



## STRUCTURAL PERFORMANCE TEST REPORT

Rendered to:

CUSTOM DECORATIVE MOULDING  
12136 Sussex Highway  
Greenwood, Delaware 19950

Report No: 53086.01-119-19  
Test Date: 08/23/04  
Through: 09/02/04  
Report Date: 02/21/04

**Product:** Wood Reinforced Polyurethane Foam Porch Post

**Type:** 8 ft. Long 4-1/2" by 4-1/2" Porch Post  
9 ft. Long 5-1/4" by 5-1/4" Porch Post

**Project Summary:** Architectural Testing, Inc. (ATI) was contracted by Custom Decorative Moulding to evaluate the structural performance of their 4-1/2" by 4-1/2" and 5-1/4" by 5-1/4" wood reinforced polyurethane foam porch posts. The evaluation was for pure axial loads in compression, lateral loads, and uplift strength tests on their porch posts.

**Test Samples:** All test samples were provided by the manufacturer for testing. Nine columns of each size were provided for testing with three columns for each structural evaluation: compression, lateral load and uplift strength tests. The compression samples and lateral load samples measured 95-5/8" (4-1/2" by 4-1/2" porch post) and 107-5/8" (5-1/4" by 5-1/4" porch post) in actual lengths while the uplift samples measured in the range of 20" to 22-5/8" in length. Each sample was comprised of a wood reinforcing member (finger joint construction) encased in molded polyurethane foam. There were two types of wood utilized in the fabrication of the test samples, Matoa and Agathis. Each structural loading test will indicate which specie the sample was comprised of. On February 18, 2005 a representative of Custom Decorative Moulding visited Architectural Testing Inc (York, PA) to identify the wood species of the tested specimens. See attached drawings in Appendix A and photographs in Appendix B for additional description.

**Equipment:** The axial load test fixture consisted of a flat rigid steel support at the top. The bottom consisted of a hydraulic jack positioned on a leveling fixture, fitted with a flat steel bearing plate and a 50,000 pound load cell. Test duration and deflection were recorded throughout the test.

For the lateral load tests, the columns were tested in a self-contained structural frame. The specimen is loaded using an electric winch mounted to a rigid steel test frame. High strength cables and nylon lifting straps are used to impose test loads on the specimen. Applied load is measured using an electronic load cell located in-line within the loading system. Deflections are measured to the nearest 0.01" using electronic linear transducers.

For the uplift strength tests the specimens were tested to ultimate capacity in tension utilizing a SATEC model 50UD universal test machine.

#### **Test Set-Up:**

Axial Load Test: The posts were installed into the compression fixture. The columns were plumbed with a "PLS-5" laser plumbing device, while applying a minimal preload to hold the specimen in place. Two electronic linear transducers were positioned perpendicular to the midpoints of two adjacent sides of the columns, to measure lateral displacements about the x- and y-axes of the column.

Lateral Load Test: Both test specimens were tested by directly securing the ends of the columns into a rigid steel test frame. Transducers mounted to an independent reference frame are located to record movement of reference points on the columns (ends and mid-point) to determine net component deflections.

Uplift Load Test: The testing machine was fitted with 4 x 4 pressure treated SYP wood posts at the top and bottom to accommodate anchorage of the column brackets. The top 4 x 4 wood post was attached to the test machine with a swivel mechanism and the bottom 4 x 4 wood post was attached rigidly to the test machine. The swivel compensated for any inconsistencies in the squareness and plumb of the specimens. Each end bracket was secured to the 4 x 4 wood posts with four #12 by 2" Robertson head screws. Tests were run at a cross-head speed of 0.125 in./min. and all tests were conducted at lab ambient temperature (68°F ±4°F). Reference photographs in Appendix B for test setups.

**Test Procedure:** The test specimen was inspected prior to testing to verify size and general condition of the materials, assembly and installation. Any potentially compromising defects observed were noted prior to the load test.

**Axial Load Test:** The tests began with a small initial load and continued in incremental step loads until failure. Lateral displacements and the time (to the nearest 30 seconds) were recorded at each load increment. The ultimate load and mode of failure were recorded for each test.

**Lateral Load Test:** Loads were increased at a steady uniform rate until the specimens ultimate test load was reached. The load was applied at 36" from the bottom of the 4-1/2" by 4-1/2" porch posts and 42" from the bottom of the 5-1/4" by 5-1/4" porch posts. The test duration, deflection, and ultimate test load were recorded.

**Uplift Load Test:** After securing each column into the test machine, the load was applied at a uniform rate (0.125 in/min) until the fasteners and/or column bracket reached its ultimate load capacity.

**Axial Load Test Results:** Test loads are pure axial compression (concentric). X- and Y-Axis displacements are measured at the column mid-height. Load/deflection curves are adjusted for the offset from the origin due to the initial load at the zero point of the deflection readings. X- and Y-Adjusted values are the X- and Y-Displacements plus the offset.

