

CITY OF SACRAMENTO

1231 I Street, Sacramento, CA 95814

Permit No: 0513420

Insp Area: 2

Thos Bros: 336J4

Site Address: 803 LAKE FRONT DR SAC

Parcel No: 031-1240-021

Sub-Type: RES

Housing (Y/N): N

CONTRACTORMONARCH ROOFING INC
8262 ALPINE AVE SUITE A
SACRAMENTO, CA 95826**OWNER**BAKER WILLIAM ANDREW/EMELI
803 LAKE FRONT DR
SACRAMENTO, CA 95831**ARCHITECT****Nature of Work:** T/O RE-ROOF & RE-SHEET 36 SQS & INSTALL LIGHT WEIGHT TILE ROOFING**CONSTRUCTION LENDING AGENCY:** I hereby affirm under penalty of perjury that there is a construction lending agency for the performance of the work for which this permit is issued (Sec. 3097, Civ. C).

Lender's Name _____

Lender's Address _____

LICENSED CONTRACTORS DECLARATION: I hereby affirm under penalty of perjury that I am licensed under provisions of Chapter 9 (commencing with section 7000) of Division 3 of the Business and Professions Code and my license is in full force and effect.License Class C39 License Number 806787 Date 9-1-05 Contractor Signature **OWNER-BUILDER DECLARATION:** I hereby affirm under penalty of perjury that I am exempt from the contractors License Law for the following reason (Sec. 7031.5, Business and Professions Code; any city or county which requires a permit to construct, alter, improve, demolish, or repair any structure, prior to its issuance, also requires the applicant for such permit to file a signed statement that he or she is licensed pursuant to the provisions of the Contractors License Law (Chapter 9 (commencing with Section 7000) of Division 8 of the Business and Professions Code) or that he or she is exempt therefrom and the basis for the alleged exemption. Any violation of Section 7031.5 by any applicant for a permit subjects the applicant to a civil penalty of not more than five hundred dollars (\$500.00);

I, as a owner of the property, or my employees with wages as their sole compensation, will do the work, and the structure is not intended or offered for sale (Sec. 7044, Business and Professional Code: The Contractors License Law does not apply to an owner of property who builds or improves thereon, and who does such work himself or herself or through his/her own employees, provided that such improvements are not intended or offered for sale. If, however, the building or improvement is sold within one year of completion, the owner-builder will have the burden of proving that he/she did not build or improve for the purpose of sale.)

I, as owner of the property, am exclusively contracting with licensed contractors to construct the project (Sec. 7044, Business and Professions Code: The Contractors License Law does not apply to an owner of property who builds or improves thereon, and who contracts for such projects with a contractor(s) licensed pursuant to the Contractors License Law).

I am exempt under Sec. _____ B & PC for this reason: _____

Date _____

Owner Signature _____

PAID
CITY OF SACRAMENTO

SEP 01 2005

IN ISSUING THIS BUILDING PERMIT, the applicant represents, and the city relies on the representation of the applicant, that the applicant verified all measurements and locations shown on the application or accompanying drawings and that the improvement to be constructed does not violate any law or private agreement relating to permissible or prohibited locations for such improvements. This building permit does not authorize any illegal location of any improvement or the violation of any private agreement relating to location of improvements.

I certify that I have read this application and state that all information is correct. I agree to comply with all city and county ordinances and state laws relating to building construction and hereby authorize representative(s) of this city to enter upon the abovementioned property for inspection purposes.

Date 9-1-05 Applicant/Agent Signature **WORKER'S COMPENSATION DECLARATION:** I hereby affirm under penalty of perjury one of the following declarations:

I have and will maintain a certificate of consent to self-insure for workers' compensation as provided for by Section 3700 of the Labor Code, for the performance of work for which the permit is issued.

SA I have and will maintain workers' compensation insurance, as required by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. My workers' compensation insurance carrier and policy number are:

Carrier VIRGINIA SURETY COMPANY, INC

Policy Number 005-00016796

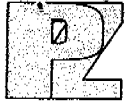
Exp Date 01/01/2006

(This section need not be completed if the permit is for \$100 or less) I certify that in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the workers' compensation laws of California and agree that if I should become subject to the workers' compensation provisions of Section 3700 of the Labor Code, I shall forthwith comply with those provisions.

Date 9-1-05 Applicant Signature **WARNING:** FAILURE TO SECURE WORKER'S COMPENSATION COVERAGE IS UNLAWFUL AND SHALL SUBJECT AN EMPLOYER TO CRIMINAL PENALTIES AND CIVIL FINES UP TO ONE HUNDRED THOUSAND DOLLARS (\$100,000) IN ADDITION TO THE COST OF COMPENSATION, DAMAGES AS PROVIDED FOR IN SECTION 3706 OF THE LABOR CODE, INTEREST AND ATTORNEY'S FEE.**THIS PERMIT SHALL EXPIRE BY LIMITATION IF WORK IS NOT COMMENCED WITHIN 180 DAYS.**

0513420

Baker



Paul Zacher - Structural Engineers, Inc
4701 Lakeside Way
Fair Oaks, CA 95628

TEL: 916.961.3960
FAX: 916.961.6552

August 16, 2005

Monarch Roofing
8262 Alpine Avenue, Suite A
Sacramento, CA 95826
TEL: (916) 978-3182
FAX: (916) 456-1703

Attn.: Mr. Neal Weber,

re: Job 2005418: BAKER

Subject: Structural Investigation Report of the Roof for the Residence located at 803 Lake Front Drive, Sacramento, CA 95831.

As requested by Mr. Neal Weber, this is a report to determine what needs should be addressed to correct any structural deficiencies of the roof. Paul Zacher visited the site August 15, 2005. The investigation was made to determine the existing condition of the structure. All information, data and analysis contained within this report are based on the 1997 Uniform Building Code with 2001 CBC Title 24 Amendments.

The following is based on visual observations with no subsurface investigation being made.

DESCRIPTION:

Type of Facility: Residence.
Year Built: Estimated 1980's vintage.
Occupancy: Residential.
No. of Stories: Two.
Dimensions: Approximately 3000 square feet.

