ALLSTRUCTURE
Engineering LLC

2

RECEIVED
MAY 14 2013
BDS
DOCUMENT SERVICES

13-139743-RS

May 13, 2013

Ben Logos
Above All Fences Decks & Construction LLC
7424 SW Fir St
Tigard, OR 97223

RE: 9777 NW Caxton Ln Deck
Response to Checksheet Comments dated 5/3/13
City of Portland Permit No. 13-139743-000-00-RS
Allstructure #13116.00

Dear Ben:

The following is our response to the above referenced City of Portland structural and site development checksheet comments:

| Structural Item #: | Response: |
|---|---|
| 1. | See revised detail 7/S1. The requested site plan is being provided by owner. Our new footings will be located so they do not undermine or surcharge the existing stacked rock retaining walls as shown in the revised detail 7/S1. |
| 2. | Owner is providing guardrail drawings and calculations. Allstructure's drawings show the connection of that guardrail system to the deck. |
| Site Development Item # | |
| 1. | Owner to provide this. |
| 2. | See revised detail 7/S1. The overall site is sloped, but around the house/deck area the soil is terraced or stepped. See the attached sketch. Our new footings will be located in such a way as to minimize the impact on the existing retaining walls as shown in the revised detail 7/S1. |
| 3. | Owner to provide this. |

We appreciate this opportunity to be of service to you on this matter. Please do not hesitate to contact us at 503.620.4314 should you have any additional questions.

Sincerely,

Aaron Heath, PE
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
65641PE
OREGON
JULY 10, 2007
AARON HEATH
EXPIRES: June 30, 2013

AH/jms

Attachments: Plan Check Letters
Sheet S1 – REV 1 dated 5/13/13
Supporting Sketch

C: file

# Building Permit Application
## City of Portland, Oregon - Bureau of Development Services
1900 SW 4th Avenue, Portland, Oregon 97201 • 503-823-7310 • TTY 503-823-6868 • www.portlandoregon.gov/bds

**This permit application expires if a permit is not obtained within 180 days after it has been accepted as complete.**

### Type of work
- [X] New construction
- [ ] Addition/alteration/replacement
- [ ] Demolition
- [ ] Other:

### Category of construction
- [X] 1 & 2 family dwelling
- [ ] Commercial/industrial
- [ ] Accessory building
- [ ] Multifamily
- [ ] Master builder
- [ ] Other:

### Job site information and location
| | |
|---|---|
| Job no.: | Job address: 9777 NW CAXTON LN. |
| City/State/ZIP: PORTLAND OR 97229 | |
| Suite/bldg./apt. no.: | Project name: MIKE |
| Cross street/directions to job site: | |
| Subdivision: | Lot no. / Tax map/parcel no. |

### Description of work
INSTALL A NEW DECK AND RAIL.

Provide RS Permit no.

### [X] Property owner / [ ] Tenant
| | |
|---|---|
| Name: MIKE ARNDT | E-mail: |
| Address: 9777 NW CAXTON LN. | |
| City/State/ZIP: PORTLAND OR 97229 | |
| Phone: 612-381-4385 | FAX: |

**Owner installation:** This installation is being made on property that I own, which is not intended for sale, lease, rent, or exchange.

Owner signature: Date:

### [X] Contractor
| | |
|---|---|
| Business name: ABOVE ALL FENCES | E-mail: abovecallconstruction@gmail |
| Address: 7424 SW FIR ST. | |
| City/State/ZIP: TIGARD OR 97223 | |
| Phone: 971 404 7609 | FAX: |
| CCB lic. no. 190649 | |

Authorized signature: Jayos B.

Print name: Ben Logos Date: 4-16-13.

### [X] Applicant / [ ] Contact Person
| | |
|---|---|
| Business name: ABOVE ALL FENCES, DECKS & CONSTRUCTION | |
| Contact name: BEN LOGOS | |
| Address: 7424 SW FIR ST. | |
| City/State/ZIP: TIGARD OR 97223 | |
| Phone: 971 404 7609 | FAX: |
| E-mail: abovecallconstruction@gmail.com. | |

Authorized signature: Jayos B.

Print name: Ben Logos Date: 4-16-13

### Office Use Only
| |
|---|
| Permit no: |
| Date received: |
| By: |

### Required Data: One and Two Family Dwelling
Permit fees* are based on the value of the work performed. Indicate the value (rounded to the nearest dollar) of all equipment, materials, labor, overhead, and the profit for the work indicated on this application.

| | | |
|---|---|---|
| Valuation: | 4,600 | |
| Number of bedrooms: | | |
| Number of bathrooms: | | |
| Total number of floors: | | |
| New dwelling area: | | square feet |
| Garage/carport area: | | square feet |
| Covered porch area: | | square feet |
| Deck area: | 510 | square feet |
| Other structure area: | | square feet |

### Required Data: Commercial Use
Permit fees* are based on the value of the work performed. Indicate the value (rounded to the nearest dollar) of all equipment, materials, labor, overhead, and the profit for the work indicated on this application.

| | | |
|---|---|---|
| Valuation: | | |
| Existing building area: | | square feet |
| New building area: | | square feet |
| Number of stories: | | |
| Type of construction: | | |
| Occupancy groups | | |
| Existing: | | |
| New: | | |

### Notice
All contractors and subcontractors are required to be licensed with the Oregon Construction Contractors Board under ORS 701 and may be required to be licensed in the jurisdiction in which work is being performed.

**Statement of Fact:** I certify that the facts and information set forth in this application are true and complete to the best of my knowledge. I understand that any falsification, misrepresentation or omission of fact (whether intentional or not) in this application or any other required document, as well as any misleading statement or omission, may be cause for revocation of permit and/or certificate of occupancy, regardless of how or when discovered.

I acknowledge that work related to this Building Permit Application may be subject to regulations governing the handling, removal and/or disposal of asbestos and/or lead-based paint. _____ (initials)

### Building Permit Fees*
**Please refer to fee schedule**

| | |
|---|---|
| Fees due upon application | |
| Amount received | |
| Date received | |

**Residential Combo permit subcontractor submittals only can be faxed to 503-823-7693 or e-mailed to BDSCombInspSec@portlandoregon.gov.**

ALLSTRUCTURE
Engineering LLC

3

RECEIVED
MAY 14 2013
BDS
DOCUMENT SERVICES

May 13, 2013

Ben Logos
Above All Fences Decks & Construction LLC
7424 SW Fir St
Tigard, OR 97223

RE: 9777 NW Caxton Ln Deck
Response to Checksheet Comments dated 5/3/13
City of Portland Permit No. 13-139743-000-00-RS
Allstructure #13116.00

13-139743-RS

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Project Engineer

REGISTERED PROFESSIONAL ENGINEER
65641PE
OREGON
JULY 10, 2007
AARON HEATH
EXPIRES: June 30, 2013

AH/jms

Attachments: Plan Check Letters
Sheet S1 – REV 1 dated 5/13/13
Supporting Sketch

C: file

7140 S.W. Fir Loop, Ste. 231 • Tigard, Oregon 97223
v: 503.620.4314 • f: 503.620.4304 • www.allstructure.com

# City of Portland, Oregon

## Bureau of Development Services

### Site Development

FROM CONCEPT TO CONSTRUCTION

Charlie Hales, Mayor
Paul L. Scarlett, Director
Phone: (503) 823-6892
Fax: (503) 823-5433
TTY: (503) 823-6868
www.portlandoregon.gov/bds


# Site Development Checksheet Response

**Permit #:** 13-139743-000-00-RS **Date:** _____

**Customer name and phone number:** _____

*Note:* *Please number each change in the '#' column. Use as many lines as necessary to describe your changes. Indicate which reviewer's checksheet you are responding to and the item your change addresses. If the item is not in response to a checksheet, write* **customer** *in the last column.*

| # | Description of changes, revisions, additions, etc. | Checksheet and Item # |
|---|---|---|
| 1. | All work will be done by hand. No machineris. | |
| 2. | Please see engining drawings. | |
| 3. | Same as #1. | |

*(For office use only)*

**City of Portland, Oregon**
**Bureau of Development Services**
**Plan Review / Permitting Services**
FROM CONCEPT TO CONSTRUCTION

Dan Saltzman, Commissioner
Paul L. Scarlett, Director
Phone: (503) 823-7310
Fax: (503) 823-4172
TTY: (503) 823-6868
www.portlandoregon.gov/bds

# BDS Checksheet Response

**Permit #:** _____ **Date:** _____

**Customer name and phone number:** _____

*Note:* Check which review you are responding to. Please provide specific information concerning the changes you have made in response to the checksheet. Note the checksheet item number. Describe the change, revision, or correction. Identify the location on the plans (i.e. page number and/or detail number). Use as many lines as needed. *If the item is not in response to a checksheet, write **"Applicant"** in the column labeled "Checksheet item number."*

| | | | | |
|---|---|---|---|---|
| ☐ **Planning** | ☐ **Structural** | ☐ **PDOT** | ☐ **Fire** | ☐ **Plumbing** |
| ☐ **Life Safety** | ☐ **BES Pollution Prevention** | ☐ **BES** | ☐ **Water** | ☐ **Site Dev.** |
| ☐ **Electrical** | ☐ **Urban Forestry** | ☐ **Addressing** | ☐ **Parks & Recreation** | |

Please use this sheet to submit your response to only one of the above review groups. If you need to respond to more than one review group, you will need a separate Checksheet Response Form for each group.

| Checksheet item number | Description of changes, corrections, additions, etc. | Location on plans |
|---|---|---|
| | I BROGHT IN THE TOPOGRAPIC PLANS AND THE FENCE PLANS FOR EROZION CONTROL. | |
| | THANK YOU | |
| | Ben. | |

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ALLSTRUCTURE
Engineering LLC

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DOCUMENT SERVICES

May 13, 2013

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7424 SW Fir St
Tigard, OR 97223

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Project Engineer

REGISTERED PROFESSIONAL ENGINEER
65641PE

OREGON
JULY 10, 2007
AARON HEATH

EXPIRES: June 30, 2013

AH/jms

Attachments: Plan Check Letters
Sheet S1 – REV 1 dated 5/13/13
Supporting Sketch

C: file

13-139743-RS

7140 S.W. Fir Loop, Ste. 231 • Tigard, Oregon 97223
v: 503.620.4314 • f: 503.620.4304 • www.allstructure.com

CITY OF PORTLAND, OREGON – BUREAU OF DEVELOPMENT SERVICES

1900 SW Fourth Avenue, Suite 5000 • Portland, Oregon 97201 • www.portlandonline.com/bds

MULTNOMAH COUNTY

# STRUCTURAL CHECKSHEET

Application # : 13-139743-000-00-RS
Review Date : May 3, 2013

**Residential 1 & 2 Family Permit**

| | | | | |
|---|---|---|---|---|
| **To:** | APPLICANT | BEN LOGOS<br>ABOVE ALL FENCES DECKS & CONSTRUCTION LLC<br>7424 SW FIR ST<br>TIGARD, OR 97223 | Work:<br>Fax:<br>e-Mail: | 503-270-1864<br>503-336-5197<br>aboveallconstruction@gmail.com |
| **From:** | STRUCTURAL ENGINEER | ERIC THOMAS | Phone: | 503-823-7653 |
| **cc:** | OWNER | PATRICK, MARC & ANGELA<br>PATRICK, MARC & ANGELA<br>9777 NW CAXTON LN<br>PORTLAND, OR 97229 | | |

## PROJECT INFORMATION

| | |
|---|---|
| Street Address: | 9777 NW CAXTON LN |
| Description of Work: | 23' x 22' DECK ADDITION AT REAR OF HOME |

Based on the plans and specifications submitted, the following items appear to be missing or not in conformance with the Oregon Structural Specialty Code and / or other city, state, or federal requirements.

| Item # | Location on plans | Code Section | Clarification / Correction Required |
|---|---|---|---|
| 1. | | | Please provide a response to the Site Development checksheet dated May 3, 2013. Based on sketches in the calculations, it appears that the deck footings could undermine existing retaining walls. On the requested site plan, show the locations of the walls relative to the new footings. Address any undermined or surcharged walls. |
| 2. | | | Provide the guardrail drawings and calculations. |

## STRUCTURAL CHECKSHEET

Application # 13-139743-000-00-RS
Review Date: May 3, 2013

**INSTRUCTIONS**

To respond to this checksheet, come to Permitting Services (located at 1900 SW Fourth Ave., 2nd Floor, hours 8:00 a.m. - 3:00 p.m. Tuesday through Friday) and update all four sets of the originally submitted drawings. To update the drawings, you may either replace the original sheets with new sheets, or edit the originally submitted sheets. (Specific instructions for updating plans are posted in Document Services.)

Please complete the attached Checksheet Response Form and include it with your re-submittal.

If you have specific questions concerning this Checksheet, please call me at the phone number listed above. To check the status of your project, go to http://www.portlandonline.com/bds/index.cfm?c=34194. Or, you may request the status to be faxed to you by calling 503-823-7000 and selecting option 4.

You may receive separate Checksheets from other City agencies that will require separate responses.

**NEW DEVELOPMENT SERVICES CENTER HOURS:** The DSC (1st floor) and Permitting Services (2nd floor) are open Tuesday through Friday from 8:00 a.m. to 3:00 p.m. (closed on Mondays). In the DSC, Land Use, Site Development or Building Permit application review, submittal or intake of complete permits/applications will be limited to between 8:00 AM and 12:00 PM. Land Use applications and Building Permit review or intake will not be processed after 12:00 PM. Please visit the BDS website for more information regarding the Development Services Center hours.

**NEW RECHECK FEE**: Please note that for plans submitted on or after July 1, 2010 plan review fees for Life Safety, Structural, Site Development and Planning and Zoning will cover the initial review and up to two checksheets and the reviews of the applicant's responses to those checksheets. All additional checksheets and reviews of applicant responses will be charged $175.00 per checksheet.