**Specimen No. 1: 4-1/2" by 4-1/2" Porch Post  
Test Date: 08/23/04 - Wood Type: Agathis**

Test Load (lbs)	Displacement (inches)		Origin Offset Adjustment	
	X	Y	X-Adjusted	Y-Adjusted
0	-	-	0.000	0.000
168	0.000	0.000	0.034	-0.022
1100	0.057	0.078	0.091	0.056
2100	0.075	0.078	0.109	0.056
3300	0.107	0.080	0.141	0.058
4100	0.128	0.087	0.162	0.065
5100	0.148	0.094	0.182	0.072
6300	0.164	0.099	0.198	0.077
7200	0.181	0.106	0.215	0.084
8100	0.198	0.119	0.232	0.097
9300	0.226	0.134	0.260	0.112
10400	0.272	0.153	0.306	0.131
11000	0.293	0.171	0.327	0.149
12200	0.339	0.203	0.373	0.181
13300	0.411	0.231	0.445	0.209
14200	0.500	0.271	0.534	0.249
15200	0.714	0.370	0.748	0.348
15500	Ultimate Load / Lateral Buckling			

Test Results: (Continued)

**Specimen No. 2: 4-1/2" by 4-1/2" Porch Post**  
**Test Date: 08/23/04 - Wood Type: Agathis**

Test Load (lbs)	Displacement (inches)		Origin Offset Adjustment	
	X	Y	X-Adjusted	Y-Adjusted
0	-	-	0.000	0.000
116	0.000	0.000	0.016	0.001
1100	0.035	0.005	0.051	0.006
2100	0.055	0.011	0.071	0.012
3100	0.078	0.019	0.094	0.020
4300	0.107	0.037	0.123	0.038
5100	0.128	0.056	0.144	0.057
6200	0.150	0.073	0.166	0.074
7300	0.168	0.091	0.184	0.092
8000	0.181	0.105	0.197	0.106
9200	0.212	0.126	0.228	0.127
10200	0.241	0.153	0.257	0.154
11100	0.272	0.188	0.288	0.189
12200	0.321	0.241	0.337	0.242
13000	0.375	0.300	0.391	0.301
14100	0.447	0.407	0.463	0.408
15200	Ultimate Load / Lateral Buckling			

Test Results: (Continued)

Specimen No. 3: 4-1/2" by 4-1/2" Porch Post  
Test Date: 08/24/04 - Wood Type: Agathis

Test Load (lbs)	Displacement (inches)		Origin Offset Adjustment	
	X	Y	X-Adjusted	Y-Adjusted
0	-	-	0.000	0.000
181	0.000	0.000	0.012	-0.007
1060	0.000	0.048	0.012	0.041
2100	0.000	0.055	0.012	0.048
3700	0.007	0.092	0.019	0.085
4500	0.023	0.119	0.035	0.112
5080	0.033	0.131	0.045	0.124
6100	0.036	0.160	0.048	0.153
7000	0.037	0.183	0.049	0.176
8100	0.037	0.226	0.049	0.219
9200	0.037	0.263	0.049	0.256
10100	0.037	0.300	0.049	0.293
11000	0.040	0.367	0.052	0.360
12300	0.046	0.466	0.058	0.459
13200	0.052	0.553	0.064	0.546
14200	0.061	0.722	0.073	0.715
15200	0.171	1.316	0.183	1.309
15200	Ultimate Load / Lateral Buckling			

Test Results: (Continued)

Specimen No. 1: 5-1/4" by 5-1/4" Porch Post  
Test Date: 08/24/04 - Wood Type: Matao

Test Load (lbs)	Displacement (inches)		Origin Offset Adjustment	
	X	Y	X-Adjusted	Y-Adjusted
0	-	-	0.000	0.000
182	0.000	0.000	-0.010	-0.016
1000	0.064	0.073	0.054	0.057
2200	0.132	0.095	0.122	0.079
3100	0.152	0.100	0.142	0.084
4200	0.171	0.104	0.161	0.088
5100	0.188	0.107	0.178	0.091
6200	0.202	0.112	0.192	0.096
7200	0.212	0.118	0.202	0.102
8200	0.226	0.125	0.216	0.109
9300	0.236	0.133	0.226	0.117
10100	0.246	0.141	0.236	0.125
11100	0.258	0.156	0.248	0.140
12300	0.273	0.170	0.263	0.154
13100	0.281	0.174	0.271	0.158
14200	0.299	0.180	0.289	0.164
15100	0.320	0.191	0.310	0.175
16100	0.330	0.210	0.320	0.194
17100	0.352	0.222	0.342	0.206
18200	0.369	0.240	0.359	0.224
19100	0.392	0.257	0.382	0.241
20000	0.417	0.279	0.407	0.263
21600	0.457	0.324	0.447	0.308
22500	0.501	0.354	0.491	0.338
23200	0.531	0.386	0.521	0.370
24200	0.581	0.441	0.571	0.425
25200	0.678	0.544	0.668	0.528
26100	0.813	0.686	0.803	0.670
27000	0.998	0.812	0.988	0.796
27500	Ultimate Load / Lateral Buckling			

Test Results: (Continued)