CONSTRUCTION:

Roof:

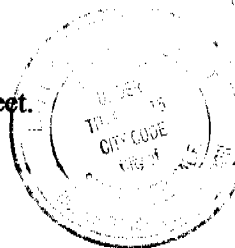
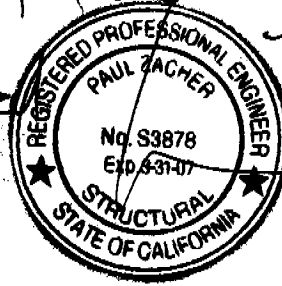
The roof covering will consist of a Light Weight Concrete Tile over a batten system. The roof structure is conventionally framed with 2x6 rafters spaced at 24" on center with 2x6 purlins supported at no more than 6'-0" on center by 2x4 struts bearing on walls below except for the vaulted ceiling areas. The vaulted ceiling is constructed of 2x10 rafters spaced at 24" on center. The garage area is framed with 2x6 rafters spaced at 24" on center and 2x6 cross ties spaced at 16" on center.

CONCLUSIONS:

Roof:

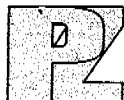
The roof structure currently lacks sufficient structural capacity for the applied live and dead loads. See "Recommendations" for location and repair to bring the roof structure up to the required capacity.

Field verify max. 7.3 psf tile weight
Field verify structural modifications. See Page 2 & 6.



SHALL NOT BE USED TO EXCEED OR VIOLATE ANY CITY ORDINANCE OR STATE LAW.
JK6 9.1.05

1/6



Baker

Paul Zacher - Structural Engineers, Inc.
4701 Lakeside Way
Fair Oaks, CA 95628

TEL: 916.961.3960
FAX: 916.961.6552

RECOMMENDATIONS:

If any of the following recommendations do not correspond to actual field conditions, the engineer of record shall be notified for further investigation and evaluation before continuing work.

Roof Structure:

1. Provide a 2x4 strut from the existing rafter to the bearing walls below where the span exceeds 12'-0". The unbraced length of the struts shall not exceed 8'-0" and the minimum slope of the struts shall not be less than 45 degrees from the horizontal. See detail 1.

It shall be noted that small hairline cracking may occur at exterior stucco and interior gypboard finished walls that are load bearing or distributing roof strut loads. These cracks are a natural occurrence as the existing structure re-distributes the new roof weight. They are cosmetic in nature and are not an indication of a structural hazard or failure.

It shall be noted that some deflection of the rafters may be evident after installation of the tile. The existing roof framing has deflected but this may not be readily evident due to the uneven nature of the existing roofing material. Concrete tile is a very consistent and uniform product and when installed in an even plane, even small deflections can become apparent. This is only a cosmetic issue and not a structural concern.

The inspection consisted of visual observation only, made solely to determine the structural capacity of the existing roof. Analysis does not determine any effects on the overall structure under lateral forces or effects on the foundation unless specifically noted in the calculations and in this document. No warranties, expressed or implied, are made or intended in conjunction with this report. The inspection was made only to the portions that were accessible. The specific items noted were those that were observable and there may be defects that are not observable, or are hidden by architectural and structural materials.

If you have any questions on the above, do not hesitate to call.

Sincerely,

Paul Zacher, P.E., S.E.
file

DESIGN LOADING:

Roof Pitch	6	in 12
Pitch Adjustment Factor	1.12	

LOCATION: ROOF BATTEN SYTEM

<u>MATERIAL</u>	<u>WEIGHT</u>	
Light Weight Tile	7.30	psf
Roofing felt	0.30	psf
1x4 skip sht'g	1.09	psf
Batten system	0.50	psf
2x6 rafters @ 24" oc	1.00	psf
Load	10.2	psf
Roof Pitch Adjustment	1.20	psf
Total Load	11.4	psf

LOCATION: VAULT BATTEN SYSTEM

<u>MATERIAL</u>	<u>WEIGHT</u>	
Light Weight Tile	7.30	psf
Roofing felt	0.30	psf
Batten system	0.50	psf
1x4 skip sht'g	1.09	psf
2x10 rafters @ 24" oc	1.69	psf
Batt/blown insul	0.50	psf
1/2" Gypboard	2.50	psf
Load	13.9	psf
Roof Pitch Adjustment	1.64	psf
Total Load	15.5	psf

PAUL ZACHER- STRUCTURAL ENGINEERS, INC.

Job #: 05_418

Date: 08/16/2005

4701 Lakeside Way

Fair Oaks, Ca 95628

TEL: (916) 961-3960

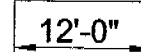
FAX: (916) 961-6552

LOADING:Rafter:

Dr = 11.4 psf x 2'-0" = 22.8 plf
Lr = 16.0 psf x 2'-0" = 32.0 plf

2x6 #2

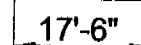
22.8 / 32.0

12'-0"Vault:

Dr = 15.5 psf x 2'-0" = 31.0 plf
Lr = 16.0 psf x 2'-0" = 32.0 plf

2x10 #2

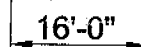
31.0 / 32.0

17'-6"B1:

Dr = 11.4 psf x 7'-0" = 80 plf
Lr = 16.0 psf x 7'-0" = 112 plf

4x12 #2

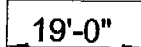
80 / 112

16'-0"B2:

Dr = 15.5 psf x 15'-0" = 232 plf
Lr = 16.0 psf x 15'-0" = 240 plf

6x12 #1

232 / 240

19'-0"

Paul Zacher Structural Engr's, Inc.
4701 Lakeside Way
Fair Oaks, CA 95628

Title :
Dsgnr:
Description :

Job #
Date: 7:03PM, 16 AUG 05

Scope :

Rev: 580006
User: KW-0602844, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Timber Beam & Joist

