



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: Matoa

| Test Load (lbs) | Displacement (inches) | | Origin Offset Adjustment | |
|-----------------|----------------------------------|----------------|--------------------------|------------|
| | X | Y ¹ | 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 | | | |

¹Equipment 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 ¹ | 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

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

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

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

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 Post¹

Test Date: 09/02/04

| Specimen No. | Ultimate Load (lbs) |
|----------------|---------------------|
| 1 - M | 1421 |
| 2 - A | 1039 |
| 3 - M | 1461 |
| Average | 1309 |

¹ Load applied 36" from base.

5-1/4" by 5-1/4" Porch Post¹

Test Date: 09/02/04

| Specimen No. | Ultimate Load (lbs) |
|----------------|---------------------|
| 1 - M | 894 |
| 2 - M | 1128 |
| 3 - M | 919 |
| Average | 980 |

¹ 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 |
| Average: | 3337 | | |

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

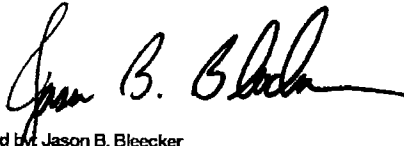
Test Date: 08/26/04

| 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 |
| Average: | 2271 | | |

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

Jason B. Bleecker
Technician

JBB:jbb/nlb

Attachments (pages)

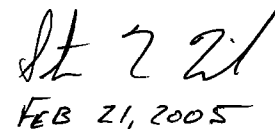
Appendix A - Drawings (5)

Appendix B - Photographs (7)



Digitally Signed by: Steven M. Urich

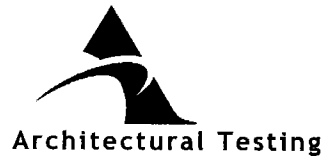
Steven M. Urich, P.E.
Senior Project Engineer