# Structural Checksheet Response

**Permit #:** 13-139743-000-00-RS **Date:** _____

**Customer name and phone number:** _____

*Note:* *Please number each change in the '#' column. Use as many lines as necessary to describe your changes. Indicate which reviewer's checksheet you are responding to and the item your change addresses. If the item is not in response to a checksheet, write* **customer** *in the last column.*

| # | **Description of changes, revisions, additions, etc.** | Checksheet and item # |
|---|---|---|
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*(for office use only)*

# City of Portland, Oregon
## Bureau of Development Services
### Site Development
FROM CONCEPT TO CONSTRUCTION

Charlie Hales, Mayor
Paul L. Scarlett, Director
Phone: (503) 823-6892
Fax: (503) 823-5433
TTY: (503) 823-6868
www.portlandoregon.gov/bds


## SITE DEVELOPMENT CHECKSHEET

Application #: **13-139743-000-00-RS**
Review Date: May 3, 2013

| | | | | |
|---|---|---|---|---|
| **To:** | APPLICANT | **BEN LOGOS**<br>**ABOVE ALL FENCES DECKS & CONSTRUCTION LLC**<br>**7424 SW FIR ST**<br>**TIGARD, OR 97223** | Work<br>Fax<br>E-mail | 503 270-1864<br>503 336-5197<br>ABOVEALLCONSTRUCTION@GMAIL.COM |
| **From:** | GEOTECHNICAL ENGINEER | **JEANNE M. NIEMER; PE, GE** | Phone<br>Fax<br>e-mail | 503-823-7539<br>503-823-5433<br>Jeanne.Niemer@portlandoregon.gov |
| **Cc:** | OWNER | **PATRICK, MARC & ANGELA**<br>**9777 NW CAXTON LN**<br>**PORTLAND, OR 97229** | | |

### PROJECT INFORMATION

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|---|---|
| Street Address: | **9777 NW CAXTON LN** |
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### PLAN REVIEW

Based on the plans and specifications submitted, the following items appear to be missing or not in conformance with the Oregon Structural Specialty Code, Oregon One and Two Family Dwelling Specialty Code and/or other city, state, or federal requirements.

| Item # | Location on plans | Code Section | Clarification / Correction Required |
|---|---|---|---|
| 1 | | | The site is located in the potential landslide hazard zone and in an area with steep slopes. Please provide a site plan and sections that delineate topographic contours and site elevations, based on NAVD, City of Portland, or on an assumed datum. |
| 2 | | | The permit drawings are not complete enough for review. Please include sections and details that include planned footing embedments and sizes, as well as minimum footing-to-slope setbacks. |

| | | | |
|---|---|---|---|
| 3 | | PCC 10.40 | An erosion control plan was not included in the plan set. Please revise the drawings to include an erosion control plan prepared in accordance with the City of Portland Erosion Control Manual. Please include standard construction notes and detail drawings. References:<br>Erosion Control Manual (*Applications/Handouts* tab): http://www.portlandonline.com/shared/cfm/image.cfm?id=94539<br>Detail drawings: http://www.portlandonline.com/bds/index.cfm?c=48104. The erosion control manual and typical illustrations are available on line at www.portlandonline.com/bds/index.cfm?c=45055. |
| 4 | | | |
| 5 | | | |

## INSTRUCTIONS

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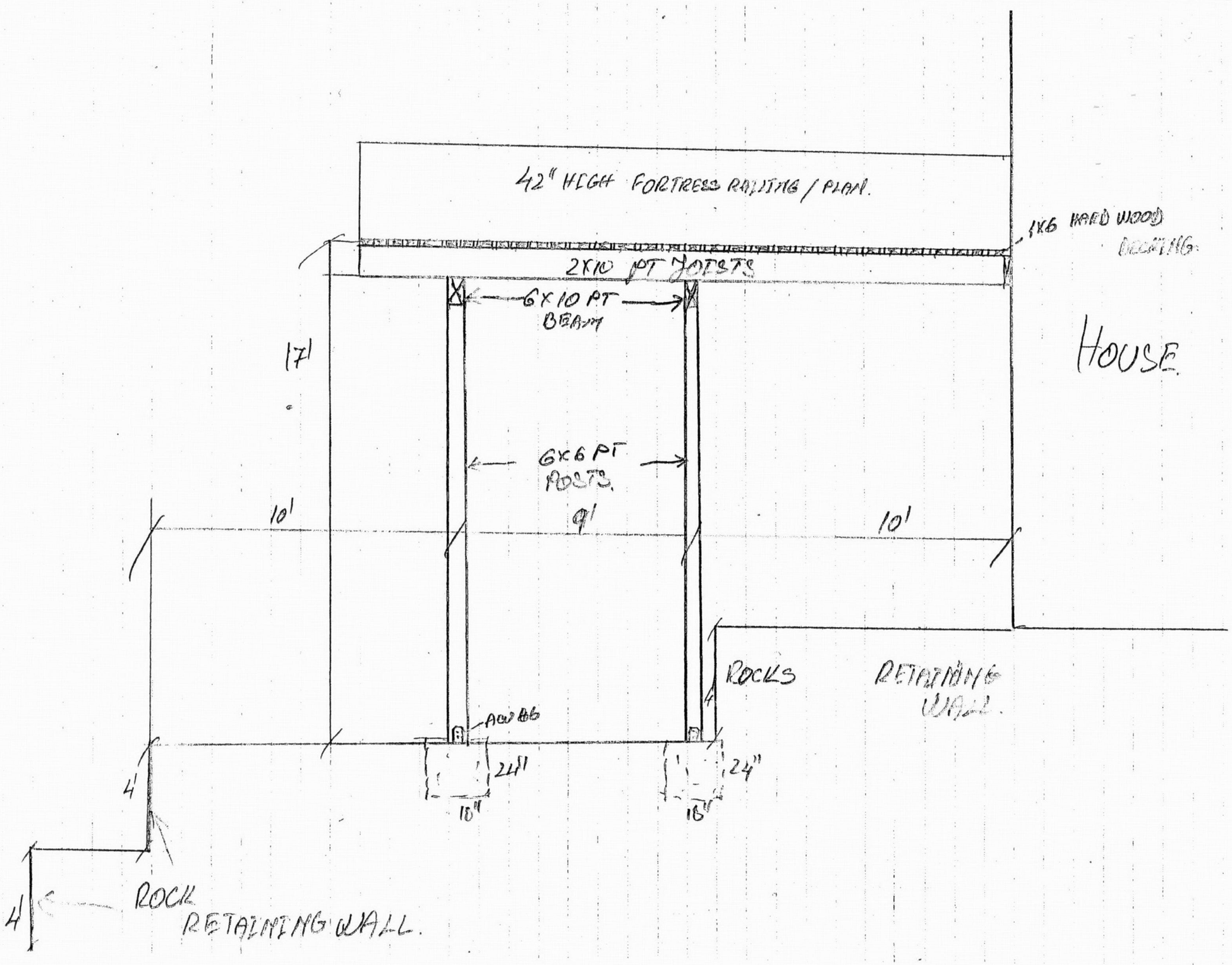
*(For office use only)*


42" HIGH FORTRESS RAILING / PLAN.
1X6 HARD WOOD
DECKING.
2X10 PT JOISTS
6X10 PT
BEAM
17'
HOUSE.
6X6 PT
POSTS.
10'
9'
10'
ROCKS
RETAINING
WALL.
4'
24"
16"
24"
16"
4'
ROCK
RETAINING WALL.

Architectural Testing

# TEST REPORT

Rendered to:

## FORTRESS RAILING PRODUCTS

For:

***Al[13] Traditional Aluminum Railing***

**Report No: B7787.01-119-19**
**Report Date: 05/08/12**

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
fax: 717-764-4129
www.archtest.com

Architectural Testing

# TEST REPORT

B7787.01-119-19
May 08, 2012

## TABLE OF CONTENTS

Architectural Testing

# TEST REPORT

Rendered to:

FORTRESS RAILING PRODUCTS
P.O. Box 831268
Richardson, Texas 75083

Report No: B7787.01-119-19
Test Date: 03/20/12
Through: 04/10/12
Report Date: 05/08/12

## 1.0 General Information

### 1.1 Product

*Al[13] Traditional Aluminum Railing*

### 1.2 Project Description

Architectural Testing was contracted by Fortress Railing Products to perform material and structural testing on their 8 ft by 42 in *Al[13] Traditional Aluminum Railing* in a level configuration. This report is in conjunction with Architectural Testing Report No. B4686.01-119-19, which includes assembly fastener test results. The purpose of the testing is code compliance evaluation in accordance with the following criteria:

ICC-ES™ AC273 (editorially revised January 1, 2012), *Acceptance Criteria for Handrails and Guards*

ICC-ES™ AC273 was developed by the ICC Evaluation Service, Inc. (ICC-ES™) as acceptance criteria to evaluate compliance with the following building codes:

2012 *International Building Code®*, International Code Council

2012 *International Residential Code®*, International Code Council

130 Derry Court
York, PA 17406-8405
phone: 717-764-7700
fax: 717-764-4129
www.archtest.com

### 1.3 Limitations

All tests performed were to evaluate structural performance of the railing assembly to carry and transfer imposed loads to the supports (posts). The test specimen evaluated included the balusters, rails, aluminum post (at one end only), rail brackets and attachment to the supporting structure. The support post (at one end only) were conventional construction and not within the scope of the evaluation. Conventional posts were therefore not a tested component and were included in the test specimen only to facilitate anchorage of the rail brackets. Testing is limited to satisfying the IRC - One- and Two-Family Dwellings requirements of ICC-ES™ AC273.

Anchorage of aluminum support posts to the supporting structure is not included in the scope of this testing and would need to be evaluated separately.

### 1.4 Qualifications

Architectural Testing has demonstrated compliance with ANS/ISO/IEC Standard 17025 and is consequently accredited as a Testing Laboratory (TL-144) by International Accreditation Service, Inc. Architectural Testing is accredited to perform all testing reported herein.

### 1.5 Product Description

The *Al[13] Traditional Aluminum Railing* is comprised of aluminum rails and pickets which are pre-welded into a panel section and attached to *Al[13] Posts* using the *Al[13] Phantom Brackets* (level and mitered condition). Test specimens consisted of one product color: Gloss Black. Drawings are included in Appendix A to verify the overall dimensions and other pertinent information of the tested product, its components, and any constructed assemblies.

### 1.6 Product Sampling

A representative of Architectural Testing visited Fortress Railing Products facility in Richardson, Texas, on 03/09/12, to select the components used for testing. All samples selected for testing were marked for identification and were the samples used for all tests reported herein. See photograph in Appendix B for typical sampling mark.

### 1.7 Witnessing

There were no witnesses from Fortress Railing Products present for testing conducted and reported herein.

### 1.8 Conditions of Testing

Unless otherwise indicated, all testing reported herein was conducted in a laboratory set to maintain temperature in the range of 68 ± 4°F and humidity in the range of 50 ± 5% RH.

## 2.0 Reference Standards

ASTM B 221-05, *Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes*

ASTM E 8 / E 8M-09, *Standard Test Methods for Tension Testing of Metallic Materials*

## 3.0 Tensile Testing

Re: ICC-ES™ AC273 - Section 4.1

### 3.1 General

Tensile tests were performed on dog-bone specimens machined from the top and bottom rails used in the railing assemblies for the purpose of verifying the material specification.

### 3.2 Test Specimens

One set of ten test specimens was taken from ten different rails (five top and five bottom). Specimen size was per FIG. 1 of ASTM E8 / E8M for sheet-type products.

### 3.3 Test Procedure

The specimens were tested on 04/10/12 using an Instron® Model 3369 Universal Testing Machine with Instron® "T" Grips and operating at a uniform cross-head speed of 0.2 in/min. Strain was measured using an Instron® Model 2630-100 Series Clip-on Extensometer with a 2 in. gage length. See photograph in Appendix B for typical test setup.

### 3.4 Test Results

| Sample No. | Width (in) | Thickness (in) | Modulus of Elasticity (ksi) | Yield Strength (ksi) | Tensile Strength (ksi) | Elongation (%) |
|---|---|---|---|---|---|---|
| 1 | 0.500 | 0.121 | 9554 | 21.5 | 27.4 | 16.3 |
| 2 | 0.500 | 0.121 | 9201 | 19.2 | 26.0 | 20.9 |
| 3 | 0.500 | 0.115 | 9208 | 26.9 | 28.4 | 19.6 |
| 4 | 0.500 | 0.120 | 8870 | 17.4 | 23.6 | 22.8 |
| 5 | 0.500 | 0.121 | 9173 | 16.8 | 22.8 | 22.7 |
| 6 | 0.500 | 0.122 | 9314 | 16.1 | 22.8 | 21.0 |
| 7 | 0.500 | 0.121 | 8731 | 15.9 | 22.4 | 20.8 |
| 8 | 0.500 | 0.121 | 8645 | 26.5 | 27.6 | 21.9 |
| 9 | 0.500 | 0.115 | 9489 | 17.1 | 24.0 | 22.2 |
| 10 | 0.500 | 0.121 | 9003 | 18.2 | 24.7 | 21.8 |
| | | **Minimum:** | 8645 | 15.9 | 22.4 | 16.3 |
| | | **Maximum:** | 9554 | 26.9 | 28.4 | 22.8 |
| | | **Average:** | 9119 | 19.6 | 24.9 | 21.0 |
| | | **Standard Deviation:** | 304 | 4.1 | 2.2 | 1.9 |
| | | **Coefficient of Variation:** | 3.3% | 20.9% | 8.8% | 9.0% |

### 3.5 Analysis of Test Results

Per Fortress Railing Products, the material used in their *Al[13] Traditional Aluminum Railing* tested and reported herein was specified as extruded 6063 –T5. The following criteria are listed under ASTM B 221, Table 2 - *Mechanical Property Limits,* for 6063-T5:

- Tensile strength, min, ksi - 22.0
- Yield strength, min, ksi - 16.0

| | Min. Tensile Strength (ksi) | Min. Yield Strength (ksi) |
|---|---|---|
| 6063-T5 | 22.0 | 16.0 |
| Test Samples | 22.4 | 15.9 |

## 4.0 Structural Performance Testing of Assembled Railing Systems

Re: ICC-ES™ AC273 - Section 4.2.1

### 4.1 General

Railing assemblies were tested in a self-contained structural frame designed to accommodate anchorage of a rail assembly and application of the required test loads. The specimen was loaded using an electric winch mounted to a rigid steel test frame. High strength steel cables, nylon straps, and load distribution beams were used to impose test loads on the specimen. Applied load was measured using an electronic load cell located in-line with the loading system. Deflections were measured to the nearest 0.01 in using electronic linear displacement transducers.

### 4.2 Railing Assembly Description

The *Al[13] Traditional Aluminum Railing* consisted of pre-welded aluminum top and bottom rails with spaced pickets between the rail members. The level (in-line) guardrail systems had an overall top rail length (inside of post to inside of post) of 93 in with an overall rail height (deck surface to top of top rail) of 43-1/2 in. The level (mitered 45° angle) guardrail systems had an overall top rail length (inside of post to inside of post) of 93 in with an overall rail height (deck surface to top of top rail) of 44-3/4 in. Top and bottom rails attached to an aluminum post mount (*Al[13] Post*) on one end and a conventional 4x4 wood post on the other end via *Al[13] Phantom Brackets*. See Section 3.4 Fastening Schedule for connection details. No support block on the bottom rail was used for testing. See drawings in Appendix A and photographs in Appendix B for additional details.

### 4.3 Component Descriptions

The scope of testing performed and reported herein was intended to evaluate the *Al[13] Traditional Aluminum Railing* consisting of the following components (see Appendix A for drawings):

Top and Bottom Rails: 1.62 in wide by 1.11 in high by 0.126 in wall by 93 in long, extruded rectangular 6063-T5 aluminum profile

Brackets: 1.90 in wide by 1.31 in high, cast aluminum bracket (*Al[13] Phantom Bracket)*

Balusters: 0.75 in square by 0.06 in wall by 37-3/4 in long, extruded 6063-T5 aluminum picket; pickets have welded connection points to top and bottom rails

Support Posts:

*Al[13] Post* - 3 in square by 0.175 in wall, 6063-T5 aluminum tube post welded to a nominal 5-1/2 in square by 0.40 in thick 6063-T5 aluminum base plate with four 0.47 in diameter holes with the center of the holes located approximately 5/8 in in from each edge. The center to center spacing of the holes was approximately 4-1/4 in. One 0.98 in diameter hole was located in the center of the base plate. A 1/4" continuous fillet weld connected the tube to the base plate. The post base was surface-mounted to a rigid steel test surface (simulated concrete) as described in Section 4.4 Fastening Schedule.