Baker.ecw:Calculations

Description RAFTERS AND BEAMS

Timber Member Information

Code Ref: 1997/2001 NDS, 2000/2003 IBC, 2003 NFPA 5000. Base allowables are user defined

		rafter	vault	B1	B2
Timber Section		2x6	2x10	4x12	6x14
Beam Width	in	1.500	1.500	3.500	5.500
Beam Depth	in	5.500	9.250	11.250	13.500
Le: Unbraced Length	ft	0.00	0.00	0.00	0.00
Timber Grade		Douglas Fir - Larch, No.2	Douglas Fir - Larch, No.2	Douglas Fir - Larch, No.2	Douglas Fir - Larch, No.1
Fb - Basic Allow	psi	875.0	875.0	875.0	1,350.0
Fv - Basic Allow	psi	95.0	95.0	95.0	85.0
Elastic Modulus	ksi	1,600.0	1,600.0	1,600.0	1,600.0
Load Duration Factor		1.250	1.250	1.250	1.250
Member Type		Sawn	Sawn	Sawn	Sawn
Repetitive Status		Repetitive	Repetitive	No	No

Center Span Data

Span	ft	12.00	17.50	16.00	19.00
Dead Load	#/ft	22.80	31.00	80.00	232.00
Live Load	#/ft	32.00	32.00	112.00	240.00

Results Ratio = 0.9572 0.9779 0.8300 0.9185

Mmax @ Center	in-k	11.84	28.94	73.73	255.59
@ X =	ft	6.00	8.75	8.00	9.50
fb : Actual	psi	1,565.2	1,353.0	998.6	1,529.9
Fb : Allowable	psi	1,635.2	1,383.6	1,203.1	1,665.6
		Bending OK	Bending OK	Bending OK	Bending OK
fv : Actual	psi	55.5	54.4	52.0	80.4
Fv : Allowable	psi	118.8	118.8	118.8	106.3
		Shear OK	Shear OK	Shear OK	Shear OK

Reactions

@ Left End DL	lbs	136.80	271.25	640.00	2,204.00
LL	lbs	192.00	280.00	896.00	2,280.00
Max. DL+LL	lbs	328.80	551.25	1,536.00	4,484.00
@ Right End DL	lbs	136.80	271.25	640.00	2,204.00
LL	lbs	192.00	280.00	896.00	2,280.00
Max. DL+LL	lbs	328.80	551.25	1,536.00	4,484.00

Deflections

		Ratio OK	Deflection OK	Deflection OK	Deflection OK
Center DL Defl	in	-0.320	-0.413	-0.178	-0.377
L/Defl Ratio		450.5	508.1	1,081.5	604.7
Center LL Defl	in	-0.449	-0.427	-0.249	-0.390
L/Defl Ratio		320.9	492.3	772.5	584.6
Center Total Defl	in	-0.768	-0.840	-0.426	-0.767
Location	ft	6.000	8.750	8.000	9.500
L/Defl Ratio		187.4	250.0	450.6	297.2

REGISTERED PROFESSIONAL ENGINEER
PAUL KENNETH ZACHER
No. S3876
Exp. 3-31-07
STRUCTURAL
STATE OF CALIFORNIA



LEGACY REPORT

ER-4660

Reissued June 1, 2003

ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office: 5350 Workman Mill Road, Whittier, California 90601 • (562) 899-0543
Regional Office: 900 Mondak Road, Suite A, Birmingham, Alabama 35213 • (205) 399-9800
Regional Office: 4051 West Floreano Road, Country Club Hills, Illinois 60478 • (708) 789-2308

Legacy report on the 1997 Uniform Building Code™

DIVISION: 07—THERMAL AND MOISTURE PROTECTOR
Section: 07320—Roof Tile

EAGLE AND EAGLELITE INTERLOCKING CONCRETE ROOFING TILES

EAGLE ROOFING PRODUCTS
3548 NORTH RIVERSIDE AVENUE
RIALTO, CALIFORNIA 92377

1.0 SUBJECT

Eagle and Eaglelite™ Interlocking Concrete Roofing Tiles

2.0 DESCRIPTION

2.1 General

2.1.1 Eagle Tiles: Eagle conventional-weight interlocking concrete roofing tiles are produced in high-profile (Capistrano), low-profile (Malibu), and flat-profile styles with either smooth surfaces (Bel Air Standard, Bel Air Estate or Standard, Ponderosa Estate, Ponderosa Double Eagle or Ponderosa Golden Eagle). Ridge and rake trim units are produced to match each product.

The tiles are composed of Type II portland cement, washed sand, and proprietary additives. Mineral coloring oxides are added to or are mixed with portland cement and water for surface application following extrusion. Units are cured under controlled temperature and humidity conditions. Tiles are 17 inches (432 mm) long, 12³/₄ inches (315 mm) wide, and nominally 1/2 inch (12.7 mm) thick. They are manufactured in interlocking side laps designed to resist surface water penetration and maintain proper alignment. All tiles have protruding head lugs on the underside, which provide for mechanical attachment over wooden battens, or provide a stable foundation for nail attachment to solid decking. Two nail holes are provided in each tile for use where half tiles are needed at roof edges, chimneys, skylights, etc. Approximate installed dry weight with 3-inch (76 mm) head laps are 6.5 pcf (46 kg/m³) for Capistrano tiles, 5.5 pcf (46 kg/m³) for Malibu tiles and 10.0 pcf (49 kg/m³) for Ponderosa and Bel Air tiles.

2.1.2 Eaglelite Tiles: Eaglelite tiles are produced in the same size, manner and shapes as the conventional-weight Eagle tiles described in Section 2.1.1, except for substitution of lightweight aggregates and additives for sand. Approximate installed dry weight with 3-inch (76 mm) head laps are 5.7 pcf (25 kg/m³) for Capistrano tiles, 5.5 pcf (27 kg/m³) for

Malibu tiles and 7.0 pcf (34 kg/m³) for Ponderosa and Bel Air tiles.

2.2 Installation

2.2.1 New Construction: Installation shall be in accordance with the Concrete and Clay Roof Tile Installation Manual for Moderate Climate Regions. See evaluation report ER-8034P.

