CITY OF SACRAMENTO

1231 I Street, Sacramento, CA 95814

Permit No: 0010964

Insp Area: 2

Site Address: 6945 SIERRA BONITA WY SAC

Parcel No: 029-0402-001

Sub-Type: RES

Housing (Y/N): N

CONTRACTOR
I ESS CO
PO BOX 41863
SACRAMENTO CA 95841

OWNER
WONG CHUCK M/ALICE L
6945 SIERRA BONITA WY
SACRAMENTO CA 95831

ARCHITECT

Nature of Work: REROOF TILE MONIER. LIGHTWEIGHT

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).

I ender's Name__ _____ Lender'sAddress_____

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.

I icense Class C-37 License Number 383288 Date 9-20-00 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_____

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 herby authorize representative(s) of this city to enter upon the aboveMentioned property for inspection purposes.

Date 9-20-00 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, forthe performance of work for which the permit is issued.

X 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 STATE FUND Policy Number 1353545-00 Exp Date 07/01/2001

_____ (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 9-20-00 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.

Job Number: #2000-15
Property: 6945 Sierra Bonita, Sacramento, CA

2. Field Inspection Summary *(continued)*

Existing Roof Framing Description (continued):

7. The vaulted Family Room attic space was not accessible for inspection but the ridge beam at this location was visible from below. The beam is a 6x14 beam spanning approximately 24ft from an interior isolated column in the Family Room to the North Bedroom/Family Room wall. The beam appears to have adequate support at each end.

There are exposed 6x10 and 6x12 beams at the eave overhangs where the roof extends beyond the interior space to create a covered exterior patio. The maximum span of this type of beam is approximately 17 ft clear. The beam appears lightly loaded and is likley such a large beam primarily for architectural considerations.

Recommendations

The following strengthening is recommended prior to installing the new 7/16" OSB and new roof tile. Furthermore, the following construction sequencing during the loading of the existing roof with the new roof tile bundles is recommended.

Existing Roof Framing Strengthening where required.

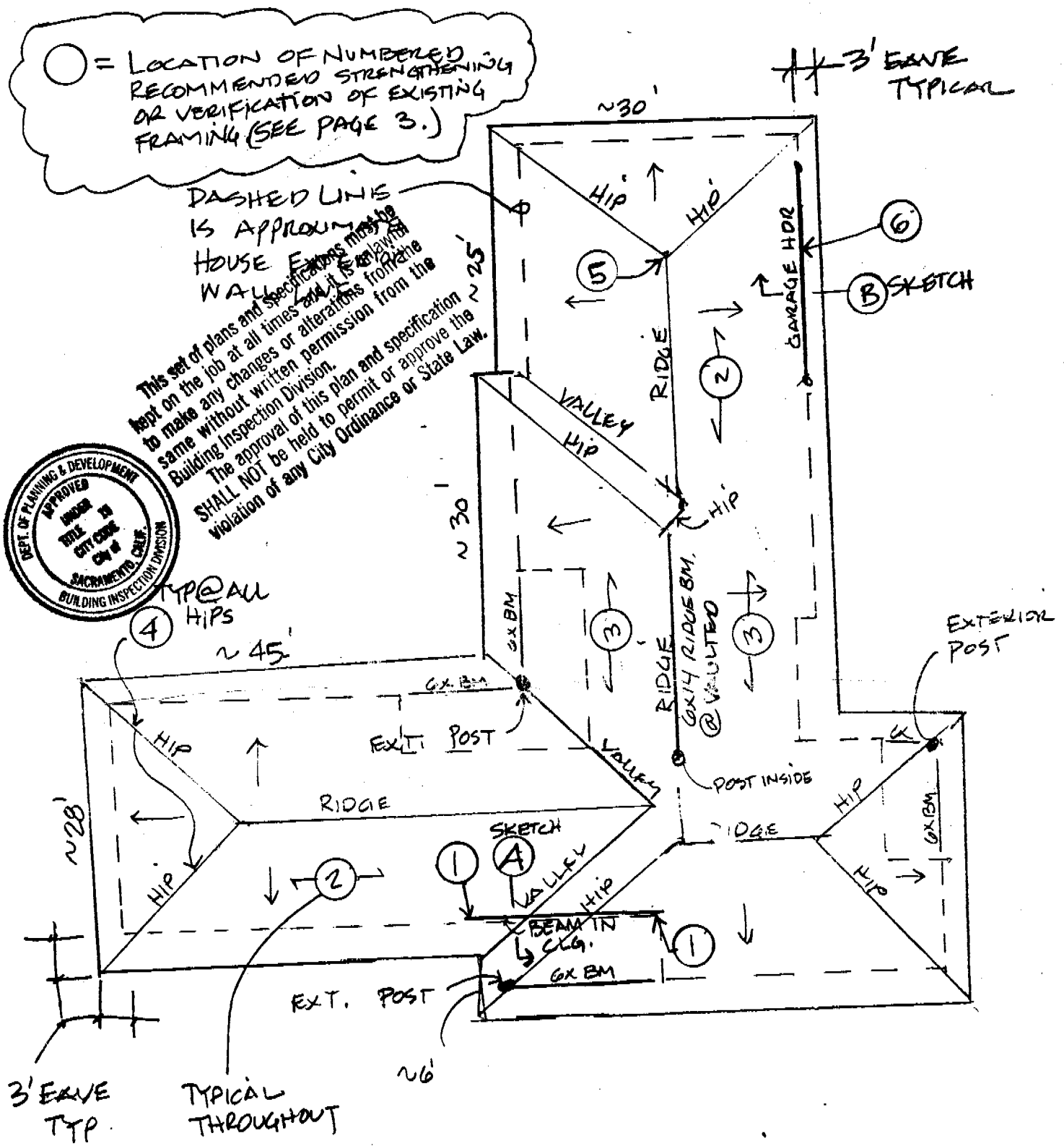
1. Install end and intermediate braces at the 4x14 beam pocketed in the ceiling above the Living Room per Sketch #1.
2. Where rafters are spaced at 24" centers, and rafter spans exceeding 10'-0" (measured horizontally), add a support to the rafter with a new strut and/or purlin supported at existing bearing wall locations. See Appendix D.
3. Where rafters are spaced at 16" centers, and rafter spans exceeding 11'-6" (measured horizontally), add a support to the rafter with a new strut and/or purlin supported at existing bearing wall locations. See Appendix D.
4. Verify that all 2x8 hip and valley beams have a support location (strut, brace, bearing wall) at 10'-0" maximum intervals. Where there is no existing support, install a new double 2x4 strut to bearing wall as required to achive the span requirement listed above. See Appendix D.
5. Verify the the ridge beam ands hip beam connection above the Garage is braced to existing Garage side wall nearest the connection. Also verify that the ceiling joists in the Garage are parallel and are fastened to, the existing roof rafters at this location. Install 1x6 collar ties to the existing rafters if the ceiling joist are not parallel.
6. Verify that the existing Garage header at the 16' opening , is a 4x14 , or 6x12, minimum header. If it is a 4x12 header, add one layer of ½" CDX plywood to the inside face and nail with 8d nails and 4"centers each way and at all plywood edges.

