18		
12	224		228	+ 4	235	+ 11	375	+ 151	366	+ 142		
13	710		738	+ 28	854	+ 144	858	+ 148	860	+ 150		
14	527		518	- 9	449	- 78	421	- 106	414	- 113		
15	161		160	- 1	154	- 7	015	- 146	020	- 141		
16	412		412	0	413	+ 1	415	+ 3	603	+ 191		
17	303		392	+ 89	467	+ 164	485	+ 182	494	+ 191		
18	106		178	+ 72	955	- 151	054	- 52	055	- 51		
19	494		493	- 1	493	- 1	484	- 10	289	- 205		

PANEL: A-1-a-1-s
 SERIES: II

DATE GLAZED: 7/15/1959
 DATE TESTED: 7/21/1959

PART III

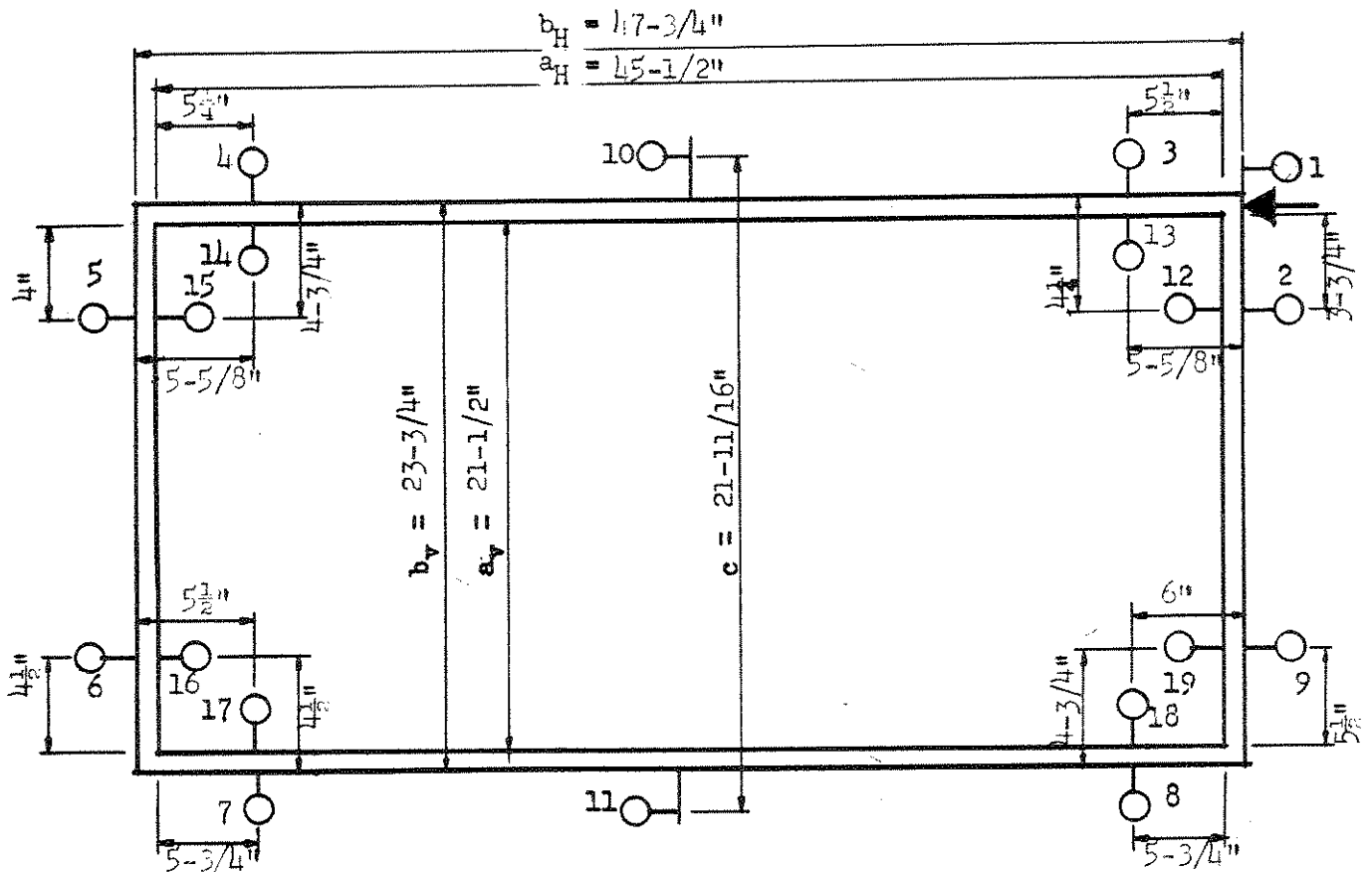
Results at failure:

$$\Delta = 1.36''$$

$$\phi h = \frac{0}{1.36''}$$

$$\Delta - \phi h = 1.36''$$

$$P = 1720 \text{ lbs}$$



Not to scale

Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-1-a-1-s

SERIES: II

PART III

LOAD	0 psi		100		200		300		400	
	0 lbs		85		170		515		690	
GAGE	READ		READ		READ		READ		READ	
1	1939		1920	- 19	1752	- 187	1384	- 555	898	-1041
2	989		1005	+ 16	1147	+ 158	1444	+ 455	1777	+ 788
3	574		573	- 1	587	+ 13	604	+ 30	596	+ 22
4	257		257	0	241	- 16	243	- 14	253	- 4
5	1957		1951	- 6	1813	- 144	1532	- 425	1174	- 783
6	790		788	- 2	763	- 27	680	- 110	564	- 226
7	498		489	+ 1	498	+ 10	495	+ 7	505	+ 17
8	144		144	0	142	- 2	140	- 4	140	- 4
9	943		946	+ 3	972	+ 29	1080	+ 137	1221	+ 278
10	078		097	+ 19	264	+ 186	613	+ 535	1067	+ 989
11	1022		1022	0	1023	+ 1	1047	+ 25	1078	+ 56
12	417		415	- 2	467	+ 50	640	+ 223	661	+ 244
13	489		491	+ 2	494	+ 5	498	+ 9	664	+ 175
14	1216		1215	- 1	1205	- 11	1202	- 14	1189	- 27
15	411		414	+ 3	364	- 47	202	- 209	197	- 214
16	278		254	- 24	315	+ 37	362	+ 84	560	+ 282
17	562		562	0	562	0	555	- 7	538	- 24
18	1223		1224	+ 1	1225	+ 2	1225	+ 2	1078	- 145
19	912		896	- 16	836	- 76	795	- 117	612	- 300

PANEL: A-1-a-1-s

SERIES: II

PART III

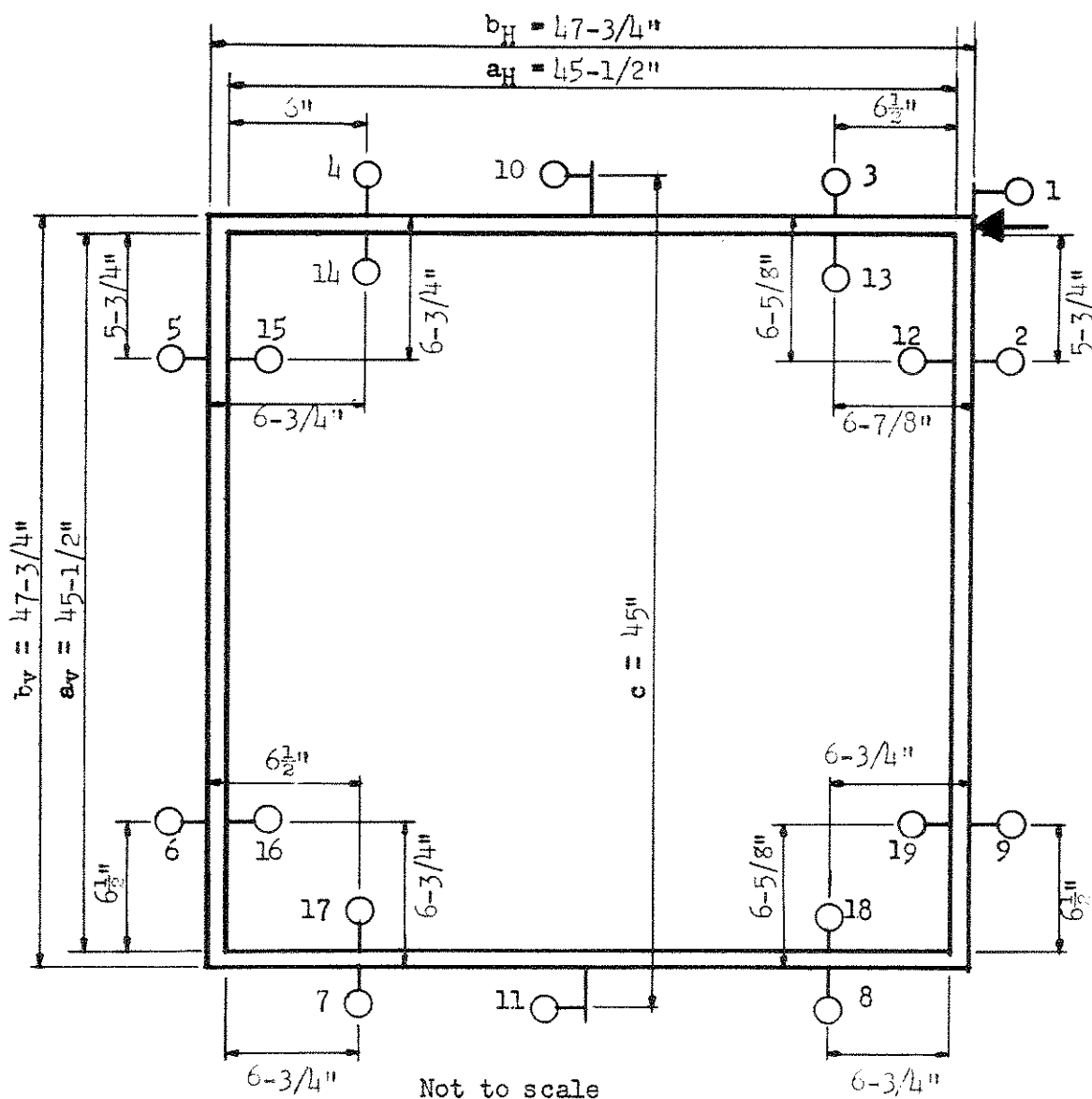
LOAD	500 psi		600		700		800		900		1000	
	860 lbs		1030		1200		1375		1550		1720	
GAGE	READ		READ		READ		READ		READ		READ	
1	765	-1174	668	-1271	572	-1367	465	-1474	364	-1575	Failure	
2	1862	+ 873	1924	+ 935	1983	+ 994	2048	+1059	2110	+1121		
3	586	+ 12	582	+ 8	581	+ 7	577	+ 3	575	+ 1		
4	258	+ 1	264	+ 7	268	+ 11	276	+ 19	282	+ 25		
5	1080	- 877	1011	- 946	946	-1011	873	-1084	808	-1149		
6	526	- 264	493	- 297	459	- 331	424	- 366	392	- 398		
7	494	+ 6	486	- 2	480	- 8	477	- 11	481	- 7		
8	140	- 4	140	- 4	141	- 3	142	- 2	143	- 1		
9	1261	+ 318	1290	+ 347	1318	+ 375	1349	+ 406	1379	+ 436		
10	1193	+1115	1267	+1189	1344	+1266	1431	+1353	1516	+1438		
11	1092	+ 70	1107	+ 85	1122	+ 100	1137	+ 115	1152	+ 130		
12	668	+ 251	669	+ 252	671	+ 254	674	+ 257	678	+ 261		
13	775	+ 286	823	+ 334	836	+ 347	850	+ 361	845	+ 356		
14	1165	- 51	1131	- 85	1070	- 146	984	- 232	888	- 328		
15	194	- 217	192	- 219	192	- 219	187	- 224	187	- 224		
16	567	+ 289	576	+ 298	585	+ 307	576	+ 298	592	+ 314		
17	560	- 2	596	+ 34	660	+ 98	743	+ 181	839	+ 277		
18	971	- 252	922	- 301	906	- 317	903	- 323	903	- 323		
19	612	- 300	612	- 300	609	- 303	607	- 305	607	- 305		

PANEL: A-2-a- $\frac{1}{2}$ -s
 SERIES: II

DATE GLAZED: 7/15/1959
 DATE TESTED: 7/31/1959

PART III

Results at failure: $\Delta = 1.09''$
 $\phi h = 0.28''$
 $\Delta - \phi h = 0.81''$
 $P = 4660 \text{ lbs}$



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-2-a- $\frac{1}{2}$ -s

SERIES: II

PART III

LOAD	0 psi		100		200		300		400	
	0 lbs		85		170		515		690	
GAGE	READ		READ		READ		READ		READ	
1	2362		2337	- 25	2249	- 113	2126	- 236	1967	- 395
2	941		959	+ 18	1009	+ 68	1089	+ 148	1233	+ 272
3	331		329	- 2	319	- 12	310	- 21	300	- 31
4	468		470	+ 2	470	+ 2	462	- 6	461	- 7
5	1796		1775	- 21	1707	- 89	1616	- 180	1486	- 310
6	876		875	- 1	848	- 28	828	- 48	791	- 85
7	115		112	- 3	109	- 6	105	- 10	104	- 11
8	076		077	+ 1	078	+ 2	078	+ 2	081	+ 5
9	015		019	+ 4	032	+ 17	048	+ 33	073	+ 58
10	000		22	+ 22	93	+ 93	190	+ 190	329	+ 329
11	000		000	0	1	+ 1	4	+ 4	9	+ 9
12	524		526	+ 2	537	+ 13	548	+ 24	564	+ 40
13	366		369	+ 3	375	+ 9	380	+ 14	387	+ 21
14	590		588	- 2	575	- 15	555	- 35	540	- 50
15	643		639	- 4	625	- 18	609	- 34	586	- 57
16	646		650	+ 4	658	+ 12	691	+ 45	745	+ 99
17	522		523	+ 1	535	+ 13	553	+ 31	572	+ 50
18	488		486	- 2	477	- 11	468	- 20	462	- 26
19	568		562	- 6	548	- 20	514	- 54	454	- 114

PANEL: A-2-a- $\frac{1}{2}$ -s

SERIES: II

PART III

LOAD	500 psi		600		800		1000		1200	
	860 psi		1030		1375		1720		2065	
GAGE	READ		READ		READ		READ		READ	
1	1868	- 494	1795	- 567	1691	- 671	1607	- 755	1540	- 822
2	1292	+ 351	1347	+ 406	1428	+ 487	1493	+ 552	1545	+ 604
3	294	- 37	287	- 44	273	- 58	257	- 74	242	- 89
4	459	- 9	459	- 9	455	- 13	447	- 21	446	- 22
5	1403	- 393	1344	- 452	1262	- 534	1196	- 600	1144	- 652
6	765	- 111	745	- 131	720	- 156	703	- 173	687	- 189
7	103	- 12	102	- 13	100	- 15	99	- 16	98	- 17
8	085	+ 9	090	+ 14	103	+ 27	117	+ 41	130	+ 54
9	089	+ 74	101	+ 86	121	+ 106	136	+ 121	149	+ 134
10	416	+ 416	478	+ 478	563	+ 563	633	+ 633	690	+ 690
11	15	+ 15	213	+ 21	33	+ 33	47	+ 47	58	+ 58
12	571	+ 47	576	+ 52	583	+ 59	587	+ 63	588	+ 64
13	390	+ 24	392	+ 26	396	+ 30	398	+ 32	398	+ 32
14	535	- 55	532	- 58	527	- 63	523	- 67	518	- 72
15	574	- 69	564	- 79	550	- 93	540	- 103	534	- 109
16	778	+ 132	794	+ 148	801	+ 155	802	+ 156	805	+ 159
17	582	+ 60	588	+ 66	596	+ 74	600	+ 78	604	+ 82
18	459	- 29	453	- 35	442	- 46	432	- 56	425	- 63
19	416	- 152	394	- 114	378	- 190	367	- 201	358	- 210

PANEL: A-2-a- $\frac{1}{2}$ -s

SERIES: II

PART III

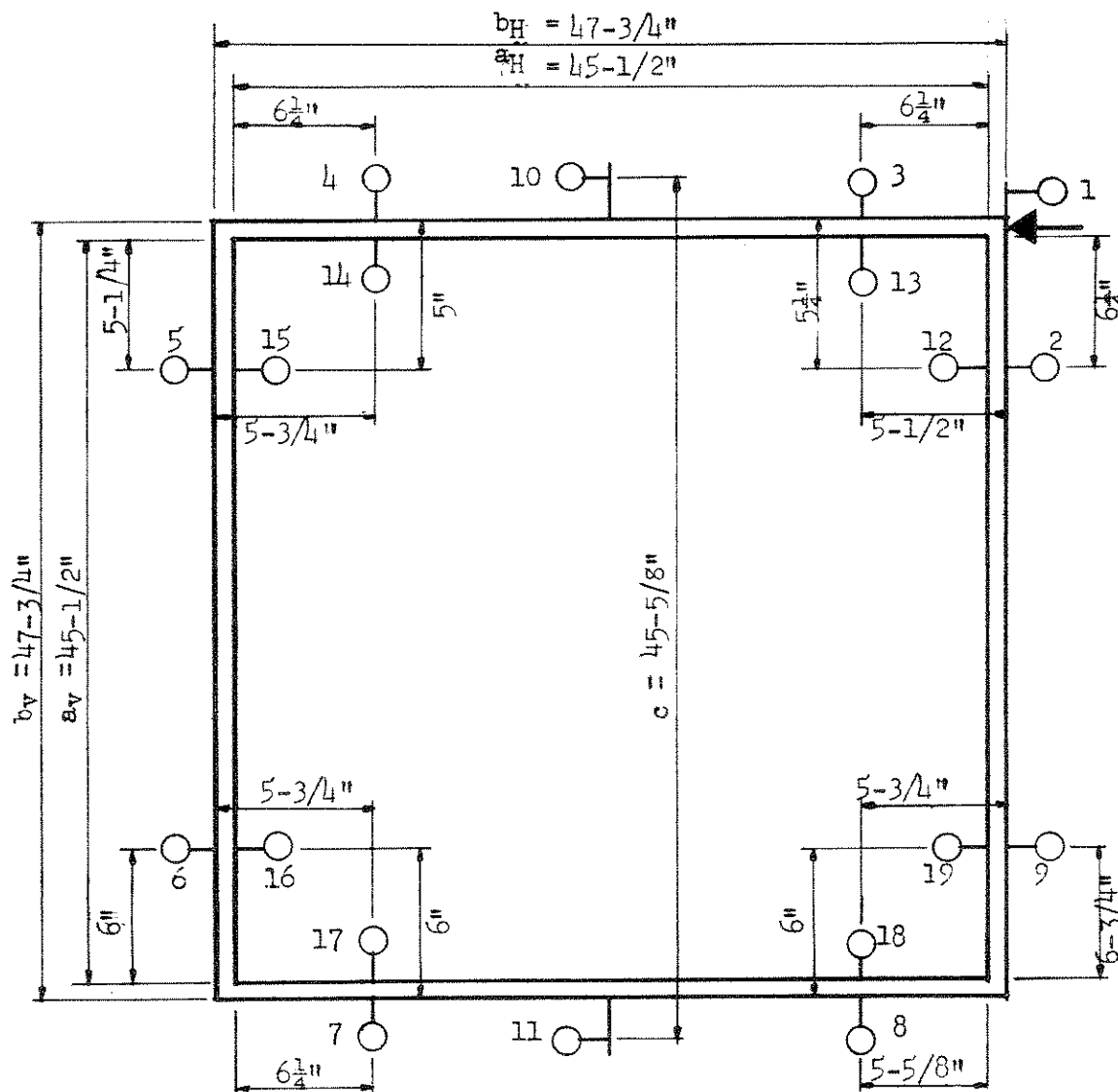
LOAD	1400 psi		1600		2000		2400		2600	
	2410 lbs		2770		3525		4280		4660	
GAGE	READ		READ		READ		READ		READ	
1	1469	- 893	1367	- 995	1196	-1166	969	-1393	Failure	
2	160	+ 660	1679	+ 738	1810	+ 869	1971	+1030		
3	227	- 104	205	- 126	177	- 154	114	- 217		
4	445	- 23	445	- 23	441	- 27	431	- 36		
5	1089	- 707	1012	- 784	882	- 914	720	-1076		
6	671	- 205	650	- 226	619	- 257	589	- 287		
7	98	- 17	96	- 19	93	- 22	82	- 33		
8	114	+ 38	132	+ 56	158	+ 82	195	+ 119		
9	163	+ 148	182	+ 167	205	+ 190	251	+ 236		
10	748	+ 748	828	+ 828	964	+ 964	1146	+1146		
11	71	+ 71	88	+ 88	112	+ 112	146	+ 146		
12	591	+ 67	594	+ 70	611	+ 87	624	+ 100		
13	398	+ 32	397	+ 31	399	+ 33	405	+ 39		
14	514	- 76	504	- 86	489	- 101	463	- 127		
15	527	- 116	519	- 124	499	- 144	487	- 156		
16	808	+ 162	812	+ 166	819	+ 173	839	+ 193		
17	608	+ 86	616	+ 94	634	+ 112	672	+ 150		
18	416	- 72	405	- 83	385	- 103	357	- 131		
19	349	- 219	336	- 232	316	- 252	297	- 271		