2.2.2 Reroofing: Eagle tiles, as described in Section 2.1.1, provide a Class A roof when installed over existing asphalt shingle roofs. Care should be taken to ensure both horizontal and vertical alignment on the roof. Foreign matter must be cleaned from all interlocking areas. Cracked or broken tiles must be removed from the roof. Damaged or rusted flashing should be replaced. Existing framing must be adequate for the additional load. Structural data verifying adequacy should be submitted to the building official. The existing roof must be inspected in accordance with Appendix Chapter 15, Section 1515, of the 1997 Uniform Building Code™ (UBC). When reroofing wood shake roofs, existing shakes must be removed and solid decking and tile must be installed, as with new construction. When installed over existing spaced sheathing boards, underlayment complying with the UBC or an ICC-ES evaluation report, installed with or without battens, may be used. One layer of No. 30 felt or approved equal underlayment must be installed on the roof prior to application of tile. In lieu of this underlayment's being provided, the building official may determine that the existing roof covering provides the required underlayment protection.

Details not covered under this section are identical to those described in Section 2.2.1.

2.3 Roof Classification

When installed over solid sheathing in accordance with this report, Eagle and Eaglelite roofing tiles are Class A roof coverings in accordance with Section 1504.1 of the UBC. When installed over spaced or solid sheathing in accordance with this report, the tiles are noncombustible roof coverings in accordance with Section 1504.2 of the UBC. The tiles are Class A roof coverings when installed over existing asphalt shingles in accordance with Section 2.2.2 of this report.

2.4 Identification

The name EAGLE and the evaluation report number (ER-4660) are imprinted on each tile. A tag on each shipping pallet indicates the producing plant location, product identification and the installed weight. Each Eaglelite tile is identified by the product name "Eaglelite" on a tag and a light-colored strip across the headlap area.

ICC-ES legacy reports are to be construed as representing evaluation or any other services requested, and are to be construed as an endorsement of the quality of the report or a recommendation for its use. There is no warranty by ICC Evaluation Service, Inc., express or implied, as to any finding or other matter in this report, or as to any product covered by the report.

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3.0 EVIDENCE SUBMITTED

Results of tests in accordance with the ICC-ES Interim Criteria for Clay and Concrete Roof Tiles (AC108), dated January 2002, and a quality control manual.

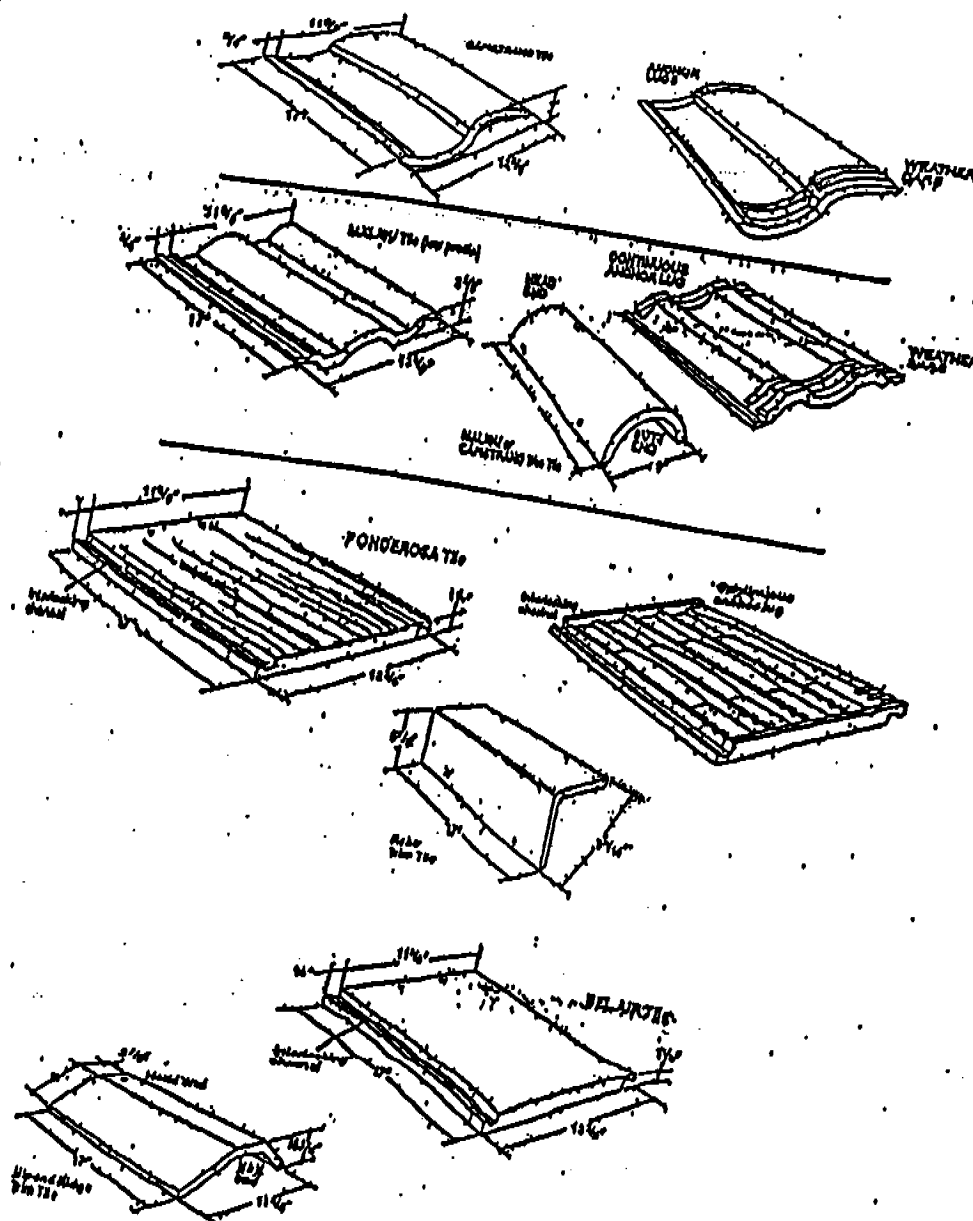
4.0 FINDINGS

That the Eagle Concrete Roofing Tiles described in this report comply with the 1997 Uniform Building Code™, subject to the following conditions:

4.1 Tiles are manufactured, identified and installed in accordance with this report and the manufacturer's instructions.

4.2 Tiles are manufactured at Eagle Roofing Products facilities located in Rialto, California, and Phoenix, Arizona.

This report is subject to re-examination in two years.