Wood Post - Nominal 4x4 preservative treated, Grade No. 2, Southern Pine wood post in rigid vertical stanchions

See drawings in Appendix A and photographs in Appendix B for additional details.

### 4.4 Fastening Schedule

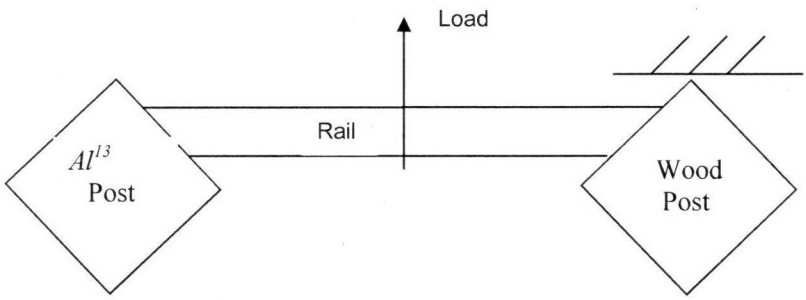
| Connection | Fastener |
|---|---|
| Rail Bracket to *Al[13] Post** | Two 1/4 in by 1 in Torx Drive, self-tapping, flat head sheet metal screws |
| Rail Bracket to Wood Post* | Two #12 by 2-1/2 in , Torx Drive, flat head screws |
| Rail Bracket to Rail* | Two 1/4 in by 1 in Torx Drive, self-tapping, flat head sheet metal screws |
| *Al[13] Post* to Substructure (Rigid Steel Channel) | Four 3/8 in Grade 8 hex head bolts with washers |

** 5/32 in diameter pre-drill used*

### 4.5 Test Setup

The railing assembly was installed and tested as a single railing section by directly securing the *Al*[13] *Post* and conventional 4x4 wood post as indicated in Section 4.3, above. The railing was assembled by an Architectural Testing technician. Transducers mounted to an independent reference frame were located to record movement of reference points on the railing system components (ends and mid-point) to determine net component deflections. See photographs in Appendix B for test setups.

Test Series No. 2 utilized top and bottom rails with 45° mitered ends and brackets, oriented on the support posts and installed in an angled condition similar to the diagram below:




### 4.6 Test Procedure

Testing and evaluation was performed in accordance with Section 4.2.1 of ICC-ES™ AC273. The test specimen was inspected prior to testing to verify size and general condition of the materials, assembly, and installation. No potentially compromising defects were observed. One specimen was used for all load tests which were performed in the order reported. Each design load test was performed using the following procedure:

1. Zeroed transducers and load cell at zero load;
2. Increased load to specified test load in no less than ten seconds; and
3. Held test load for no less than one minute.

## 4.7 Test Results

Unless otherwise noted, all loads and displacement measurements were normal to the rail (horizontal). The test results apply only to the railing assembly between supports and anchorage to the support.

**Key to Test Results Tables:**

Load Level: Target test load

Test Load: Actual applied load at the designated load level (target). Where more than one value is reported, the test load was the range (min. - max.) that was held during the time indicated in the test.

Elapsed Time (E.T.): The amount of time into the test with zero established at the beginning of the loading procedure. Where more than one value is reported, the time was the range (start-end) that the designated load level was reached and sustained.

**Test Series No. 1**
**93 in by 43-1/2 in *Al[13] Traditional Aluminum Railing* / In-Line Condition**
**Attached to *Al[13] Post* at One End (Simulated Concrete Application)**
**and Preservative Treated (SYP) 4x4 Wood Post in Rigid Stanchions at the Other End**
**Limited to Use in IRC - One- and Two-Family Dwellings / ICC-ES™ AC273**

**Specimen No. 1 of 3**

| **Test No. 1 - Test Date: 03/20/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 128 | 00:38 - 01:45 | Sustained load equal to or greater than 125 lb for one full minute without failure |

| **Test No. 2 - Test Date: 03/20/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 128 | 00:22 - 01:26 | Sustained load equal to or greater than 125 lb for one full minute without failure |

**4.7 Test Results** (Continued)

**Test Series No. 1** (Continued)

**Specimen No. 1 of 3** (Continued)

| **Test No. 3 - Test Date: 03/20/12**<br>**Design Load: 200 lb Concentrated Load at Mid-Span of Top Rail** | | | | | | |
|---|---|---|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Displacement (in)** | | | |
| | | | **End** | **Mid** | **End** | **Net** [1] |
| 200 lb (D.L.) | 200 | 00:30 | 0.24 | 1.36 | 0.10 | 1.19 |
| 500 lb (2.50 x D.L.) | 504 | 01:40 - 02:41 | **Result**: Withstood load equal to or greater than 500 lb for one full minute without failure | | | |
| Deflection Evaluation:<br>Maximum rail deflection at 200 lb = 1.19 in on an 8 ft rail (93 in)<br>Limits per AC273: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{43.5}{24}+\frac{93}{96}\right)=2.78" > 1.19" \therefore ok$ | | | | | | |

[1] *Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.*

| **Test No. 4 – Test Date: 03/20/12**<br>**Design Load: 200 lb Concentrated Load at Both Ends of Top Rail (Brackets)** | | | |
|---|---|---|---|
| **Load Level** [1] | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 1000 lb (2.5 x D.L.) x 2 | 1004 | 01:17 – 02:17 [2] | Each end withstood a load equal to or greater than 500 lb for at least one minute without failure |

[1] *Load was imposed on* both *ends of rail using a spreader beam; therefore, loads were doubled.*
[2] *During the (2.5x D.L) x 2 hold, the load dropped below 1000 lb for a total of four seconds.*

**4.7 Test Results** (Continued)

**Test Series No. 1** (Continued)

**Specimen No. 1 of 3** (Continued)

| **Test No. 5 - Test Date: 03/20/12**<br>**Design Load: 200 lb Concentrated Load at Top of Post Mount (43-1/2 in High)** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Displacement (in)** |
| 200 lb<br>(D.L.) | 201 | 00:22 | 0.42 |
| 500 lb<br>(2.50 x D.L.) | 507 | 00:54 - 01:57 | **Result**: Withstood load equal to or greater than 500 lb for one full minute without failure |
| Deflection Evaluation:<br>Maximum post deflection at 201 lb = 0.42 in on an 8 ft rail (93 in)<br>Limits per AC273: $\frac{h}{12} = \frac{43.5}{12} = 3.63" > 0.42" \therefore ok$ | | | |

**Specimen No. 2 of 3**

| **Test No. 1 - Test Date: 03/20/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 128 | 00:19 - 01:23 | Sustained load equal to or greater than 125 lb for one full minute without failure |

| **Test No. 2 - Test Date: 03/20/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 129 | 00:18 - 01:22 | Sustained load equal to or greater than 125 lb for one full minute without failure |

**4.7 Test Results** (Continued)

**Test Series No. 1** (Continued)

**Specimen No. 2 of 3** (Continued)

| **Test No. 3 - Test Date: 03/20/12**<br>**Design Load: 200 lb Concentrated Load at Mid-Span of Top Rail** | | | | | | |
|---|---|---|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Displacement (in)** | | | |
| | | | **End** | **Mid** | **End** | **Net** [1] |
| 200 lb (D.L.) | 200 | 00:27 | 0.27 | 1.35 | 0.07 | 1.18 |
| 500 lb (2.50 x D.L.) | 505 | 01:15 - 02:19 | **Result**: Withstood load equal to or greater than 500 lb for one full minute without failure | | | |
| Deflection Evaluation:<br>Maximum rail deflection at 200 lb = 1.18 in on an 8 ft rail (93 in)<br>Limits per AC273: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{43.5}{24}+\frac{93}{96}\right)=2.78" > 1.18" \therefore ok$ | | | | | | |

[1] *Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.*

| **Test No. 4 – Test Date: 03/20/12**<br>**Design Load: 200 lb Concentrated Load at Both Ends of Top Rail (Brackets)** | | | |
|---|---|---|---|
| **Load Level** [1] | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 1000 lb (2.5 x D.L.) x 2 | 1006 | 01:04 – 02:07 | Each end withstood a load equal to or greater than 500 lb for at least one minute without failure |

[1] *Load was imposed on* both *ends of rail using a spreader beam; therefore, loads were doubled.*

**4.7 Test Results** (Continued)

**Test Series No. 1** (Continued)

**Specimen No. 2 of 3** (Continued)

| **Test No. 5 - Test Date: 03/20/12**<br>**Design Load: 200 lb Concentrated Load at Top of Post Mount (43-1/2 in High)** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Displacement (in)** |
| 200 lb (D.L.) | 205 | 00:22 | 0.49 |
| 500 lb (2.50 x D.L.) | 504 | 00:54 - 01:58 | **Result**: Withstood load equal to or greater than 500 lb for one full minute without failure |
| Deflection Evaluation:<br>Maximum post deflection at 205 lb = 0.49 in on an 8 ft rail (93 in)<br>Limits per AC273: $\frac{h}{12} = \frac{43.5}{12} = 3.63" > 0.49" \therefore ok$ | | | |

**Specimen No. 3 of 3**

| **Test No. 1 - Test Date: 03/21/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb (2.50 x D.L.) | 128 | 00:21 - 01:26 | Sustained load equal to or greater than 125 lb for one full minute without failure |

| **Test No. 2 - Test Date: 03/21/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb (2.50 x D.L.) | 129 | 00:16 - 01:19 | Sustained load equal to or greater than 125 lb for one full minute without failure |

**4.7 Test Results** (Continued)

**Test Series No. 1** (Continued)

**Specimen No. 3 of 3** (Continued)

| **Test No. 3 - Test Date: 03/21/12**<br>**Design Load: 200 lb Concentrated Load at Mid-Span of Top Rail** | | | | | | |
|---|---|---|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Displacement (in)** | | | |
| | | | **End** | **Mid** | **End** | **Net** [1] |
| 200 lb (D.L.) | 204 | 00:30 | 0.26 | 1.43 | 0.06 | 1.27 |
| 500 lb (2.50 x D.L.) | 505 | 01:10 - 02:15 | **Result**: Withstood load equal to or greater than 500 lb for one full minute without failure | | | |
| Deflection Evaluation:<br>Maximum rail deflection at 204 lb = 1.27 in on an 8 ft rail (93 in)<br>Limits per AC273: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{43.5}{24}+\frac{93}{96}\right)=2.78" > 1.27" \therefore ok$ | | | | | | |

[1] *Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.*

| **Test No. 4 – Test Date: 03/21/12**<br>**Design Load: 200 lb Concentrated Load at Both Ends of Top Rail (Brackets)** | | | |
|---|---|---|---|
| **Load Level** [1] | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 1000 lb (2.5 x D.L.) x 2 | 1005 | 00:59 - 02:03 | Each end withstood a load equal to or greater than 500 lb for at least one minute without failure |

[1] *Load was imposed on* both *ends of rail using a spreader beam; therefore, loads were doubled.*

**4.7 Test Results** (Continued)

**Test Series No. 1** (Continued)

**Specimen No. 3 of 3** (Continued)

| **Test No. 5 - Test Date: 03/21/12**<br>**Design Load: 200 lb Concentrated Load at Top of Post Mount (43-1/2 in High)** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Displacement (in)** |
| 200 lb<br>(D.L.) | 207 | 00:22 | 0.40 |
| 500 lb<br>(2.50 x D.L.) | 505 | 00:43 - 01:46 | **Result**: Withstood load equal to or greater than 500 lb for one full minute without failure |
| Deflection Evaluation:<br>Maximum post deflection at 207 lb = 0.40 in on an 8 ft rail (93 in)<br>Limits per AC273: $\frac{h}{12} = \frac{43.5}{12} = 3.63" > 0.40" \therefore ok$ | | | |

**Test Series No. 2**
**93 in by 44-3/4 in *Al[13] Traditional Aluminum Railing* / Mitered 45° Condition**
**Attached to *Al[13] Post* at One End (Simulated Concrete Application)**
**and Preservative Treated (SYP) 4x4 Wood Post in Rigid Stanchions at the Other End**
**Limited to Use in IRC - One- and Two-Family Dwellings / ICC-ES™ AC273**

**Specimen No. 1 of 3**

| **Test No. 1 - Test Date: 03/21/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 130 | 00:23 - 01:27 | Sustained load equal to or greater than 125 lb for one full minute without failure |

| **Test No. 2 - Test Date: 03/21/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 129 | 00:14 - 01:18 | Sustained load equal to or greater than 125 lb for one full minute without failure |

**4.7 Test Results** (Continued)

**Test Series No. 2** (Continued)

**Specimen No. 1 of 3** (Continued)

| **Test No. 3 - Test Date: 03/21/12**<br>**Design Load: 200 lb Concentrated Load at Mid-Span of Top Rail** | | | | | | |
|---|---|---|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Displacement (in)** | | | |
| | | | **End** | **Mid** | **End** | **Net** [1] |
| 200 lb<br>(D.L.) | 203 | 00:25 | 0.23 | 1.22 | 0.07 | 1.07 |
| 500 lb<br>(2.50 x D.L.) | 506 | 01:16 - 02:18 | **Result**: Withstood load equal to or greater than 500 lb for one full minute without failure | | | |
| Deflection Evaluation:<br>Maximum rail deflection at 203 lb = 1.07 in on an 8 ft rail (93 in)<br>Limits per AC273: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{44.75}{24}+\frac{93}{96}\right)=2.83" > 1.07" \therefore ok$ | | | | | | |

[1] *Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.*

| **Test No. 4 – Test Date: 03/21/12**<br>**Design Load: 200 lb Concentrated Load at Both Ends of Top Rail (Brackets)** | | | |
|---|---|---|---|
| **Load Level** [1] | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 1000 lb<br>(2.5 x D.L.) x 2 | 1009 | 01:01 - 02:05 | Each end withstood a load equal to or greater than 500 lb for at least one minute without failure |

[1] *Load was imposed on* both *ends of rail using a spreader beam; therefore, loads were doubled.*

**Specimen No. 2 of 3**

| **Test No. 1 - Test Date: 03/21/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 131 | 00:18 - 01:22 | Sustained load equal to or greater than 125 lb for one full minute without failure |

**4.7 Test Results** (Continued)

**Test Series No. 2** (Continued)

**Specimen No. 2 of 3** (Continued)

| **Test No. 2 - Test Date: 03/21/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 131 | 00:39 - 01:42 | Sustained load equal to or greater than 125 lb for one full minute without failure |

| **Test No. 3 - Test Date: 03/21/12**<br>**Design Load: 200 lb Concentrated Load at Mid-Span of Top Rail** | | | | | | |
|---|---|---|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Displacement (in)** | | | |
| | | | **End** | **Mid** | **End** | **Net** [1] |
| 200 lb<br>(D.L.) | 202 | 00:21 | 0.26 | 1.25 | 0.06 | 1.09 |
| 500 lb<br>(2.50 x D.L.) | 505 | 01:07 - 02:13 | **Result**: Withstood load equal to or greater than 500 lb for one full minute without failure | | | |
| Deflection Evaluation:<br>Maximum rail deflection at 202 lb = 1.09 in on an 8 ft rail (93 in)<br>Limits per AC273: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{44.75}{24}+\frac{93}{96}\right)=2.83" > 1.09" \therefore ok$ | | | | | | |