Construction sequencing:

7. While installing the new tile; **do not** stack tile bundles on hip or valley beams; **do not** stack more than one tile bundle on any single rafter; and **do not** stack tile bundles on adjacent rafters.

(1) Verify items #1 thru #6 in field.
(2) Garage not checked by engineer - check in Field - if not clear - refer back to plan check.
Reviewed by Matt P. 9/20/00 (3) Contractor to provide access if req'd. for insp.

APPENDIX A



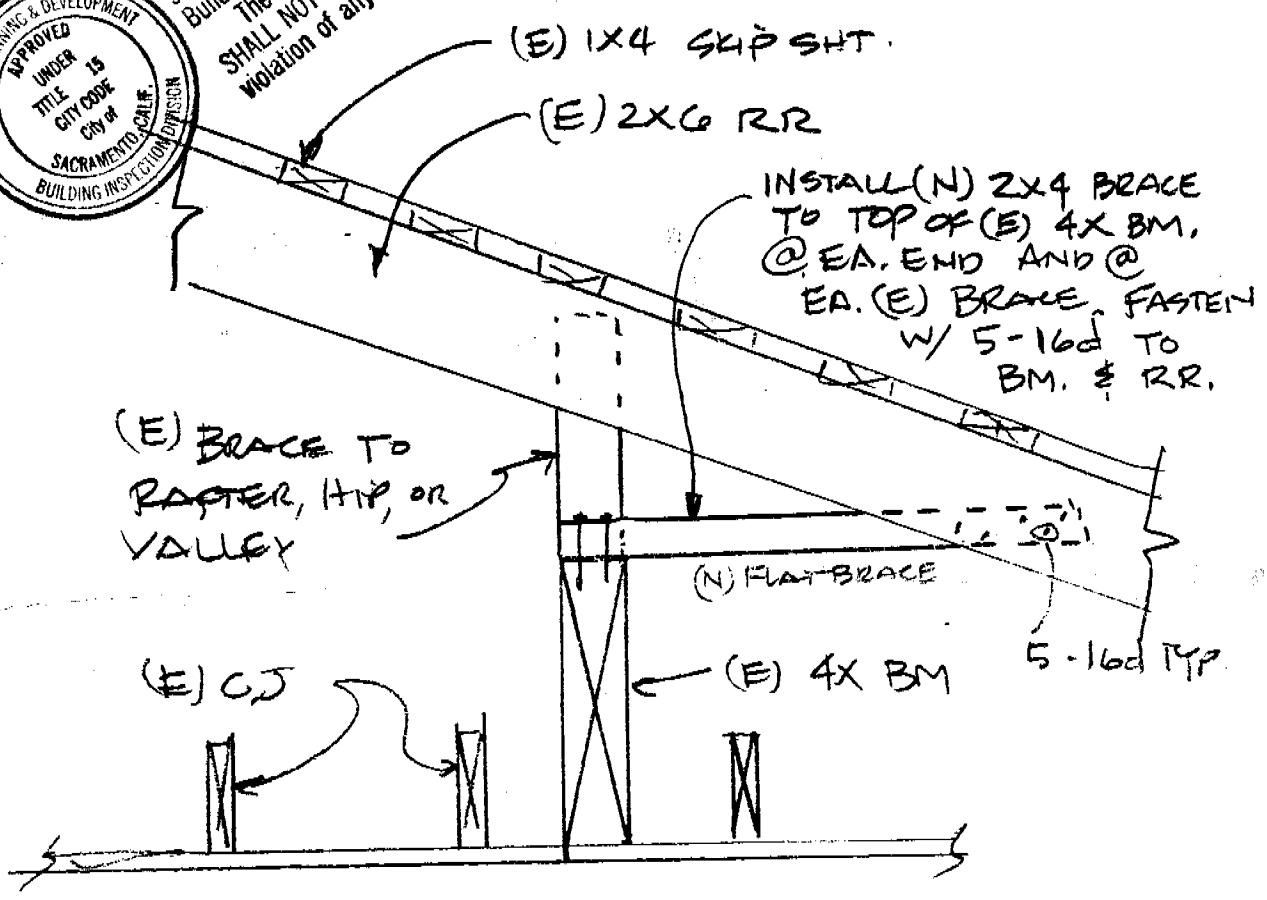
ROOF PLAN SCHEMATIC

(NOT TO SCALE)