FIELD AND TRIM SPECIFICATIONS

Batten system reqs



Paul Zacher - Structural Engineers
4701 Lakeside Way
Fair Oaks, CA 95828

TEL: 916.961.3960
FAX: 916.961.3960

June 15, 2002

Monarch Roofing
8250 Alpine Avenue, Suite H
Sacramento, CA 95826
TEL: (916) 978-3182
FAX: (916) 452-5140

Attn: Mr. Neal Weber,

re: Job 2002234

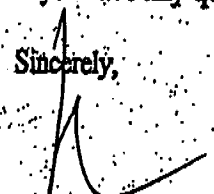
Subject: Installation of the Batten / Counter-Batten System.

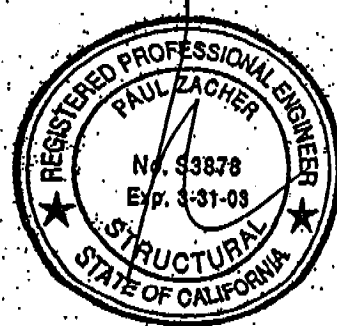
Per Mr. Neal Weber's request, the following items for the installation of Light Weight Concrete Tile are addressed:

1. Loading
2. Flexural properties and capacity of batten.
3. Flexural properties and capacity of counter batten.
4. Axial load capacity of the counter batten (tension only).
5. Fastener capacity (shear and tensile) at counter batten to deck (16d).
6. Fastener capacity (shear and tensile) at batten to counter batten (screw).
7. Fastener capacity (shear and tensile) at tile to batten.

If you have any questions on the above, do not hesitate to call.

Sincerely,


Paul Zacher, P.E., S.E.
file



1/10

Job #: 02-234

Date: 6/15/02

LOADING

WIND UPLIFT = 10.97 PSF ↑

TILE (DL) = 8.0 PSF (INCLUDES STAGGER)

TILE (SLIDING ON GLUE SLOPE) = 8.0 PSF $\times 6/\sqrt{180}$ = 4.77 PSF

THERMO PLY = 0.5 PSF

FLEXURAL CAPACITY OF BATTEN (22 GAGE)DB = 8.5 PSF $\times 13\frac{1}{2}/12$ = 9.6 PSFLp = 16.0' $\times 18.0'$

9.6/18.0

2°

$$\Delta_{PERD} = \frac{1.5 (27.6) (2)^2}{33,000} = 0.0050 \text{ IN}^3$$

$$S_{ACTUAL} = \frac{I}{c} = \frac{0.01 \text{ IN}^3}{7.16 \text{ IN}} = 0.0297 \text{ IN}^3 > 0.005 \text{ O.K.}$$

FLEXURAL CAPACITY OF
COUNTED BATTEN (22 GAGE)NOT APPLICABLE AS THIS MEMBER IS PLACED DIRECTLY
OVER AND IS SUPPORTED BY A WOOD RAFTERAXIAL CAPACITY OF
COUNTED BATTEN (25 GAGE)

AREA = 0.104 #

$$T = 4.77 \text{ PSF} \times 2' \times 2' = 19 \text{ #}$$

$$T_{ALLOW} = 0.6 \times 33,000 \times 0.104 = 2059 \text{ #} > 19 \text{ # O.K.}$$

Job #: 02-234

Date: 6/15/02

EASTONEL CAPACITYCOUNTER BATTEN TO DECKSHEAR

$$V = 9.77 \text{ kSF} \times 20 \times 20 = 19 \text{ #}$$

$$P_e = F_{em} / F_{cs} = \frac{4650}{33,000} = 0.141$$

$$K_1 = -1 + \left[\frac{2(1+0.141) + 2(100,000)(1+2(0.141))(0.135)^2}{2 \times 4650 (0.141)^2} \right]^{1/2}$$

$$= -1 + \left[2.282 + 0.0272 \right]^{1/2} = 0.5196$$

$$K_2 = -1 + \left[\frac{2(1+0.141)}{0.141} + \frac{2(100,000)(2+0.141)(0.135)^2}{2 \times 4650 (0.0272)^2} \right]^{1/2}$$

$$K_2 = -1 + \left[16.18 + 0.25745 \right]^{1/2} = 24.536$$

MODE III_m

$$Z = \frac{K_1 D_p F_{em}}{K_D (1+2P_e)} = \frac{0.5196(0.135)(3^{1/2})4650}{2.2(1+2(0.141))} = 405 \text{ #}$$

MODE III_s

$$Z = \frac{K_2 D_t F_{em}}{K_D (2+P_e)} = \frac{24.536(0.135)(0.0249)(4650)}{2.2(2+0.141)} = 97 \text{ #}$$

Job #: 02-234

Date: 6/15/02

MODE III

$$Z = \frac{D^2}{K_D} \left[\frac{2 \text{ From } F_{1D}}{5(1 + P_c)} \right]^{1/2}$$

$$Z = \frac{(0.125)^2}{1.2} \left[\frac{2 \times 4050 \times 100,000}{5(1 + 0.141)} \right]^{1/2} = 136"$$

$$Z = 97" > 19" \text{ OK}$$

COUNTER BATTEN TO DECK

Uplift

$$T = (11 \text{ psf} - 0 \text{ psf}) 2' \times 2' = 12"$$

$$\text{NAIL CAPACITY} = 50" \times 1 1/2" = 115" > 12"$$

NAIL CHANNEL CAPACITY:

SINCE THE HEAD OF THE 16d NAIL NAIL IS EQUIVALENT TO THE DIAMETER OF A #6 SCREW, THE PULL OUT (OR PULL THROUGH) VALUE IS 32 lbs PER THE ATTACHED SHEET. THIS IS ADEQUATE TO RESIST THE APPLIED UPLIFT FORCE OF 12 lbs.