**Specimen No. 2: 5-1/4" by 5-1/4" Porch Post**  
**Test Date: 08/24/04 - Wood Type: Matao**

Test Load (lbs)	Displacement (inches)		Origin Offset Adjustment	
	X	Y <sup>1</sup>	X-Adjusted	Y-Adjusted
0	-	-	0.000	0.000
270	0.000	0.000	0.027	0.000
1100	0.013	0.000	0.040	0.000
2000	0.045	0.000	0.072	0.000
3000	0.070	0.000	0.097	0.000
4300	0.098	0.000	0.125	0.000
5200	0.117	0.000	0.144	0.000
6200	0.129	0.000	0.156	0.000
7100	0.137	0.000	0.164	0.000
8000	0.151	0.000	0.178	0.000
9500	0.171	0.000	0.198	0.000
10300	0.175	0.000	0.202	0.000
11500	0.180	0.000	0.207	0.000
12200	0.185	0.000	0.212	0.000
13500	0.202	0.000	0.229	0.000
14300	0.213	0.000	0.240	0.000
15200	0.220	0.000	0.247	0.000
16000	0.230	0.000	0.257	0.000
17700	0.248	0.000	0.275	0.000
18100	0.263	0.000	0.290	0.000
19100	0.286	0.000	0.313	0.000
20000	0.303	0.000	0.330	0.000
21100	0.331	0.000	0.358	0.000
22200	0.359	0.000	0.386	0.000
23200	0.391	0.000	0.418	0.000
24300	0.433	0.000	0.460	0.000
25700	0.505	0.000	0.532	0.000
26300	0.555	0.000	0.582	0.000
27200	0.619	0.000	0.646	0.000
28200	0.737	0.000	0.764	0.000
28200	Ultimate Load / Lateral Buckling			

<sup>1</sup>Equipment malfunction for Y-axis displacement measurement.

Test Results: (Continued)

Specimen No. 3: 5-1/4" by 5-1/4" Porch Post  
Test Date: 08/24/04 - Wood Type: Matao

Test Load (lbs)	Displacement (inches)		Origin Offset Adjustment	
	X	Y <sup>1</sup>	X-Adjusted	Y-Adjusted
0	-	-	0.000	0.000
716	0.000	0.000	0.056	0.001
1500	0.020	0.027	0.076	0.028
2000	0.029	0.027	0.085	0.028
3200	0.043	0.035	0.099	0.036
4100	0.060	0.040	0.116	0.041
5100	0.067	0.040	0.123	0.041
6200	0.086	0.040	0.142	0.041
7100	0.109	0.040	0.165	0.041
8400	0.120	0.050	0.176	0.051
9500	0.127	0.050	0.183	0.051
10500	0.143	0.050	0.199	0.051
11500	0.156	0.050	0.212	0.051
12600	0.168	0.050	0.224	0.051
13100	0.176	0.050	0.232	0.051
14100	0.188	0.055	0.244	0.056
15000	0.204	0.065	0.260	0.066
16300	0.222	0.075	0.278	0.076
17400	0.240	0.083	0.296	0.084
18100	0.252	0.087	0.308	0.088
19200	0.283	0.095	0.339	0.096
20200	0.300	0.106	0.356	0.107
21000	0.330	0.116	0.386	0.117
22300	0.359	0.130	0.415	0.131
23100	0.388	0.143	0.444	0.144
24100	0.431	0.161	0.487	0.162
25000	0.484	0.188	0.540	0.189
26300	0.626	0.245	0.682	0.246
27300	0.713	0.303	0.769	0.304
27300	Ultimate Load / Lateral Buckling			



**Summary of Axial Load Test Results:** Results are ultimate load capacity of individual specimens and should not be used as safe working values or design load values.

**4-1/2" by 4-1/2" Porch Post**

<b>Specimen No.</b>	<b>Ultimate Load (lbs)</b>	<b>Percent Deviation From Average</b>
1	15500	1.3%
2	15200	0.7%
3	15200	0.7%
Minimum:	15200	
Maximum:	15500	
<b>Average:</b>	<b>15300</b>	

**5-1/4" by 5-1/4" Porch Post**

<b>Specimen No.</b>	<b>Ultimate Load (lbs)</b>	<b>Percent Deviation From Average</b>
1	27500	0.6%
2	28200	1.9%
3	27300	1.3%
Minimum:	27300	
Maximum:	28200	
<b>Average:</b>	<b>27667</b>	

**Lateral Load Test Results:** Lateral Loads (lbs) at Ultimate Post Strength (failure):

**Specie Identification:** M - Matoa, A - Agathis

**4-1/2" by 4-1/2" Porch Post<sup>1</sup>**

**Test Date: 09/02/04**

Specimen No.	Ultimate Load (lbs)
1 - M	1421
2 - A	1039
3 - M	1461
<b>Average</b>	<b>1309</b>

<sup>1</sup> Load applied 36" from base.

**5-1/4" by 5-1/4" Porch Post<sup>1</sup>**

**Test Date: 09/02/04**

Specimen No.	Ultimate Load (lbs)
1 - M	894
2 - M	1128
3 - M	919
<b>Average</b>	<b>980</b>

<sup>1</sup> Load applied 42" from base.