PANEL: A-2-a-1-s
 SERIES: II

DATE GLAZED: 7/15/1959
 DATE TESTED: 7/29/1959

PART III

Results at failure: $\Delta = 1.88''$
 $\phi h = 0.09''$
 $\Delta - \phi h = 1.79''$
 $P = 2400$ lbs



Not to scale

Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-2-a-1-s

SERIES: II

PART III

LOAD	0 psi		150		200		250		300	
	0 lbs		260		345		430		515	
GAGE	READ		READ		READ		READ		READ	
1	2372		2321	- 51	2200	- 172	1916	- 456	1666	- 706
2	995		1045	+ 50	1147	+ 152	1389	+ 394	1597	+ 602
3	570		567	- 3	565	- 5	571	+ 1	569	- 1
4	536		525	- 11	530	- 6	532	- 4	538	+ 2
5	1944		1892	- 52	1787	- 157	1545	- 399	1332	- 612
6	685		679	- 6	659	- 26	611	- 74	570	- 115
7	1012		1009	- 3	1008	- 4	1007	- 5	1000	- 12
8	529		529	0	529	0	529	0	530	+ 1
9	168		178	+ 10	200	+ 32	252	+ 84	299	+ 131
10	000		59	+ 59	177	+ 177	449	+ 449	686	+ 686
11	000		1	+ 1	3	+ 3	11	+ 11	23	+ 23
12	593		611	+ 18	649	+ 56	750	+ 157	808	+ 215
13	258		261	+ 3	264	+ 6	269	+ 11	288	+ 30
14	1297		1286	- 11	1278	- 19	1265	- 32	1241	- 56
15	1061		1044	- 17	998	- 63	885	- 176	821	- 240
16	349		366	+ 17	402	+ 53	481	+ 132	552	+ 203
17	191		198	+ 7	208	+ 17	221	+ 30	246	+ 55
18	407		404	- 3	400	- 7	395	- 12	378	- 29
19	1294		1277	- 17	1238	- 56	1153	- 141	1078	- 216

PANEL: A-2-a-1-s

SERIES: II

PART III

LOAD	400 psi		500		600		800		900	
	690 lbs		860		1030		1375		1550	
GAGE	READ		READ		READ		READ		READ	
1	1289	-1083	822	-1550	616	-1756	523	-1849	462	-1910
2	1913	+ 918	2274	+1279	2433	+1438	2501	+1506	2545	+1550
3	567	- 3	539	- 31	544	- 26	537	- 33	534	- 36
4	549	+ 13	568	+ 32	577	+ 41	583	+ 47	589	+ 53
5	1014	- 930	624	-1320	453	-1491	377	-1567	329	-1615
6	503	- 182	418	- 267	375	- 310	348	- 337	332	- 353
7	992	- 20	988	- 24	986	- 26	983	- 29	982	- 30
8	532	+ 3	532	+ 3	538	+ 9	545	+ 16	549	+ 20
9	369	+ 201	458	+ 290	494	+ 326	512	+ 344	523	+ 355
10	1042	+1042	1483	+1483	1672	+1672	1748	+1748	1797	+1797
11	41	+ 41	64	+ 64	82	+ 82	105	+ 105	119	+ 119
12	839	+ 246	865	+ 272	885	+ 292	891	+ 298	891	+ 298
13	396	+ 138	512	+ 254	613	+ 355	621	+ 363	633	+ 375
14	1162	- 135	1082	- 215	965	- 332	952	- 345	945	- 352
15	795	- 266	785	- 276	778	- 283	771	- 290	766	- 295
16	604	+ 255	625	+ 276	628	+ 279	632	+ 283	634	+ 285
17	329	+ 138	502	+ 311	519	+ 328	524	+ 333	527	+ 336
18	268	- 139	147	- 260	047	- 360	036	- 371	022	- 385
19	1029	- 265	1013	- 281	1007	- 287	995	- 299	998	- 296

PANEL: A-2-a-1-s

SERIES: II

PART III

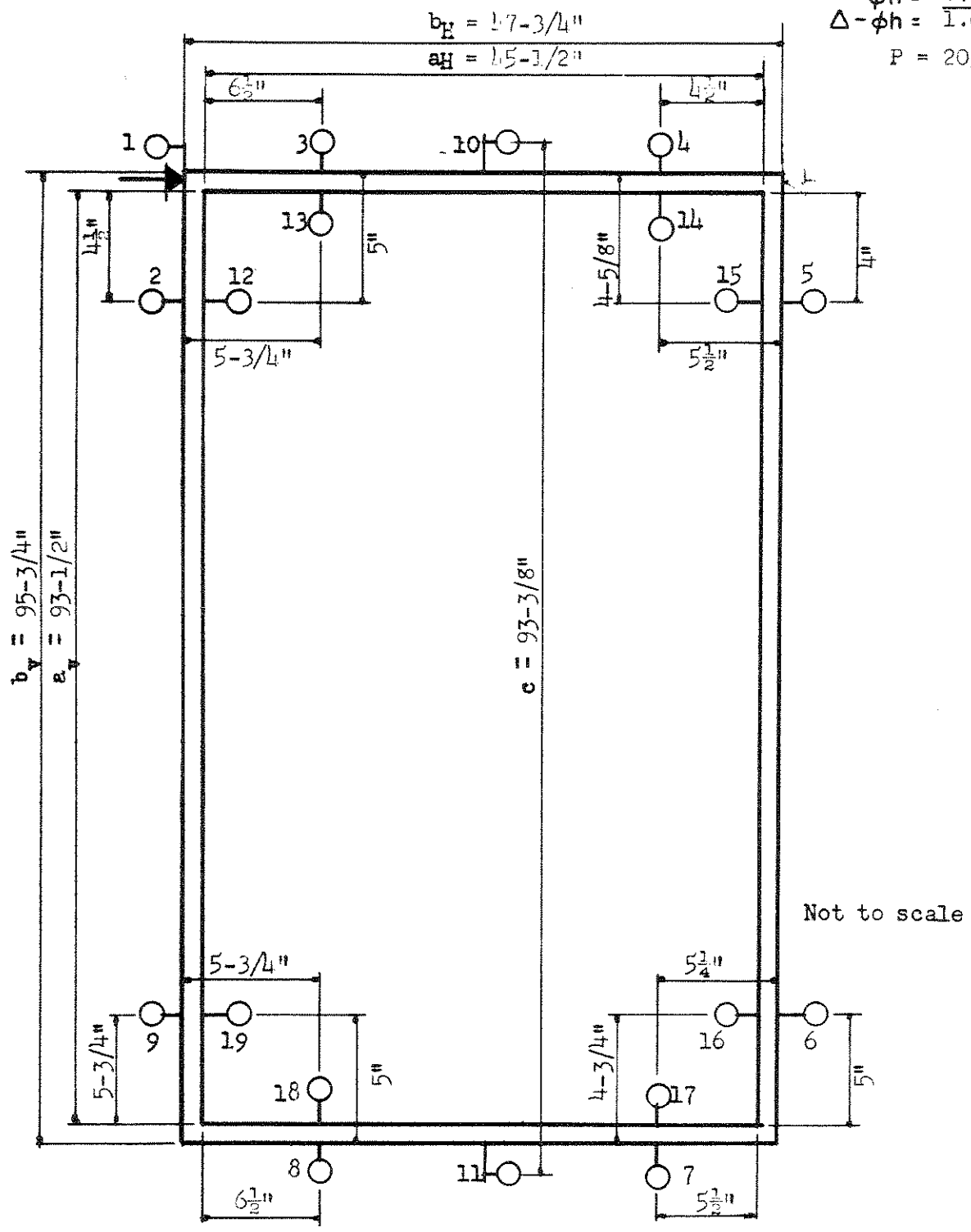
LOAD	1000 psi		1200		1400
	1720 lbs		2065		2400
GAGE	READ		READ		READ
1	416	-1956	207	-2165	Failure
2	2572	+1577	2644	+1649	
3	534	- 36	529	- 41	
4	590	+ 54	595	+ 59	
5	294	-1650	206	-1738	
6	321	- 364	296	- 389	
7	981	- 31	979	- 33	
8	562	+ 33	562	+ 33	
9	531	+ 363	554	+ 386	
10	1830	+1830	1914	+1914	
11	123	+ 123	124	+ 124	
12	895	+ 302	905	+ 312	
13	634	+ 376	642	+ 384	
14	943	- 354	933	- 364	
15	765	- 296	760	- 301	
16	637	+ 288	645	+ 296	
17	530	+ 339	536	+ 345	
18	018	- 389	004	- 403	
19	992	- 302	981	- 313	

PANEL: A-3-a- $\frac{1}{2}$ -s
 SERIES: II

DATE GLAZED: 7/15/1959
 DATE TESTED: 7/21/1959

PART III

Results at failure: $\Delta = 2.06''$
 $\phi h = 0.37''$
 $\Delta - \phi h = 1.69''$
 P = 2030 lbs



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-3-a- $\frac{1}{2}$ -s

SERIES: II

PART III

LOAD	0 psi		100		200		300		400	
	0 lbs		170		345		515		690	
GAGE	READ		READ		READ		READ		READ	
1	2934		2010	- 924	1665	-1269	1473	-1461	1270	-1664
2	085		957	+ 872	1257	+1172	1407	+1322	1548	+1463
3	501		492	- 9	478	- 23	457	- 54	439	- 72
4	350		338	- 12	334	- 16	332	- 18	331	- 17
5	2623		1732	- 891	1424	-1199	1257	-1366	1095	-1528
6	792		757	- 35	740	- 52	723	- 69	686	- 106
7	675		676	+ 1	663	- 12	662	- 13	664	- 11
8	009		000	- 9	000	- 9	011	+ 2	023	+ 14
9	219		326	+ 107	348	+ 129	366	+ 147	406	+ 187
10	000		920	+ 920	1235	+1235	1398	+1398	1561	+1561
11	011		018	+ 7	025	+ 14	034	+ 23	061	+ 50
12	228		345	+ 117	358	+ 130	364	+ 136	375	+ 147
13	360		573	+ 213	574	+ 214	580	+ 220	590	+ 230
14	261		213	- 48	200	- 61	168	- 93	156	- 105
15	627		496	- 131	479	- 148	472	- 155	458	- 169
16	049		201	-152	226	+ 177	231	+ 182	237	+ 188
17	121		140	+ 19	235	+ 114	260	+ 139	272	+ 151
18	463		238	- 225	226	- 237	200	- 263	183	- 280
19	471		305	- 166	308	- 163	311	- 160	312	- 159

PANEL: A-3-a- $\frac{1}{2}$ -s

SERIES: II

PART III

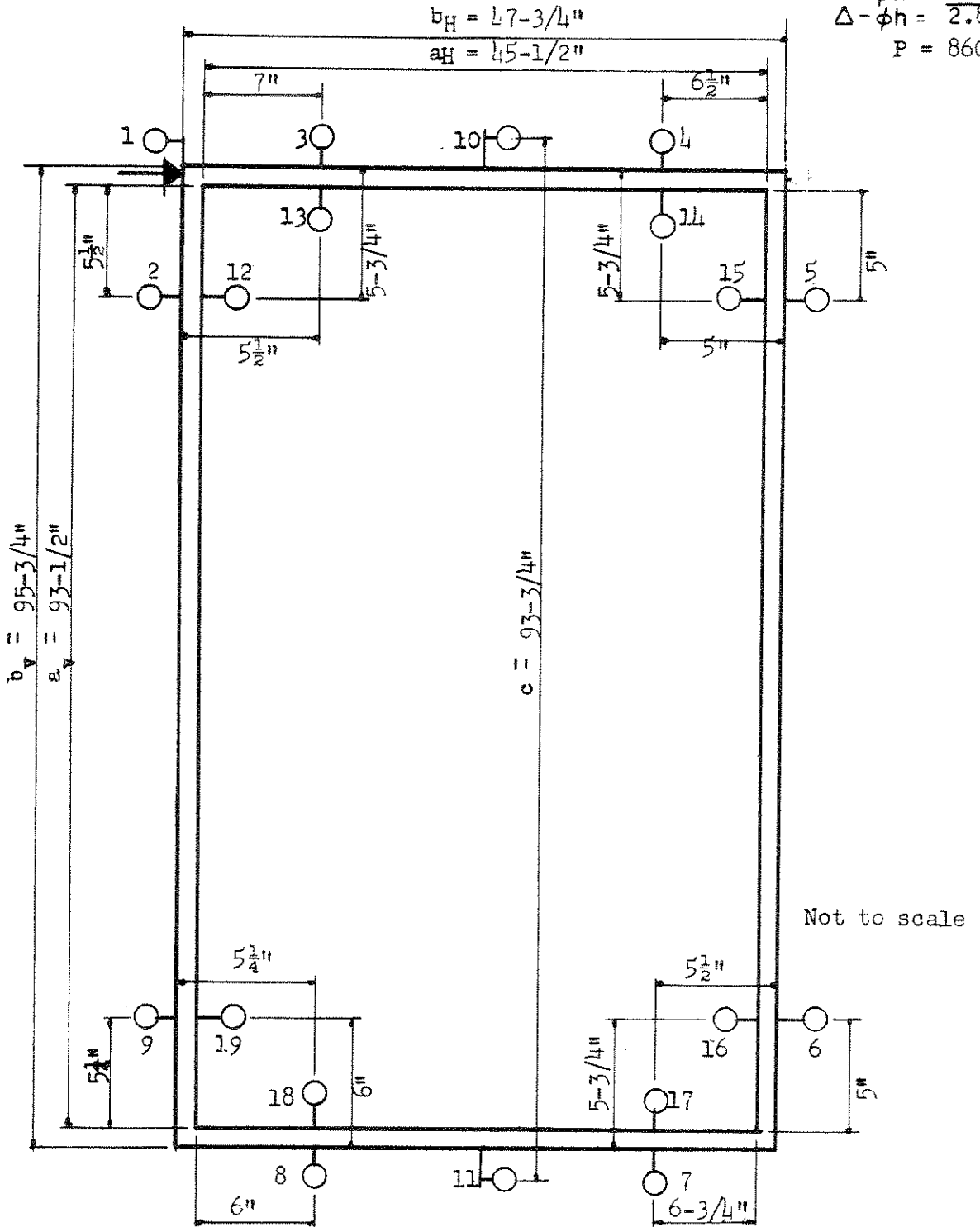
LOAD	500 psi		600		700		800		1000		1180	
	860 lbs		1030		1200		1375		1720		2030	
GAGE	READ		READ		READ		READ		READ		READ	
1	1151	-1783	794	-2140	719	-2215	644	-2290	486	-2448	Failure	
2	1633	+1548	1850	+1765	1905	+1820	1964	+1879	2091	+2006		
3	390	- 121	286	- 225	274	- 237	274	- 237	230	- 271		
4	325	- 11	303	- 33	301	- 35	301	- 35	296	- 40		
5	1004	-1619	713	-1910	651	-1972	592	-2031	464	-2159		
6	668	- 124	638	- 154	630	- 162	623	- 169	604	- 188		
7	664	- 11	663	- 12	664	- 11	667	- 8	674	- 1		
8	030	+ 21	030	+ 21	031	+ 22	031	+ 22	031	+ 22		
9	419	+ 200	442	+ 223	448	+ 229	456	+ 237	472	+ 253		
10	1654	+1654	1968	+1968	2031	+2031	2094	+2094	2230	+2230		
11	071	+ 60	094	+ 83	100	+ 89	105	+ 94	116	+ 105		
12	379	+ 151	457	+ 229	462	+ 234	464	+ 236	467	+ 239		
13	590	+ 230	662	+ 302	668	+ 308	674	+ 314	676	+ 316		
14	155	- 106	154	- 107	154	- 107	154	- 107	154	- 107		
15	453	- 174	403	- 224	397	- 230	392	- 235	385	- 242		
16	238	+ 189	237	+ 188	237	+ 188	238	+ 189	243	+ 194		
17	276	+ 155	280	+ 159	283	+ 162	288	+ 167	230	+ 119		
18	168	- 295	075	- 388	061	- 402	046	- 417	011	- 452		
19	313	- 158	311	- 160	311	- 160	310	- 161	310	- 161		

PANEL: A-3-a-1-s
 SERIES: II

DATE GLAZED: 7/15/1959
 DATE TESTED: 7/17/1959

PART III

Results at failure: $\Delta = 2.80''$
 $\phi h = 0.00''$
 $\Delta - \phi h = 2.80''$
 $P = 860 \text{ lbs}$



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-3-a-1-s

SERIES: II

PART III

LOAD	0 psi		70		100		200		300	
	0 lbs		120		170		345		515	
GAGE	READ		READ		READ		READ		READ	
1	3870		2555	-1315	1976	-1894	1294	-2576	1092	-2778
2	157		1319	+1162	1824	+1667	2485	+2328	2628	+2471
3	530		580	+ 50	592	+ 62	598	+ 68	586	+ 56
4	380		370	- 10	376	- 4	397	+ 17	398	+ 18
5	3628		2471	-1157	1982	-1646	1323	-2305	1167	-2461
6	964		923	- 41	895	- 69	853	- 111	833	- 131
7	413		425	+ 12	426	+ 13	418	+ 5	416	+ 3
8	642		604	- 38	589	- 53	594	- 48	594	- 48
9	144		198	+ 54	227	+ 83	283	+ 139	305	+ 161
10	000		1205	+1205	1732	+1732	2433	+2433	2582	+2582
11	300		322	+ 22	341	+ 41	354	+ 54	366	+ 66
12	143		533	+ 390	536	+ 393	545	+ 402	529	+ 386
13	021		240	+ 219	380	+ 359	429	+ 408	439	+ 418
14	1224		1151	- 73	1114	- 110	902	- 322	877	- 347
15	772		382	- 390	386	- 386	380	- 392	375	- 397
16	251		560	+ 309	664	+ 413	678	+ 427	679	+ 428
17	230		252	+ 22	284	+ 54	497	+ 267	523	+ 293
18	475		276	- 199	129	- 346	069	- 406	053	- 422
19	1391		1080	- 311	988	- 403	966	- 425	968	- 423

PANEL: A-3-a-1-s

SERIES: II

PART III

LOAD	400 psi		500
	690 lbs		860
GAGE	READ		READ
1	929	-2941	Failure
2	2914	+2757	
3	567	+ 37	
4	398	+ 18	
5	1015	-2613	
6	809	- 155	
7	412	- 1	
8	601	- 41	
9	360	+ 186	
10	2726	+2726	
11	370	+ 70	
12	555	+ 412	
13	448	+ 427	
14	857	- 367	
15	371	- 401	
16	683	+ 432	
17	543	+ 313	
18	035	- 440	
19	961	- 430	