Job #: 02-234

Date: 6/15/02

BATTEN TO COUNTER BATTENSHEAR:

$$V = 4.77 \text{ PSF} \times 20 \times 2 = 19 \text{ k}$$

A #8 SCREW HAS A SHEAR VALUE OF 96 lbs

PER THE ATTACHED CHART THIS VALUE IS
ADEQUATE TO RESIST THE APPLIED SHEAR FORCE
OF 19 lbs

UPLIFT:

$$T = (11 \text{ PSF} - 8 \text{ PSF}) 20 \times 20 = 12 \text{ k}$$

A #8 SCREW HAS A PULLOUT VALUE OF 47 lbs

PER THE ATTACHED CHART THE VALUE IS
ADEQUATE TO RESIST THE APPLIED UPLIFT FORCE
OF 12 lbs

TILE TO BATTEN:

THE FOLLOWING IS BASED ON THE ASSUMPTION
THAT TILE IS EQUIVALENT TO GYPSUM BOARD
IN SHEAR, BEARING & FLEXURAL STRENGTH

SHEAR:

$$V = 4.77 \text{ PSF} \times 1/2 (1 \text{ SCREW PER TILE}) = 4.77 \text{ PSF}$$

A QUADRIPOLE "DWESD1342, 1582" SCREW HAS A
CAPACITY OF 140 lbs / 4 = 47 lbs (BASED ON
A SAFETY FACTOR OF 3). THIS VALUE IS ADEQUATE
TO RESIST THE APPLIED SHEAR FORCE

Job #: 02-234

Date: 6/15/02

TILE TO BATTENLIFT:

$$*V = (1 \text{ p.f.} + 8 \text{ p.f.}) = 12 \text{ lb}$$

NO VALUES ARE GIVEN FOR THE PULL OUT OF GYPSUM BOARD (TILE) TO 22 GA METAL. HOWEVER, THE LIFT FAILURE MAY BE BROKEN INTO A MINIMUM OF 2 COMPONENTS. FOR PURPOSES OF THIS DOCUMENT, THE 2 COMPONENTS OF CONCERN ARE THE SCREW TO TILE FAILURE AND THE SCREW TO BATTEN FAILURE. THE SCREW TO BATTEN CAPACITY IS PER THE ATTACHED QUIKDRIVE CHART AND IS $105 \text{ lb} / \text{in} = 125 \text{ lb}$ (22 GA METAL W/ A SAFETY FACTOR = 3). THIS VALUE IS ADEQUATE TO RESIST THE APPLIED LIFT FORCE. THE SCREW TO TILE CAPACITY IS ADDRESSED AS FOLLOWS. THESE SCREWS ARE USED TO HOLD GYPSUM BOARD CEILINGS IN PLACE SINCE $1/2"$ THICK GYPSUM WEIGHS 5 p.f. (SUSTAINED LONG TERM LOAD) AND THE APPLIED LIFT FORCE IS 3 p.f. (SHORT TERM WIND LOAD). THESE VALUES ARE ADEQUATE BY OBSERVATION.

WIND FORCE DISTRIBUTION:**DESCRIPTION:****Lateral Design Front - Rear Direction****METHOD 2: Primary Frames and Systems**

$P = C_e C_q q_s I$

 C_e = Exposure factor

B

 C_q = Pressure coeff.

1.3 or 1.4

Basic wind speed

70

 q_s = wind stag. pressure

12.6

 I_w = Importance factor

1

Roof Pitch:

N

Formula 18-1

Table 16-G

Table 16-H

Figure 16-1

Table 16-F

Table 16-K

Ex: enter 6 if 6:12. For gabled end or hip roof elevation only. Otherwise, enter N

Level	Story Ht feet	Exposed Width (ft)	Projected Area (sf)	Diaphragm Shear (lbs)	Story Shear
Top of Roof	21	60			
1st floor top plate	9	78.75	1074.375	12671	
1st floor	0	78.75			12671

$P_{\text{uplift}} = C_e C_q q_s I$

8.44

psf

Note: The exposure coefficient, C_e is taken at the mean roof height**METHOD 1: Elements and Components**

Not in areas of discontinuities (enclosed or unenclosed):

Interpolate between
tributary areas of
10 and 100 sf

Wall Elements:			
	Direction of wind	Tributary Area (sf)	Pressure, p (psf)
Slope > 12:12	Inward	10	10.13
		100	7.60
	Outward	10	10.13
		100	7.60

Roof Elements:			
	Direction of wind	Tributary Area (sf)	Pressure, p (psf)
Slope < 7:12	Outward	10	10.97
		100	8.44
Slope 7:12 to 12:12	Inward	10	10.97
		100	18.27
	Outward	10	10.97
		100	8.44

(Hat) Furring (F) Channel Section Properties

22 GAGE

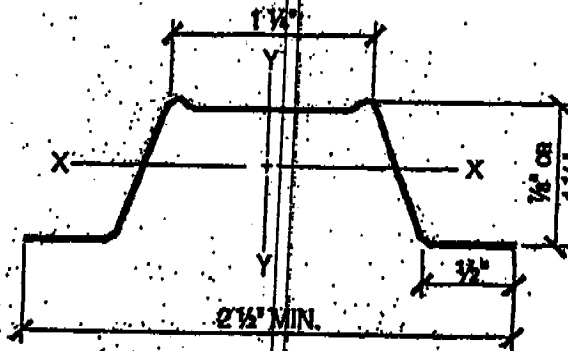
087F125-18	0.0178	0.0188	0.070	0.008	28.4
087F125-27	0.0289	0.0283	0.104	0.013	44.8
087F125-30	0.0296	0.0312	0.118	0.014	50.3
087F125-33	0.0329	0.0348	0.127	0.015	55.4
087F125-43	0.0428	0.0451	0.183	0.019	70.1
150F125-18	0.0179	0.0188	0.093	0.029	58.4
150F125-27	0.0289	0.0283	0.140	0.045	83.4
150F125-30	0.0296	0.0312	0.154	0.050	104.9
150F125-33	0.0329	0.0348	0.170	0.055	115.8
150F125-43	0.0428	0.0451	0.220	0.070	147.5