APPENDIX 'G'

This set of plans and specifications must be kept on the job at all times and it is unlawful to make any changes or alterations from the same without written permission from the Building Inspection Division. The approval of this plan and specification SHALL NOT be held to permit or approve the violation of any City Ordinance or State Law.

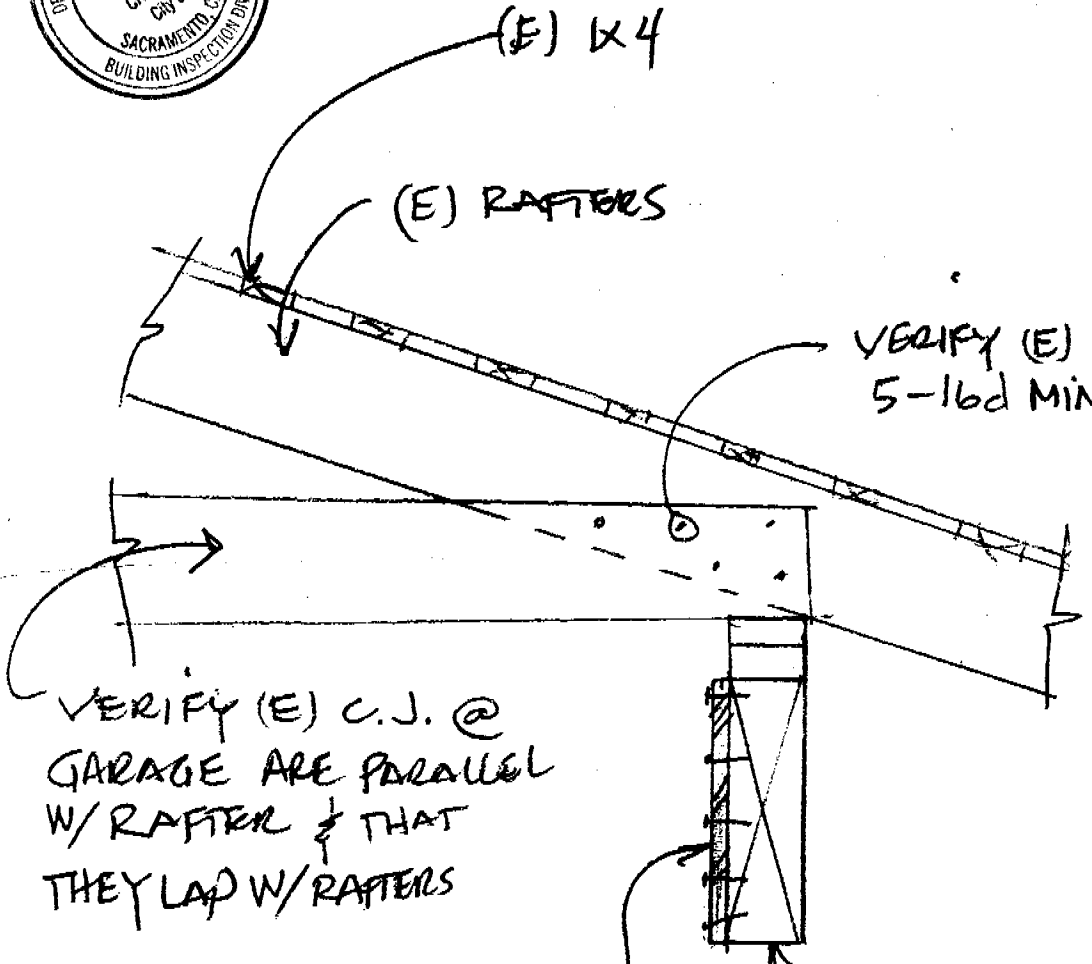
DEPT. OF PLANNING & DEVELOPMENT APPROVED UNDER TITLE 15 CITY CODE City of SACRAMENTO, CALIF. BUILDING INSPECTION DIVISION



(A) SKETCH

REGISTERED PROFESSIONAL ENGINEER JAMES J. ASCHELL No. S 4005 STRUCTURAL STATE OF CALIFORNIA

APPENDIX 'C'



REGISTERED PROFESSIONAL ENGINEER
JAMES J. ACCINELLI
No. S 4005
STRUCTURAL
STATE OF CALIFORNIA

(B) SKETCH

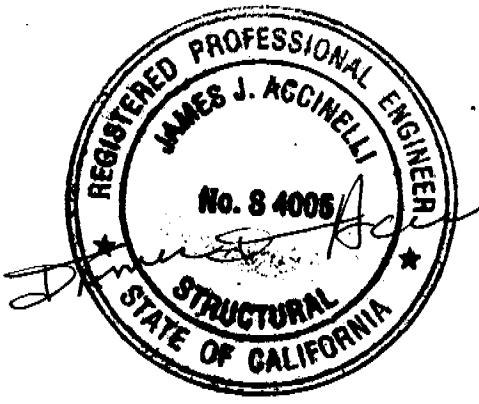
Limited Structural
Roof Assessment Report
Of
6945 Sierra Bonita
Sacramento, CA