PANEL: A-1-a- $\frac{1}{2}$ -h

SERIES: II

PART III

LOAD	0 psi		100		200		400		500	
	0 lbs		170		345		690		860	
GAGE	READ		READ		READ		READ		READ	
1	1432		1432	0	1430	- 2	1415	- 17	1388	- 44
2	891		892	+ 1	892	+ 1	900	+ 9	913	+ 22
3	346		345	- 1	344	- 2	340	- 6	336	- 10
4	423		422	- 1	422	- 1	430	+ 7	430	+ 7
5	859		857	- 2	857	- 2	846	- 13	835	- 24
6	809		809	0	809	0	802	- 7	797	- 12
7	098		097	- 1	097	- 1	093	- 5	090	- 8
8	525		526	+ 1	526	+ 1	529	+ 4	531	+ 6
9	976		976	0	976	0	977	0	987	+ 10
10	013		013	0	013	0	025	+ 12	038	+ 25
11	1023		1023	0	1024	+ 1	1027	+ 4	1033	+ 10
12	364		364	0	364	0	364	0	365	+ 1
13	397		397	0	397	0	397	0	397	0
14	259		259	0	259	0	259	0	258	- 1
15	404		404	0	404	0	404	0	404	0
16	482		482	0	482	0	482	0	482	0
17	282		282	0	282	0	282	0	283	+ 1
18	157		157	0	157	0	157	0	156	- 1
19	467		467	0	467	0	466	- 1	465	- 2

PANEL: A-1-a- $\frac{1}{2}$ -h

SERIES: II

PART III

LOAD	600 psi		700		800		900		1000	
	1030 lbs		1200		1375		1550		1720	
GAGE	READ		READ		READ		READ		READ	
1	1340	- 92	1285	- 147	1237	- 195	1190	- 242	1148	- 284
2	935	+ 44	958	+ 67	979	+ 88	1001	+ 110	1023	+ 132
3	332	- 14	324	- 22	314	- 32	305	- 41	298	- 48
4	431	+ 8	423	0	421	- 2	419	- 4	412	- 11
5	810	- 49	782	- 77	758	- 101	734	- 125	710	- 149
6	771	- 38	748	- 61	729	- 80	710	- 99	698	- 117
7	084	- 14	080	- 18	079	- 19	038	+ 56	078	- 20
8	534	+ 9	540	+ 15	546	+ 21	551	+ 26	554	+ 29
9	1007	+ 30	1028	+ 51	1046	+ 69	1064	+ 87	1080	+ 103
10	064	+ 51	094	+ 81	122	+ 109	148	+ 135	171	+ 158
11	1048	+ 25	1062	+ 39	1074	+ 51	1089	+ 66	1102	+ 79
12	368	+ 4	369	+ 5	370	+ 6	370	+ 6	370	+ 6
13	397	0	395	- 2	394	- 3	393	- 4	393	- 4
14	258	- 1	256	- 3	254	- 5	253	- 6	252	- 7
15	402	- 2	400	- 4	397	- 7	394	- 10	391	- 13
16	481	- 1	480	- 2	480	- 2	480	- 2	478	- 4
17	284	+ 2	284	+ 2	284	+ 2	284	+ 2	284	+ 2
18	156	- 1	153	- 4	150	- 7	147	- 10	145	- 12
19	462	- 5	458	- 9	454	- 13	452	- 15	449	- 18

PANEL: A-1-a- $\frac{1}{2}$ -h

SERIES: II

PART III

LOAD	1200 psi		1400		1600		2000		2170	
	2065 lbs		2410		2770		3525		3850	
GAGE	READ		READ		READ		READ		READ	
1	1067	- 365	988	- 444	931	- 501	813	- 619	Failure	
2	1066	+ 175	1111	+ 220	1145	+ 254	1205	+ 314		
3	287	- 59	276	- 70	269	- 77	254	- 92		
4	418	- 5	419	- 4	419	- 4	420	- 3		
5	667	- 194	621	- 238	585	- 274	516	- 343		
6	658	- 156	626	- 189	602	- 213	554	- 261		
7	078	- 20	077	- 21	075	- 23	048	- 50		
8	561	+ 36	568	+ 43	574	+ 49	627	+ 102		
9	1114	+ 137	1148	+ 171	1174	+ 197	1226	+ 249		
10	217	+ 204	263	+ 250	301	+ 288	377	+ 364		
11	1131	+ 108	1159	+ 136	1182	+ 159	1236	+ 213		
12	369	+ 5	365	+ 1	364	0	371	+ 7		
13	369	- 28	392	- 5	390	- 7	383	- 14		
14	250	- 9	248	- 11	245	- 14	236	- 23		
15	385	- 19	378	- 26	372	- 32	358	- 46		
16	475	- 7	470	- 12	468	- 14	469	- 13		
17	285	+ 3	284	+ 2	282	0	276	- 6		
18	142	- 15	138	- 19	135	- 22	129	- 28		
19	443	- 24	438	- 29	432	- 35	427	- 40		

PANEL: A-1-a-1-h
 SERIES: II

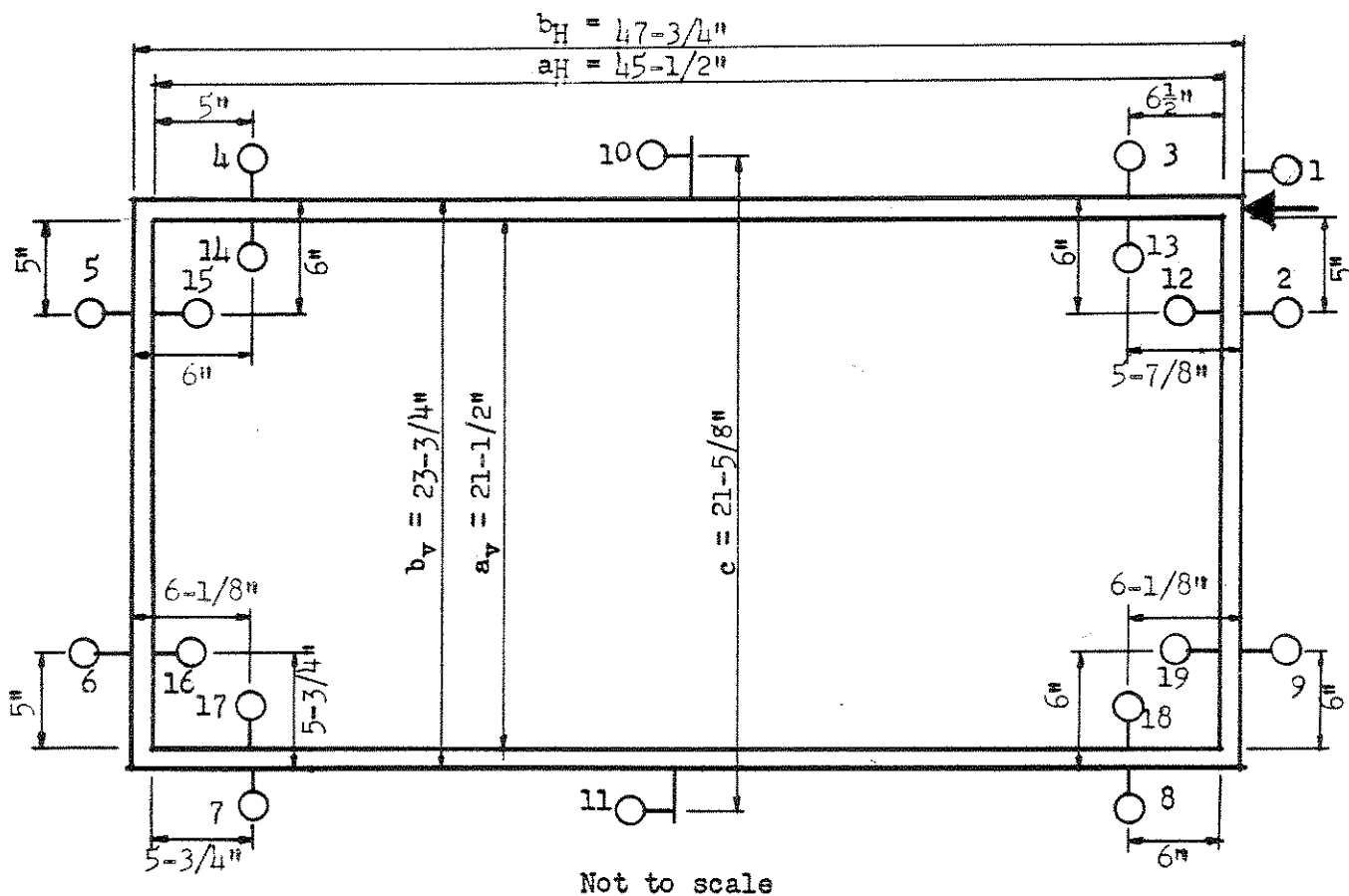
DATE GLAZED: 7/16/1959
 DATE TESTED: 7/27/1959

PART III

Results at failure:

$\Delta = 0.27''$
 $\phi h = 0.10''$
 $\Delta - \phi h = 0.17''$

P = 5700 lbs



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-1-a-1-h

SERIES: II

PART III

LOAD	0 psi		100		300		400		500	
	0 lbs		170		515		690		860	
GAGE	READ		READ		READ		READ		READ	
1	866		865	- 1	845	- 21	823	- 43	796	- 70
2	043		044	+ 1	057	+ 14	068	+ 25	080	+ 37
3	643		642	- 1	635	- 8	628	- 15	620	- 23
4	319		319	0	319	0	319	0	320	+ 1
5	915		915	0	901	- 14	889	- 26	875	- 40
6	933		933	0	923	- 10	915	- 18	904	- 29
7	412		412	0	412	0	412	0	409	- 3
8	004		005	+ 1	012	+ 8	018	+ 14	025	+ 21
9	157		158	+ 1	167	+ 10	175	+ 18	185	+ 28
10	000		000	0	16	+ 16	31	+ 31	49	+ 49
11	1027		1027	0	1035	+ 8	1041	+ 14	1049	+ 22
12	275		275	0	276	+ 1	276	+ 1	276	+ 1
13	524		524	0	523	- 1	523	- 1	522	- 2
14	263		263	0	262	- 1	262	- 1	260	- 3
15	480		480	0	478	- 2	476	- 4	474	- 6
16	334		334	0	333	- 1	333	- 1	333	- 1
17	406		406	0	407	+ 1	407	+ 1	408	+ 2
18	300		300	0	299	- 1	298	- 2	297	- 3
19	280		280	0	279	- 1	278	- 2	278	- 2

PANEL: A-1-a-1-h

SERIES: II

PART III

LOAD	600 psi		700		800		1000		1200		1400	
	1030 lbs		1200		1375		1720		2065		2410	
GAGE	READ		READ		READ		READ		READ		READ	
1	760	- 106	716	- 150	680	- 186	596	- 270	524	- 342	475	- 391
2	097	+ 54	119	+ 76	135	+ 92	169	+ 126	209	+ 166	241	+ 198
3	610	- 33	596	- 47	588	- 55	568	- 75	563	- 80	555	- 88
4	322	+ 3	320	+ 1	322	+ 3	325	+ 6	325	+ 6	326	+ 7
5	856	- 59	831	- 83	812	- 102	769	- 145	732	- 182	705	- 209
6	892	- 41	879	- 54	866	- 67	839	- 94	812	- 121	791	- 142
7	403	- 9	394	- 18	392	- 20	387	- 25	385	- 27	380	- 32
8	032	+ 28	039	+ 35	043	+ 39	051	+ 47	056	+ 52	059	+ 55
9	199	+ 42	216	+ 59	230	+ 73	256	+ 99	283	+ 126	306	+ 149
10	72	+ 72	98	+ 98	120	+ 120	165	+ 165	202	+ 202	233	+ 233
11	1057	+ 30	1067	+ 40	1077	+ 50	1100	+ 73	1124	+ 97	1143	+ 116
12	278	+ 3	280	+ 5	280	+ 5	280	+ 5	277	+ 2	274	+ 1
13	522	- 2	521	- 3	519	- 5	516	- 8	513	- 11	511	- 13
14	257	- 6	253	- 10	250	- 13	245	- 18	242	- 21	237	- 26
15	472	- 8	468	- 12	466	- 14	457	- 23	450	- 30	446	- 34
16	333	- 1	332	- 2	331	- 3	327	- 7	324	- 10	321	- 13
17	409	+ 3	410	+ 4	410	+ 4	410	+ 4	411	+ 5	412	+ 6
18	295	- 5	290	- 10	286	- 14	283	- 17	272	- 28	267	- 33
19	278	- 2	279	- 1	279	- 1	276	- 4	272	- 8	266	- 14

PANEL: A-1-a-1-h

SERIES: II

PART III

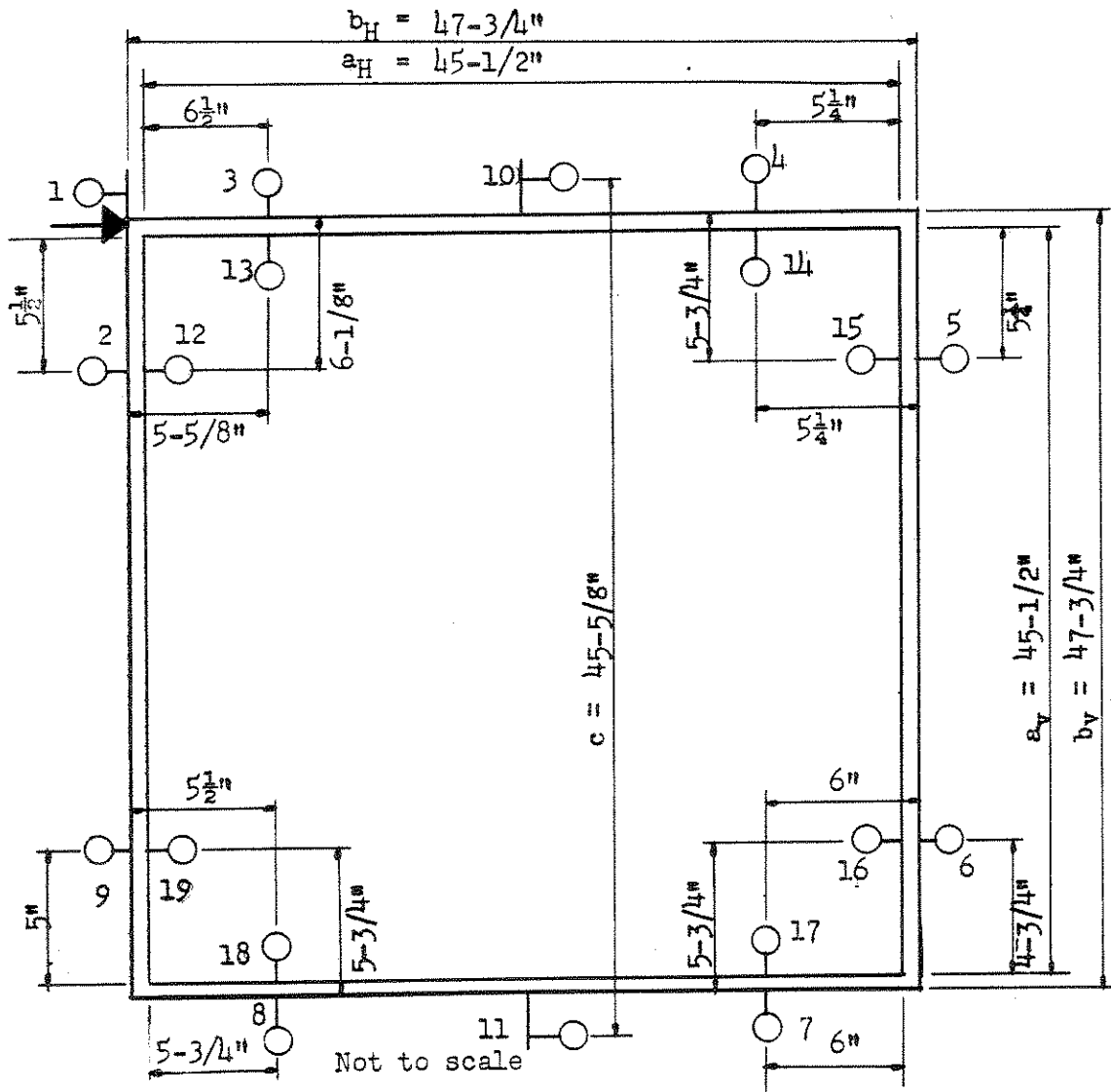
LOAD GAGE	1600 psi		2000		2700		2900		3100		3150
	2770 lbs		3525		4850		5230		5610		5700
	READ		READ		READ		READ		READ		READ
1	429	- 437	336	- 520	145	- 711	097	- 759	025	- 831	Failure
2	272	+ 229	333	+ 290	481	+ 438	--	--	--	--	
3	548	- 95	--	--	--	--					
4	327	+ 8	--	--	--	--					
5	676	- 238	619	- 295	--	--					
6	769	- 164	728	- 205	--	--					
7	378	- 34	--	--	--	--					
8	063	+ 59	--	--	--	--					
9	328	+ 171	370	+ 213	--	--					
10	264	+ 264	325	+ 325	--	--					
11	1156	+ 129	1177	+ 150	--	--					
12	269	- 6	--	--	--	--					
13	509	- 15	--	--	--	--					
14	230	- 33	--	--	--	--					
15	439	- 41	--	--	--	--					
16	320	- 14	--	--	--	--					
17	411	+ 5	--	--	--	--					
18	262	- 38	--	--	--	--					
19	260	- 20	--	--	--	--					

PANEL: A-2-a- $\frac{1}{2}$ -h
 SERIES: II

DATE GLAZED: 7/16/1959
 DATE TESTED: 7/29/1959

PART III

Results at failure: $\Delta = 0.48''$
 $\phi h = 0.25''$
 $\Delta - \phi h = 0.23''$
 $P = 6420 \text{ lbs}$



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-2-a- $\frac{1}{2}$ -h

SERIES: II

PART III

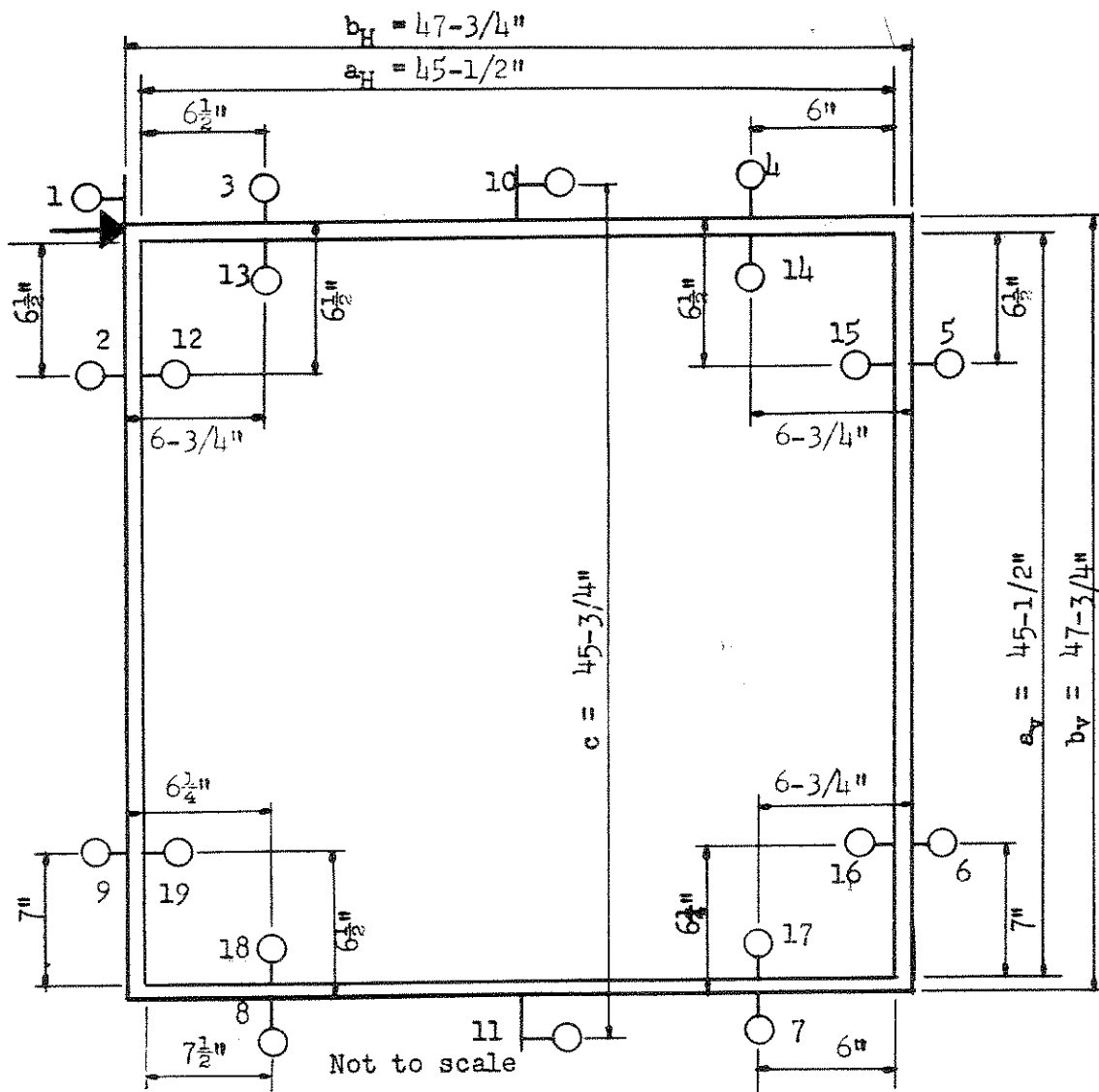
LOAD	2800 psi		3200		3470
	5040 lbs		5800		6420
GAGE	READ		READ		READ
1	560	- 894	403	-1051	Failure
2	697	+ 514	773	+ 590	
3	939	- 201	907	- 233	
4	897	+ 8	--	--	
5	301	- 585	211	- 675	
6	725	- 238	681	- 282	
7	335	- 2	--	--	
8	169	+ 97	--	--	
9	556	+ 231	594	+ 269	
10	1450	+ 570	1535	+ 665	
11	218	+ 179	251	+ 212	
12	341	+ 20	--	--	
13	208	+ 8	--	--	
14	217	- 8	--	--	
15	433	- 44	--	--	
16	089	+ 2	--	--	
17	087	+ 11	--	--	
18	184	- 101	--	--	
19	360	- 50	--	--	