**Uplift Load Test Results:** Individual results are listed in the following tables.

**4-1/2" by 4-1/2" Porch Post**

**Test Date: 08/26/04**

Specimen No,	Ultimate Load (lbs)	% Deviation From Average	Failure Mode
1	2987	10%	Bracket Failure
2	2124	36%	Shear Failure of Screws
3	4900	32%	Bracket Failure
<b>Average:</b>	<b>3337</b>		

**5-1/4" by 5-1/4" Porch Post**

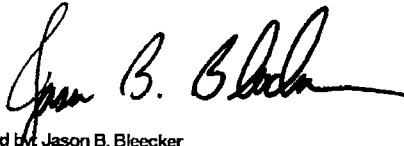
**Test Date: 08/26/04**

Specimen No,	Ultimate Load (lbs)	% Deviation From Average	Failure Mode
1	2608	13%	Bracket Failure
2	2517	10%	Screw/Porch Post Failure
3	1689	26%	Screw/Porch Post Failure
<b>Average:</b>	<b>2271</b>		

See photographs in Appendix B for various modes of failure.

A copy of this report and all supporting data will be retained by ATI for a period of four years from the original test date. This report is the exclusive property of the client so named herein and is applicable only to the sample tested. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory. This report may not be reproduced, except in full, without the written approval of Architectural Testing.

For ARCHITECTURAL TESTING, INC.:



Digitally Signed by: Jason B. Bleecker

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Jason B. Bleecker  
Technician

JBB:jbb/nlb

Attachments (pages)

Appendix A - Drawings (5)

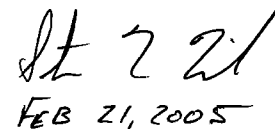
Appendix B - Photographs (7)



Digitally Signed by: Steven M. Urich

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Steven M. Urich, P.E.  
Senior Project Engineer



ST 2 21  
FEB 21, 2005

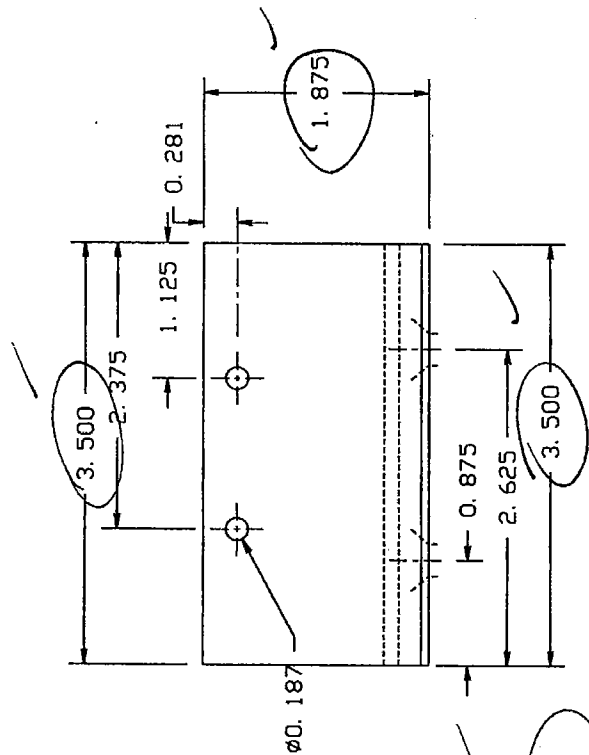
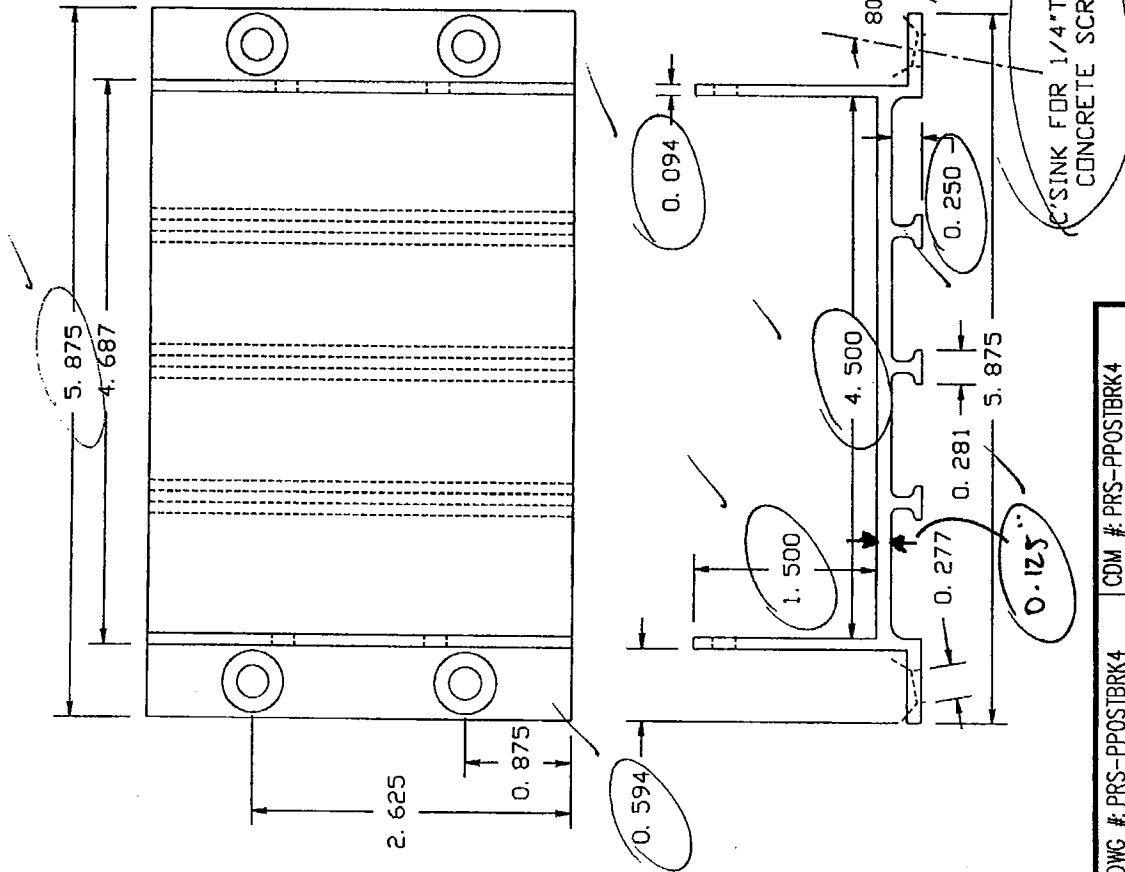
### Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	02/21/04	N/A	Original report issue