ST 2 21
FEB 21, 2005

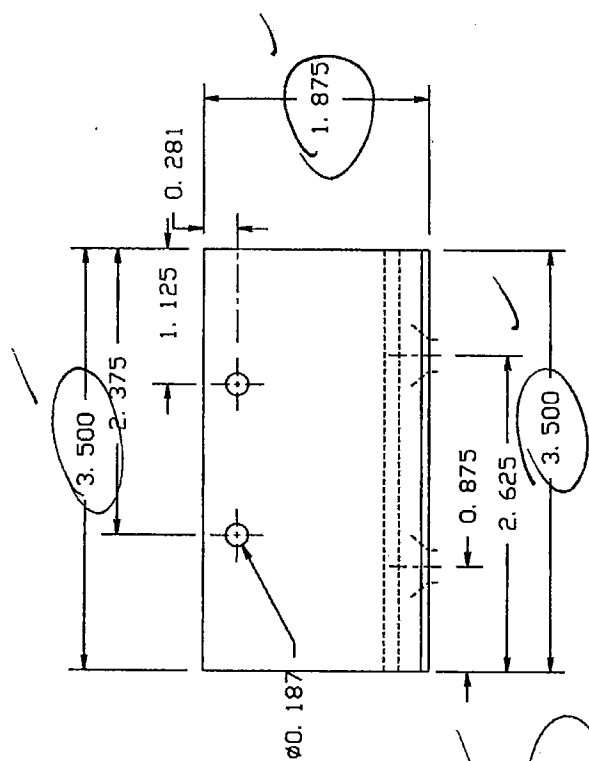
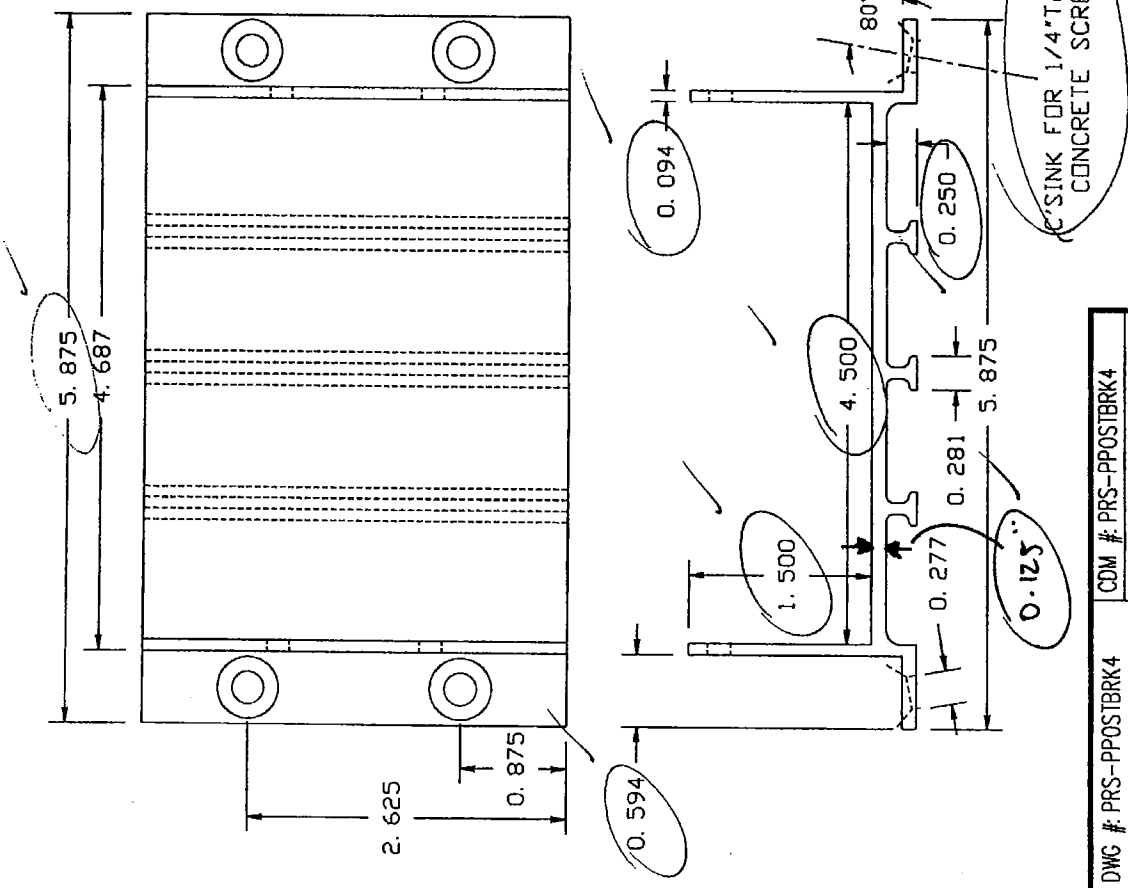
Revision Log

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

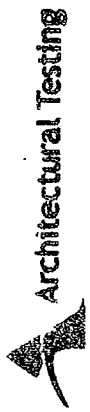


APPENDIX A

Drawings



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



Architectural Testing

Test sample complies with these details. Deviations are noted.