Prepared for :
Dennis Giles

Property owner:
Chuck Wong
6945 Sierra Bonita
Sacramento, CA

Job No. 2000-15

August 17, 2000



Job Number: #2000-15
Property: 6945 Sierra Bonita, Sacramento, CA

1. Introduction and Limitations

Report Format:

The report is intended to be read and understood in its entirety, however, for clarity and easy reference the report is separated into the following sections:

1. Introduction & Limitations
2. Field Inspection Summary
3. Recommended Strengthening

Appendix A – Plan View of Building
Appendix B – Calculations
Appendix C – Sketche(s) of Recommended Strengthening
Appendix D – Monier Duralite Load and Engineering Tables

Purpose and Scope of Report:

This report was prepared at the request of Dennis Giles and the property owner Chuck Wong to provide a Structural Engineer's assessment of the existing roof. The scope of this report is to assess the existing roof- adequacy for new roof dead loads resulting from a planned roof replacement using Monier Duralite tiles, and to determine any roof strengthening required prior to the addition of the new roof.

Basis of Report:

This report is based solely on information gathered during the following investigation(s) and review(s):

- Field Inspection performed on August 16, 2000.
- JA Engineering performed limited independent calculations and conformance checks to the 1997 Edition of the Uniform Building Code to verify conclusions.

New Roof Loading:

Without Ceiling Load at Flat Ceiling:

(N) Tile Light Wt.	= 5.8 psf Monier Duralite (See Appendix D)
(N) 30 # Felt	= 0.3 psf
(E) 2X6 Framing @ 24" & 16"	= 1.6 psf
(N)7/16" plywood	= 1.5 psf
(E) 1x4 skip shtg.	= 2.2 psf
Total Roof (N) Dead Load	= 11.4 psf
Use	**= 12.0 psf**

With Ceiling Load at Vaulted Ceiling:

Same as Above	= 11.4 psf
(E) 2x6 Ceiling Joist	= 1.6 psf
Insulation	= 1.0 psf
Misc.	= 1.0 psf
Total Roof Dead Load	= 15.0 psf
Use	**= 15.0 psf**

Roof Live Load = 16.0 psf **w/ Load Duration Cd = 1.25**

Report Limitations:

The conclusions and recommendations in this report are limited to the scope as defined above. Assessment of the structure for wind load, earthquake load, and any other loading not directly related to the proposed new roof is beyond the scope of this report. Although a partial roof attic inspection was performed, this report should not be interpreted to mean that every potential structural deficiency in the building or roof has been uncovered.

This report represents the opinion of James Accinelli, Licensed Structural Engineer, and is based on a limited investigation of the subject building using industry standard assessment methods and analytical techniques conforming to the requirements of the Uniform Building Code. All dimensions in this report are approximate.

Job Number: #2000-15
Property: 6945 Sierra Bonita, Sacramento, CA

2. Field Inspection Summary

Inspection Date:	August 16, 2000
Inspecting Engineer:	James Accinelli, S.E.
Assisting Inspector:	None
Also Present:	Mr. Chuck Wong
Limitations of Inspection:	Information resulting from this inspection is limited to the features of the subject building accessible and witnessed during the field inspection. Where portions of the building were not accessible, construction details were estimated based on similar construction at other locations on the site. Should existing conditions be uncovered during construction which differ significantly from those described in this report, the contractor should immediately notify the engineer of such differing conditions to verify that the conclusions of this report are still applicable.
Location of Inspection:	Inspection was limited to accessible and visible portions of the following areas: • House Interior • House Exterior • Attic above Bedrooms at West Wing of House • Garage Interior Inspection of the Attic space above the, Kitchen, Family Room , North Bedroom Wing, and Garage was not performed due to limited or no access.
General Description:	The structure is a one-story wood framed single family residence with redwood exterior siding, an existing wood shake roof, and a raised wood first floor. The first floor is presumed supported on interior concrete isolated footings and a perimeter concrete grade beam foundation. The owner, Chuck Wong, stated that the house was built in 1979, which appears consistent with the observed construction techniques and materials.
Existing Roof Framing Description:	1. Roof sheathing is 1x4 skip sheathing spaced at 3.5" centers. The sheathing is to remain in-place under new 7/16" OSB. 2. Roof rafters are 2x6 DF spaced at 24" centers generally spanning approximately 8'-0" between purlins and/or individual struts. Rafters at the vaulted Family Room appear to be spaced at 16" centers as viewed from the exterior eave overhangs. 3. The typical ceiling joists are 2x6 DF spanning parallel and perpendicular to the rafters. generally, where ceiling joist are perpendicular to the rafters, there appears to be 1x6 collars ties spaced at 48" centers connecting opposing rafters. 4. There are 2x6 purlins supporting most rafters with 2x4 braces to bearing walls at approximately 48" centers. generally, where purlins are not installed, it appears there is an individual strut installed to support the rafters, valleys, and hips. 5. Typical ridge, hip, and valley beams are 2x8 DF and they generally appear braced to bearing walls at regular intervals. 6. There is a 4x14 (approximate) beam pocketed in the ceiling above the Living Room approximately above the front window wall west of the front door. The beam is supporting several short struts to the rafters and valley beam at that location. The beam does not appear to be adequately braced against lateral torsional buckling. See recommendation number 1.