[1] *Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.*

| **Test No. 4 – Test Date: 03/21/12**<br>**Design Load: 200 lb Concentrated Load at Both Ends of Top Rail (Brackets)** | | | |
|---|---|---|---|
| **Load Level** [1] | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 1000 lb<br>(2.5 x D.L.) x 2 | 1005 | 01:00 - 02:03 [2] | Each end withstood a load equal to or greater than 500 lb for at least one minute without failure |

[1] *Load was imposed on* both *ends of rail using a spreader beam; therefore, loads were doubled.*
[2] *During the (2.5x D.L) x 2 hold, the load dropped below 1000 lb for a total of two seconds.*

**4.7 Test Results** (Continued)

**Test Series No. 2** (Continued)

**Specimen No. 3 of 3**

| **Test No. 1 - Test Date: 03/22/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Center of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 128 | 00:11 - 01:13 | Sustained load equal to or greater than 125 lb for one full minute without failure |

| **Test No. 2 - Test Date: 03/22/12**<br>**Design Load: 50 lb / 1 Square ft of In-Fill at Bottom of Two Pickets** | | | |
|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 125 lb<br>(2.50 x D.L.) | 129 | 00:15 - 01:18 | Sustained load equal to or greater than 125 lb for one full minute without failure |

| **Test No. 3 - Test Date: 03/22/12**<br>**Design Load: 200 lb Concentrated Load at Mid-Span of Top Rail** | | | | | | |
|---|---|---|---|---|---|---|
| **Load Level** | **Test Load (lb)** | **E.T. (min:sec)** | **Displacement (in)** | | | |
| | | | **End** | **Mid** | **End** | **Net** [1] |
| 200 lb<br>(D.L.) | 205 | 00:26 | 0.23 | 1.26 | 0.06 | 1.12 |
| 500 lb<br>(2.50 x D.L.) | 504 | 01:11 - 02:14 | **Result**: Withstood load equal to or greater than 500 lb for one full minute without failure | | | |
| Deflection Evaluation:<br>Maximum rail deflection at 205 lb = 1.12 in on an 8 ft rail (93 in)<br>Limits per AC273: $\left(\frac{h}{24}+\frac{l}{96}\right)=\left(\frac{44.75}{24}+\frac{93}{96}\right)=2.83" > 1.12" \therefore ok$ | | | | | | |

[1] *Each end displacement was measured at the center of the support. Net displacement was the rail displacement relative to the supports.*

**4.7 Test Results** (Continued)

**Test Series No. 2** (Continued)

**Specimen No. 3 of 3** (Continued)

| **Test No. 4 – Test Date: 03/22/12**<br>**Design Load: 200 lb Concentrated Load at Both Ends of Top Rail (Brackets)** | | | |
|---|---|---|---|
| **Load Level** [1] | **Test Load (lb)** | **E.T. (min:sec)** | **Result** |
| 1000 lb<br>(2.5 x D.L.) x 2 | 1006 | 00:57 - 02:00 | Each end withstood a load equal to or greater than 500 lb for at least one minute without failure |

[1] *Load was imposed on* both *ends of rail using a spreader beam; therefore, loads were doubled.*

**4.8 Summary and Conclusions**

When installed between adequate supports, the railing assemblies reported herein meet the structural performance requirements of Section 4.2.1 of ICC-ES™ AC273 for use in One- and Two-Family Dwellings (IRC).

| ***Al*[13] *Traditional Aluminum Railing*** | **Guardrail Type** | **Support Posts** | **Code Occupancy Classification** |
|---|---|---|---|
| 93 in by 43-1/2 in | Level / In-Line Condition | *Al*[13] *Post* (Simulated Concrete Application) or Preservative Treated (Southern Pine) 4x4 Wood Posts | IRC – One- and Two-Family Dwellings |
| 93 in by 44-3/4 in | Level / 45° Condition | | |

Anchorage of support posts to the supporting structure is not included in the scope of this testing and would need to be evaluated separately.

## 5.0 Closing Statement

Detailed drawings, data sheets, representative samples of test specimens, a copy of this test report, and all other supporting evidence will be retained by Architectural Testing for a period of four years from the original test date. At the end of this retention period, said materials shall be discarded without notice, and the service life of this report by Architectural Testing shall expire. Results obtained are tested values and were secured using the designated test methods. This report neither constitutes certification of this product nor expresses an opinion or endorsement by this laboratory; it is the exclusive property of the client so named herein and relates only to the tested specimens. This report may not be reproduced, except in full, without the written approval of Architectural Testing.

For ARCHITECTURAL TESTING:

Digitally Signed by: Kyle Evans

Kyle J. Evans
Technician II
Structural Systems Testing

Digitally Signed by: Virgal Thomas Mickley, Jr.

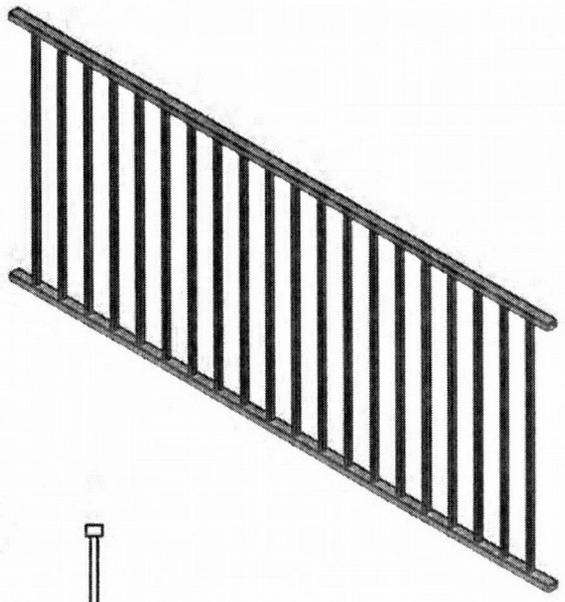
Virgal T. Mickley, Jr., P.E.
Senior Project Engineer
Structural Systems Testing

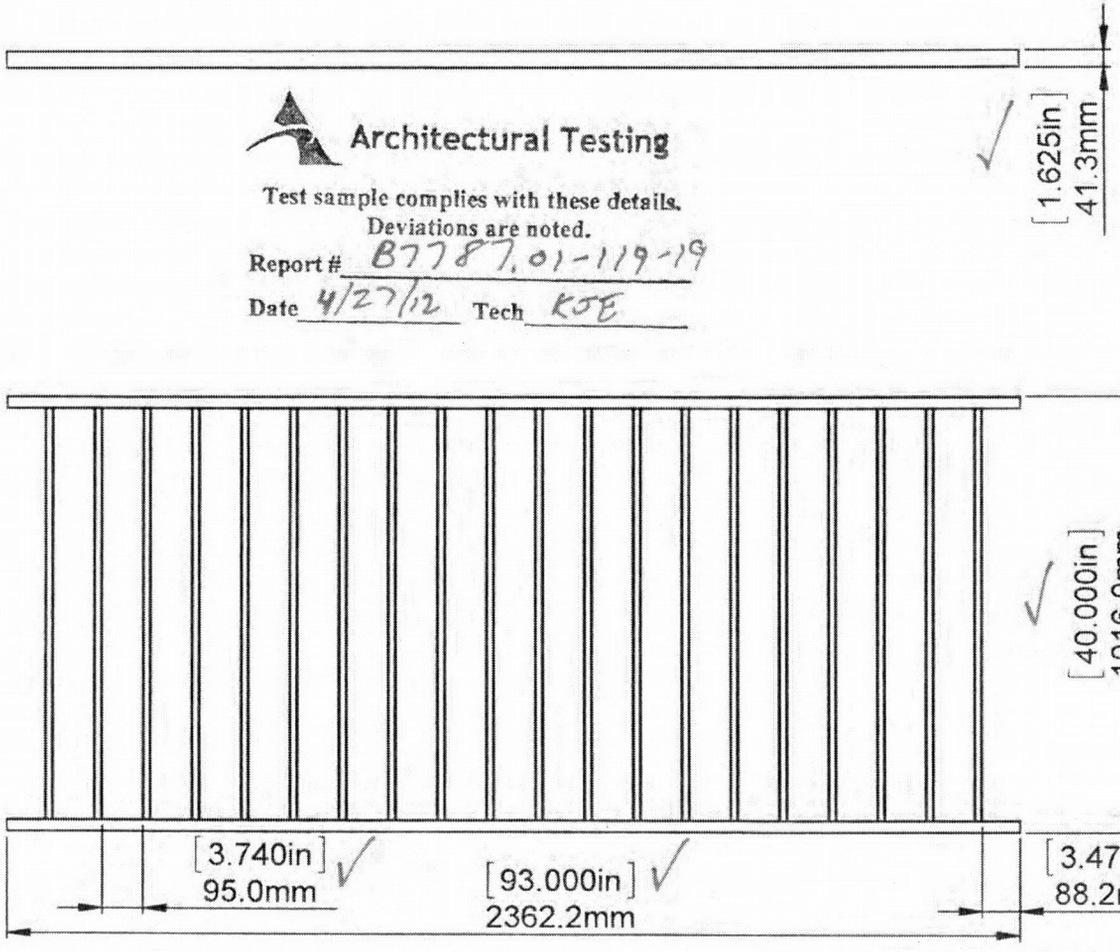
KJE:kje/drm

Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A - Drawings (5)
Appendix B - Photographs (6)

## Revision Log

| Rev. # | Date | Page(s) | Revision(s) |
|---|---|---|---|
| 0 | 05/08/12 | N/A | Original report issue |






Architectural Testing

Test sample complies with these details.
Deviations are noted.

Report # B7787.01-119-19

Date 4/27/12 Tech KOE

All Dimensions are Metric - mm
All Dimensions are ± 0.05mm



FORTRESS — RAILING PRODUCTS —

Fortress Iron, LP
1800 Jay Ell, Suite 200
Richardson, TX 75081

| REV | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 10/01/11 | DI | Initial Drawing |

TITLE: Al13 Railing System
Railing Panel - Panel

DRAWN BY: David Irick
DATE: 10/01/11
SCALE: AS SHOWN

Sheet: 2 OF 4 | PART #: XXXXXXX | DWG NAME: Al13 Traditional 40" X 8' | REV: 0

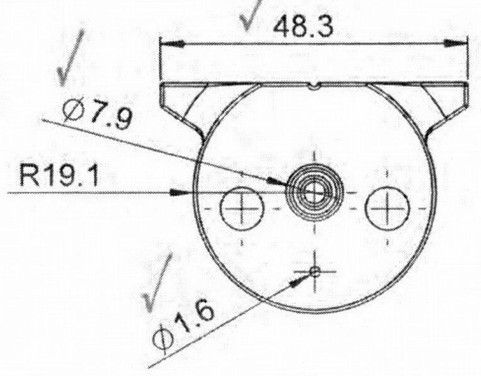
**Architectural Testing**

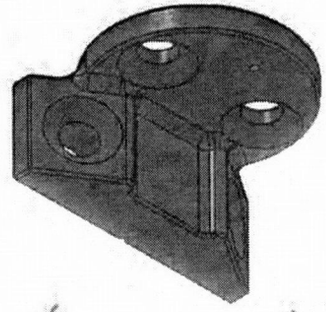
Test sample complies with these details.
Deviations are noted.

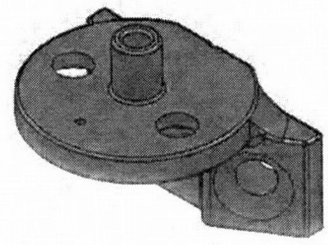
Report # B7787.01-119-19

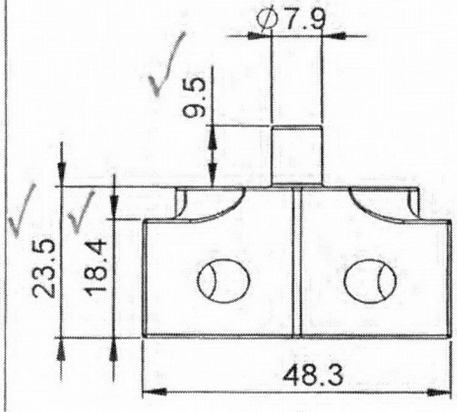
Date 4/27/12 Tech KJE

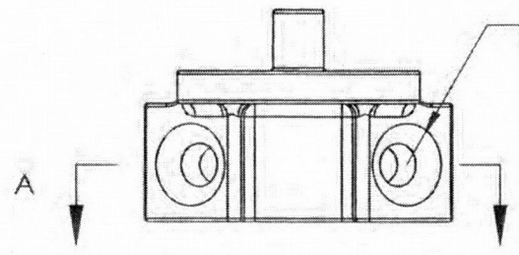
| Material | Tensil Strgth - Mpa | Elongation - % | Yield Point - Mpa |
|---|---|---|---|
| ADC12 | 3.24 | 3.5 | 1.58 |

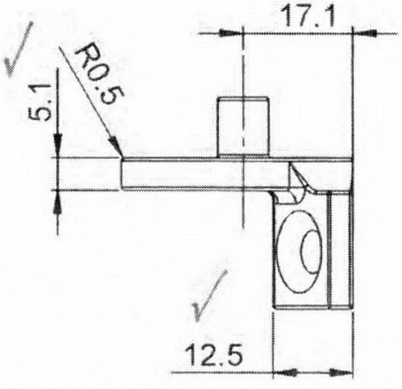


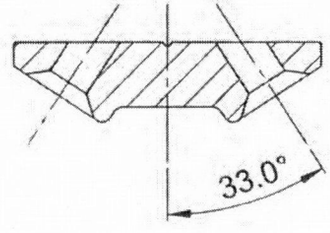


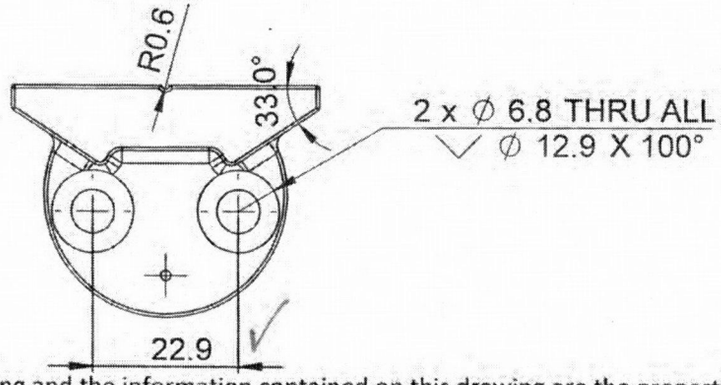



SECTION A-A




All Dimensions are Metric - mm
All Dimensions are ± 0.05mm

| REV | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 10/22/11 | DI | Initial Drawing |



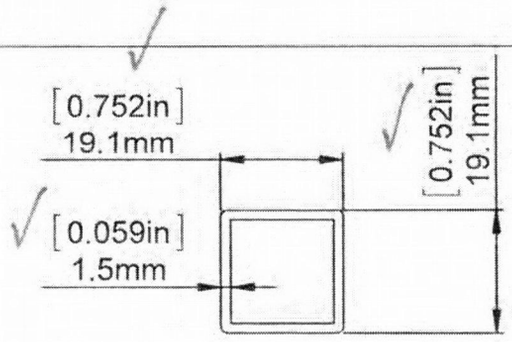
FORTRESS — RAILING PRODUCTS —

Fortress Iron, LP
1800 Jay Ell, Suite 200
Richardson, TX 75081

TITLE: Al13 Aluminum Railing System Accessories

DRAWN BY: David Irick
DATE: 10/22/11
SCALE: AS SHOWN

Sheet: 1 OF 1
PART #: 51500010
DWG NAME: Al13 Phantom Bracket
REV: 0




| Material | Tensil Strgth - Mpa | Elongation - % | Yield Point - Mpa |
|---|---|---|---|
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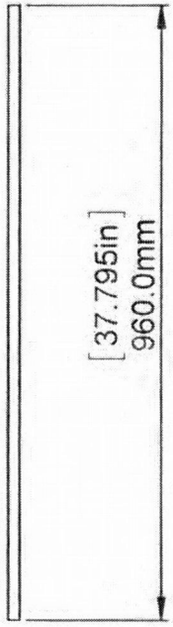


**Architectural Testing**

Test sample complies with these details.
Deviations are noted.