Report # 53086.01

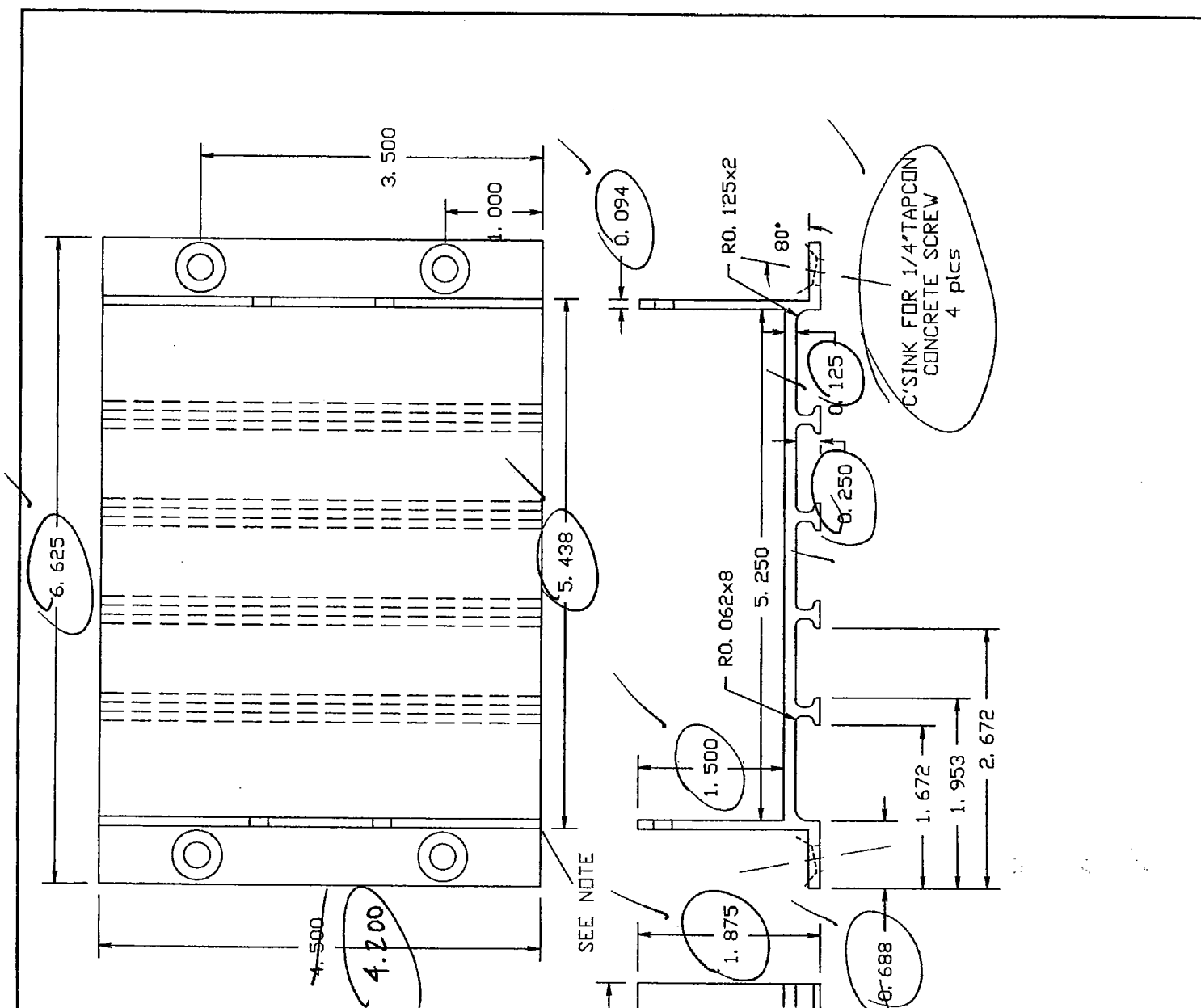
Date 11/22/04 Tech 883



Architectural Testing