APPENDIX 'B'

Job: 6945 Sierra Bonita
New Roof Check

Job No: 2000-15
Date: 17-Aug-00

Joist, Rafter & Beam Calculations

Beam Name		Typical Rafter at 16"	Typical Rafter at 24"	Typical Rafter w/ Ceilig	Ridge Beam at Vault	Garage Header	17' Long Beam at Entry
Beam Section Data							
Beam Section		2x6	2x6	2x6	6x14	4x14	6x10
Species		DF-#2	DF-#2	DF-#2	DF-#2	DF-#2	DF-#2
Beam Width	in	1.50	1.50	1.50	5.50	3.50	5.50
Beam Depth	in	5.50	5.50	5.50	13.25	13.25	9.50
Le: Unbraced L	ft	2.00	2.00	2.00	1.33	2.00	2.00
Fb - 1997 UBC	psi	1310	1310	1310	1235	1235	1235
Fv - 1997 UBC	psi	95	95	95	95	95	95
E - Modulus	ksi	1600	1600	1600	1600	1600	1600
Cd - Load Duration		1.25	1.25	1.25	1.25	1.25	1.25
Member Type		sawn	sawn	sawn	sawn	sawn	sawn
Repetative Stress	Y/N	Y	Y	Y	N	N	N
Span & Load Data							
Span (or maximum)	ft	11.5	10	10	24	16	17
Spacing **	in	16	24	16	12	12	12
Dead Load **	lbs/sf	12	12	15	120	195	135
Live Load **	lbs/sf	16	16	16	128	208	144
** use 12" spacing if single beam & load with lbs/ft							
Results							
Mmax @ Center	in-k	7.41	8.40	6.20	214.27	154.75	120.95
fb: Actual		979 ok	1111 ok	820 ok	1331 ok	1511 ok	1462 ok
Fb: Allowable		1638	1638	1638	1544	1544	1544
fv: Actual		39	51	38	61	104	68
Fv: Allowable		119	119	119	119	119	119
Reactions							
Left End DL	lbs	92	120	100	1440	1560	1148
LL	lbs	123	160	107	1536	1664	1224
Max DL+LL	lbs	215	280	207	2976	3224	2372
Right End DL	lbs						
LL	lbs						
Max DL+LL	lbs						
Deflections							
Delta Center DL	in	-0.189	-0.162	-0.135	-0.525	-0.265	-0.403
L/Delta (DL Only)		729	739	887	548	725	506
Delta Center LL	in	-0.252	-0.216	-0.144	-0.560	-0.283	-0.430
L/Delta (LL Only)	L/360	547	555	832	514	680	474
Delta Center (D+L)	in	-0.442	-0.379	-0.279	-1.085	-0.547	-0.834
L/Delta (D+L)	L/240	313	317	429	265	351	245

APPENDIX 'D'

ENGINEERED FOR DURALITE AND PREMIUM DURALITE LIGHTWEIGHT CONCRETE TILES • ROOF SPAN TABLES • ENGINEERED FOR DURALITE AND PREMIUM DURALITE LIGHTWEIGHT CONCRETE TILES • ROOF SPAN TABLES • ENGINEERED FOR DURALITE AND PREMIUM DURALITE LIGHTWEIGHT CONCRETE TILES • ROOF SPAN TABLES • ENGINEERED FOR DURALITE AND PREMIUM DURALITE LIGHTWEIGHT CONCRETE TILES • ROOF SPAN TABLES •

ROOF SPAN TABLES

ENGINEERED FOR DURALITE & PREMIUM DURALITE LIGHTWEIGHT CONCRETE ROOF TILES

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3/1/94

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3/1/94

Monier
INNOVATIVE ROOFSCAPES

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Fx: 206-584-5989

ICBO Report #2093 (August 1994); Los Angles, California Research #23250

Monier

Dear Reader:

Monier's corporate philosophy is that as a roofing products manufacturer we have an obligation to make available information pertinent to a safe and long-lasting roof installation. It is for that reason that this informational booklet is available free to roofing contractors, property owners, building department officials and regulators, engineers, and others.

Regardless of what type of reroofing material is to be installed, it is in everyone's best interests that a thorough roof structural inspection be performed. The goal of such an inspection is to ensure that the structure meets or exceeds official minimum requirements.

The charts and tables provided here were calculated by Civil Engineer, Ronald Ogawa (P.E.).

The information herein is made available for the sole purpose of assessing the allowable spans of specific members in existing roof structures only. They are not in any way intended to be used as a guide or as a recommendation for roof strengthening or restructuring. Any changes to existing structures need to be recommended by a qualified engineer. Also, if assumed conditions, as provided in the charts, do not exist, the roof should be examined by a structural engineer.

Monier's experience has been that if the home or building was constructed to meet recent Uniform Building Code standards, the structure typically will not require any modifications in order to accommodate the Duralite line of products. However, in the event that engineering is required, structural work often can be performed by your licensed roofing contractor or carpenter.

If you have questions, please call your local Monier office for assistance. In addition to a sizeable field sales staff, Monier has a dedicated technical team available to answer questions about our products and their proper installation and use.