PANEL: A-2-a-1-h
 SERIES: II

DATE GLAZED: 7/16/1959
 DATE TESTED: 7/31/1959

PART III

Results at failure: $\Delta = 0.67''$
 $\phi h = 0.24''$
 $\Delta - \phi h = 0.43''$
 P = 6660 lbs



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-2-a-1-h

SERIES: II

PART III

LOAD	0 psi		200		400		600		800		1000	
	0 lbs		345		690		1030		1375		1720	
GAGE	READ		READ		READ		READ		READ		READ	
1	1430		1398	- 32	1289	- 141	1195	- 235	1099	- 331	1008	- 422
2	041		060	+ 19	137	+ 96	196	+ 155	256	+ 215	308	+ 267
3	274		271	- 3	240	- 34	222	- 52	205	- 69	199	- 75
4	253		256	+ 3	257	+ 4	257	+ 4	256	+ 3	255	+ 2
5	935		912	- 23	833	- 102	765	- 170	698	- 237	634	- 301
6	739		730	- 9	705	- 34	682	- 57	655	- 84	631	- 108
7	040		040	0	039	- 1	038	- 2	038	- 2	037	- 3
8	101		102	+ 1	110	+ 9	114	+ 13	121	+ 20	128	+ 27
9	183		192	+ 9	219	+ 36	238	+ 55	258	+ 75	279	+ 96
10	085		109	+ 24	191	+ 106	249	+ 164	307	+ 222	360	+ 275
11	041		048	+ 7	060	+ 19	080	+ 39	103	+ 62	121	+ 80
12	398		399	+ 1	403	+ 5	409	+ 11	417	+ 19	422	+ 24
13	450		451	+ 1	460	+ 10	462	+ 12	465	+ 15	463	+ 13
14	578		577	- 1	577	- 1	576	- 2	574	- 4	571	- 7
15	297		296	- 1	280	- 17	277	- 20	263	- 34	250	- 47
16	614		616	+ 2	620	+ 6	624	+ 10	626	+ 12	626	+ 12
17	386		388	+ 2	388	+ 2	390	+ 4	390	+ 4	388	+ 2
18	501		498	- 3	468	- 33	456	- 45	443	- 58	429	- 72
19	600		599	- 1	598	- 2	588	- 12	580	- 20	573	- 27

PANEL: A-2-a-1-h

SERIES: II

PART III

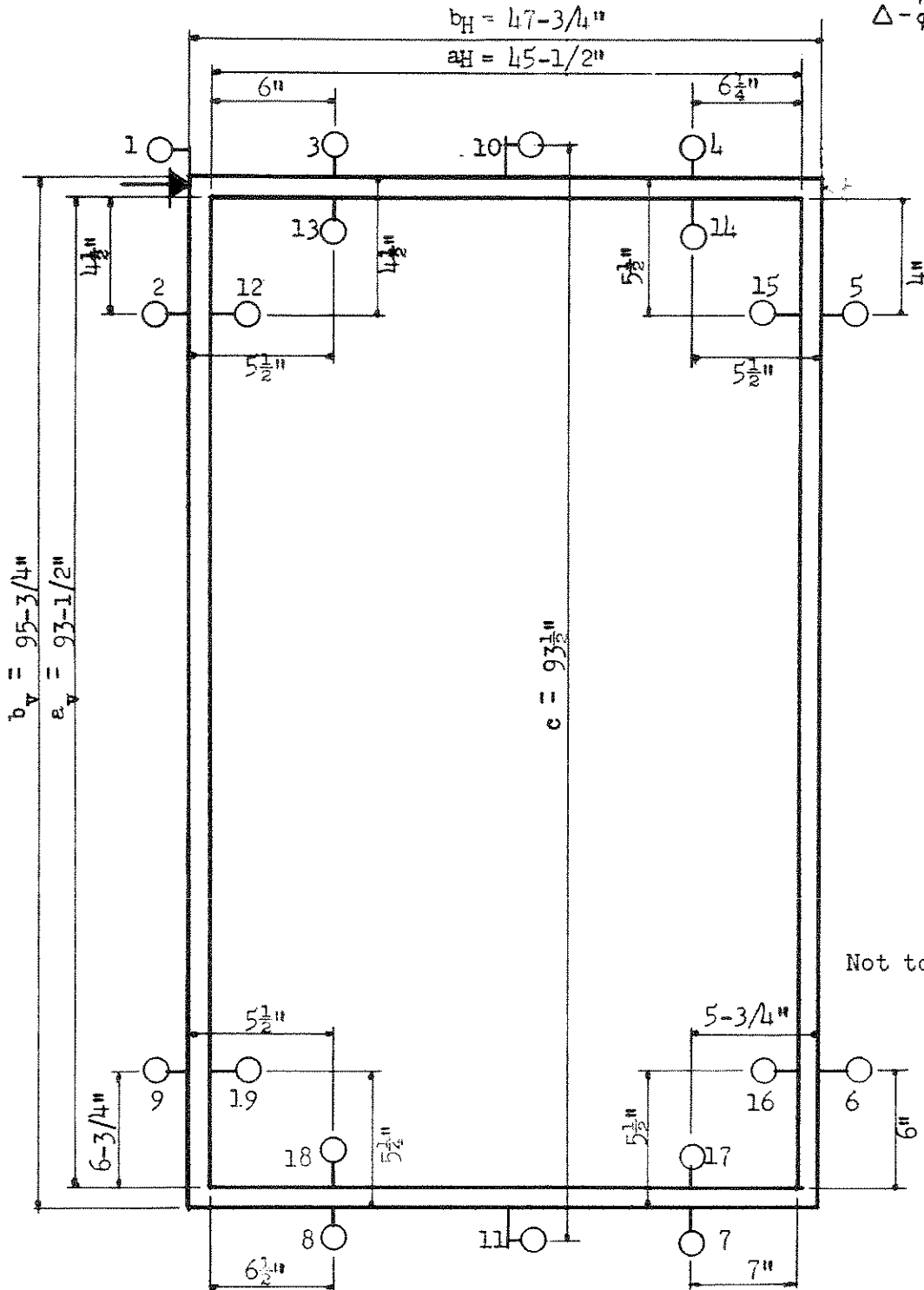
LOAD	1200 psi		1600		2000		2400		2800		3200		3570	
	2065 lbs		2770		3525		4280		5040		5800		6660	
GAGE	READ		READ		READ		READ		READ		READ		READ	
1	918	- 512	773	- 657	663	- 767	560	- 870	449	- 981	323	-1107	Failure	
2	363	+ 322	457	+ 416	527	+ 486	599	+ 558						
3	178	- 96	150	- 124	134	- 140	119	- 155						
4	256	+ 3	262	+ 9	271	+ 18	281	+ 28						
5	569	- 366	470	- 465	390	- 545	318	- 617						
6	608	- 131	572	- 167	542	- 197	511	- 228						
7	037	- 3	037	- 3	032	- 8	028	- 12						
8	133	+ 32	145	+ 44	151	+ 50	157	+ 56						
9	303	+ 120	337	+ 154	367	+ 184	398	+ 215						
10	413	+ 328	506	+ 421	580	+ 495	656	+ 571						
11	138	+ 97	165	+ 124	190	+ 149	217	+ 176						
12	425	+ 27	421	+ 23	418	+ 20	416	+ 18						
13	460	+ 10	453	+ 3	450	0	449	- 1						
14	567	- 11	559	- 19	550	- 28	545	- 33						
15	243	- 54	237	- 60	213	- 84	212	- 85						
16	625	+ 11	622	+ 8	621	+ 7	623	+ 9						
17	386	0	386	0	392	+ 6	400	+ 14						
18	415	- 86	392	- 109	381	- 120	373	- 128						
19	569	- 31	558	- 42	550	- 50	546	- 54						

PANEL: A-3-a- $\frac{1}{2}$ -h
SERIES: II

DATE GLAZED: 7/16/1959
DATE TESTED: 7/23/1959

PART III

Results at failure: $\Delta = 1.01''$
 $\phi h = 0.53''$
 $\Delta - \phi h = 0.48''$
 $P = 3550 \text{ lb}$



Not to scale

Outside gages measure movement of sash
Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-3-a- $\frac{1}{2}$ -h

SERIES: II

PART III

LOAD	0 psi		100		200		300		400	
	0 lbs		170		345		515		690	
GAGE	READ		READ		READ		READ		READ	
1	1421		1400	- 21	1338	- 83	1279	- 142	1213	- 208
2	990		1009	+ 19	1057	+ 67	1107	+ 117	1163	+ 173
3	451		446	- 5	438	- 13	425	- 26	411	- 40
4	405		408	+ 3	413	+ 8	418	+ 13	421	+ 16
5	1919		1901	- 18	1856	- 63	1810	- 109	1757	- 162
6	975		973	- 2	967	- 8	960	- 15	951	- 24
7	496		494	- 2	493	- 3	492	- 4	490	- 6
8	365		365	0	366	+ 1	369	+ 4	371	+ 6
9	009		012	+ 3	022	+ 13	032	+ 23	043	+ 34
10	083		101	+ 18	150	+ 67	197	+ 114	248	+ 165
11	050		052	+ 2	056	+ 6	060	+ 10	065	+ 15
12	596		596	0	598	+ 2	600	+ 4	603	+ 7
13	400		399	- 1	398	- 2	398	- 2	397	- 3
14	513		513	0	512	- 1	512	- 1	510	- 3
15	400		399	- 1	398	- 2	397	- 3	395	- 5
16	415		416	+ 1	416	+ 1	417	+ 2	417	+ 2
17	217		217	0	217	0	217	0	216	- 1
18	555		554	- 1	543	- 12	533	- 22	525	- 30
19	643		643	0	644	+ 1	644	+ 1	643	0

PANEL: A-3-a- $\frac{1}{2}$ -h

SERIES: II

PART III

LOAD	500 psi		600		700		800		1000	
	860 lbs		1030		1200		1375		1720	
GAGE	READ		READ		READ		READ		READ	
1	1125	- 296	1025	- 396	916	- 505	822	- 599	668	- 753
2	1229	+ 241	1296	+ 308	1368	+ 380	1433	+ 445	1538	+ 550
3	394	- 57	375	- 76	353	- 98	335	- 116	310	- 141
4	423	+ 18	427	+ 22	428	+ 23	431	+ 26	438	+ 33
5	1694	- 225	1625	- 294	1548	- 371	1478	- 441	1369	- 550
6	942	- 33	932	- 43	920	- 55	909	- 66	887	- 88
7	489	- 7	489	- 7	489	- 7	490	- 6	491	- 5
8	373	+ 8	377	+ 12	379	+ 14	382	+ 17	388	+ 23
9	055	+ 46	068	+ 59	082	+ 73	096	+ 87	120	+ 111
10	308	+ 225	370	+ 287	430	+ 347	516	+ 433	680	+ 597
11	070	+ 20	076	+ 26	082	+ 32	089	+ 39	104	+ 54
12	605	+ 9	607	+ 11	608	+ 12	610	+ 14	612	+ 16
13	399	- 1	398	- 2	398	- 2	397	- 3	397	- 3
14	509	- 4	508	- 5	505	- 8	504	- 9	501	- 12
15	391	- 9	386	- 14	380	- 20	375	- 25	369	- 31
16	418	+ 3	418	+ 3	418	+ 3	418	+ 3	420	+ 5
17	215	- 2	217	0	210	- 7	207	- 10	201	- 16
18	516	- 39	502	- 53	488	- 67	479	- 76	460	- 95
19	643	0	642	- 1	641	- 2	641	- 2	640	- 3

PANEL: A-3-a- $\frac{1}{2}$ -h

SERIES: II

PART III

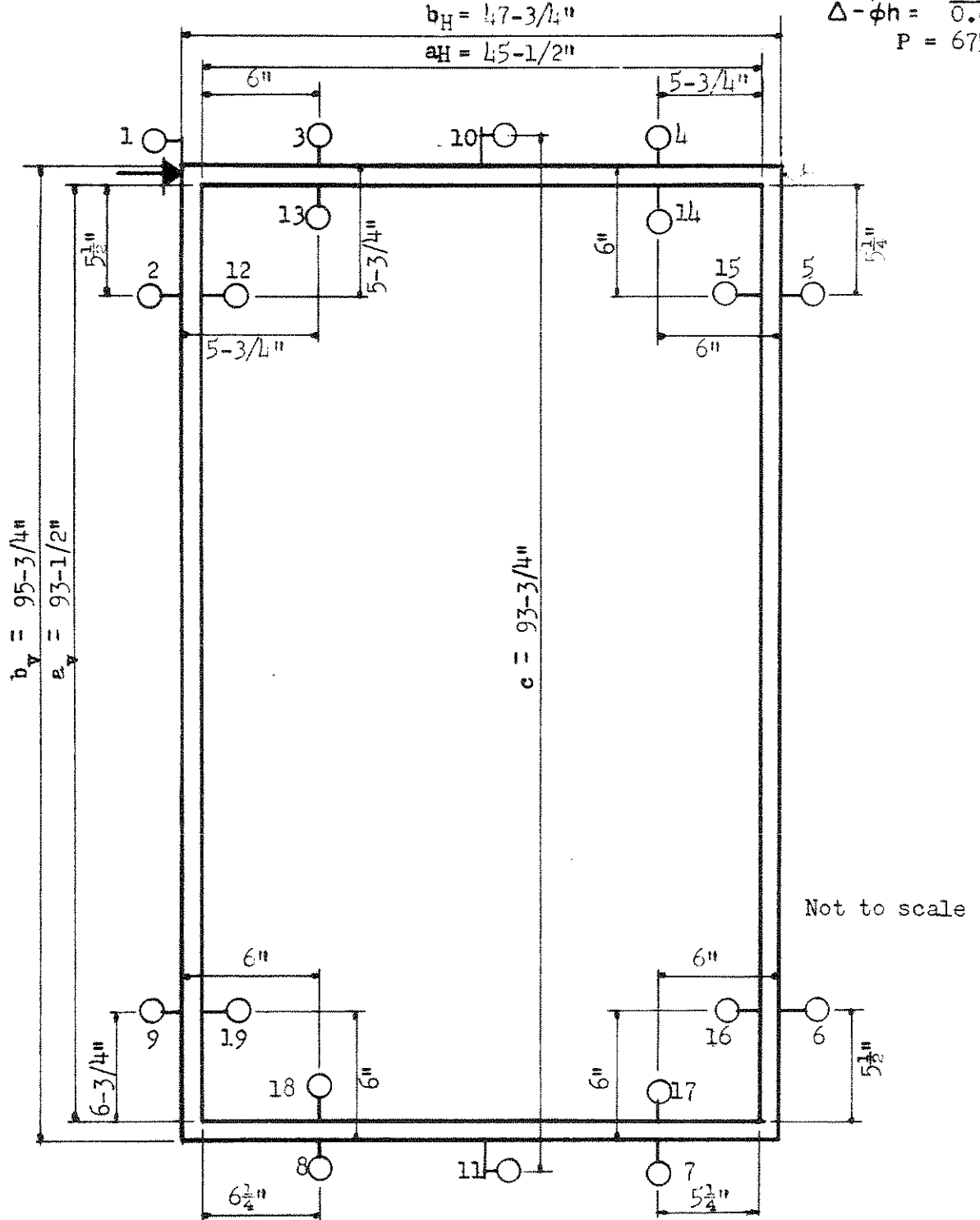
LOAD	1200 psi		1600		2000		2000	
	2065 lbs		2770		3525		3550	
GAGE	READ		READ		READ		READ	
1	522	- 899	268	-1153	021	-1400	Failure	
2	1649	+ 661	1847	+ 859	2056	+1068		
3	288	- 163	247	- 204	186	- 265		
4	443	+ 38	452	+ 47	453	+ 48		
5	1236	- 683	1042	- 877	807	-1112		
6	863	- 112	814	- 161	772	- 203		
7	494	- 2	499	+ 3	501	+ 5		
8	396	+ 31	421	+ 56	410	+ 45		
9	147	+ 138	198	+ 189	208	+ 199		
10	811	+ 728	1021	+ 938				
11	122	+ 72	159	+ 109				
12	614	+ 18	613	+ 17				
13	396	- 4	402	+ 2				
14	498	- 15	492	- 21				
15	365	- 35	359	- 41				
16	422	+ 7	426	+ 11				
17	194	- 23	182	- 35				
18	443	- 112	418	- 137				
19	639	- 4	637	- 6				

PANEL: A-3-a-1-h
SERIES: II

DATE GLAZED: 7/16/1959
DATE TESTED: 7/27/1959

PART III

Results at failure: $\Delta = 2.20''$
 $\phi h = 1.38''$
 $\Delta - \phi h = 0.82''$
 $P = 6750 \text{ lb}$



Outside gages measure movement of sash
Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-3-a-1-h

SERIES: II

PART III

LOAD	0 psi		200		400		600		800	
	0 lbs		345		690		1030		1375	
GAGE	READ		READ		READ		READ		READ	
1	2897		2803	- 94	2690	- 207	2485	- 412	2280	- 617
2	932		1005	+ 73	1106	+ 174	1282	+ 350	1429	+ 497
3	443		427	- 16	407	- 36	365	- 78	329	- 114
4	442		449	+ 7	459	+ 17	468	+ 26	470	+ 28
5	1951		1868	- 83	1762	- 189	1584	- 367	1436	- 515
6	890		881	- 9	862	- 28	829	- 61	800	- 90
7	605		597	- 8	581	- 24	590	- 15	588	- 17
8	029		040	+ 11	051	+ 22	075	+ 46	099	+ 70
9	969		976	+ 7	1002	+ 33	1033	+ 64	1061	+ 92
10	055		138	+ 83	245	+ 190	427	+ 372	581	+ 526
11	027		033	+ 6	046	+ 19	070	+ 43	090	+ 63
12	645		645	0	646	+ 1	647	+ 2	649	+ 4
13	715		715	0	715	0	713	- 2	715	0
14	676		674	- 2	668	- 8	661	- 15	658	- 18
15	395		392	- 3	389	- 6	384	- 11	379	- 16
16	359		357	- 2	359	0	362	+ 3	365	+ 6
17	335		340	+ 5	347	+ 12	352	+ 17	355	+ 20
18	503		493	- 10	478	- 25	452	- 51	434	- 69
19	343		345	+ 2	346	+ 3	347	+ 4	351	+ 8