Report # B7787.01-119-19

Date 4/27/12 Tech KJE

All Dimensions are Metric - mm
All Dimensions are ± 0.05mm

| REV | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 10/01/11 | DI | Initial Drawing |

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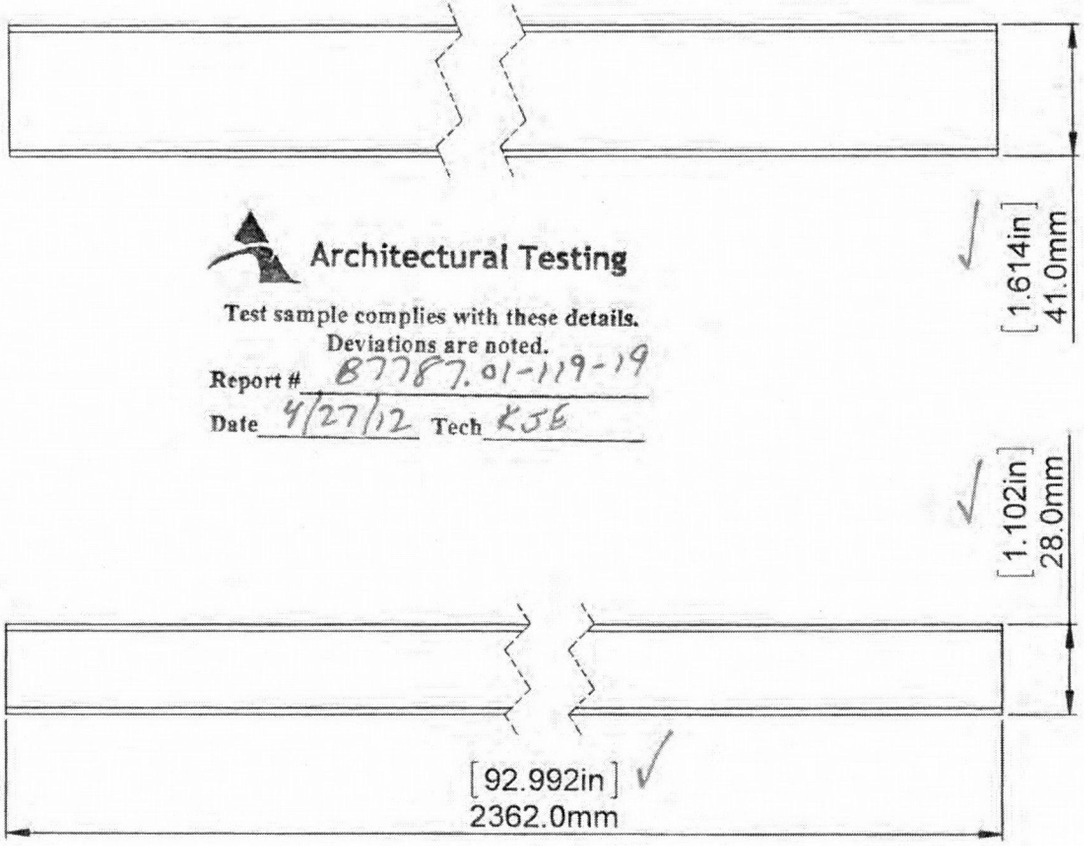
**Fortress Iron, LP**
1800 Jay Ell, Suite 200
Richardson, TX 75081

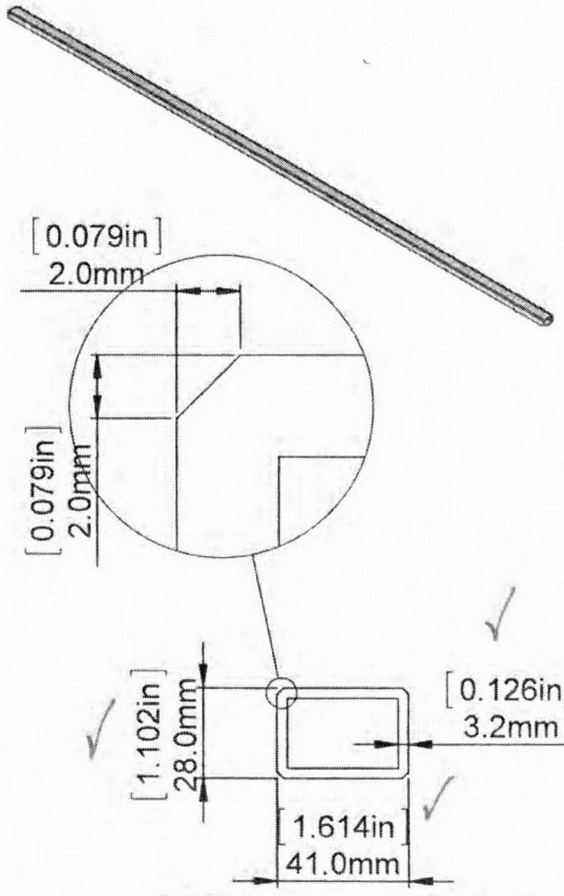
TITLE: Al13 Aluminum Railing System
Railing Panel - Picket

DRAWN BY: David Irick
DATE: 10/01/11
SCALE: AS SHOWN

Sheet: 4 OF 4
PART #: XXXXXXX
DWG NAME: Al13 Traditional 40" Picket
REV: 0

| Material | Tensil Strgth - Mpa | Elongation - % | Yield Point - Mpa |
|---|---|---|---|
| 6063-T5 | 230 | 12 | 200 |




**Architectural Testing**

Test sample complies with these details.
Deviations are noted.

Report # 87787.01-119-19

Date 4/27/12 Tech KJE

All Dimensions are Metric - mm
All Dimensions are ± 0.05mm

| REV | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 0 | 10/01/11 | DI | Initial Drawing |

FORTRESS — RAILING PRODUCTS —

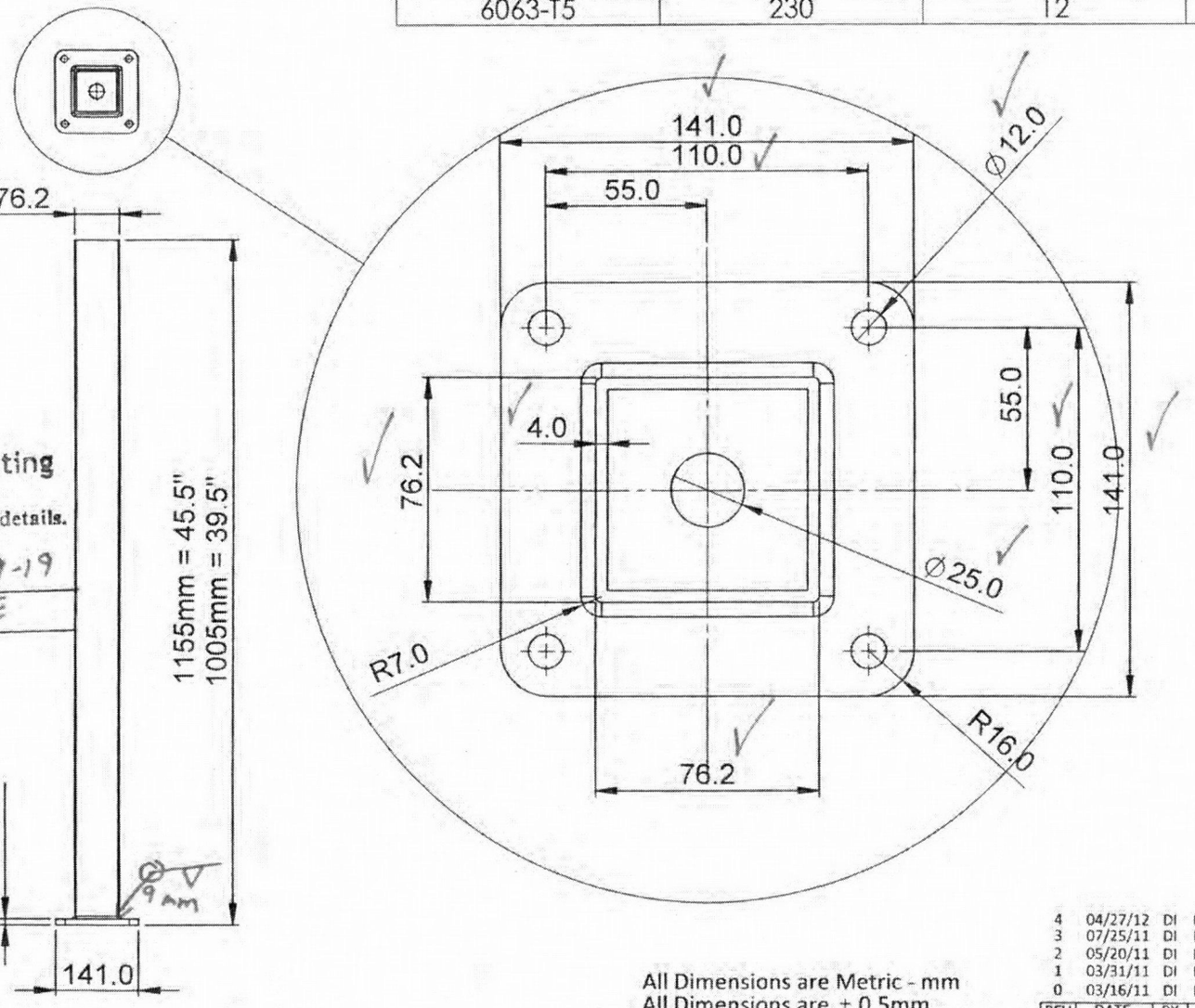
Fortress Iron, LP
1800 Jay Ell, Suite 200
Richardson, TX 75081

TITLE: Al13 Aluminum Railing System
Railing Panel - Rail

DRAWN BY: David Irick
DATE: 10/01/11
SCALE: AS SHOWN

Sheet: 3 OF 4
PART #: XXXXXXX
DWG NAME: Al13 Traditional 8' Rail
REV: 0

| Material | Tensil Strgth - Mpa | Elongation - % | Yield Point - Mpa |
|---|---|---|---|
| 6063-T5 | 230 | 12 | 200 |




Architectural Testing

st sample complies with these details.
Deviations are noted.

ort # B7787.01-119-19

e 4/27/12 Tech KJE

All Dimensions are Metric - mm
All Dimensions are ± 0.5mm

| REV | DATE | BY | DESCRIPTION |
|---|---|---|---|
| 4 | 04/27/12 | DI | Revised Material Spec |
| 3 | 07/25/11 | DI | Released for Production |
| 2 | 05/20/11 | DI | Revised Post Tube Size |
| 1 | 03/31/11 | DI | Revised Base Plate to 8mm Thick |
| 0 | 03/16/11 | DI | Initial Drawing |



FORTRESS
*Iron Railing & Fence Systems*

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1800 Jay Ell, Suite 200
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TITLE: Aluminum Post
3" X 3" X 39 1/2" & 45 1/2"

| DRAWN BY: David Irick | SCALE: AS SHOWN |
|---|---|
| DATE: 03/16/11 | |
| PART #: XXXXXXX | DWG NAME: AL IP 3X 39.5"/45.5"W/5.75 Base |
| | REV: 4 |