1 Minimum bare metal thickness is 35% of design thickness.

2 Moment of inertia given is for deflection calculations.

3 Effective properties are given as the minimum value for either positive or negative bending.

4 Effective properties based on $F_y = 33$ ksi.



(Hat) Furring (F) Channel Allowable Ceiling Spans $L/240$

087F125	18	33	Single	6'-2"	4'-5"	4'-1"	3'-6"	3'-1"	3'-7"	3'-0"	3'-2"	2'-9"
			Multiple	5'-5"	5'-10"	5'-1"	5'-7"	5'-1"	4'-2"	4'-0"	3'-5"	2'-10"
	30	33	Single	6'-2"	5'-7"	4'-10"	5'-4"	4'-10"	4'-3"	4'-2"	3'-5"	3'-3"
			Multiple	7'-7"	6'-11"	5'-0"	5'-5"	5'-0"	4'-5"	4'-1"	3'-8"	3'-11"
	43	33	Single	6'-10"	5'-2"	5'-5"	5'-5"	5'-5"	4'-0"	4'-7"	4'-2"	3'-8"
			Multiple	8'-3"	7'-5"	5'-5"	7'-5"	6'-3"	5'-10"	5'-5"	5'-2"	4'-6"
150F125	18	33	Single	7'-10"	7'-11"	6'-3"	6'-10"	6'-3"	5'-5"	5'-3"	4'-9"	3'-11"
			Multiple	9'-4"	8'-10"	7'-9"	8'-8"	7'-8"	6'-1"	6'-10"	6'-1"	5'-11"
	30	33	Single	8'-4"	8'-2"	7'-5"	8'-2"	7'-5"	6'-5"	6'-3"	5'-8"	5'-0"
			Multiple	11'-0"	10'-4"	9'-2"	10'-1"	9'-2"	8'-0"	7'-9"	6'-11"	6'-5"
	43	33	Single	10'-5"	9'-9"	8'-3"	9'-2"	8'-3"	7'-3"	7'-1"	6'-5"	5'-7"
			Multiple	12'-11"	11'-6"	10'-3"	11'-3"	10'-3"	8'-11"	8'-9"	7'-11"	6'-8"

Allowable ceiling spans based on effective properties.

Multiple span indicates two or more equal spans with channel continuous over center support.

Bearing length = 0.75".

Screw Table Notes

1. Screw spacing and edge distance shall not be less than $3 \times D$. (D = Nominal screw diameter)
2. The allowable screw values are based on the steel properties of the members being connected, per AISI section E4.
3. When connecting materials of different metal thicknesses or yield strength, the lowest applicable values should be used.
4. Screw strength needs to be verified by the screw manufacturer.
5. Values include a 3.0 factor of safety.
6. Applied loads may be multiplied by 0.75 for seismic or wind loading, per AISI A 5.1.3.
7. Penetration of screws through joined materials should not be less than 3 exposed threads. Screws should be installed and tightened in accordance with screw manufacturer's recommendations.
8. Values based on a tensile to yield steel property ratio of 1.08.

Allowable Loads For Screw Connections

12. GAGE

18	0.0185	33	36	45	28	50	54	55	36	60	41
27	0.0283	33	36	55	39	96	97	104	54	110	62
30	0.0312	33	36	102	43	111	112	120	60	128	68
65	0.0713	33	36	318	98	378	118	414	137	441	158
97	0.1017	33	36	450	142	535	168	620	195	705	222
54	0.0558	50	54	378	120	412	142	444	165	473	187
65	0.0713	50	54	478	161	568	179	627	207	669	236
97	0.1017	50	54	682	215	811	255	839	285	1069	336

Weld Table Notes

1. Weld capacities based on AISI, section E2.
2. When connecting materials of different metal thickness or yield strength, the lowest applicable values should be used.
3. Values include a 2.5 factor of safety.
4. Applied loads may be multiplied by 0.75 for seismic or wind loading per AISI A 5.1.3.
5. Values based on a tensile to yield steel property ratio of 1.08.

Allowable Loads For Fillet Welds And Flare Groove Welds

43	0.0451	33	36	482
54	0.0558	33	36	605
43	0.0451	60	54	731
54	0.0558	60	54	917

Pull & Shear Testing

Test data provided by screw suppliers and is not certified by Quik Drive USA, Inc.

SCREW

Ultimate Loads (lbs)

Pull test for screws: one piece metal

(steel gauge) 12 14 16 18 20 22 26

DWF114, 158

828

634

450

272

185

PHSS-1, 34, 114

828

634

450

272

185

PHSD-1, 34, 114

735

590

344

288

160

DWFSD114Z, 158Z

705

523

320

231

105

DWC114, 158, 178

624

538

270

Shear strength test for screws: metal to metal ultimate load (lbs)

(steel gauge) 12 14 16 18 20 22 26

DWF114, 158

957

690

670

320

PHSS-1, 34, 114

957

690

670

320

PHSD-1, 34, 114

1140

1040

805

658

320

DWFSD114Z, 158Z

1220

760

613

505

Shear test: gypsum board to metal (pounds)

(steel gauge)

18ga

18ga

22ga

DWFSD114Z, 158Z

130

135

140

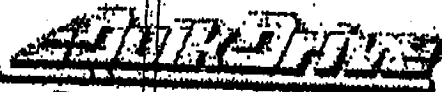
DWF114, 114-PH, 158

147

153

160

Technical Data



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Quik Drive

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FOR ATTACHING TILE TO METAL BATTEN



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A subsidiary corporation of the International Conference of Building Officials

EVALUATION REPORT

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ER-4488

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Filing Category: WALL COVERING (288)

THERMO-SHEATH SHEATHING

NATIONAL SHELTER PRODUCTS, INC.
22526 S.E. 64TH PLACE, SUITE 230
ISSAQUAH, WASHINGTON 98027

1.0 SUBJECT

Thermo-Sheath Sheathing.

2.0 DESCRIPTION

2.1 General:

Thermo-Sheath sheathing, a laminated board consisting of a kraft-paper core with aluminized facings, is recognized as a bracing material and weather-resistive barrier for wood-framed wall construction and as an underlayment for concrete roof tiles. The sheathing has a nominal size of either 48 $\frac{3}{4}$ by 96 inches (1238 by 2438 mm) or 48 by 96 inches (1219 by 2438 mm). Four sheathings are recognized:

1. Thermo-Sheath Standard, nominal 0.078 inch (2 mm) thick, green print identification.
2. Thermo-Sheath Structural, nominal 0.105 inch (2.7 mm) thick, red print identification.
3. Thermo-Sheath Structural Plus, nominal 0.115 inch (2.9 mm) thick, black print identification.
4. Thermo-Sheath Super Structural, nominal 0.137 inch (3.5 mm) thick, blue print identification.