PANEL: A-3-a-1-h

SERIES: II

PART III

LOAD	1000 psi		1200		1400		1600		1800	
	1720 lbs		2065		2410		2770		3117	
GAGE	READ		READ		READ		READ		READ	
1	2075	- 822	1920	- 977	1789	-1108	1614	-1283	1441	-1456
2	1581	+ 649	1693	+ 761	1799	+ 867	1928	+ 996	2069	+1137
3	301	- 142	282	- 161	263	- 180	242	- 201	216	- 227
4	472	+ 30	466	+ 34	481	+ 39	489	+ 47	476	+ 34
5	1282	- 669	1168	- 783	1068	- 883	927	-1024	787	-1164
6	767	- 123	736	- 154	701	- 189	681	- 209	648	- 242
7	583	- 22	574	- 31	565	- 40	553	- 52	541	- 64
8	124	+ 95	140	+ 111	158	+ 129	175	+ 146	193	+ 164
9	1091	+ 122	1120	+ 151	1145	+ 176	1172	+ 203	1197	+ 228
10	749	+ 694	870	+ 815	976	+ 921	1114	+1059	1262	+1207
11	113	+ 86	137	+ 110	153	+ 126	175	+ 148	198	+ 171
12	652	+ 7	654	+ 9	654	+ 9	654	+ 9	666	+ 21
13	713	- 2	714	- 1	716	+ 1	718	+ 3	720	+ 5
14	653	- 23	646	- 30	640	- 36	630	- 46	621	- 55
15	374	- 21	372	- 23	370	- 25	368	- 27	366	- 29
16	366	+ 7	368	+ 9	369	+ 10	369	+ 10	369	+ 10
17	359	+ 24	365	+ 30	370	+ 35	378	+ 43	385	+ 50
18	420	- 83	414	- 89	410	- 93	409	- 94	408	- 95
19	350	+ 7	351	+ 8	351	+ 8	352	+ 9	353	+ 10

PANEL: A-3-a-1-h

SERIES: II

PART III

LOAD	2200 psi		2600		3700	
	3900 lbs		4660		6750	
GAGE	READ		READ		READ	
1	992	-1905	792	-2105	Failure	
2	2361	+1429				
3	137	- 306				
4	445	+ 3				
5	454	-1497				
6	585	- 305				
7	509	- 96				
8	221	+ 192				
9	1273	+ 304				
10	1619	+1564				
11	243	+ 216				
12	654	+ 9				
13	727	+ 12				
14	584	- 92				
15	367	- 28				
16	367	+ 8				
17	408	+ 73				
18	407	- 96				
19	355	+ 12				

P A R T IVSERIES IIIFailure Modes:

- A-2-p-a-1/2-s Cracks in the glass of the right bottom corner of the upper pane appeared under a load of 770 lb. These cracks extended further under a load of 1180 lb. Final failure was due to buckling of the right bottom corner of the lower pane under a load of 1325 lb.
- The first cracks are considered as the actual failure of the window panel.
- No glass-break-out of any significance was noticed.
- A-2-p-a-1-s A small insignificant crack appeared at the left top corner of the lower pane under a load of 700 lb. The window panel continued to resist further loads until a complete collapse of the upper pane under a load of 1190 lb. (Failure load). After this failure the load dropped to 500 lb. When the load was raised again to 930 lb the lower pane failed also, due to cracking of the right bottom corner.
- No significant glass-break-out was noticed.
- A-3-p-a-1/2-s Small cracks appeared in practically all loaded corners of the panes under a load of 1200 lb. (Failure load). After the readings were taken, the upper and lower horizontal muntin bars were pushed out of the plane of the window under a load of 1270 lb. Following this failure the load dropped to 520 lb. A final set of deflection readings were taken under a load of 1000 lb. Under an

increasing load all three lower panes failed completely. After a load of 1180 lb was reached the test was stopped. No significant glass-break-out was noticed.

A-3-p-a-1-s At a load of 1300 lb first cracks appeared in the top pane (Failure load). After being dropped to a value of 690 lb the load was raised again to 1140 lb. Under this load the horizontal muntin bar at mid-height moved out of the plane of the panel. The load dropped to 520 lb. While trying to raise the load the lower muntin bar also failed and was pushed out of the window panel. The load was increased now until complete failure of all panels occurred under a load of 1030 lb.

No glass broke out.

A-2-c-a-1/2-s The right pane failed under a load of 1570 lb. (Failure load). After this failure the load dropped to 500 lb. The left pane failed after the load was increased to 1200 lb. No complete buckling occurred and no glass broke out.

A-2-c-a-1-s The right top corner of the left pane was crushed under a load of 1030 lb. (Failure load). This pane withstood a load of 11400 lb before it failed due to further cracking. Under this load the right top corner of the right pane was only crushed.

A-3-c-a-1/2-s The glass in the left top corner of the left top pane failed under a load of 860 lb. (Failure load). After this failure the load dropped to 520 lb. Increasing the load caused failure of the horizontal muntin bar, which was pushed out of the plane of the panel. The right bottom pane finally

failed under a load of 800 lb. Gage 1 indicated that the deflection after failure of the first pane was 6.5 in. This deflection increased even to 9 in. after the second pane failed.

The glass flew over a distance a few feet in both directions.

A-3-p-a-1-s

The right bottom corner of the right bottom pane failed under a load of 1200 lb. (Failure load). After this failure the load dropped to 520 lb. Increasing the load caused failure of the horizontal muntin bar, which was pushed out of the plane of the panel. Under a load of 720 lb the left top pane failed due to buckling.

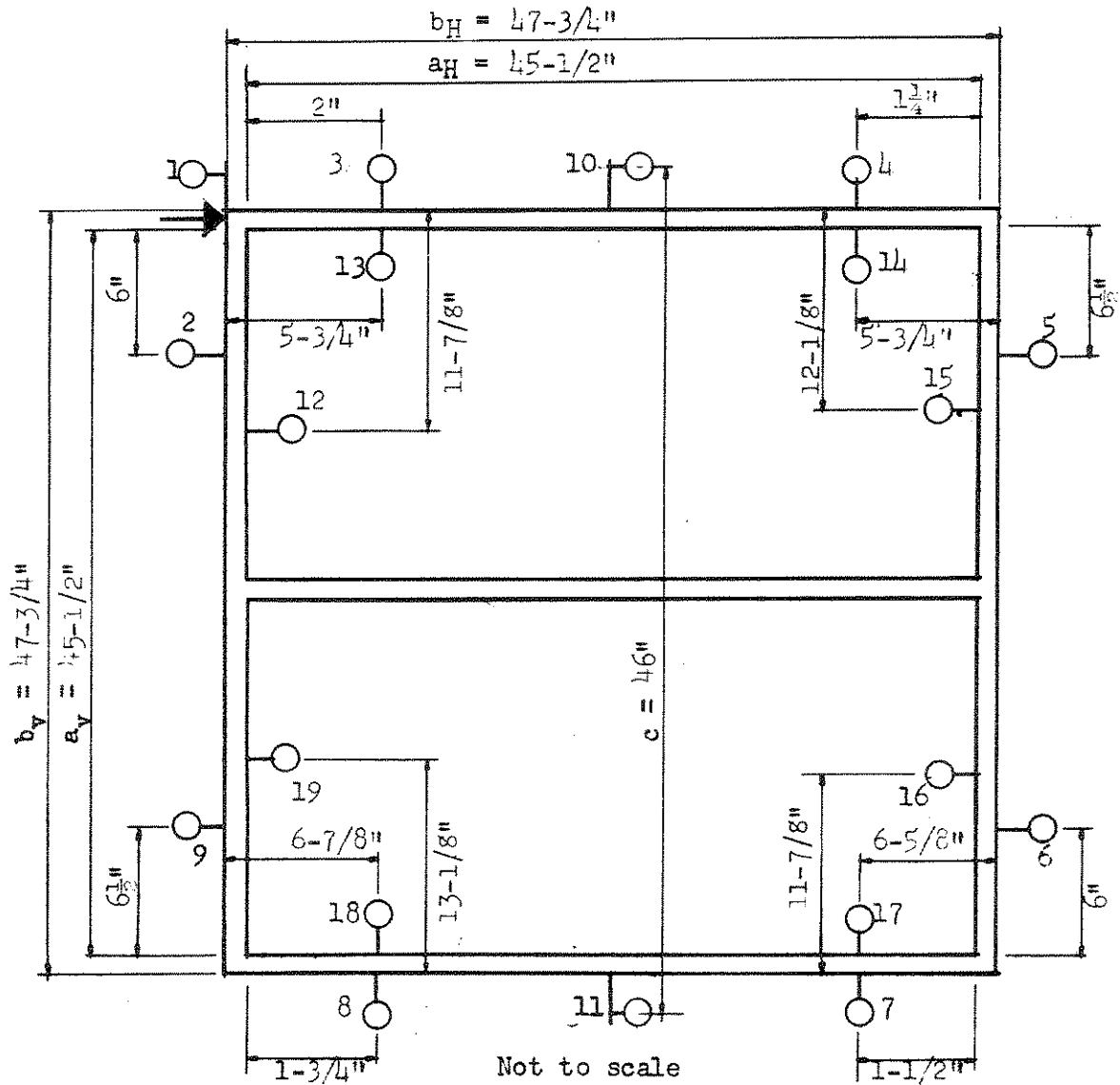
Some glass flew outward over a distance of 15 ft and some inward over a distance of only 2 ft.

PANEL: A-2-p-a- $\frac{1}{2}$ -s
 SERIES: III

DATE GLAZED: 8/17/1959
 DATE TESTED: 8/19/1959

PART IV

Results at failure: $\Delta = 1.82''$
 $\phi h = 0.04''$
 $\Delta - \phi h = 1.78''$
 $P = 770 \text{ lbs}$



Outside gages measure absolute movement of panel
 Inside gages measure absolute movement of separate glass panels

DIAL GAGE ARRANGEMENT

PANEL: A-2-p-a- $\frac{1}{2}$ -s

SERIES: III

PART IV

LOAD	0 psi	100	150	200	300
	0 lbs	170	260	345	515
GAGE	READ	READ	READ	READ	READ
1	3026	2402 - 624	1912 -1214	1593 -1533	1372 -1754
2	021	560 + 539	1068 +1047	1333 +1312	1496 +1475
3	775	847 + 72	902 + 127	919 + 144	917 + 142
4	717	711 - 6	725 + 8	736 + 19	750 + 33
5	2773	2247 - 526	1751 -1022	1486 -1287	1300 -1473
6	446	345 - 101	251 - 195	205 - 241	163 - 283
7	286	316 + 30	332 + 46	338 + 52	371 + 85
8	089	053 - 36	042 - 47	043 - 46	050 - 39
9	995	1099 + 104	1200 + 205	1250 + 255	1286 + 291
10	000	515 + 515	1099 +1099	1399 +1399	1571 +1571
11	067	097 + 30	129 + 62	141 + 74	155 + 88
12	367	826 + 459	1248 + 881	1474 +1107	1619 +1252
13	768	803 + 35	831 + 63	796 + 28	769 + 1
14	647	638 - 9	641 - 6	656 + 9	691 + 44
15	1873	1418 - 455	1000 - 873	776 -1097	634 -1239
16	654	468 - 186	305 - 349	251 - 403	187 - 467
17	092	117 + 25	129 + 37	131 + 39	93 + 1
18	696	673 - 23	659 - 37	659 - 37	745 + 49
19	391	577 + 186	740 + 349	795 + 404	859 + 468
20	126	437 + 311	728 + 602	892 + 766	1000 + 874

PANEL: A-2-p-a- $\frac{1}{2}$ -s

SERIES: III

PART IV

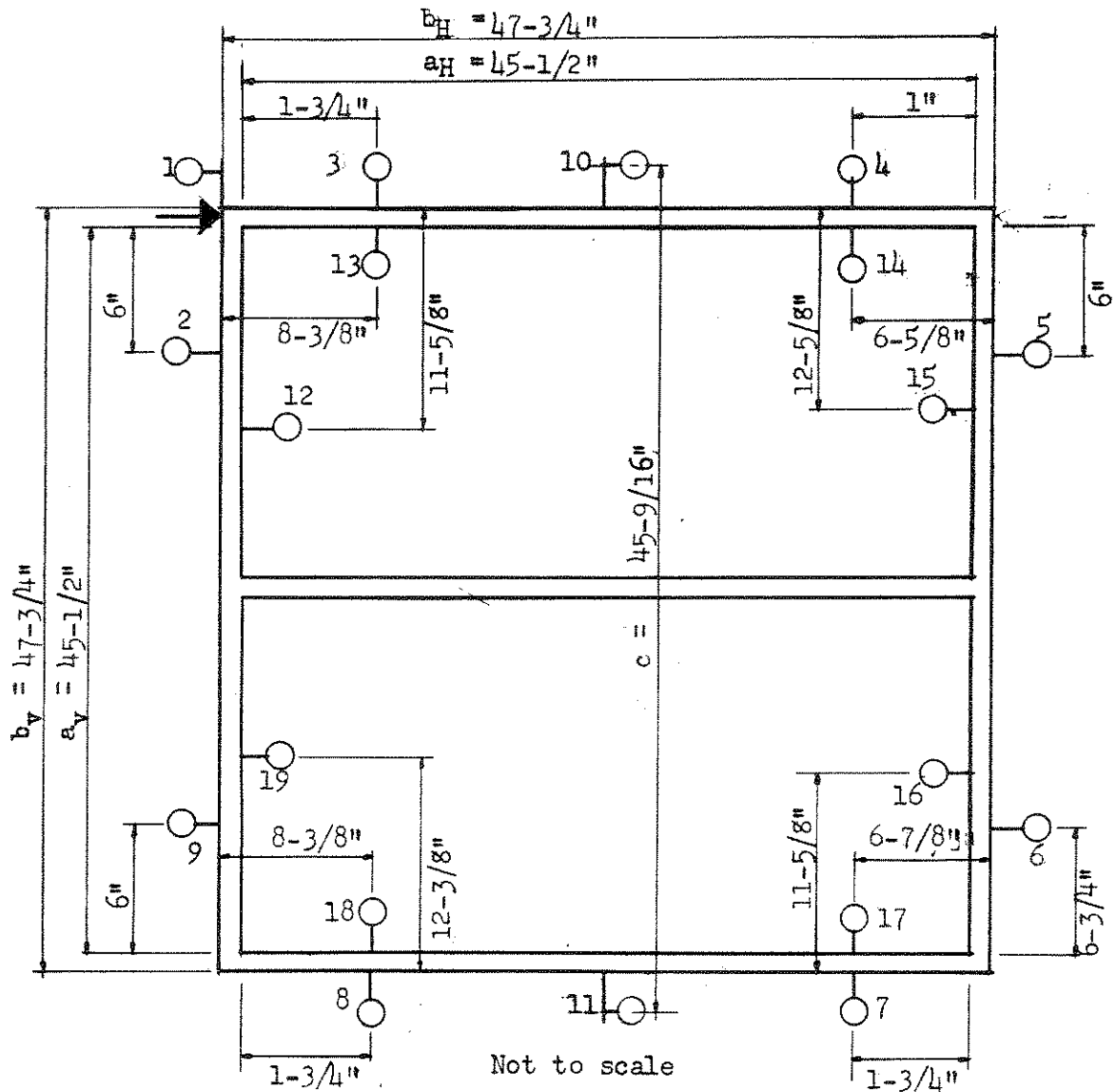
LOAD	400 psi		500		770	
	690 lbs		860		1325	
GAGE	READ		READ		READ	
1	1150	-1976	962	-2164	Final Failure	
2	1659	+1638	1802	+1781		
3	902	+ 127	878	+ 103		
4	774	+ 57	800	+ 83		
5	1134	-1639	987	-1786		
6	118	- 328	74	- 372		
7	355	+ 69	338	+ 52		
8	074	- 15	107	+ 18		
9	1324	+ 329	1360	+ 365		
10	1742	+1742	1903	+1903		
11	177	+ 110	202	+ 135		
12	1761	+1394	1995	+1528		
13	758	- 10	739	- 29		
14	762	+ 115	780	+ 133		
15	495	-1378	364	-1509		
16	131	- 523	81	- 573		
17	51	- 41	29	- 63		
18	792	+ 96	824	+ 128		
19	918	+ 527	968	+ 577		
20	1093	+ 967	1169	+1043		

PANEL: A-2-p-a-l-s
 SERIES: III

DATE GLAZED: 8/17/1959
 DATE TESTED: 8/21/1959

PART IV

Results at failure: $\Delta = 3.02''$
 $\phi h = 0.02''$
 $\Delta - \phi h = 3.00''$
 $P = 1190 \text{ lbs}$



Outside gages measure absolute movement of panel
 Inside gages measure absolute movement of separate glass panels

DIAL GAGE ARRANGEMENT

PANEL: A-2-p-a-l-s

SERIES: III

PART IV

LOAD	0 psi		100		140		200		290	
	0 lbs		170		240		345		500	
GAGE	READ		READ		READ		READ		READ	
1	3965		3506	- 459	2964	-1001	2122	-1843	1308	-2657
2	126		515	+ 389	991	+ 865	1729	+1603	2410	+2284
3	118		132	+ 14	132	+ 14	154	+ 36	167	+ 49
4	082		067	- 15	060	- 22	047	- 35	054	- 28
5	2888		2485	- 403	2018	- 870	1301	-1587	624	-2264
6	1480		1436	- 44	1373	- 107	1245	- 235	1118	- 362
7	706		713	+ 7	726	+ 20	735	+ 29	743	+ 37
8	060		055	- 5	049	- 11	040	- 20	034	- 26
9	016		076	+ 60	159	+ 143	306	+ 290	447	+ 431
10	066		521	+ 455	1036	+ 970	1868	+1802	2639	+2573
11	053		055	+ 2	067	+ 14	119	+ 66	163	+ 110
12	095		432	+ 337	818	+ 723	1418	+1323	1889	+1794
13	462		462	0	450	- 12	452	- 10	265	- 197
14	179		175	- 4	164	- 15	150	- 29	172	- 7
15	2831		2491	- 340	2104	- 727	1497	-1334	928	-1903
16	1781		1665	- 116	1533	- 248	1277	- 504	1000	- 781
17	635		640	+ 5	650	+ 15	661	+ 26	669	+ 34
18	390		371	- 19	351	- 39	316	- 74	399	+ 9
19	046		161	+ 115	293	+ 247	549	+ 503	838	+ 792
20	176		397	+ 221	660	+ 484	1071	+ 895	1459	+1283