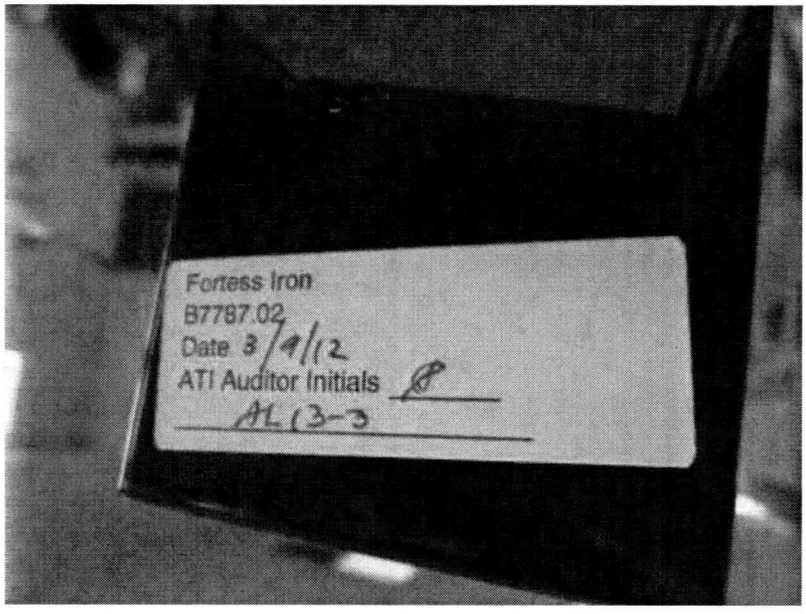



**Photo No. 1**
**Typical Sampling Mark**

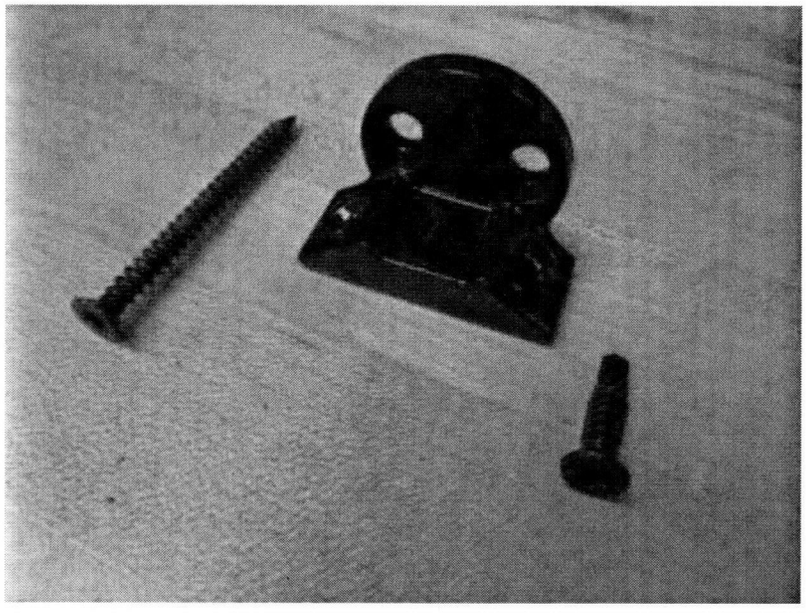


**Photo No. 2**
***AL[13] Phantom Bracket* and Screws**

**Photo No. 3**
**Typical Tensile Test Setup**

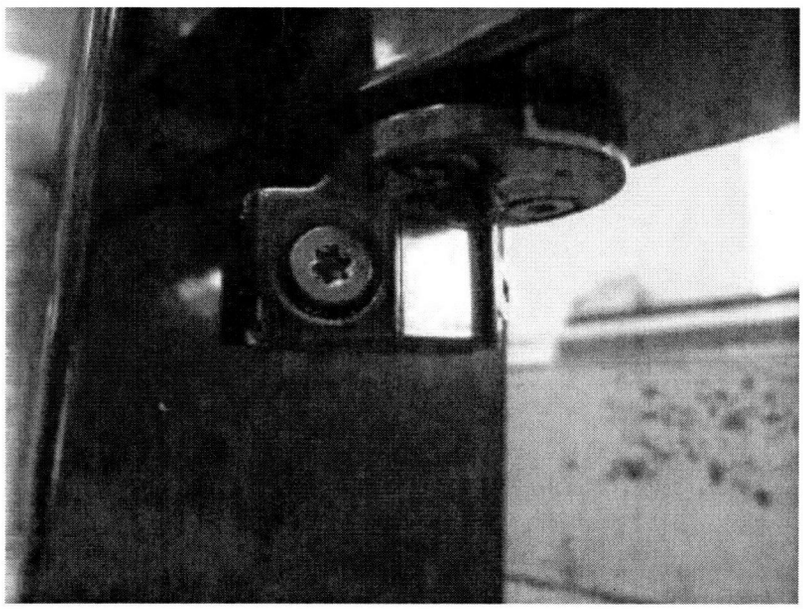


**Photo No. 4**
***AL[13] Phantom Bracket* to Post Mount Connection (In-Line Condition)**

**Photo No. 5**
***AL[13] Phantom Bracket* to Post Mount Connection (Mitered 45° Condition)**

**Photo No. 6**
**In-Fill Load Test at Center of Two Pickets**

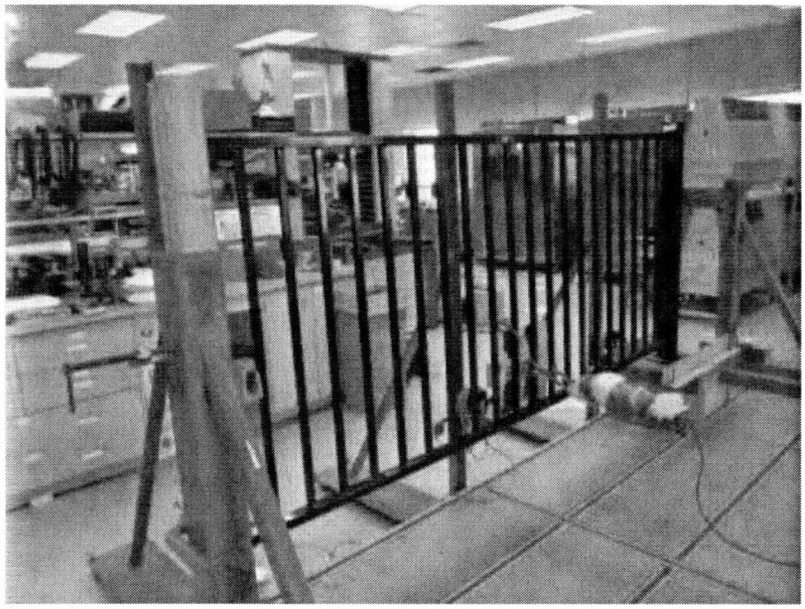


**Photo No. 7**
**In-Fill Load Test at Bottom of Two Pickets**

**Photo No. 8**
**Concentrated Load Test at Mid-Span of Top Rail**

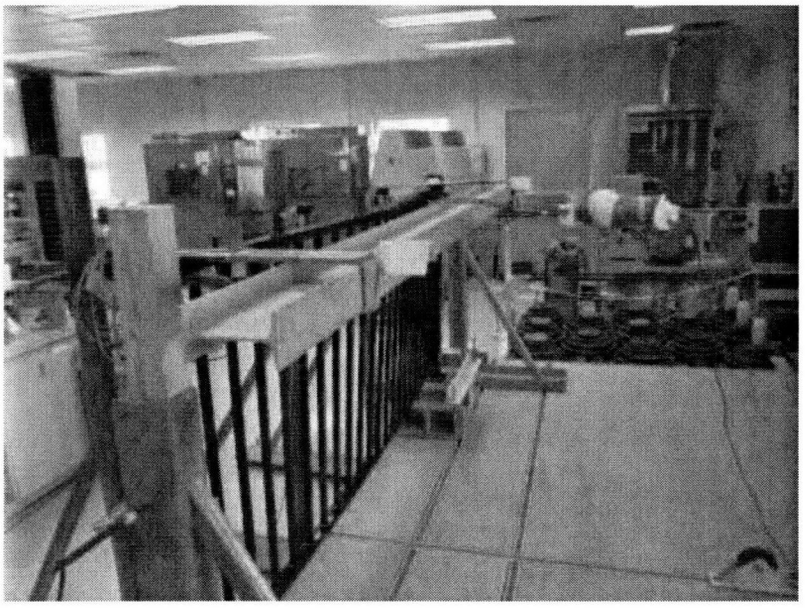


**Photo No. 9**
**Concentrated Load Test at End of Top Rail (Brackets)**

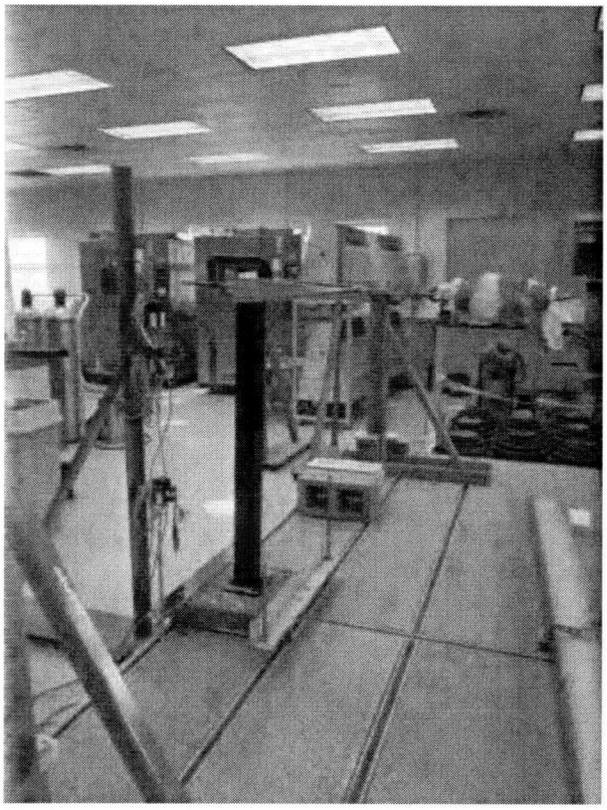
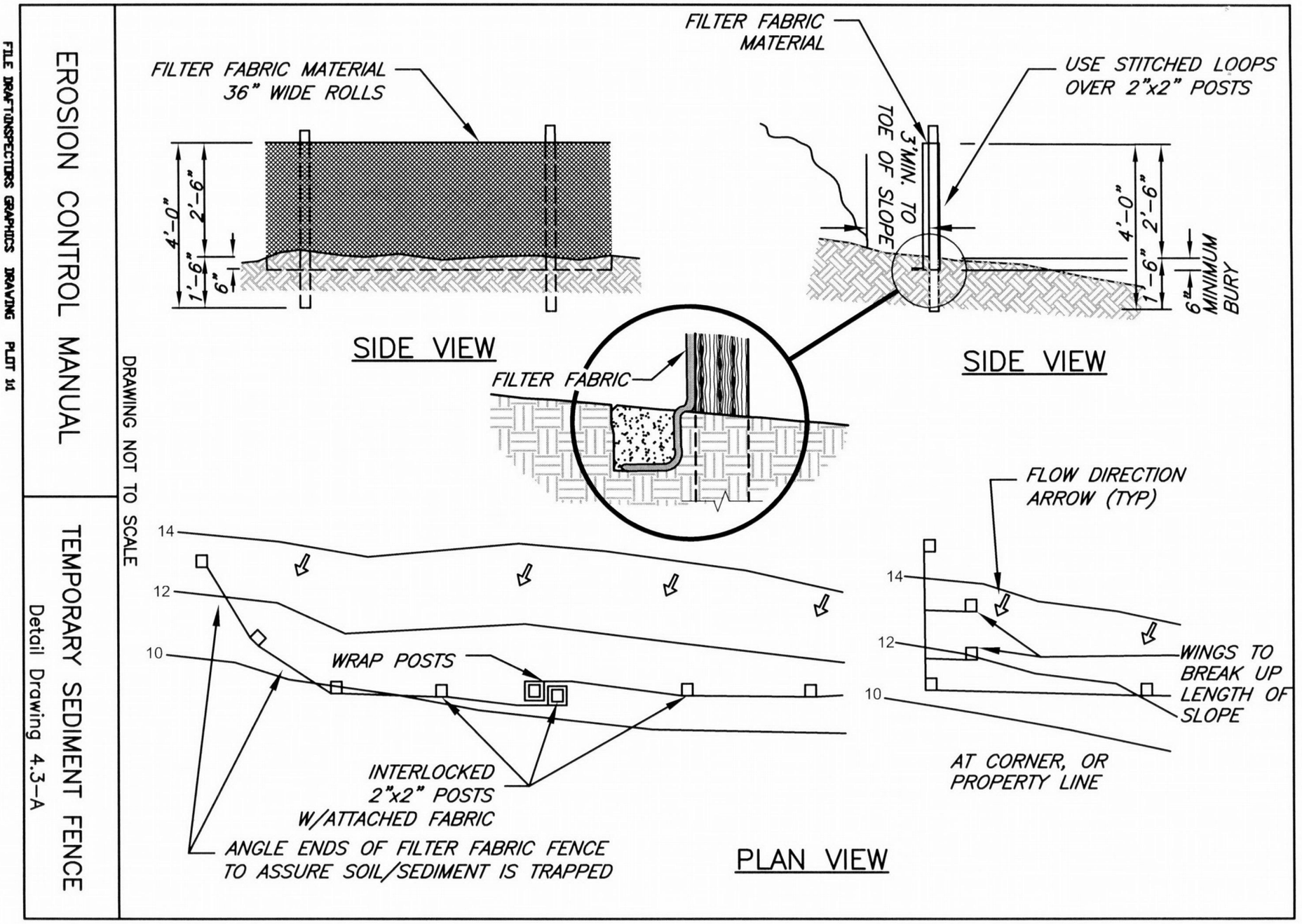


**Photo No. 10**
**Concentrated Load Test at Top of Post Mount (*AL[13] TD Post*)**


EROSION CONTROL MANUAL
TEMPORARY SEDIMENT FENCE
Detail Drawing 4.3-A
DRAWING NOT TO SCALE
FILE DRAFT\INSPECTORS GRAPHICS DRAWING PLOT 14
FILTER FABRIC MATERIAL
36" WIDE ROLLS
4'-0"
2'-6"
1'-6"
6"
SIDE VIEW
FILTER FABRIC
MATERIAL
USE STITCHED LOOPS
OVER 2"x2" POSTS
3' MIN. TO
TOE OF SLOPE
4'-0"
2'-6"
1'-6"
6" MINIMUM
BURY
SIDE VIEW
FILTER FABRIC
14
12
10
WRAP POSTS
INTERLOCKED
2"x2" POSTS
W/ATTACHED FABRIC
ANGLE ENDS OF FILTER FABRIC FENCE
TO ASSURE SOIL/SEDIMENT IS TRAPPED
PLAN VIEW
FLOW DIRECTION
ARROW (TYP)
14
12
10
WINGS TO
BREAK UP
LENGTH OF
SLOPE
AT CORNER, OR
PROPERTY LINE

FORTRESS
—RAILING PRODUCTS—
A division of THE FORTRESS COMPANY

# Installation Instructions for Fortress Al[13] Railing Traditional Panels with Phantom Brackets and Al[13] Posts

**It is the responsibility of the installer to meet all code and safety requirements, and to obtain all required building permits. The deck and railing installer should determine and implement appropriate installation techniques for each installation situation . The Fortress Company or its distributors shall not be held liable for improper or unsafe installations.**

**Fortress Al[13] Posts must always be secured to the deck framing. Fortress Al[13] Posts should never be attached to only the deck boards.**

## Note

When cutting Fortress railing, it is very important to complete the following at cut points. Not following the below steps will result in corrosion at the cut areas:

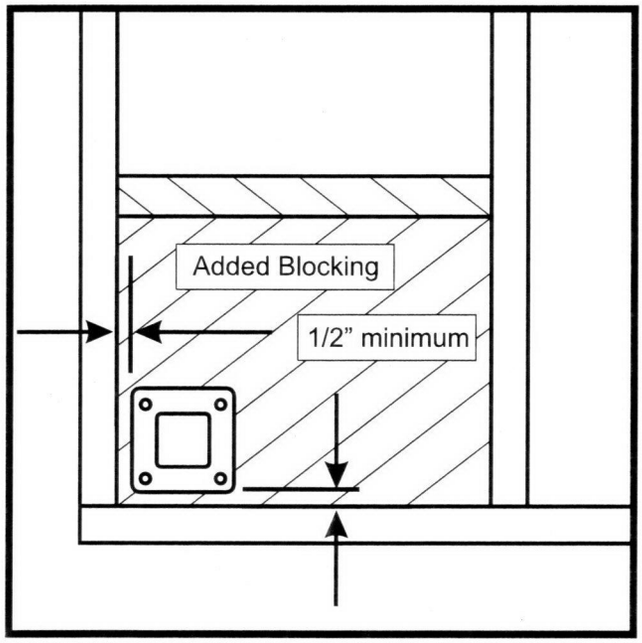
- Remove all metal shavings from the cut area
- File any sharp edges left by cutting. Thoroughly wipe and remove any filings, grime or dirt from the railing.
- Be sure to remove any metal shavings from the surface of deck, patio or balcony to prevent stains on the deck surface.