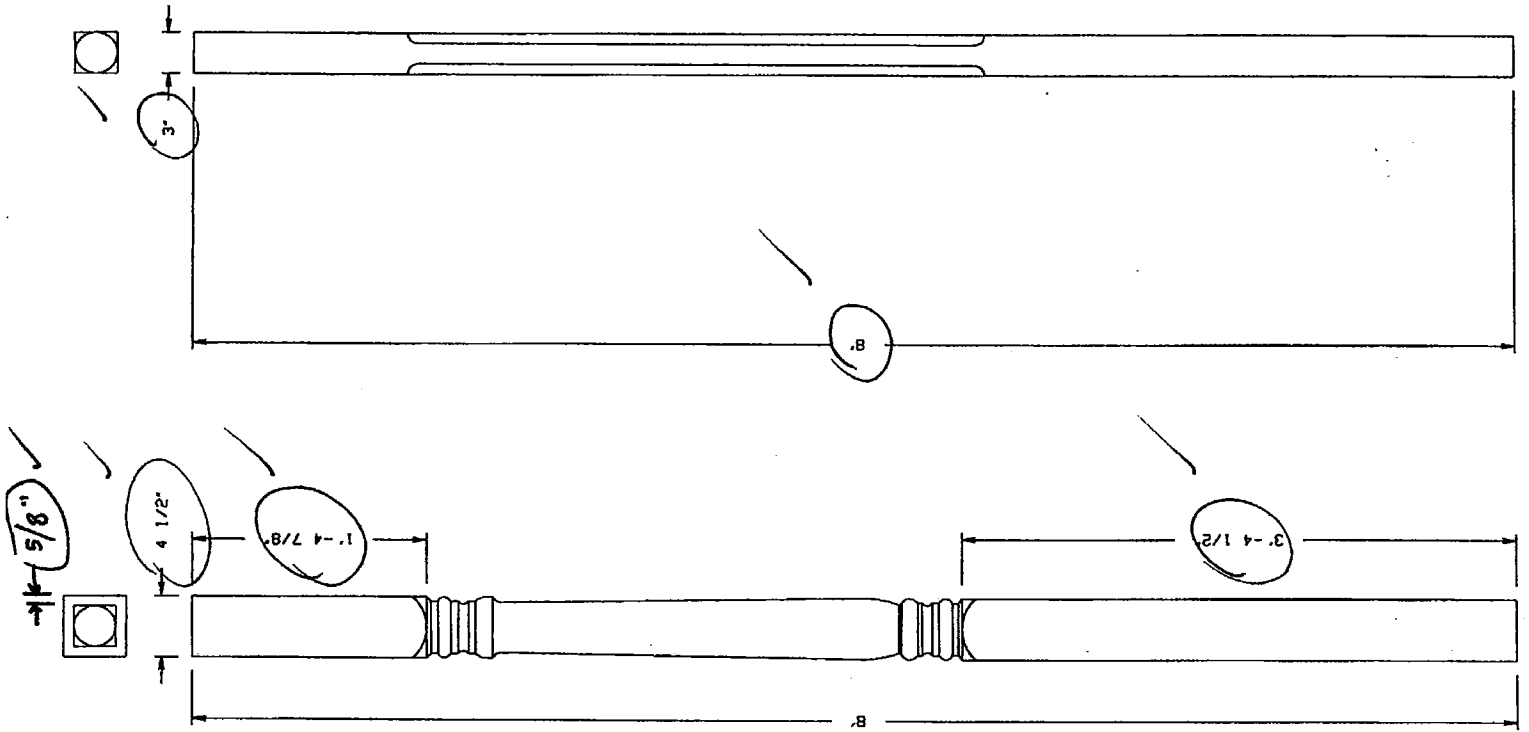
Test sample complies with these details.
Deviations are noted.