PANEL: A-2-p-a-1-s

SERIES: III

PART IV

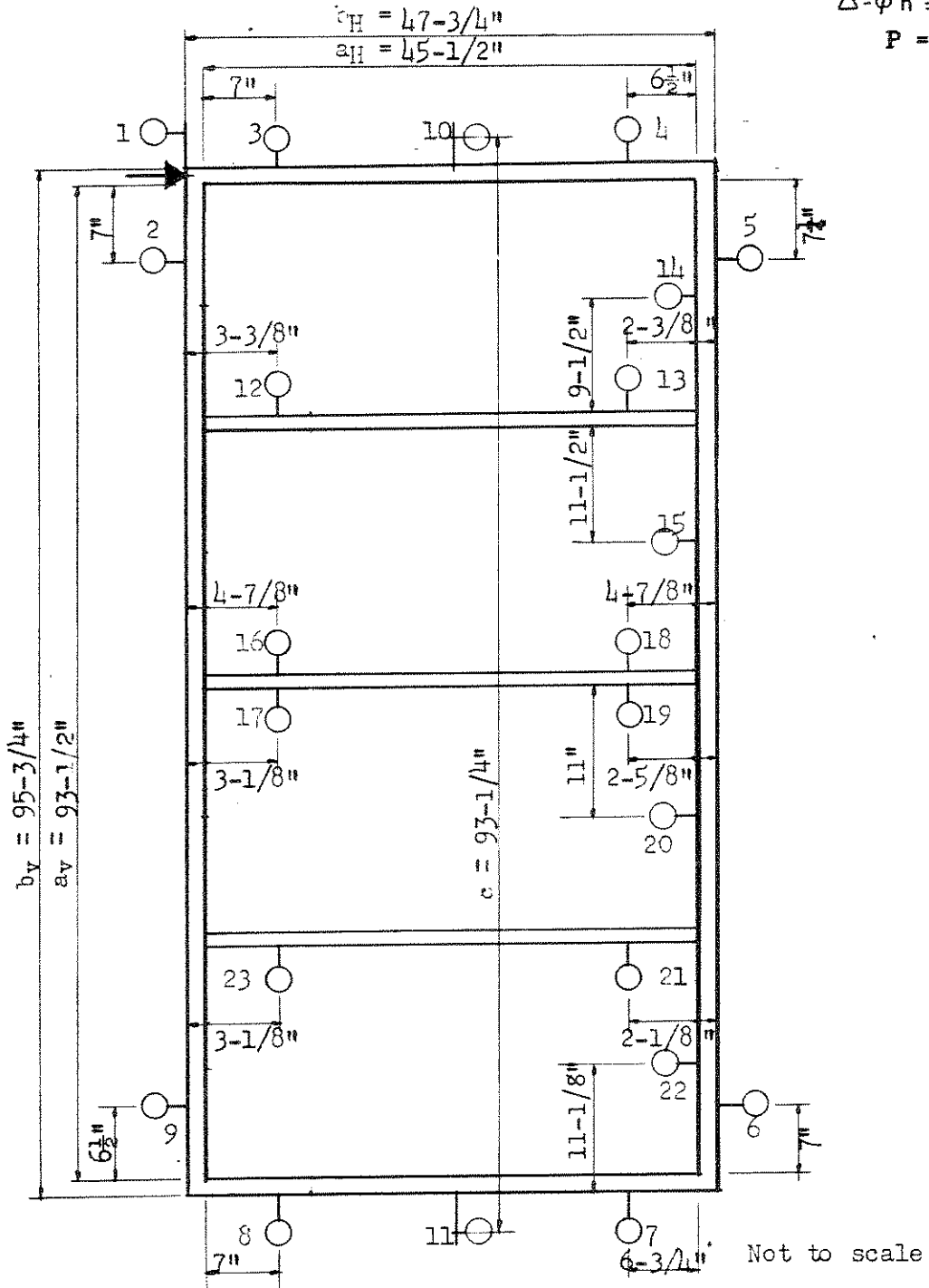
LOAD	400 psi		500		600		690	
	690 lbs		860		1030		1190	
GAGE	READ		READ		READ		READ	
1	866	-3099	517	-3448	415	-3550	Failure	
2	2746	+2620	2863	+2737	2865	+2739		
3	110	- 8	83	- 35	24	- 94		
4	065	- 17	035	- 47	004	- 78		
5	283	-2605	134	-2754	125	-2763		
6	1039	- 441	1004	- 476	986	- 494		
7	743	+ 37	758	+ 52	765	+ 59		
8	089	+ 29	078	+ 18	085	+ 25		
9	528	+ 512	571	+ 555	581	+ 565		
10	3027	+2961	3181	+3115	3187	+3121		
11	187	+ 134	188	+ 135	195	+ 142		
12	2204	+2109	2303	+2208	2294	+2199		
13	072	- 390	050	- 412	002	- 460		
14	204	+ 25	304	+ 125	288	+ 109		
15	622	-2209	507	-2324	514	-2317		
16	881	- 900	832	- 949	820	- 961		
17	608	- 27	473	- 162	460	- 175		
18	605	+ 215	671	+ 281	684	+ 294		
19	965	+ 919	1017	+ 971	1030	+ 984		
20	1599	+1423	1756	+1580	1763	+1587		

PANEL: A-3-p-a- $\frac{1}{2}$ -s
 SERIES: III

DATE GLAZED: 8/17/1959
 DATE TESTED: 8/28/1959

PART IV

Results at failure: $\Delta = 4.31''$
 $\phi h = -0.16''$
 $\Delta - \phi h = 4.47''$
 $P = 1200 \text{ lbs}$



Outside gages measure absolute movement of panel
 Inside gages measure absolute movement of separate glass panels

DIAL GAGE ARRANGEMENT

PANEL: A-3-p-a- $\frac{1}{2}$ -s

SERIES: III

PART IV

LOAD	0 psi		100		130		160		200	
	0 lbs		170		220		270		345	
GAGE	READ		READ		READ		READ		READ	
1	6975		6693	- 282	6003	- 972	5058	-1917	4673	-2302
2	991		1243	+ 252	1889	+ 898	2750	+1759	3090	+2099
3	635		640	+ 5	655	+ 20	665	+ 30	669	+ 34
4	348		360	+ 12	360	+ 12	348	0	352	+ 4
5	5876		5619	- 257	4930	- 946	4065	-1811	3720	-2156
6	916		898	- 18	857	- 59	797	- 119	764	- 152
7	273		274	+ 1	276	+ 3	278	+ 5	281	+ 8
8	1014		1014	0	1005	- 9	1000	- 14	999	- 15
9	181		198	+ 17	242	+ 61	295	+ 114	322	+ 141
10	120		385	+ 265	1056	+ 936	1976	+1856	2339	+2219
11	078		079	+ 1	081	+ 3	085	+ 7	089	+ 11
12	674		684	+ 10	702	+ 28	726	+ 52	760	+ 86
13	400		385	- 15	380	- 20	352	- 48	329	- 71
14	5736		5519	- 217	4850	- 886	4058	-1678	3742	-1994
15	3934		3732	- 202	3205	- 729	2526	-1408	2292	-1642
16	738		736	- 2	727	- 11	718	- 20	684	- 54
17	461		460	- 1	457	- 4	461	0	459	- 2
18	618		607	- 11	603	- 15	598	- 20	575	- 43
19	199		205	+ 6	200	+ 1	196	- 3	200	+ 1
20	2979		2875	-1042	616	- 363	2283	- 696	2146	- 833
21	412		412	0	412	0	412	0	419	+ 7
22	951		906	- 45	835	- 122	737	- 220	679	- 278
23	1327		1329	+ 2	1333	+ 6	1336	+ 9	1334	+ 7

PANEL: A-3-p-a- $\frac{1}{2}$ -s

SERIES: III

PART IV

LOAD	250 psi		300		400		500		600	
	430 lbs		515		690		860		1030	
GAGE	READ		READ		READ		READ		READ	
1	4126	-2849	3901	-3074	3488	-3487	2945	-4030	2672	-4303
2	3569	+2570	3754	+2763	4100	+3109	4544	+3553	4745	+3754
3	665	+ 30	466	+ 31	469	+ 34	674	+ 39	670	+ 35
4	356	+ 8	356	+ 8	362	+ 14	372	+ 28	311	+ 37
5	3241	-2635	3049	-2827	2673	-3203	2176	-3700	1963	-3913
6	707	- 209	688	- 228	638	- 278	568	- 348	538	- 378
7	326	+ 53	330	+ 57	330	+ 57	342	+ 69	343	+ 70
8	998	- 16	996	- 18	992	- 22	988	- 26	990	- 24
9	370	+ 189	401	+ 220	441	+ 260	494	+ 313	517	+ 336
10	2869	+2749	3078	+2958	3458	+3338	3946	+3826	4141	+4021
11	110	+ 32	118	+ 40	135	+ 57	165	+ 87	181	+ 103
12	881	+ 207	929	+ 255	959	+ 285	983	+ 309	995	+ 321
13	419	+ 19	397	- 3	346	- 54	252	- 148	268	- 132
14	3287	-2449	3107	-2679	2762	-2974	2302	-3434	2110	+3626
15	1968	-1966	1836	-2098	1583	-2351	1287	-2647	1135	-2799
16	745	+ 7	761	+ 23	792	+ 54	841	+ 103	858	+ 120
17	436	- 25	404	- 57	317	- 144	239	- 222	200	- 261
18	524	- 94	494	- 124	433	- 185	382	- 236	355	- 263
19	229	+ 30	262	+ 63	329	+ 130	397	+ 198	403	+ 204
20	1961	-1018	1875	-1104	1710	-1269	1609	-1370	1531	-1488
21	446	+ 34	479	+ 67	532	+ 120	576	+ 164	578	+ 166
22	601	- 356	576	- 381	525	- 432	462	- 495	435	- 522
23	1316	- 11	1286	- 41	1218	- 109	1145	- 182	1014	- 313

PANEL: A-3-p-a- $\frac{1}{2}$ -s

SERIES: III

PART IV

LOAD	740 psi		580	
	1270 lbs		1000	
GAGE	READ		READ	
1	1862	-5113	074	-6901
2	5423	+4432	6076	+5085
3	737	+ 102	833	+ 198
4	421	+ 73	466	+ 118
5	2209	-4667	1478	-5398
6	452	- 464	343	- 573
7	345	+ 72	336	+ 63
8	972	- 42	912	- 102
9	537	+ 356	564	+ 383
10	4908	+4788	5657	+5537
11	211	+ 133	250	+ 172
12	1053	+ 379	1091	+ 417
13	202	- 198	92	- 308
14	1349	-4387	612	-5124
15	672	-3262	187	-3747
16	837	+ 99	890	+ 152
17	188	- 273	218	- 243
18	310	- 308	278	- 340
19	761	+ 562	765	+ 566
20	1186	-1793	918	-2061
21	578	+ 166	589	+ 167
22	382	- 575	338	- 619
23	992	- 335	1007	- 320

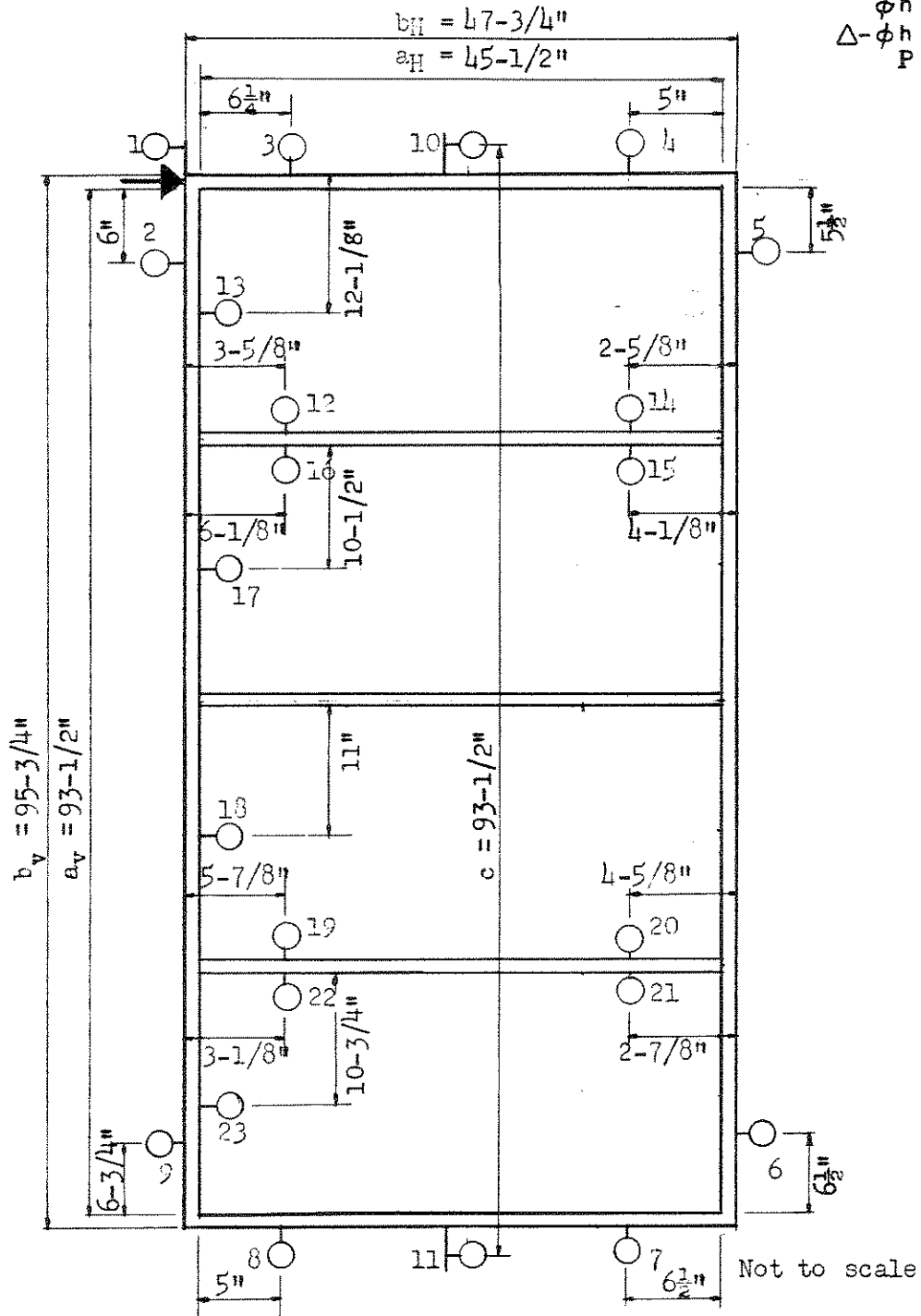
PANEL: A-3-p-a-l-s
 SERIES: III

DATE GLAZED: 8/17/1959
 DATE TESTED: 9/2/1959

PART IV

Results at failure:

$\Delta = 6.06''$
 $\phi h = -0.40''$
 $\Delta - \phi h = 6.46''$
 $P = 1300 \text{ lbs}$



Outside gages measure absolute movement of panel
 Inside gages measure absolute movement of separate glass panels

DIAL GAGE ARRANGEMENT

PANEL: A-3-p-a-l-s

SERIES: III

PART IV

LOAD	0 psi		130		140		160		220	
	0 lbs		220		235		270		380	
GAGE	READ		READ		READ		READ		READ	
1	8784		8668	-1116	7778	-2006	6889	-2895	5851	-3933
2	083		1090	+1007	1870	+1787	2844	+2761	3761	+3678
3	514		508	- 6	499	- 15	512	- 2	537	+ 23
4	284		121	- 163	119	- 165	126	- 158	148	- 136
5	6728		5754	- 974	4946	-1782	4144	-2584	3205	-3523
6	780		699	- 81	636	- 144	570	- 210	476	- 304
7	298		312	+ 14	333	+ 25	332	+ 34	343	+ 55
8	015		005	- 10	005	- 10	005	- 10	008	- 7
9	111		186	+ 75	238	+ 131	308	+ 197	408	+ 297
10	000		1067	+1067	1926	+1926	2787	+2787	3801	+3801
11	066		071	+ 5	077	+ 11	081	+ 15	089	+ 23
12	681		653	- 28	642	- 39	608	- 73	549	- 132
13	247		1120	+ 873	1895	+1648	2685	+2438	3618	+3371
14	524		555	+ 31	584	+ 60	596	+ 72	600	+ 76
15	265		258	- 7	263	- 2	275	+ 10	307	+ 42
16	487		479	- 8	470	- 17	475	- 12	461	- 26
17	130		713	+ 583	1255	+1125	1821	+1691	2501	+2371
18	993		1489	+ 496	1816	+ 823	2147	+1154	2500	+1507
19	498		483	- 15	481	- 17	466	- 32	443	- 55
20	1291		1303	+ 12	1318	+ 27	1323	+ 32	1314	+ 23
21	386		375	- 11	373	- 13	368	- 18	381	- 5
22	540		552	+ 12	552	+ 12	557	+ 17	537	- 3
23	021		211	+ 190	375	+ 354	376	+ 355	393	+ 372

PANEL: A-3-p-a-l-s

SERIES: III

PART IV

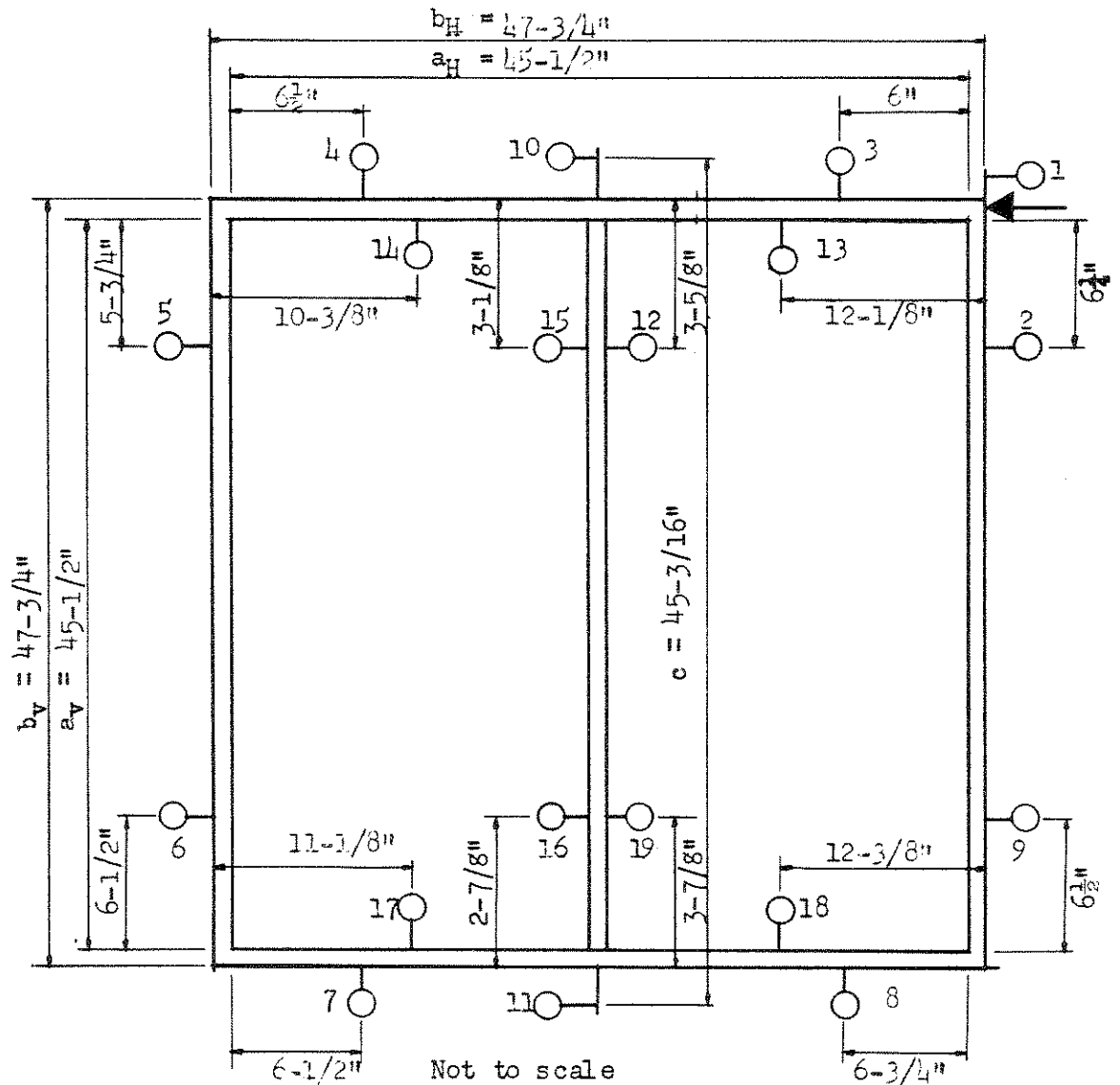
LOAD	475 psi		760		650		600		760	
	820 lbs		1210		1150		1030		1300	
GAGE	READ		READ		READ		READ		READ	
1	4290	-5494	3360	-6424	2710	-7074	766	-9018	Failure	
2	5090	+5007	5870	+5787	6326	+6253	7884	+7801		
3	529	+ 15	555	+ 41	589	+ 75	667	+ 153		
4	196	- 88	231	- 53	257	- 27	--	--		
5	1732	-4996	918	-5810	348	-6380	--	--		
6	280	- 500	--	--	--	--	--	--		
7	302	+ 4	497	+ 199	497	+ 199	--	--		
8	005	- 10	021	+ 6	020	+ 5	--	--		
9	548	+ 437	613	+ 502	651	+ 540	--	--		
10	5315	+5315	6197	+6197	6820	+6820	8775	+8775		
11	160	+ 94	--	--	--	--	--	--		
12	780	+ 99	--	--	--	--	--	--		
13	4904	+4657	--	--	--	--	--	--		
14	403	- 121	--	--	--	--	--	--		
15	511	+ 246	700	+ 435	771	+ 506	--	--		
16	244	- 243	215	- 272	217	- 270	--	--		
17	3235	+3105	3710	+3580	4087	+3957	--	--		
18	3031	+2038	3286	+2293	3495	+2502	3936	+2943		
19	629	+ 131	675	+ 177	686	+ 188	--	--		
20	1129	- 162	835	- 356	860	- 431	--	--		
21	588	+ 202	749	+ 363	780	+ 394	--	--		
22	216	- 324	174	- 366	94	- 446	--	--		
23	600	+ 579	739	+ 718	783	+ 762	1120	+1099		