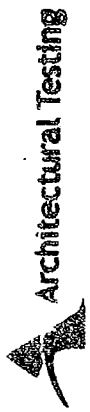


## **APPENDIX A**

### **Drawings**



DWG # PRS-PPOSTBRK4		CDM # PRS-PPOSTBRK4	
PROJECT: BRACKET FOR 4-1/2" PORCH POST		INV #:	
SCALE: 8" = 1'	DATE: 06-02-2004	REVISIONS	INITIALS
DRAWN BY: Craig H.			
CHECKED BY:			
MASTER FINISH DATE:			
NOTE:			



Test sample complies with these details. Deviations are noted.

Report # 53086.01

Date 11/22/04 Tech 883

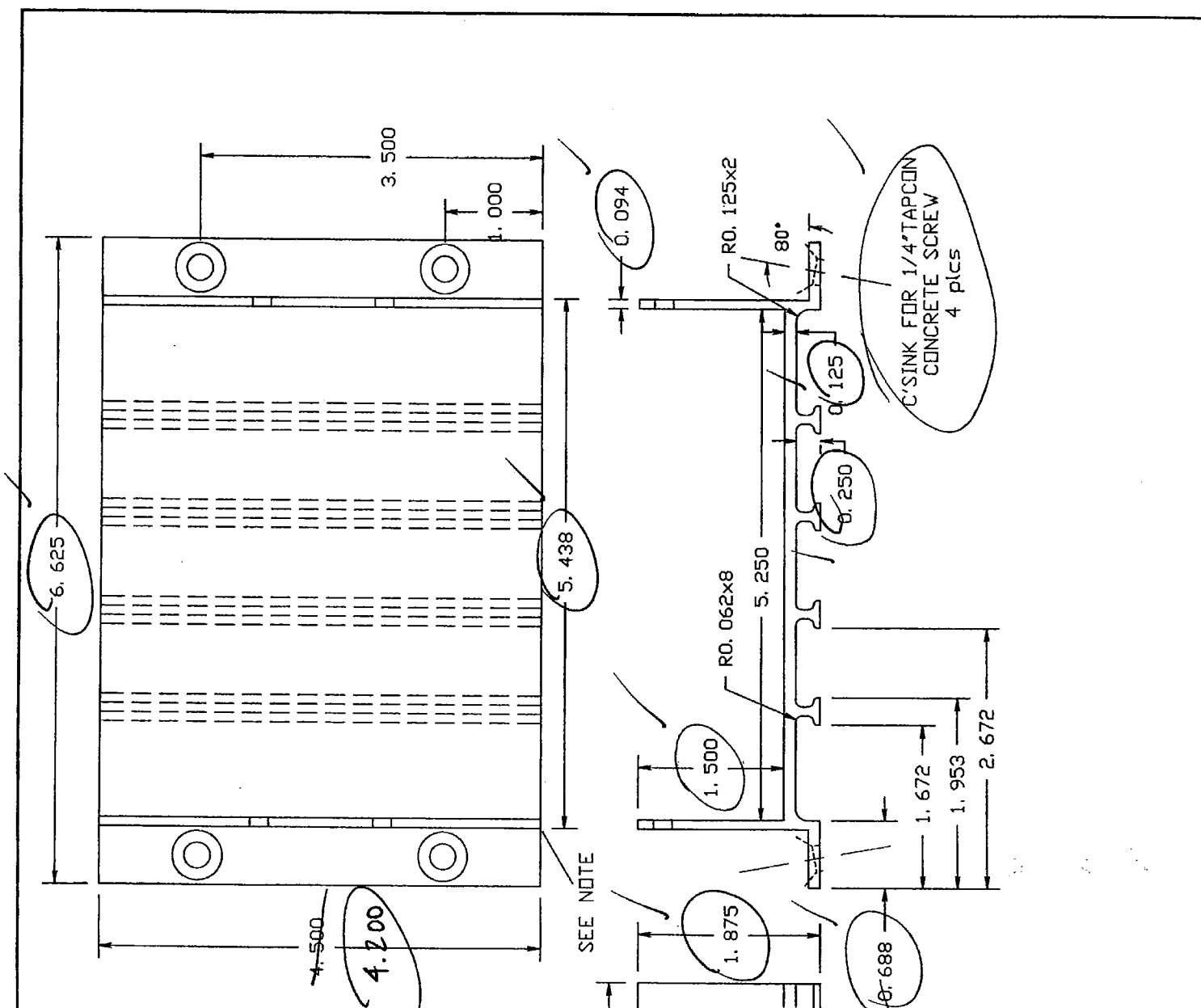


# Architectural Testing

Test sample complies with these details.  
Deviations are noted.