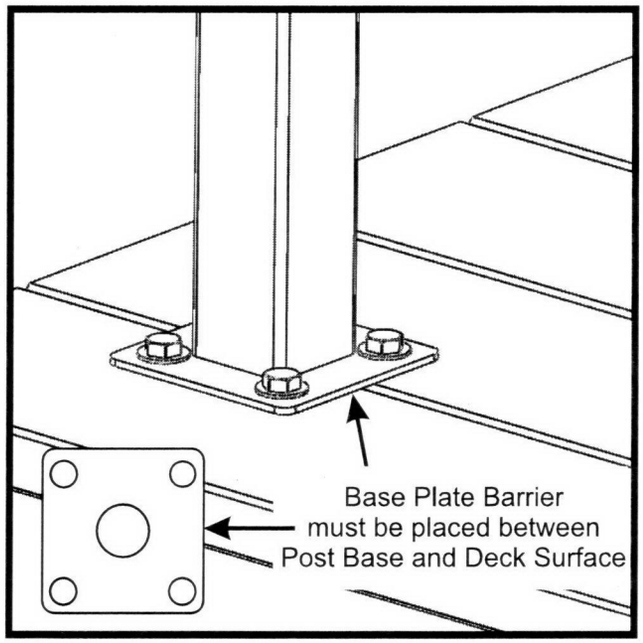
## Required Materials

Miter saw with fine tooth blade, Drill, 1/16", 5/32" and 5/16" Drill Bits, T-25 Driver Bit, Drill Bit Extender, Tape Measure, Wrenches, Speed Square, Center Punch, 3-3/4" Support Blocks and Hammer.

## Mount Al[13] Posts

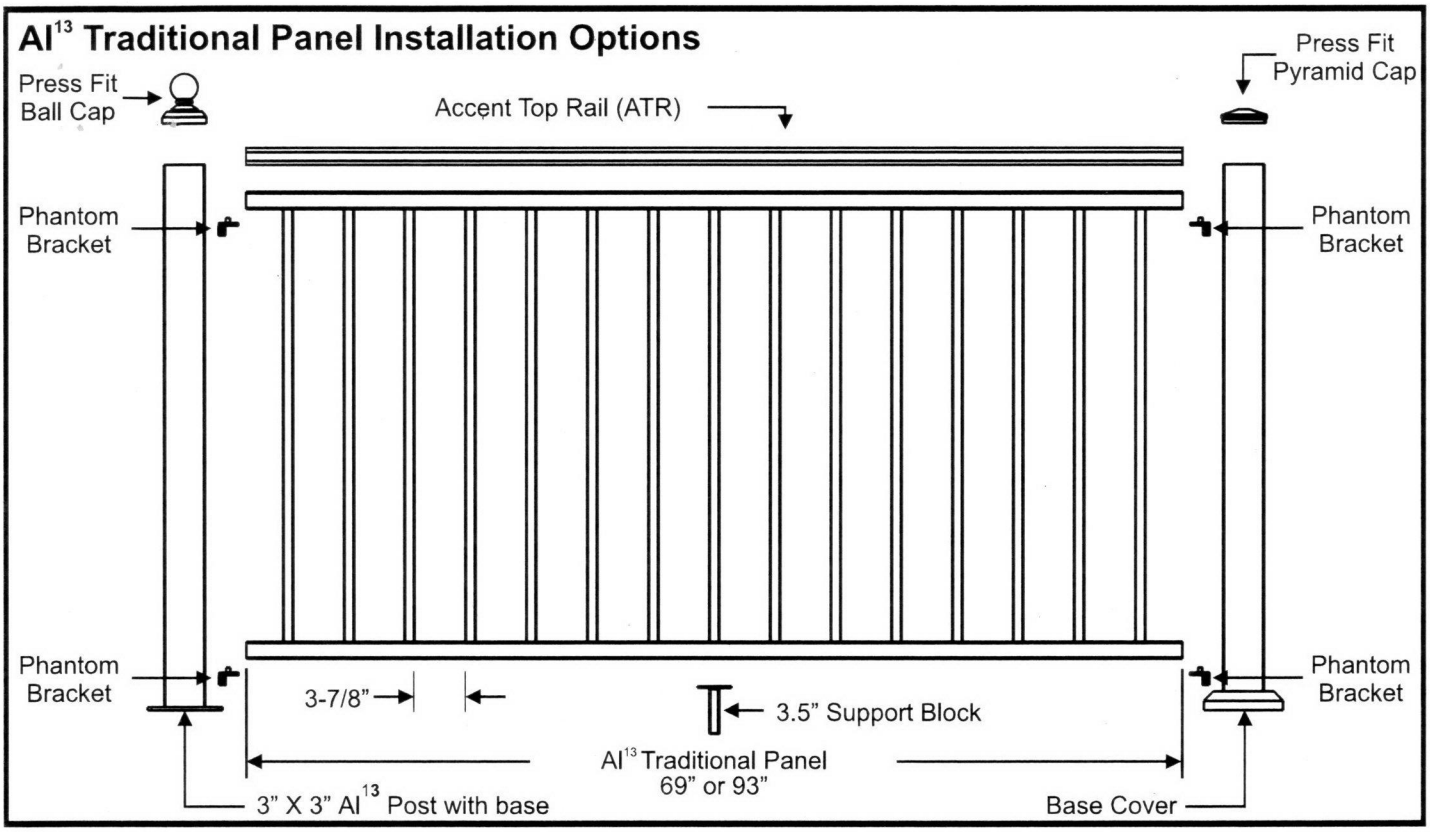
- Wood Blocking tied to deck frame must be installed and constructed with treated dimensional lumber with a minimum thickness of 1/1/2".
- **Al[13] 3" Post Spacing must not exceed 96" for 8' Panels and 72" for 6' Panels.**
- Position the edge of post base plate a minimum of ½" from the inside edge of rim joist.
- Place Base Plate Barrier between post base and deck surface.
- Mount posts at appropriate points based on panel length.
- Attach Al[13] posts with 3/8 X 3-1/2" Hex Head galvanized bolts.



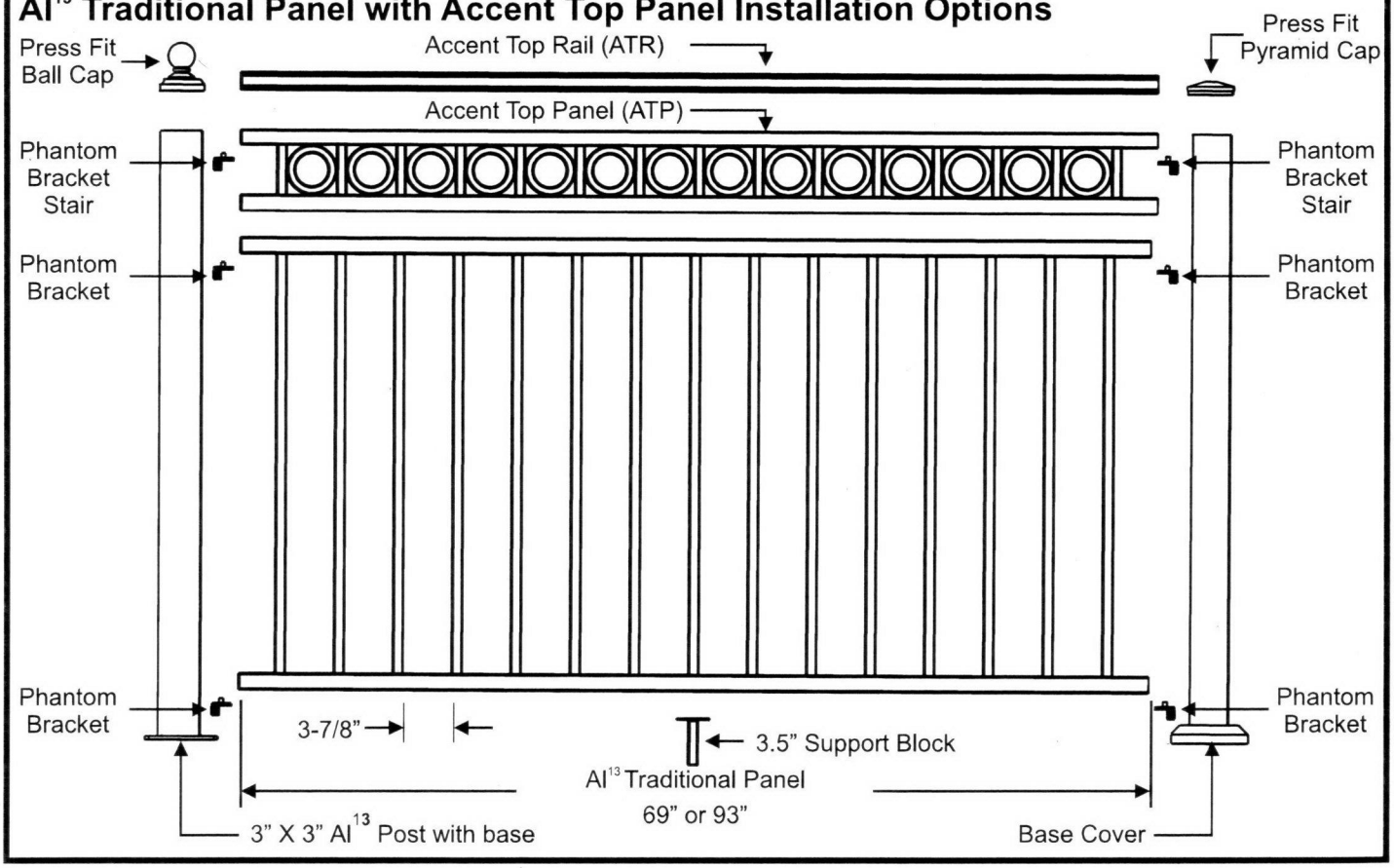




For technical assistance, please email: technicalhelp@fortressrailing.com
Hours of Operation Monday through Friday 8:00 AM to 5:00 PM, CST
Phone: 1-866-323-4766 (IRON) Fax: 972-644-3720
www.fortressrailing.com

## Al[13] Traditional Panel Installation Options




## Al[13] Traditional Panel with Accent Top Panel Installation Options



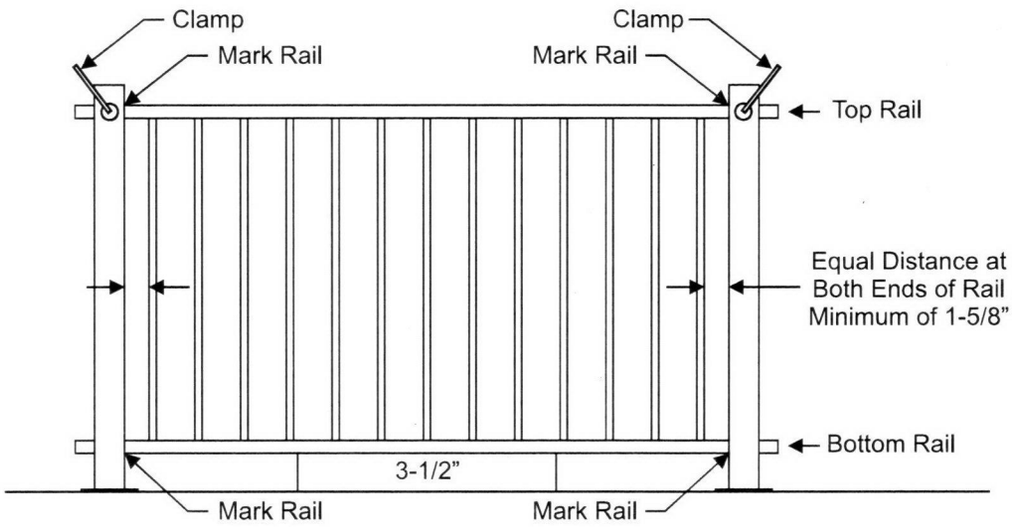
## Al[13] Traditional Panel and Al[13] Post Configurations

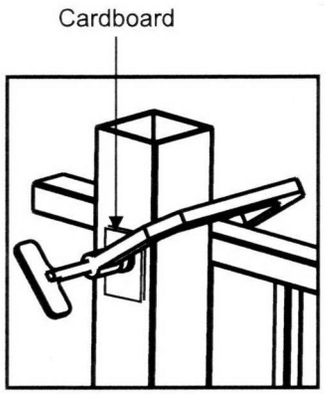
| Railing Panel Height | Railing Panel without Accent Top Panel | | Railing Panel with Accent Top Panel | |
|---|---|---|---|---|
| | Installed Panel Height* | Required Post | Installed Panel Height with ATP* | Required Post |
| 34" | 37-1/2" | 39-1/2" | 42-1/2" | 45-1/2" |
| 40" | 43-1/2" | 45-1/2" | X | X |

***Heights includes a 3-1/2" space between deck surface and bottom edge of bottom rail.**

## Al[13] Traditional Panel Installation with Phantom Bracket

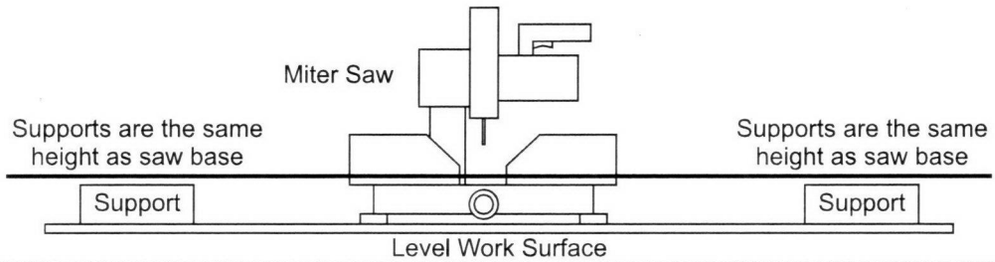
- Check posts to ensure that all posts are square and straight. Shim posts as required.
- Support Panel on 3-1/2" Support Blocks.
- Center Panel between the post so that there is a equal distance between the last baluster and post at each end.
- **Minimum distance between the last picket and post is 1-5/8"**
- Clamp Rail to Post at each end to prevent movement. **Place a piece of cardboard between clamp and Al[13] Post & Panel**
- Mark the rails so that the end cuts will be flush with the post.
- **Mark the top and bottom of Panel. This will be needed in a later step.**



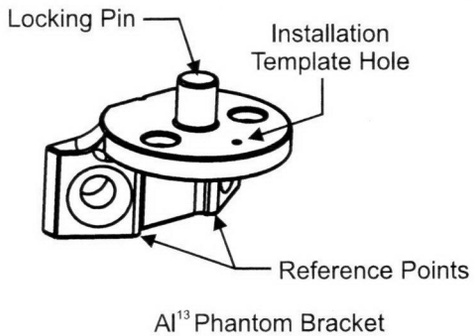

## Cutting Al[13] Traditional Panels

- The best way to cut Panels is to use a miter saw.
- A fine tooth carbide tipped blade designed to cut non-ferrous materials is recommended.
- Setup a work surface that is level and large enough to support all four corners of the Panel.
- Supports should be the same height as saw base to keep panel straight and level when cutting Panel.
- With Panels completely supported, make cuts at the marked locations from previous step.
- Al[13] Panels can be miter cut at an angle up to 45°
- Remove any burrs or shavings from cut edges.
- Check the fit of panel between post. **Be careful not to scratch post with end cuts.**