PANEL: A-2-c-a- $\frac{1}{2}$ -s
 SERIES: III

DATE GLAZED: 8/17/1959
 DATE TESTED: 8/21/1959

PART IV

Results at failure: $\Delta = 1.60''$
 $\phi h = 0.07''$
 $\Delta - \phi h = 1.53''$
 P = 1570 lbs



Outside gages measure absolute movement of panel
 Inside gages measure absolute movement of separate glass panels

DIAL GAGE ARRANGEMENT

PANEL: A-2-c-a- $\frac{1}{2}$ -s

SERIES: III

PART IV

LOAD	0 psi	100	200	300	400
	0 lbs	170	345	515	690
GAGE	READ	READ	READ	READ	READ
1	1825	1496 - 329	969 - 856	679 - 1146	499 - 1326
2	047	339 + 292	776 + 729	1011 + 964	1156 + 1109
3	527	538 + 11	546 + 19	552 + 25	546 + 19
4	376	365 - 11	375 - 1	379 + 3	387 + 11
5	1855	1566 - 289	1115 - 740	873 - 982	728 - 1127
6	923	869 - 54	779 - 144	726 - 197	691 - 232
7	308	329 + 21	338 + 30	317 + 9	303 - 5
8	054	046 - 8	036 - 18	037 - 17	041 - 13
9	009	062 + 53	153 + 144	208 + 199	243 + 234
10	000	331 + 331	830 + 830	1102 + 1102	1262 + 1262
11	30	31 + 1	52 + 22	70 + 40	82 + 52
12	1899	1615 - 284	1212 - 687	982 - 917	837 - 1062
13	471	428 - 43	430 - 41	473 + 2	488 + 17
14	639	573 - 66	524 - 115	581 - 58	600 - 39
15	045	361 + 316	744 + 699	999 + 954	1145 + 1100
16	155	185 + 30	419 + 264	458 + 303	477 + 322
17	060	123 + 63	170 + 110	122 + 62	097 + 37
18	478	523 + 45	523 + 45	478 0	463 - 15
19	900	867 - 33	635 - 265	594 - 306	568 - 332

PANEL: A-2-c-a- $\frac{1}{2}$ -s

SERIES: III

PART IV

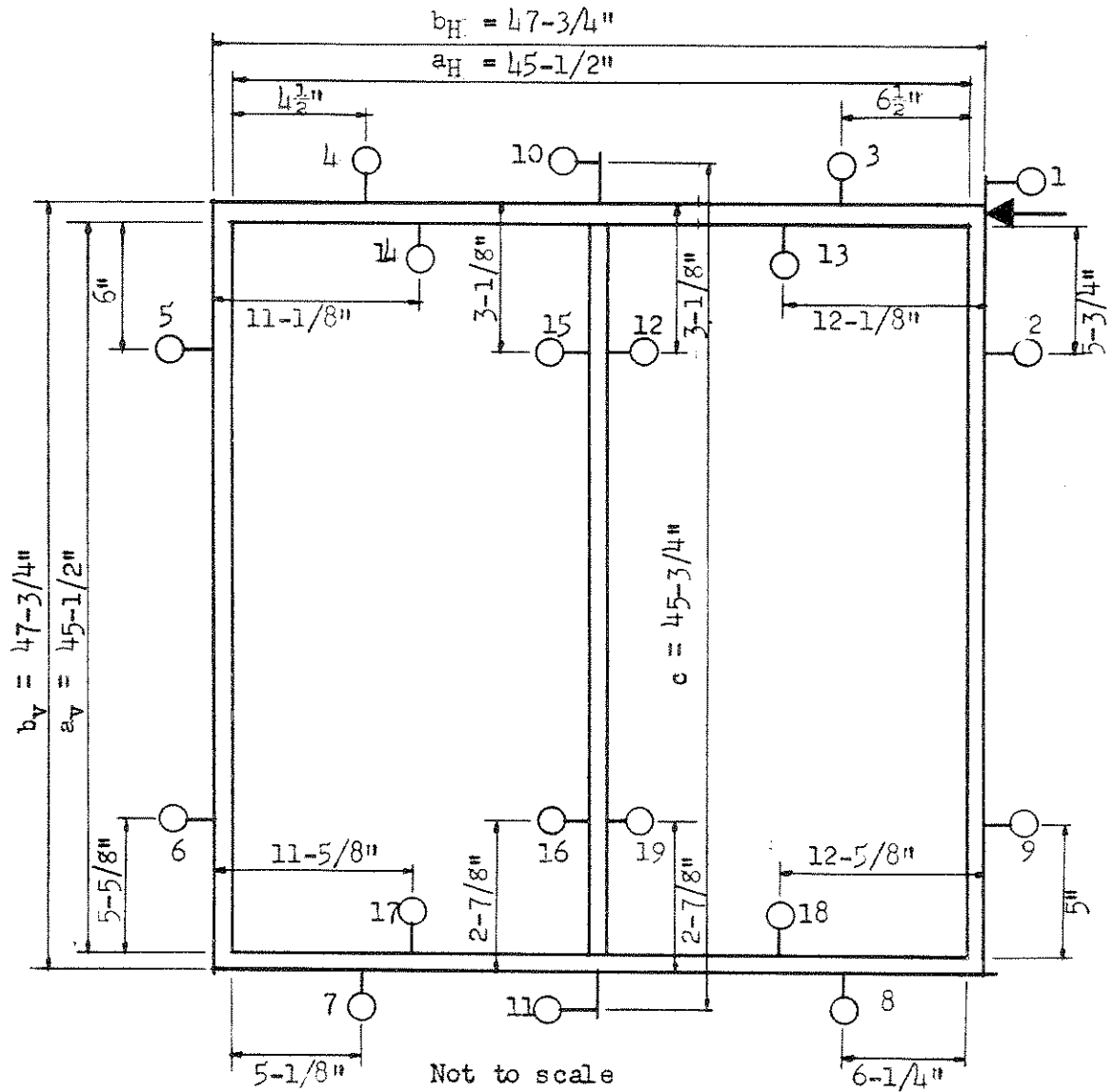
LOAD	500 psi		600		800		910	
	1030 lbs		1030		1375		1570	
GAGE	READ		READ		READ		READ	
1	361	-1164	271	-1554	071	-1754	Failure	
2	1262	+1215	1332	+1285	1178	+1131		
3	537	+ 10	523	- 4	494	- 33		
4	395	+ 19	401	+ 25	408	+ 32		
5	620	-1235	547	-1308	395	-1160		
6	663	- 260	646	- 277	609	- 314		
7	289	- 19	283	- 25	288	- 20		
8	055	- 9	048	- 6	054	0		
9	272	+ 261	288	+ 274	325	+ 316		
10	1380	+1380	1155	+1155	1616	+1616		
11	94	+ 64	103	+ 73	120	+ 90		
12	731	-1168	662	-1237	512	-1387		
13	497	+ 26	491	+ 20	481	+ 10		
14	612	- 27	618	- 21	624	- 15		
15	1245	+1200	1300	+1255	1398	+1353		
16	493	+ 338	505	+ 350	526	+ 371		
17	083	+ 23	075	+ 15	064	+ 4		
18	451	- 27	455	- 23	458	- 20		
19	546	- 354	528	- 372	482	- 418		

PANEL: A-2-c-a-l-s
 SERIES: III

DATE GLAZED: 8/17/1959
 DATE TESTED: 8/19/1959

PART IV

Results at failure: $\Delta = 2.76''$
 $\phi h = 0.06''$
 $\Delta - \phi h = 2.70''$
 $P = 1030 \text{ lbs}$



Outside gages measure absolute movement of panel
 Inside gages measure absolute movement of separate glass panels

DIAL GAGE ARRANGEMENT

PANEL: A-2-c-a-1-s

SERIES: III

PART IV

LOAD	0 psi	100	140	200	300
	0 lbs	170	240	345	515
GAGE	READ	READ	READ	READ	READ
1	2880	2421 - 459	2011 - 869	1340 -1540	981 -1899
2	153	557 + 404	918 + 765	1495 +1342	1792 +1639
3	378	417 + 39	454 + 76	501 + 123	511 + 133
4	582	569 - 13	571 - 11	582 0	595 + 13
5	2749	2353 - 396	1997 - 752	1442 -1307	1145 -1604
6	742	689 - 53	637 - 105	541 - 201	481 - 261
7	762	778 + 16	788 + 26	802 + 40	822 + 60
8	1024	1008 - 16	1001 - 23	1004 - 20	994 - 30
9	030	067 + 37	109 + 79	307 + 177	371 + 241
10	089	546 + 457	958 + 869	1602 +1513	1936 +1847
11	000	4 + 4	13 + 13	34 + 34	53 + 53
12	2960	2587 - 373	2230 - 730	1701 -1259	1460 -1500
13	412	348 - 64	285 - 127	227 - 185	238 - 174
14	1146	1086 - 60	1037 - 109	987 -159	1014 - 132
15	016	425 + 409	795 + 779	1313 +1297	1502 +1486
16	043	097 + 54	147 + 104	365 + 322	483 + 440
17	257	331 + 74	392 + 135	450 + 193	429 + 172
18	827	900 + 73	963 + 136	1031 + 204	1029 + 202
19	905	840 - 65	786 - 119	550 - 355	419 - 486

PANEL: A-2-c-a-1-s

SERIES: III

PART IV

LOAD	400 psi		500		600	
	690 lbs		860		1030	
GAGE	READ		READ		READ	
1	201	-2689	40	-2848	Failure	
2	2455	+2302	2577	+2424		
3	577	+ 199	571	+ 193		
4	626	+ 44	637	+ 55		
5	492	-2257	361	-2388		
6	333	- 409	297	- 445		
7	778	+ 16	773	+ 11		
8	1000	- 24	1003	- 21		
9	498	+ 368	429	+ 399		
10	2695	+2606	2833	+2744		
11	79	+ 79	91	+ 91		
12	761	-2199	644	-2316		
13	420	+ 8	414	+ 2		
14	1154	+ 8	1177	+ 31		
15	2181	+2165	2298	+2282		
16	550	+ 507	576	+ 533		
17	318	+ 61	294	+ 37		
18	860	+ 33	867	+ 40		
19	324	- 581	292	- 613		

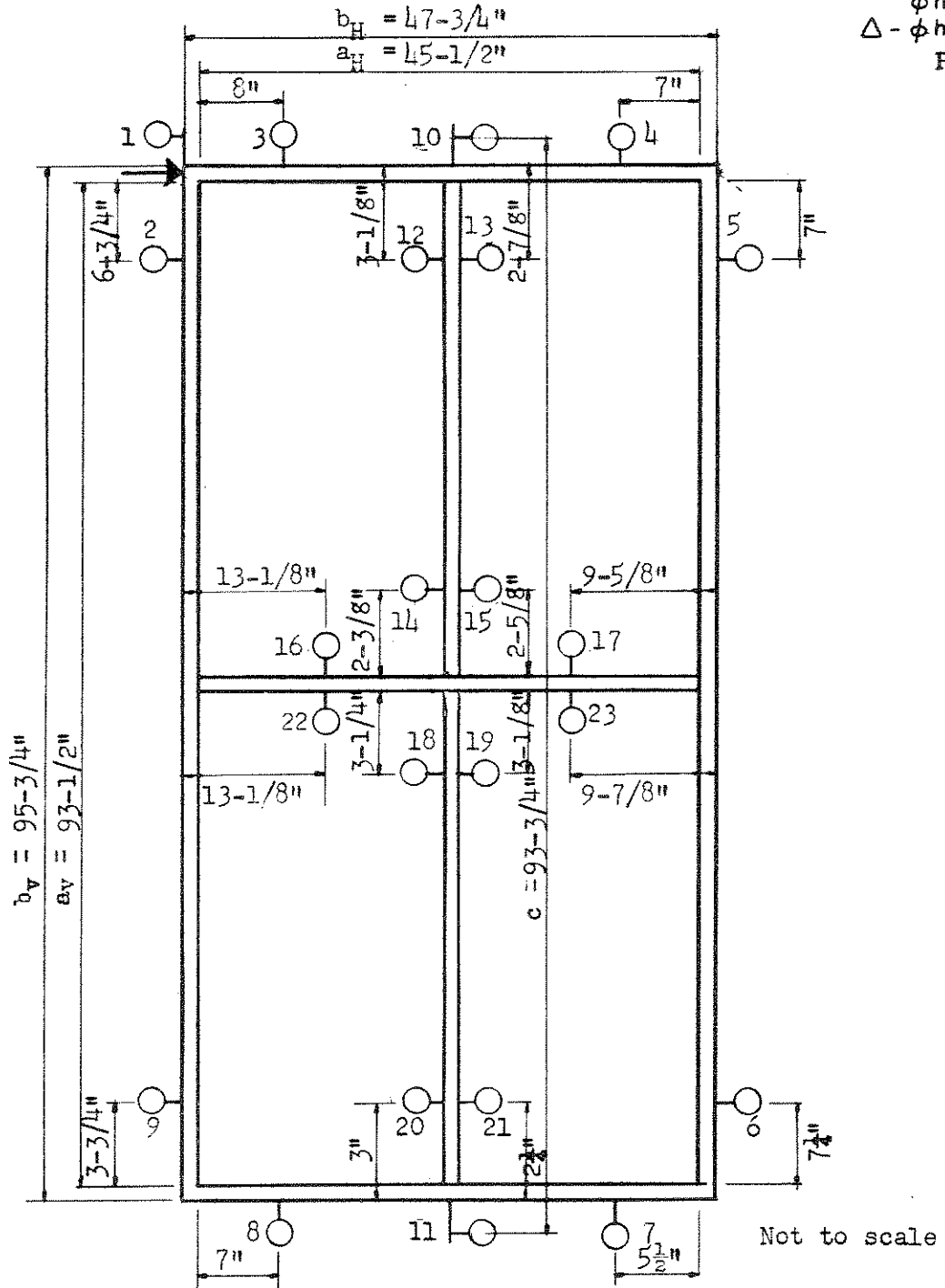
PANEL: A-3-c-a- $\frac{1}{2}$ -s
 SERIES: III

DATE GLAZED: 8/17/1959
 DATE TESTED: 8/26/1959

PART IV

Results at failure:

$\Delta = 2.49''$
 $\phi h = 0.00''$
 $\Delta - \phi h = 2.49''$
 P = 860 lbs



Outside gages measure absolute movement of panel
 Inside gages measure absolute movement of separate glass panels

DIAL GAGE ARRANGEMENT

PANEL: A-3-c-a- $\frac{1}{2}$ -s

SERIES: III

PART IV

LOAD	0 psi		130		200		300		400	
	0 lbs		220		345		515		690	
GAGE	READ		READ		READ		READ		READ	
1	3881		3011	- 870	2288	-1593	1641	-2240	846	-3035
2	093		694	+ 601	1305	+1212	1858	+1765	2559	+2466
3	329		341	+ 12	347	+ 18	379	+ 50	401	+ 72
4	291		302	+ 11	322	+ 31	354	+ 63	400	+ 109
5	3962		3324	- 638	2675	-1287	2110	-1852	1382	-2580
6	722		669	- 53	613	- 109	553	- 169	455	- 267
7	323		333	+ 10	325	+ 2	319	- 4	352	+ 29
8	045		039	- 6	035	- 10	035	- 10	030	- 15
9	063		113	+ 50	147	+ 84	184	+ 121	233	+ 170
10	156		840	+ 684	1528	+1372	2149	+1993	2903	+2747
11	81		079	- 2	083	+ 2	103	+ 22	117	+ 36
12	3839		3234	- 605	2641	-1198	2106	-1733	1433	-2406
13	050		643	+ 593	1235	+1235	1863	+1813	2580	+2530
14	2763		2418	- 345	2031	- 732	1633	-1130	1149	-1614
15	045		432	+ 387	823	+ 778	1222	+1177	1792	+1745
16	329		375	+ 46	393	+ 64	349	+ 20	305	- 24
17	588		591	+ 3	626	+ 38	602	+ 14	554	- 34
18	1937		1694	- 243	1459	- 478	1220	- 717	761	-1176
19	229		515	+ 286	274	+ 527	448	+ 701	out	--
20	689		672	- 17	579	- 110	862	+ 173	823	+ 134
21	245		252	+ 7	288	+ 43	328	+ 83	out	--
22	500		466	- 34	443	- 57	453	- 47	542	+ 42
23	458		422	- 36	432	- 26	468	+ 10	out	--
24	085		410	+ 325	733	+ 648	1027	+ 942	1501	+1416

PANEL: A-3-c- $\frac{1}{2}$ -s

SERIES: III

PART IV

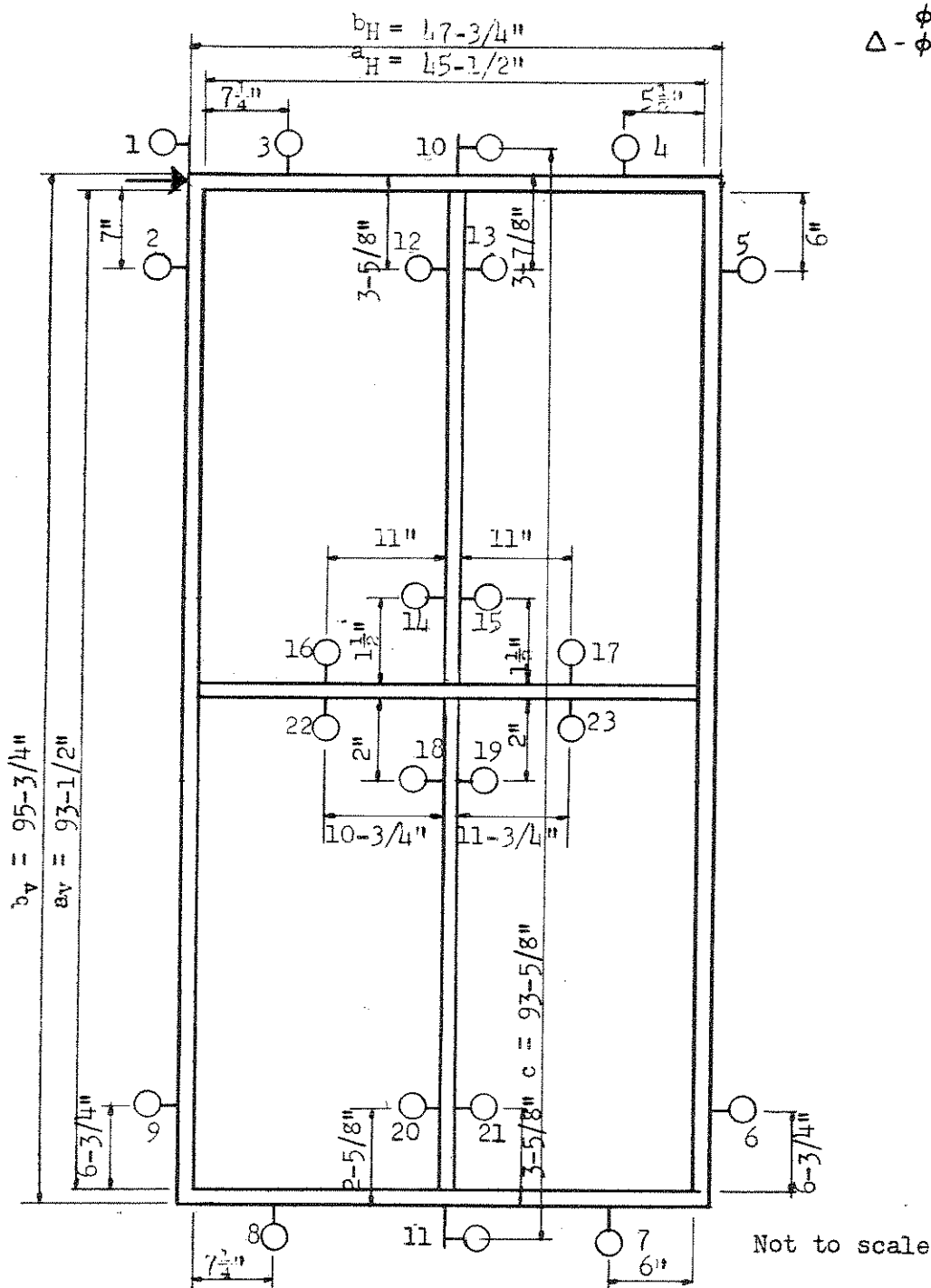
LOAD	500 psi		500	
	860 lbs		860	
GAGE	READ		READ	
1	112	-3769	Failure	
2	3172	+3079		
3	396	+ 67		
4	447	+ 156		
5	724	-3238		
6	378	- 344		
7	352	+ 29		
8	028	- 17		
9	286	+ 223		
10	3588	+3432		
11	122	+ 41		
12	783	-3056		
13	3216	+3166		
14	701	-2062		
15	2185	+2138		
16	298	- 31		
17	522	- 66		
18	401	-1536		
19	--	--		
20	814	+ 125		
21	--	--		
22	528	+ 28		
23	--	--		
24	1848	+1763		