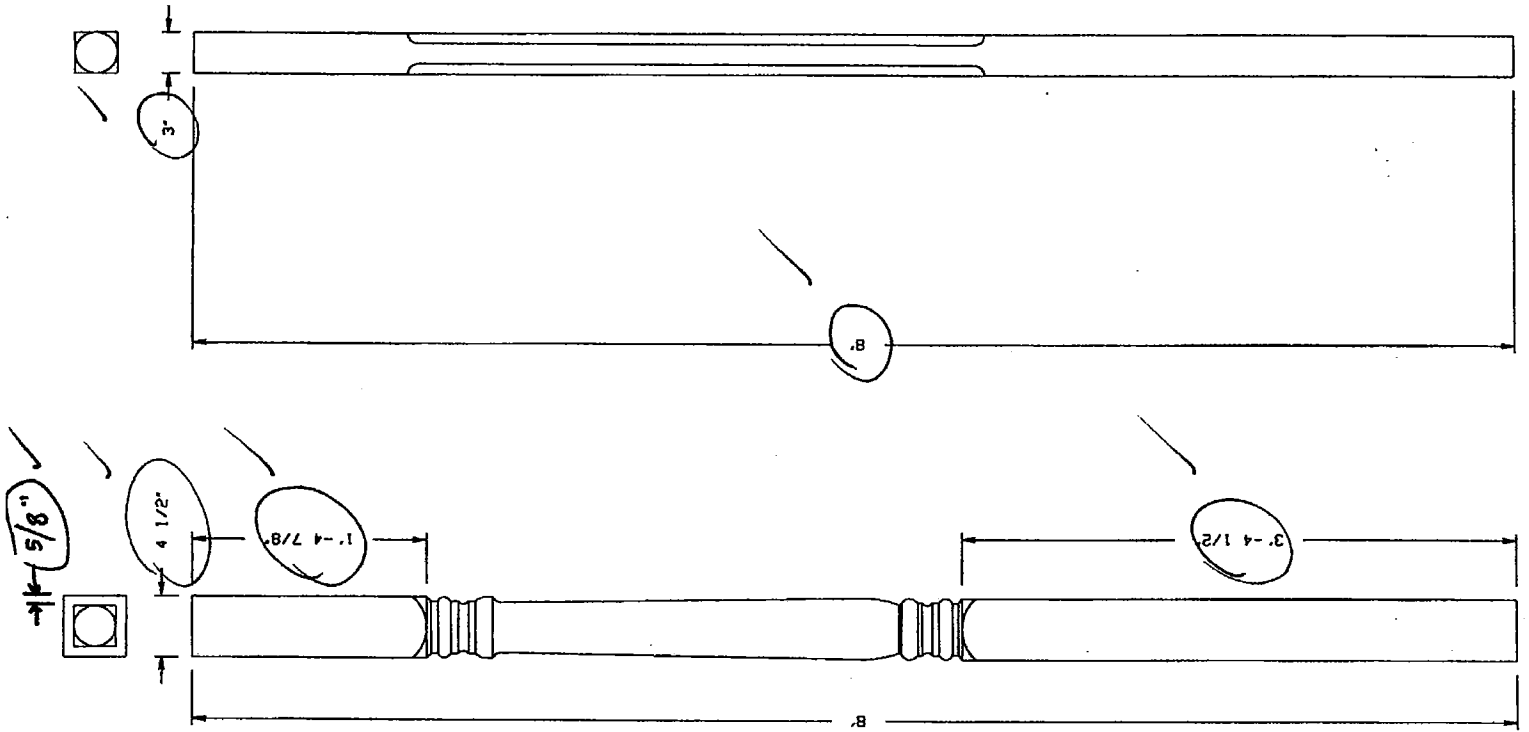
Report# 53086.01

Date 11-22-07 Tech EB



SEE NOTE

DWG # PRS-PPSTBRK5	CDM # PRS-PPSTBRKT5
	INV # 549
PROJECT: BRACKET FOR 5-1/4" PORCH POST	
SCALE: 8"=1'	DATE: 06-02-2004
DRAWN BY: Craig H.	REVISED INITIALS
CHECKED BY:	
MASTER FINISH DATE:	
NOTE:	