Report# 53086.01
Date 11-22-07 Tech EG



SEE NOTE

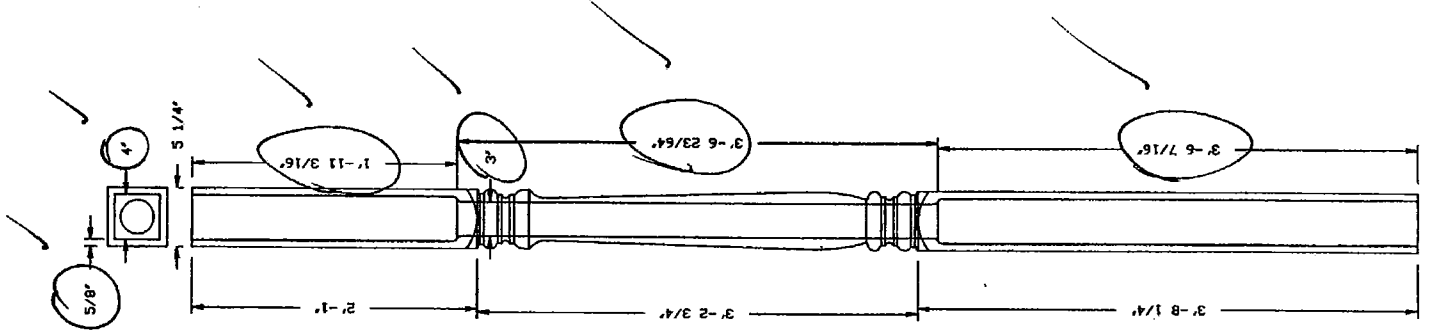
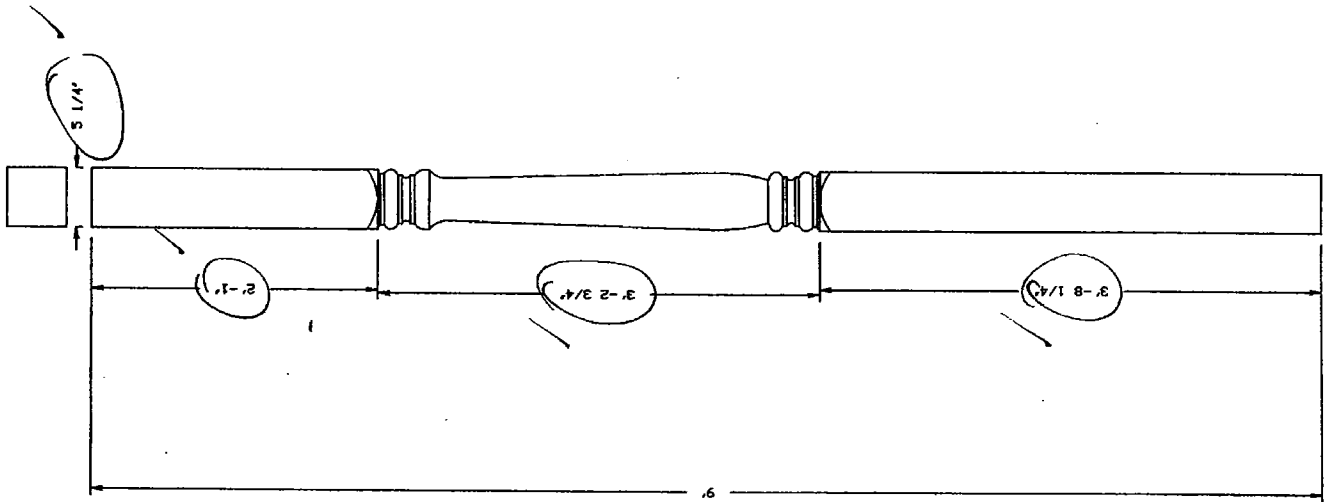
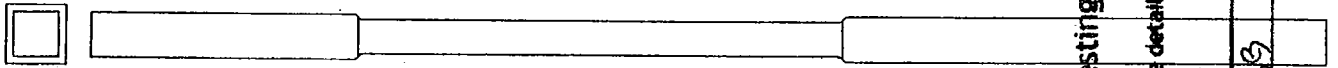
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|--|----------------------|
| DWG # PRS-PPOSTBRK5 | CDM # PRS-PPOSTBRKT5 |
| | INV # 549 |
| PROJECT: BRACKET FOR 5-1/4" PORCH POST | |
| SCALE: 8"=1' | DATE: 06-02-2004 |
| DRAWN BY: Craig H. | REVISED INITIALS |
| CHECKED BY: | |
| MASTER FINISH DATE: | |
| NOTE: | |



Test sample complies with these details.
 Deviations are noted.