PANEL: A-3-c-a-1-s
 SERIES: III

DATE GLAZED: 8/17/1959
 DATE TESTED: 8/25/1959

PART IV

Results at failure: $\Delta = 5.41''$
 $\phi h = -0.30''$
 $\Delta - \phi h = 5.71''$
 $P = 1200 \text{ lbs}$



Outside gages measure absolute movement of panel
 Inside gages measure absolute movement of separate glass panels

DIAL GAGE ARRANGEMENT

PANEL: A-3-c-a-1-s

SERIES: III

PART IV

LOAD	0 psi		100		150		190		220	
	0 lbs		170		260		330		410	
GAGE	READ		READ		READ		READ		READ	
1	6780		5882	- 898	4912	-1868	3923	-2857	3155	-3625
2	270		1083	+ 813	1901	+1631	2761	+2491	3398	+3128
3	322		380	+ 58	434	+ 112	434	+ 112	484	+ 162
4	503		466	- 37	429	- 74	414	- 89	461	- 42
5	5810		4998	- 812	4175	-1635	3316	-2494	2651	-3159
6	970		905	- 65	836	- 134	754	- 216	671	- 299
7	552		550	- 2	568	+ 16	570	+ 18	559	+ 7
8	099		075	- 24	073	- 26	070	- 29	069	- 30
9	072		124	+ 52	191	+ 119	277	+ 205	345	+ 273
10	114		974	+ 860	1854	+1740	2768	+2654	3492	+3378
11	750		752	+ 2	762	+ 12	781	+ 31	798	+ 48
12	5829		5058	- 771	4222	-1607	3394	-2435	2887	-2942
13	4988		4221	- 767	3419	-1579	2581	-2417	1992	-3006
14	3880		3394	- 486	2912	- 968	2427	-1453	1936	-1944
15	155		634	+ 479	1127	+ 972	1635	+1480	2100	+1945
16	285		357	+ 72	489	+ 204	594	+ 309	597	+ 312
17	251		307	+ 56	392	+ 141	682	+ 431	677	+ 426
18	2864		2588	- 276	2072	- 792	1808	-1056	1567	-1297
19	195		538	+ 343	949	+ 754	1228	+1033	1494	+1299
20	743		712	- 31	685	- 58	560	- 183	454	- 289
21	072		143	+ 71	212	+ 140	396	+ 324	577	+ 505
22	349		290	- 59	221	- 128	238	- 111	269	- 80
23	629		577	- 52	516	- 113	538	- 91	578	- 51
24	016		533	+ 517	959	+ 943	1396	+1380	1733	+1717

PANEL: A-3-c-a-l-s

SERIES: III

PART IV

LOAD	250 psi		375		500		600		700		700	
	430 lbs		645		860		1030		1200		1200	
GAGE	READ		READ		READ		READ		READ		READ	
1	2463	-4317	1925	-4855	1670	-5110	1254	-5526	864	-5916	Failure	
2	4013	+3743	4452	+4182	4653	+4383	4941	+4671	5342	+5072		
3	529	+ 207	557	+ 235	554	+ 232	539	+ 217	--	---		
4	448	- 55	464	- 39	468	- 35	485	- 18	--	--		
5	2026	-3784	1555	-4255	1330	-4480	939	-4871	538	-5272		
6	594	- 376	527	- 443	485	- 485	454	- 516	420	- 550		
7	549	- 3	547	- 5	535	- 17	536	- 16	--	--		
8	067	- 32	075	- 24	076	- 23	075	- 24	--	--		
9	413	+ 341	463	+ 391	495	+ 423	539	+ 467	--	--		
10	4392	+4278	4880	+4766	5105	+4991	5443	+5329	5836	+5722		
11	805	+ 55	835	+ 85	859	+ 109	889	+ 139	888	+ 138		
12	2233	-3596	1774	-4055	1571	-4258	1293	-4536	052	-4936		
13	1465	-3533	1022	-3976	802	-4196	486	-4512	749	-4881		
14	1517	-2363	1191	-2689	1039	-2841	815	-3065	433	-3447		
15	2541	+2386	2797	+2642	2921	+2766	3107	+2952	3469	+3314		
16	567	+ 282	574	+ 289	596	+ 311	638	+ 353	--	--		
17	653	+ 402	612	+ 361	594	+ 343	578	+ 327	--	--		
18	1253	-1611	1043	-1821	932	-1932	762	-2102	--	--		
19	1821	+1626	2012	+1817	2107	+1912	2247	+2052	--	--		
20	375	- 368	317	- 426	285	- 458	242	- 501	--	--		
21	628	+ 556	679	+ 607	712	+ 640	756	+ 684	720	+ 648		
22	333	- 16	343	- 6	334	- 15	314	- 35	--	--		
23	681	+ 52	722	+ 93	736	+ 107	755	+ 126	--	--		
24	2047	+2031	2258	+2242	2369	+2353	2541	+2525	--	--		

P A R T VDeflection Reversal TestsFailure Modes:

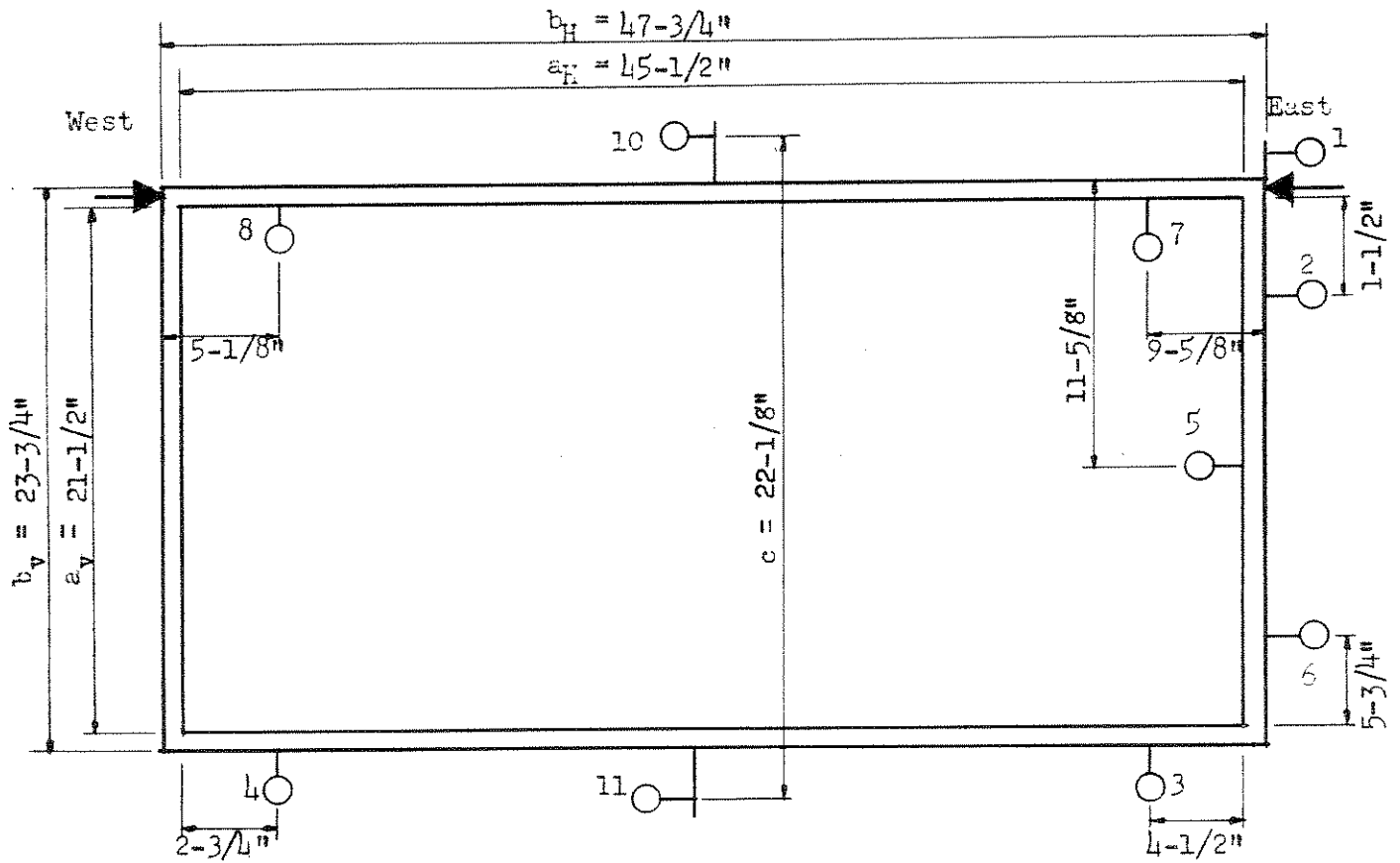
- A-1-a-1/2-s First cracks in the left bottom corner of the glass panel occurred under a load of 3053 lb applied at the east side of the hinged frame. The frame was then loaded by the west-side jack to reach a deflection of 1.25 in. Final failure in the next step occurred while the panel was loaded by the east-side jack and a deflection of 1.42 in. was reached under a load of 1375 lb.
- No glass broke out.
- A-1-a-1-s Sudden complete collapse of the panel due to buckling occurred under a load of 2305 lb which was applied against the east-side loading plate of the hinged frame.
- The glass panel buckled inward and the glass flew inward over a distance of 5 ft. Some glass flew outward over a distance of 3 ft.

PANEL: A-1-a- $\frac{1}{2}$ -s
 Deflection reversal

DATE GLAZED: 8/17/1959
 DATE TESTED: 9/1/1959

PART V

Results at failure: $\Delta = 0.85''$
 $\phi h = 0.00''$
 $\Delta - \phi h = 0.85''$
 $P = 3053 \text{ lbs}$



Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-1-a- $\frac{1}{2}$ -s (deflection reversal)

PART V

LOAD	0 lbs		+378-E		-396-W		+654-E		-550-W	
GAGE	READ		READ		READ		READ		READ	
1	1591		1336	- 255	1843	+ 252	1092	- 499	2101	+ 510
2	1420		1666	+ 242	1178	- 242	1886	+ 466	958	- 462
3	361		351	- 10	370	+ 9	346	- 15	370	+ 9
4	307		315	+ 8	289	- 18	307	0	282	- 25
5	1351		1373	+ 22	1154	- 197	1416	+ 65	917	- 434
6	1373		1443	+ 70	1303	- 70	1516	+ 143	1228	- 145
7	466		433	- 30	470	+ 4	402	- 64	480	+ 14
8	632		629	- 3	625	- 7	646	+ 14	614	- 18
9	No gage at this number				--	--	--	--	--	--
10	1425		1684	+ 259	1174	- 251	1916	+ 491	930	- 495
11	090		097	+ 7	80	- 10	115	+ 25	58	- 32
LOAD	+1270-E		-1080-W		+1940-E		-1230-W		+3053-E	
GAGE	READ		READ		READ		READ		READ	
1	815	- 776	2339	+ 748	591	-1000	2591	+1000	341	-1250
2	2098	+ 678	706	- 714	2210	+ 790	579	- 841	2377	+ 957
3	348	- 13	345	- 16	361	0	350	- 11	366	+ 5
4	283	- 24	287	- 20	278	- 29	293	- 14	283	- 24
5	1541	+ 190	727	- 624	1851	+ 500	876	- 475	1953	+ 602
6	1613	+ 240	1107	- 266	1709	+ 336	1076	- 297	1799	+ 426
7	331	- 135	530	+ 64	479	- 153	810	+ 178	443	- 189
8	770	+ 138	550	- 82	777	+ 145	465	- 167	713	+ 81
9	No gage at this number				--	--	--	--	--	--
10	1968	+ 713	571	- 854	2264	+ 839	542	- 883	2427	+1002
11	169	+ 79	005	- 85	141	+ 51	058	- 32	170	+ 80

PANEL: A-1-a- $\frac{1}{2}$ -s (deflection reversal)

PART V

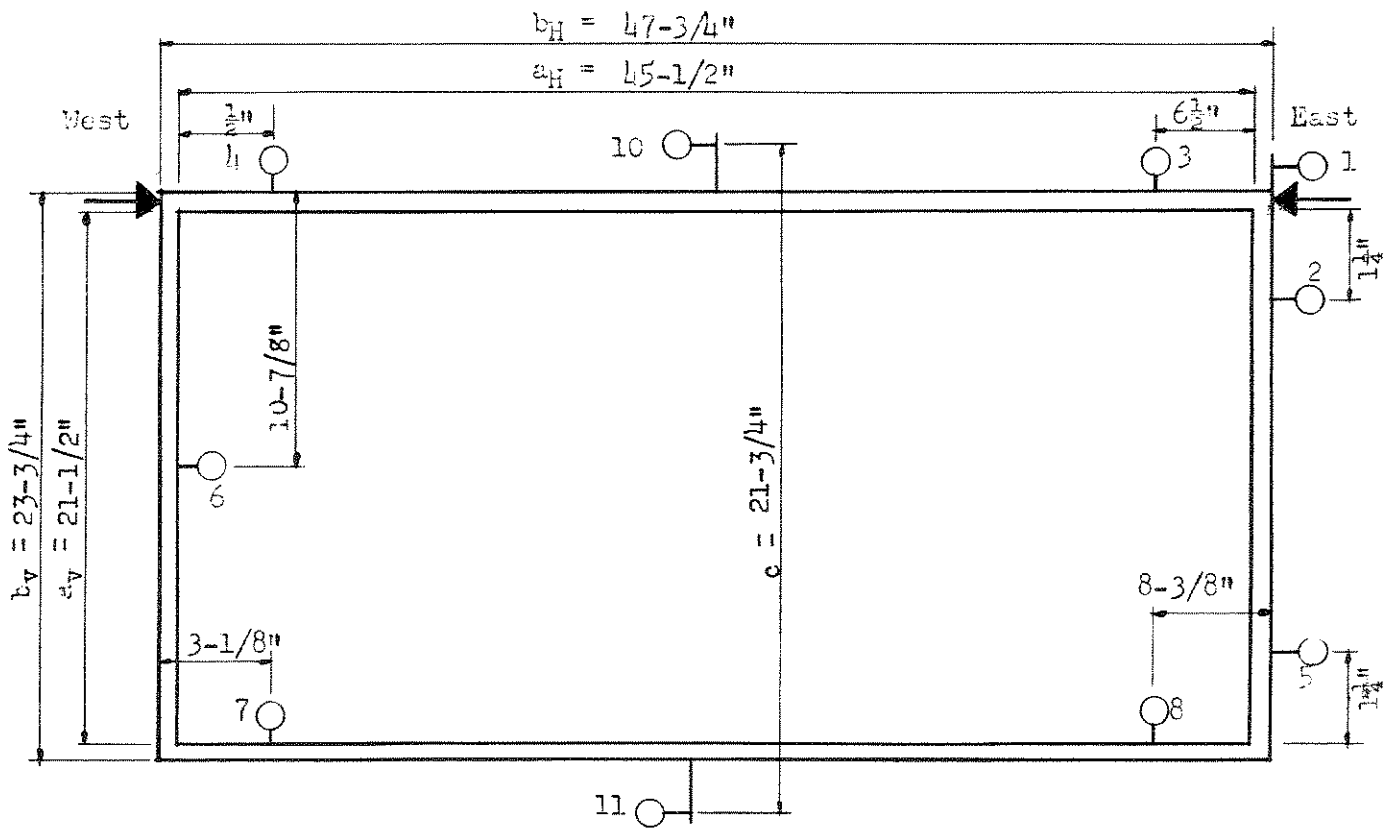
LOAD	-2440-W		+1375-E
GAGE	READ		READ
1	2841	+1250	Failure
2	447	- 973	
3	334	- 27	
4	333	+ 26	
5	593	- 758	
6	893	- 480	
7	874	+ 242	
8	398	- 234	
9	No gage at this number		
10	434	- 991	
11	--	--	

PANEL: A-1-a-1-s
 Deflection reversal

DATE GLAZED: 8/17/1959
 DATE TESTED: 9/3/1959

PART V

Results at failure: $\Delta = 1.30''$
 $\phi h = 0.00''$
 $\Delta - \phi h = 1.30''$
 $P = 2320 \text{ lbs}$



Not to scale

Outside gages measure movement of sash
 Inside gages measure movement of glass with respect to sash

DIAL GAGE ARRANGEMENT

PANEL: A-1-a-1-s (deflection reversals)

PART V

LOAD	0 lbs		+361-E		-330-W		+482-E		-460-W	
GAGE	READ		READ		READ		READ		READ	
1	1941		1691	- 250	2191	+ 250	1441	- 500	2441	+ 500
2	2214		2450	+ 236	1994	- 220	2683	+ 469	1774	- 440
3	575		584	+ 9	590	+ 15	605	+ 30	597	+ 22
4	477		477	0	470	- 7	472	- 5	475	- 2
5	986		003	+ 17	973	- 13	038	+ 52	967	- 19
6	1662		1529	- 133	1773	+ 111	1375	- 287	1894	+ 232
7	535		539	+ 4	549	+ 14	547	+ 12	552	+ 17
8	460		478	+ 18	463	+ 3	490	+ 30	463	+ 3
9	No gage at this number		--	--	--	--	--	--	--	--
10	2012		2258	+ 246	1775	- 237	2500	+ 488	1547	- 465
11	1073		1074	+ 1	1073	0	1084	+ 11	1069	- 4

LOAD	+600-E		-528-W		+690-E		-616-W		+912-E	
GAGE	READ		READ		READ		READ		READ	
1	1191	- 750	2691	+ 750	941	-1000	2941	+1000	691	-1250
2	2888	+ 674	1362	- 852	3072	+ 868	1362	- 852	3297	+1083
3	602	+ 27	607	+ 32	518	+ 57	607	+ 32	601	+ 26
4	473	- 4	486	+ 9	454	- 23	486	+ 9	473	- 4
5	1070	+ 84	824	- 162	120	+ 134	824	- 162	1156	+ 170
6	1197	- 465	1162	+ 500	1014	- 648	2162	+ 500	883	- 779
7	548	+ 13	564	+ 29	520	- 15	564	+ 29	547	+ 12
8	502	+ 42	445	- 15	508	+ 48	445	- 15	683	+ 148
9	No gage at this number		--	--	--	--	--	--	--	--
10	2709	+ 697	1119	- 893	2916	+ 904	1119	- 893	3153	+1141
11	1104	+ 31	993	- 80	1139	+ 66	993	- 80	1162	+ 89

PANEL: A-1-a-1-s (deflection reversals)

PART V

LOAD	-790-W		+1324-E		-1100-W		+2305-E	
GAGE	READ		READ		READ		READ	
1	3191	+1250	441	-1500	3441	+1500	144	-1797
2	1140	-1074	3474	+1260	944	-1270	Failure	
3	621	+ 46	547	- 28	603	+ 28		
4	476	- 1	482	+ 5	494	+ 17		
5	798	- 188	1184	+ 198	760	- 226		
6	2345	+ 683	778	- 884	842	+ 820		
7	667	+ 132	440	- 95	143	+ 392		
8	526	- 9	827	+ 292	450	- 10		
9	No gage at this number				--	--		
10	889	-1123	3279	+1267	686	-1326		
11	976	- 97	1178	+ 105	951	- 122		