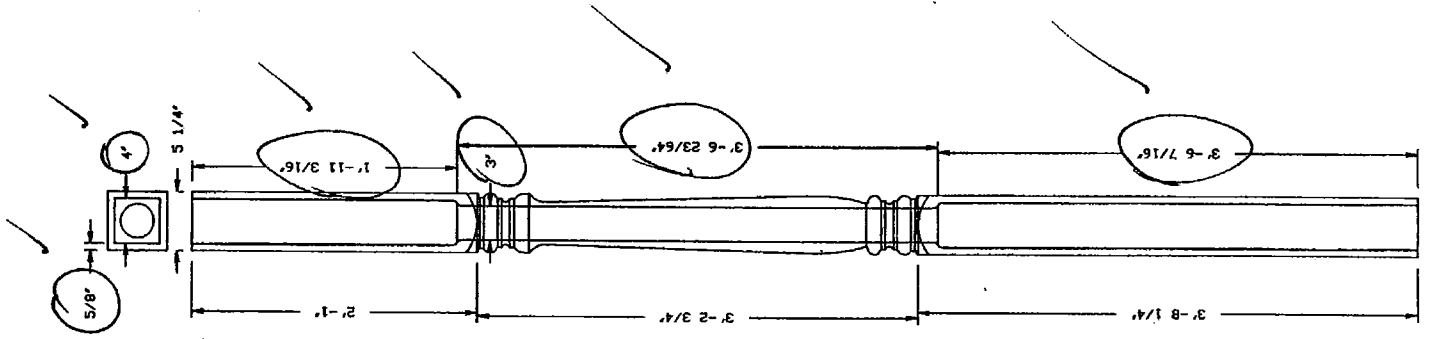
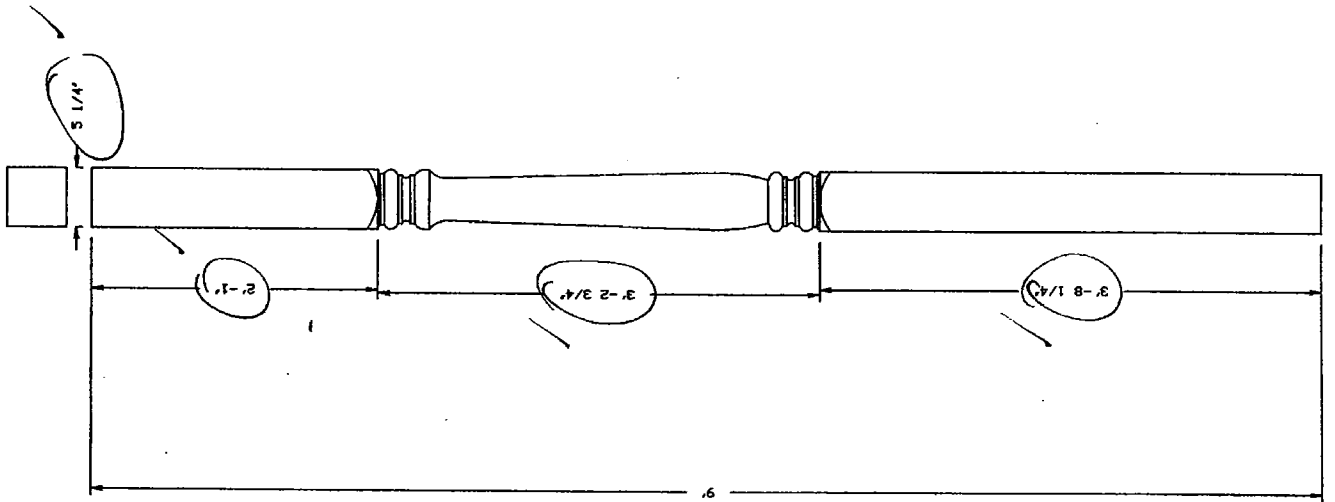
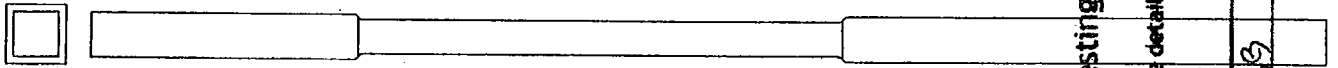


Test sample complies with these details.  
 Deviations are noted.