Thank you for your interest in Monier reroofing products. We're proud to be America's largest and best tile roof manufacturer.

Sincerely,

Michael J. Suzanski

Michael J. Suzanski
Vice President, Marketing and Reroof

TABLE OF CONTENTS

SPEAKING A COMMON LANGUAGE

FOR THE PROPER USE OF THIS BOOKLET, IT IS ESSENTIAL THAT WE UNDERSTAND EACH OTHER'S LANGUAGE. A GLOSSARY OF TERMS HAS BEEN PROVIDED AT THE BACK OF THE BOOK. IN ADDITION, BELOW ARE ILLUSTRATIONS WHICH IDENTIFY THE ROOF'S STRUCTURAL MEMBERS.

ROOF DETAIL

1. Roof Rafter
2. Continuous Ceiling Joist or Rafter Tie
3. Perlin
4. Strut (Brace or Kicker)
5. Horizontal Ridge Beam
6. Bearing Wall
7. Slope inches of rise per 12" of run
8. Overhang
9. Out Riggers

REGISTERED PROFESSIONAL ENGINEER
RONALD I. OGAWA
No. 16286
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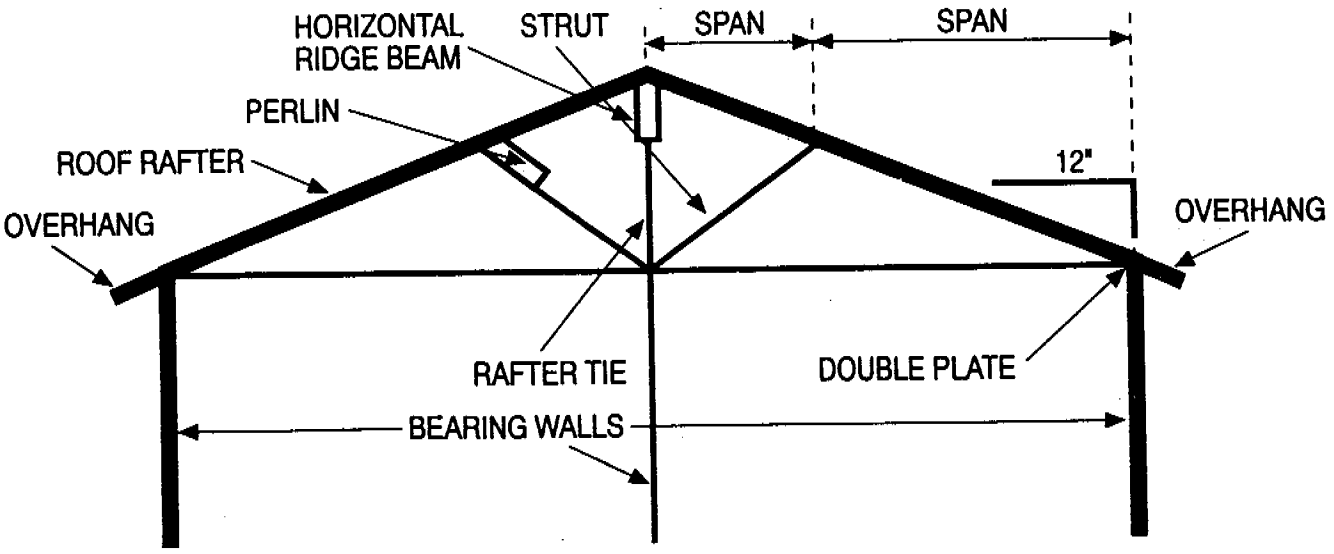
3/1/94

"MEASURING THE SPAN"



DISCLAIMER: These Charts and Tables are made available by Monier Inc. for the sole purpose of assessing the allowable spans of specific members in existing roof structures only. They are not in any way intended to be used as either a guide or a recommendation for roof strengthening or restructuring. Any changes to existing structures need to be recommended by a qualified engineer. Also, if the "assumed conditions" do not exist, the roof should be examined by a structural engineer.

SPAN CHART UPDATE TO 1994 UBC
DESIGN CRITERIA FOR ROOF SPAN CHART TO COMPLY WITH THE 1994 UNIFORM BUILDING CODE.
LUMBER: DOUGLAS FIR & LARCH: TABLE NO. 23-1-2-4

DEFLECTION: LIVE LOAD ONLY WITH PLASTER CEILING = L/360
LIVE LOAD ONLY WITH OUT PLASTER CEILING = L/240
LIVE LOAD PLUS DEAD LOAD WITH PLASTER CEILING = L/240
LIVE LOAD PLUS DEAD LOAD WITHOUT PLASTER CEILING = L/180

DEAD LOAD	VILLA (psf)	FLAT (psf)		DEAD LOAD + FRAMING	
TILE	5.8	7.4		VILLA TILE	FLAT TILE
SPACED SHEATHING	1.3	1.3	CASE 1	8	10
1/2" THICK PLYWOOD	1.5	1.5	CASE 2	9.1	11.1
EXISTING ROOFING	3	3			
UNDERLAYMENT	0.3	0.3			
FRAMING	depends on size and spacing				

LIVE LOAD LESS THAN 4:12 = 20 PSF
GREATER THAN 4:12 = 16 PSF

INVESTIGATE ROOFING LOADS FOR THE FOLLOWING CONDTIONS AT LL=20 AND 16 PSF:

1. NEW TILE OVER TYPE 30 FELT UNDERLAYMENT OVER NEW BOARDS LAYED BETWEEN EXISTING SPACED SHEATHING. DEAD LOAD = 2.2 PLUS FRAMING & TILE.