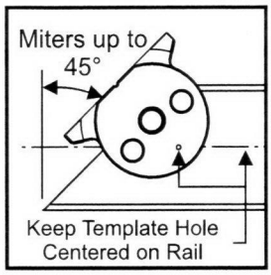


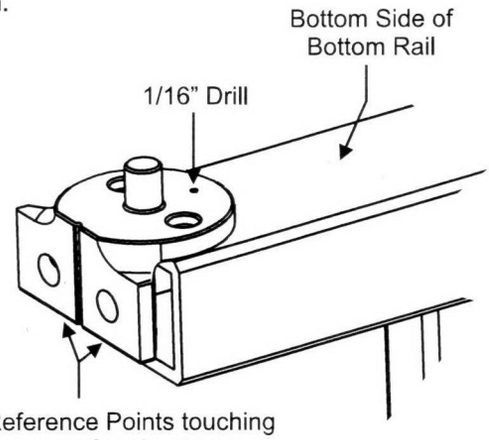
## Locating the AI[13] Phantom Bracket Locking Pin Location on the Rail

- The AI[13] Phantom Bracket is design with a integrated installation template.
- The template is used to locate the pre-drilled hole location for the Locking Pin.
- Turn Panel upside down and position Bracket as shown.
- Must be centered across the rail.
- Using a 1/16" Drill Bit, drill a hole to mark the center point



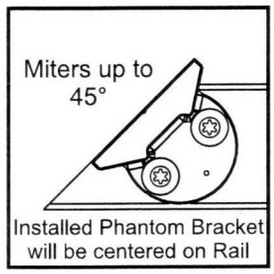

AI[13] Phantom Bracket

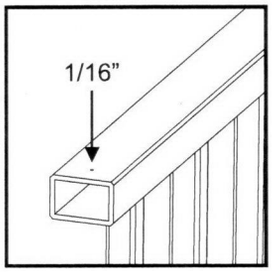


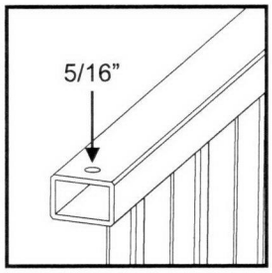



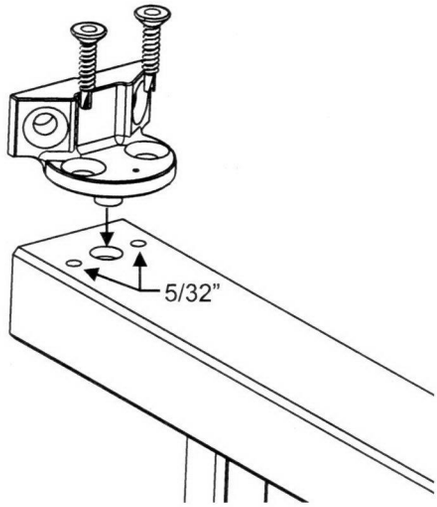

## AI[13] Phantom Bracket Straight and Miter Installation

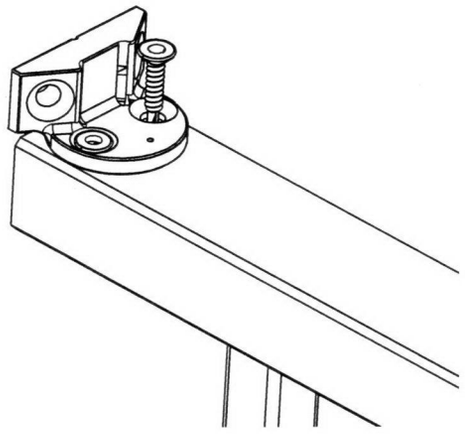
- With Panel positioned upside down. Mark the Locking Pin location at the end of each rail with 1/16" Drill Bit (4 Places).
- Using a 5/16" Drill Bit drill at hole through the bottom surface of rail at each Locking Pin Location.
- Position Bracket on rail with Locking Pin inserted into the 5/16" hole.
- Align Bracket so that backside of bracket is flush with the rail end cut.
- Mark the center point of the two screw holes and mark with a hole punch.
- Pre-drill holes with a 5/32" drill bit.
- Secure Bracket with supplied Torx Drive Self Drilling Screws.



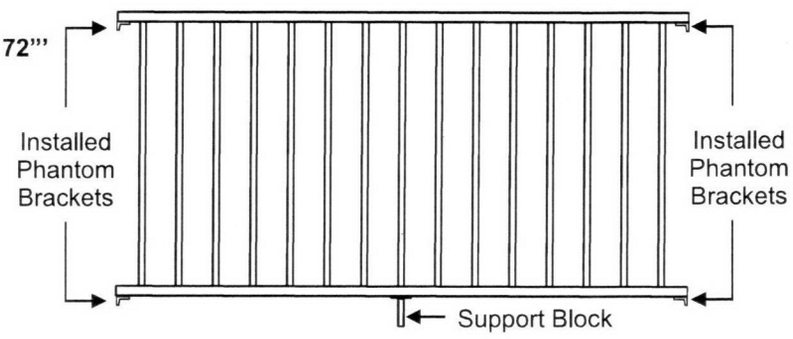



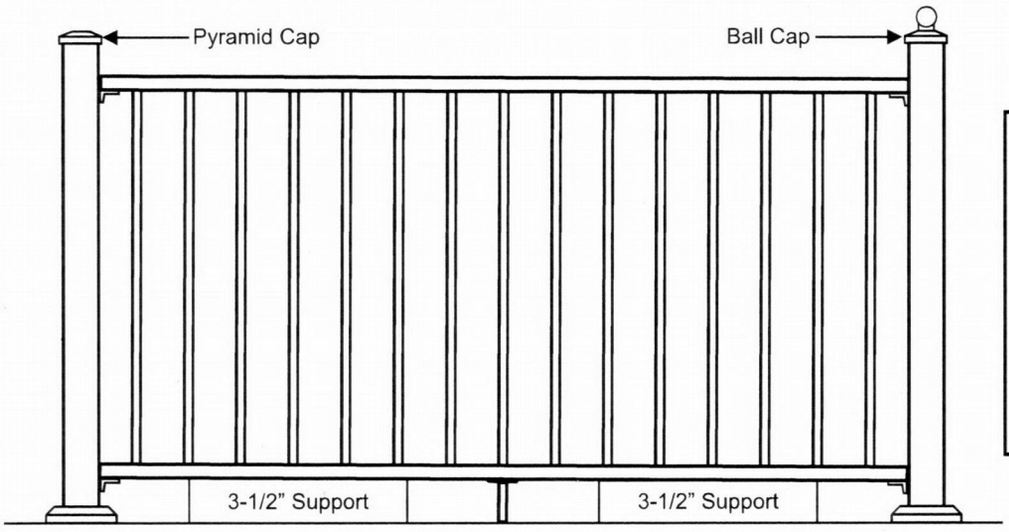
## AI[13] Support Block Installation

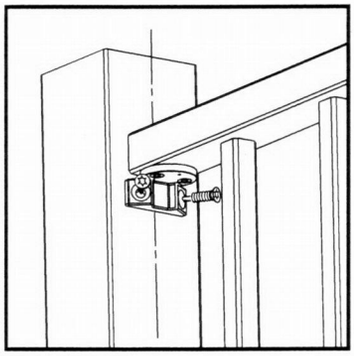
- **Support are recommended for rail spans over 72"'**
- Mark the center of Panel Bottom Rail.
- Position Support Block and mark hole locations.
- Pre-drill with a 5/32" Drill Bit
- Secure Support Block with supplied screws.



## Installing Al[13] Traditional Rail Panels to Al[13] Posts

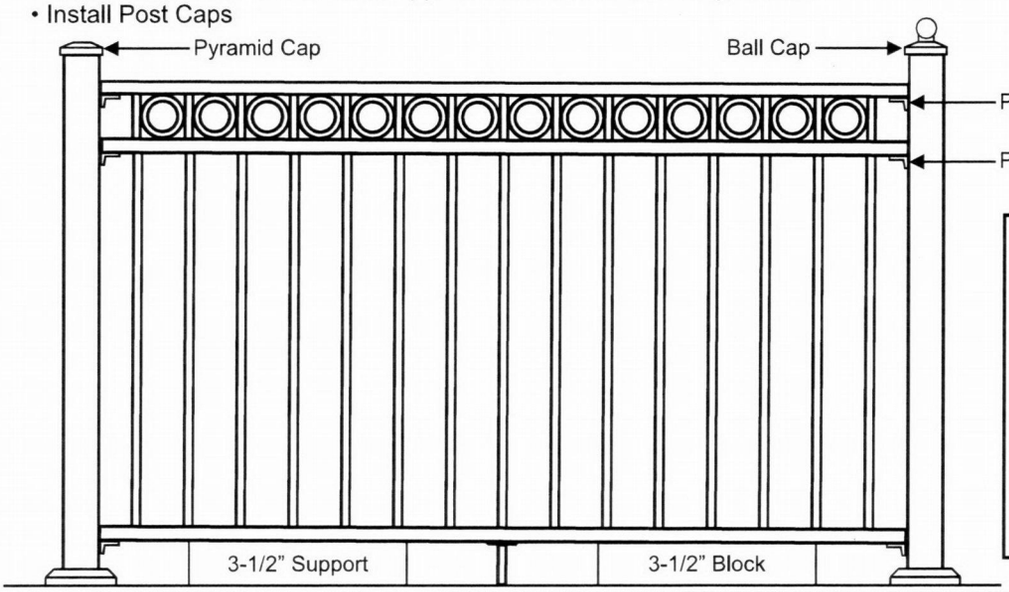
- If using Al[13] Base Covers install them now.
- Place a 3-1/2" Support near each post.
- Place Panel with Brackets and Support Blocks installed between Posts.
- Center Panel on each Post.
- With Panel in position pre-drill screw locations where Brackets meet Posts with a 5/32" drill bit.
- Secure Bracket to Post with supplied Torx Drive Self Drilling Screws.
- If installing a Al[13] Accent Top Rail (ATR), Cut ATR to length and snap onto top rail. Use epoxy to secure ATR to top rail.
- Install Post Caps

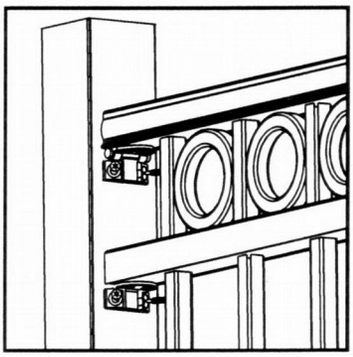


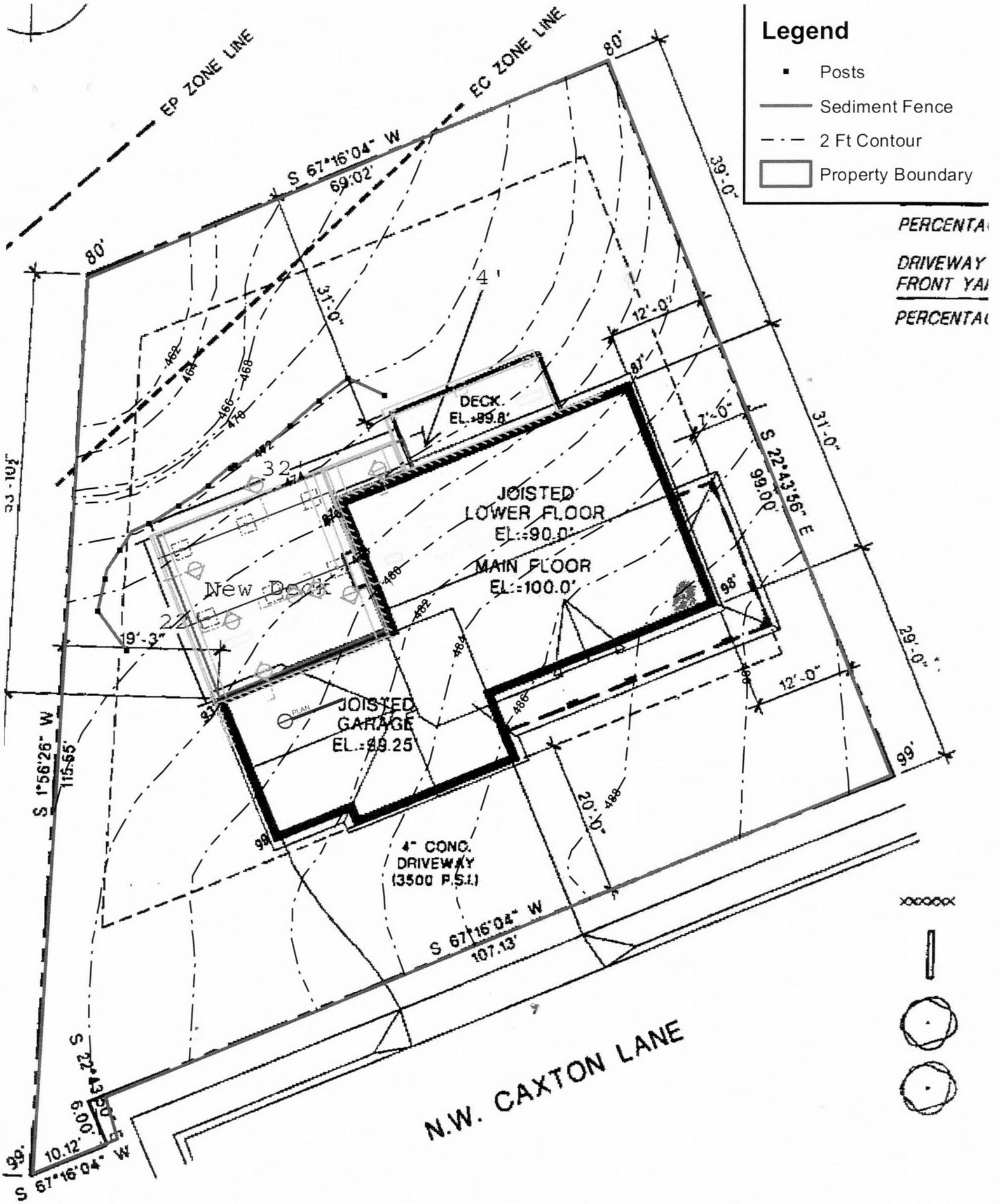



## Installing Al[13] Traditional Panels with a Al[13] Accent Top Panel (ATP) to Al[13] Posts

- If using Al[13] Base Covers install them now.
- Place a 3-1/2" support near each post.
- Place Panel with Brackets and Support installed between posts and on Support Blocks.
- Center Panel on each Post.
- With Panel in position pre-drill screw locations where Brackets meet Posts with a 5/32" drill bit.
- Secure Brackets to Posts with supplied Torx Drive Self Drilling Screws.
- Install Stair Bracket to Al[13] ATP
- Slide ATP with Stair Bracket installed over the top rail.
- Secure Brackets to Posts with supplied Torx Drive Self Drilling Screws.
- Install Post Caps






9777 NW Caxton Ln

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