Report# 53086.01  
 Date 11-22-04 Tech. 866



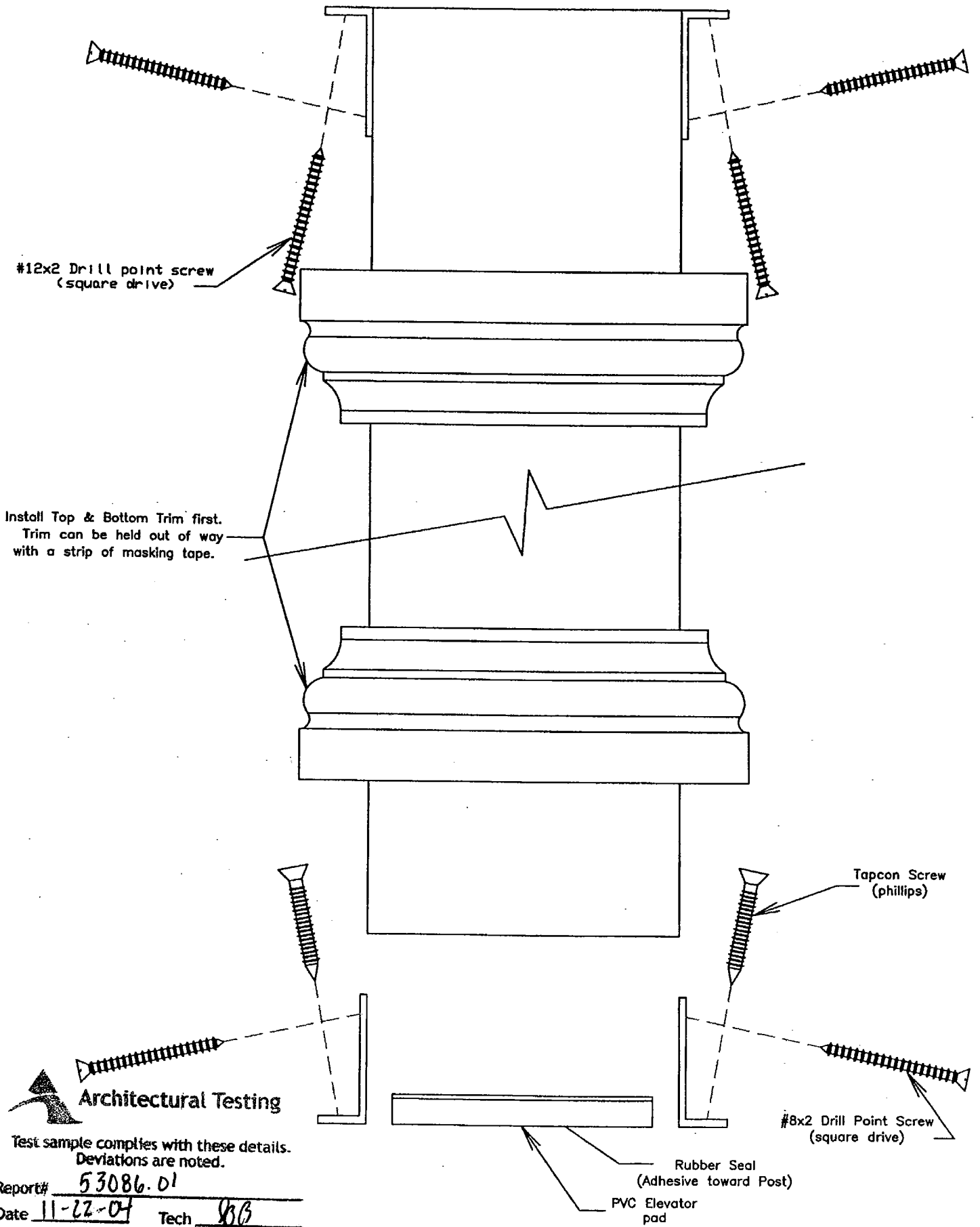
# 5 1/4" PORCH POST



Architectural Testing  
 Test sample complies with these details.  
 Deviations are noted.

Report# 53086-01

Date 11-22-04 Tech. *[Signature]*



**Architectural Testing**

Test sample complies with these details.  
Deviations are noted.

Report# 53086.01  
Date 11-22-04 Tech JB



## **APPENDIX B**

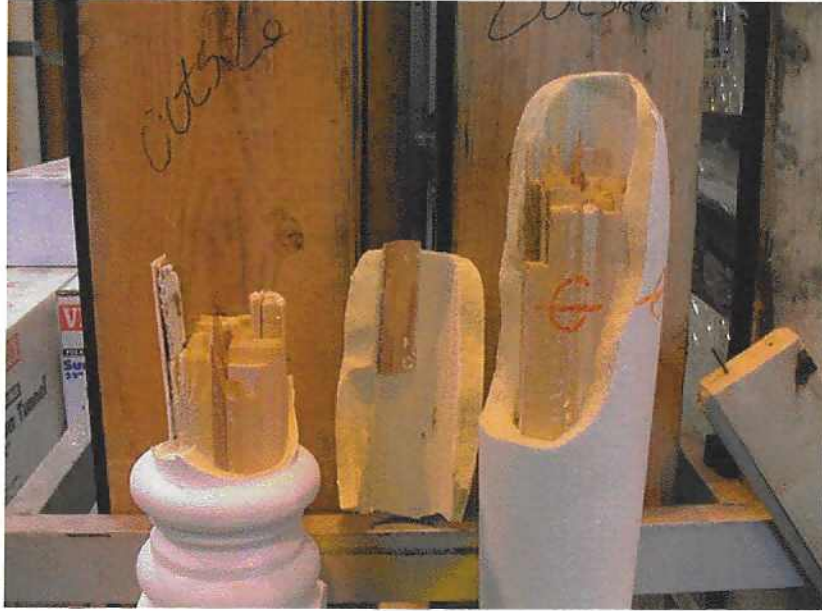
### **Photographs**



**Photo No. 1**  
**Column Base with Hydraulic Jack and Load Cell**



**Photo No. 2**  
**Axial Load Test Set-Up**



**Photo No. 3**  
**Axial Load Test Typical Failure of Specimen (5-1/4" by 5-1/4" Porch Post)**



**Photo No. 4**  
**Lateral Load Test Setup**



**Photo No. 5**  
**Lateral Load Test**  
**Typical Failure of Specimen (4-1/2" x 4-1/2" Porch Post)**



**Photo No. 6**  
**4-1/2" by 4-1/2" Porch Post Uplift Strength Test Setup**



**Photo No. 7**  
**4-1/2" by 4-1/2" Porch Post Bracket Failure**





**Photo No. 8**  
**5-1/4" by 5-1/4" Porch Post Screw/Porch Post Failure**



**Photo No. 9**  
**4-1/2" by 4-1/2" Porch Post Shear Failure of Screws**