2. NEW TILE OVER 1/2" PLYWOOD SHEATHING PLUS TYPE 30 FELT OVER EXISTING SPACED SHEATHING. DEAD LOAD = 3.3 PSF PLUS FRAMING & TILE.

BASIC FORMULA:

BENDING: FB = M/S — LB = (1152 X Fb x Z/Ws)^5
SHEAR: FV = 1.5V/A — LV = 192 x Fv x A/WS
DEFLECTION = 5WL^4/384EI — Ld = ((EI)/(37.5 x W x s))^.33333 for I/240
Ld = ((EI)/28.125 x W x s))^.333333 for I/180

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SPAN CHART UPDATE TO 1994 UBC

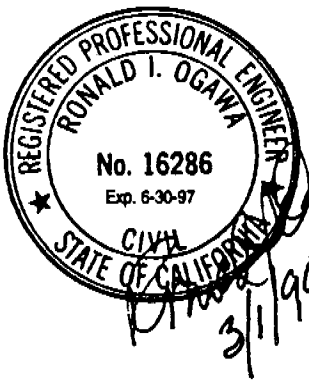
W= applied roof load in psf (tile, wt. material dead load plus live load)
s = spacing in inches
Fb = fiber bending stress of lumber
Fv = shear stress of lumber
E = modulus of elasticity of lumber
I = moment of inertia of beam or rafter
A = area of rafter or beam
Z = section modulus of rafter of beam

1994 REQUIRES ADJUSTMENTS FACTORS TO BE USED WITH VISUALLY SAWN LUMBER AS SHOWN IN TABLE A (TABLE 23-1-A-6, L994 UBC)

ITEM	LOAD DURATION FACTOR	WET SERVICE FACTOR	TEMP. FACTOR	SIZE FACTOR (1)	VOLUME FACTOR (2)	FLAT USE FACTOR (3)	REPETITIVE MEMBER FACTOR 4	CURVATURE FACTOR (5)	FORM FACTOR
Fb'	Cd	Cm	Ct	Cf	Cv	Cfu	Cr	Cc	Cf
Fv'	Cd	Cm	Ct	Cf	*	*	*	*	*
E	*	Cm	Ct	*	*	*	*	*	*

1. SIZE FACTOR, Cf, SHALL APPLY ONLY TO VISUALLY GRADED SAWN LUMBER MEMBERS AND TO ROUND TIMBER BENDING MEMBERS.
2. VOLUME FACTOR, Cv, SHALL APPLY ONLY TO GLUED-LAMINATED TIMBER BENDING MEMBERS.
3. FLAT USE FACTOR, Cfu, SHALL APPLY ONLY TO DIMENSION LUMBER BENDING MEMBERS 2 INCHES TO 4 INCHES THICK.
4. REPETIVE FACTOR, Cr, SHALL APPLY ONLY TO DIMENSION LUMBER 2 TO 4 INCHES THICK.
5. CURVATURE FACTOR, Cc SHALL ONLY CURVED PORTION OF GLUED LAM BEAMS.

FACTORS DETERMINED FROM SECTION 2304.3 OF THE CODE
Cd = DURATION FACTOR = 1.25
Cm = WET SERVICE FACTOR = 1.0 (NOT ANTICIPATED TO BE IN SERVICE AT GREATER THAN 19 PERCENT FOR EXTENDED PERIOD OF TIME.
Ct = TEMPERATURE FACTOR = 1.0 (NOT USED AT T> 100 F. FOR PROLONGED PERIODS.
Cr = REPETITIVE MEMBER FACTOR = 1.15 (MEMBERS TO BE SPACED NO GREATER THAN 24 INCH CENTERS)
Cfu = FLAT USE FACTOR NOT APPLICABLE.
Cv = VOLUME FACTOR NOT APPLICABLE FOR SAWN MEMBERS.

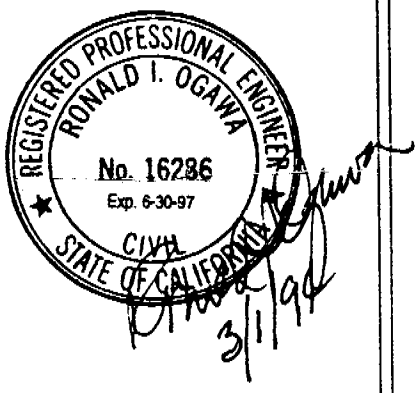


SPAN CHART UPDATE TO 1994 UBC

SIZE FACTOR, CF, ARE AS FOLLOWS FOR BENDING STRESS

GRADES OF LUMBER	WIDTH	FB THICKNESS	
		2" & 3"	4"
SS # 1 & BTR, #1	2,3,4	1.5	1.5
#2 AND #3	5	1.4	1.4
	6	1.3	1.3
	8	1.2	1.3
	10	1.1	1.2
	12	1	1.1
	14 & WIDER	0.9	1