2.2 Materials:

2.2.1 Core: The core consists of multiple layers of filler and paperboard adhered with a polyvinyl alcohol adhesive.

2.2.2 Facings: The facing materials consist of either aluminum foil or aluminized polyethylene adhered to 40-pound (18 kg) kraft paper.

2.3 Installation:

2.3.1 Walls: Sheathing, having a nominal thickness of 0.105, 0.115, and 0.137 inch (2.7, 2.9 and 3.5 mm), complies as bracing for wood-framed construction in accordance with Section 2320.11.3 of the code when installed vertically on wood framing. The 0.078-inch-thick (2 mm) sheathing is restricted to nonstructural applications. The sheathing edges are supported by studs, top and bottom plates and solid blocking. Table 1 provides installation details for sheathing used structurally, including fastener details, stud spacing and allowable shear values.

Nonstructural applications of the sheathing require that wood-framed walls be braced in accordance with Section 2320.11.3 of the code. Fasteners shall be stainless steel, aluminized, hot-dipped galvanized or electrogalvanized steel. Table 1 lists the fastener schedule for structural applications. Nonstructural sheathing applications require similar fasten-

ers with maximum spacing of 4 inches (102 mm) on center at panel edges and 8 inches (204 mm) on center at intermediate supports.

Panel edges are butt joints or are lapped a minimum of $\frac{3}{4}$ inch (19 mm).

2.3.2 Underlayment: Sheathing having a nominal thickness of 0.078 inch (2 mm) complies as an underlayment for concrete and clay roof tiles specifically recognized in an NES or ICBO ES evaluation report. The tile report holder must approve this use. The Thermo-Sheath product is installed under the spaced sheathing and is fastened 12 inches (305 mm) on center along each rafter with 1-inch-long (25.4 mm) galvanized roofing nails or No. 16-gage galvanized staples having 1-inch-long (25.4 mm) legs and $\frac{3}{8}$ -inch-wide (9.5 mm) crowns. The sheathing installation requires a minimum 2-inch (51 mm) horizontal lap.

Reroofing applications require that the sheathing be applied over the existing spaced sheathing boards and be fastened to the rafters as previously described.

2.4 Identification:

Each sheet bears a stamped label indicating the company name, National Shelter Products, Inc.; the product name; the board thickness; the evaluation report number (ER-4488); and the name of the quality control agency, Ramtech Laboratories, Inc. The labels are color-coded to facilitate easier product identification in the field. See Table 1.

3.0 EVIDENCE SUBMITTED

Reports on racking shear, transverse strength, tensile strength, mullen-burst strength, water absorption, moisture vapor transmission, and linear expansion tests, and a quality control manual.

4.0 FINDINGS

That the Thermo-Sheath Sheathing described in this report complies with the 1997 *Uniform Building Code*[™], subject to the following conditions:

- 4.1 Installation complies with this report and the manufacturer's instructions.
- 4.2 An approved exterior wall covering, capable of resisting loads perpendicular to the face of the wall, is installed over the sheathing.
- 4.3 When sheathing is installed as an approved weather-resistive barrier, the sheathing joints have minimum $\frac{3}{4}$ -inch (19 mm) laps or approved flashing.
- 4.4 The 0.105-, 0.115-, and 0.137-inch-thick (2.7, 2.9 and 3.5 mm) sheathing complies as bracing as specified in Section 2320.11.3 of the code when installed in accordance with Table 1.

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4.5 The 0.078-inch-thick (2 mm) sheathing is permitted to be an underlayment for concrete and clay roof tiles specifically recognized in an evaluation report.

4.6 The sheathing is manufactured for National Shelter

Products, Inc., in Constantine, Michigan, with quality control inspections by Ramtech Laboratories, Inc. (AA-655).

This report is subject to re-examination in two years.

TABLE 1—ALLOWABLE SHEAR LOAD (PLF)^{1,2,3}

THERMO-SHEATH PRODUCT NAME	PRODUCT IDENTIFICATION COLOR	SHEATHING THICKNESS (inch)	FASTENER	FASTENER SPACING (inches on center)	WOOD STUD SPACING (inches on center)	ALLOWABLE SHEAR LOAD (lbs. per foot)
Structural Sheathing	Red	0.105	No. 11 ga. galv. roofing nails or No. 16 ga. x 7/16-inch-crown staples. Minimum fastener length is 1 1/4 inches	3 — panel edges 6 — intermediate supports	16	130
Structural Plus Sheathing	Black	0.115	No. 11 ga. galv. roofing nails or No. 16 ga. x 7/16-inch-crown staples. Minimum fastener length is 1 1/4 inches	3 — panel edges 6 — intermediate supports	16	150
			No. 16 ga. x 1-inch-crown staples. Minimum fastener length is 1 1/4 inches	2 — panel edges 6 — intermediate supports	16	180
Super Structural Sheathing	Blue	0.137	No. 11 ga. galv. roofing nails or No. 16 ga. x 7/16-inch-crown staples. Minimum fastener length is 1 1/4 inches	3 — panel edges 3 — intermediate supports	24	185

For SI: 1 inch = 25.4 mm, 1 lb/ft = 14.6 kN/m.

¹For wind or seismic forces, in pounds per foot, for panels installed vertically on Douglas fir-larch or southern pine studs having a nominal thickness not less than 2 inches (51 mm).

²Staple crown must not puncture the sheathing. Staples are installed with the crown parallel to the framing.

³The sheathing is applied in minimum 4-by-8-foot (1.2 by 2.4 m) sheets. Blocking having a nominal thickness not less than 2 inches (51 mm) is provided at horizontal joints when the wall height exceeds the length of the sheathing panel. The maximum height-to-width ratio is 2:1.