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

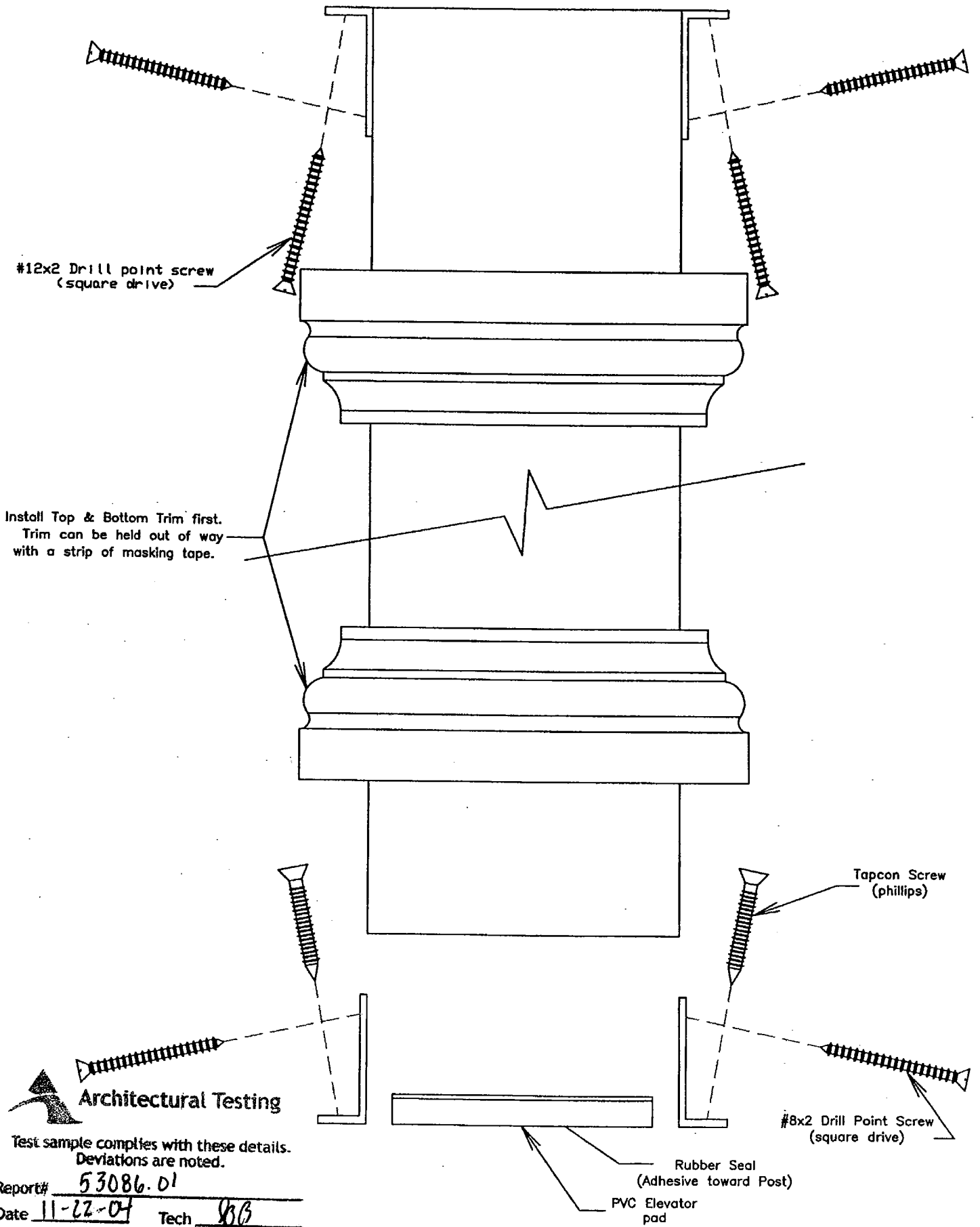
5 1/4" PORCH POST



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

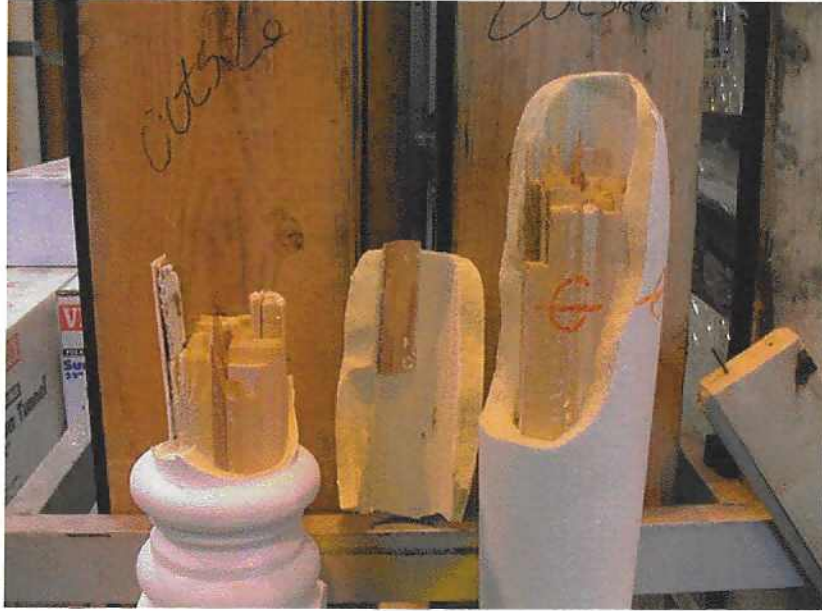


Photo No. 3
Axial Load Test Typical Failure of Specimen (5-1/4" by 5-1/4" Porch Post)



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