FRAMING DEAD LOAD	
2 X 4 @ 12 = 1.3 PSF	2 X 10 @ 12 = 3.35 PSF
2 X 4 @ 16 = 1.0 PSF	2 X 10 @ 16 = 2.5 PSF
2 X 4 @ 24 = 0.65 PSF	2 X 10 @ 24 = 1.7 PSF
2 X 6 @ 12 = 2.0 PSF	2 X 12 @ 12 = 4.1 PSF
2 X 6 @ 16 = 1.5 PSF	2 X 12 @ 16 = 3.1 PSF
2 X 6 @ 24 = 1.0 PSF	2 X 12 @ 24 = 2.0 PSF
2 X 8 @ 12 = 2.6 PSF	2 X 14 @ 12 = 4.8 PSF
2 X 8 @ 16 = 2.0 PSF	2 X 14 @ 16 = 3.6 PSF
2 X 8 @ 24 = 1.3 PSF	2 X 14 @ 24 = 2.4 PSF



SPAN CHART DESIGN CONDITIONS

	DEAD LOAD		TOTAL LOAD WITH LL= 2		TOTAL LOAD WITH LL= 16	
	VILLA TILE	FLAT TILE	VILLA*	FLAT*	VILLA*	FLAT*
CASE 1	8	10	28	30	24	26
CASE 2	9.1	11.1	29.1	31.1	25.1	27.1

*ADD FRAMING LOAD TO LOADS SHOWN BELOW TO OBTAIN TOTAL LOAD.

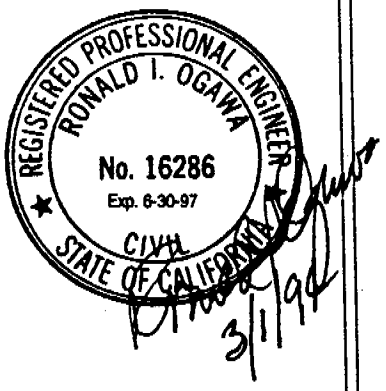
SPAN CHART UPDATE TO 1994 UBC

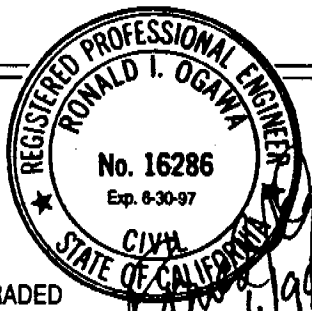
LUMBER PROPERTIES			
	A = AREA	Z= SEC MOD	I-MOI
2 X 4	5.25	3.06	5.36
2 X 6	8.25	7.56	20.80
2 X 8	10.88	13.14	47.64
2 X 10	13.88	21.39	98.93
2 X 12	16.88	31.64	177.97
2 X 14	19.88	43.89	290.78
4 X 4	12.25	7.15	12.51
4 X 6	19.25	17.65	48.53
4 X 8	25.38	30.66	111.15
4 X 10	32.38	49.91	230.84
4 X 12	39.38	73.83	415.28
4 X 14	46.38	102.41	678.48
4 X 16	53.38	135.66	1034.42
6 X 6	30.25	27.73	76.26
6 X 8	41.25	51.56	193.36
6 X 10	52.25	82.73	392.96
6 X 12	63.25	121.23	697.07
8 X 8	56.25	70.31	263.67
8 X 10	71.25	112.81	535.86

LUMBER DESIGN VALUES FOR DOUGLAS FIR			
grade/size	Fb	Fv	E
2" TO 4" THI	1450	95	1.9
2" AND WIDE	1000	95	1.7
	875	95	1.6

DETERMINE LUMBER DESIGN STRESS BY APPLYING ADJUSTMENT FACTORS.

	FB	Cd	Cm	Ct	Cr	F b'	Fv	E
SS	1450	1.25	1	1	1.15	2084	119	1.9^10^6
#1	1000	1.25	1	1	1.15	1438	119	1.7^10^6
#2	875	1.25	1	1	1.15	1258	119	1.6^10^6





SPAN CHART UPDATE TO 1994 UBC

FROM 1994 UBC TABLE 23-1-X-1 VALUES FOR JOISTS AND RAFTERS (VISUALLY GRADED LUMBER) SELECT THE DESIGN VALUE FOR DOUGLAS FIR-LARCH.

LUMBER & GRADE	SIZE	DESIGN VALUE IN BENDING FB			
		NORMAL	SNOW	7-DAY	E
SELECT STRUCTURAL	2 X 4	2500	2875	3125	1.9 X 10^6
NO. 1		1725	1985	2155	1.7 X 10^6
NO. 2		1510	1735	1855	1.6 X 10^6
SELECT STRUCTURAL	2 X 6	2170	2495	2710	1.9 X 10^6
NO. 1		1495	1720	1870	1.7 X 10^6
NO. 2		1310	1505	1635	1.6 X 10^6
SELECT STRUCTURAL	2 X 8	2000	2300	2500	1.9 X 10^6
NO. 1		1380	1585	1725	1.7 X 10^6
NO. 2		1210	1390	1510	1.6 X 10^6
SELECT STRUCTURAL	2 X 10	1835	2110	2295	1.9 X 10^6
NO. 1		1265	1455	1580	1.7 X 10^6
NO. 2		1105	1275	1385	1.6 X 10^6
SELECT STRUCTURAL	2 X 12	1670	1920	2085	1.9 X 10^6
NO. 1		1150	1325	1440	1.7 X 10^6
NO. 2		1005	1150	1260	1.6 X 10^6

TABLE A: ALLOWABLE SPAN FOR EXISTING RAFTER, FEET TYPE: VILLA DOUGLAS FIR NO.2

UBC 1994

RAFTER SIZE	SPACING (INCHES)	ROOF SLOPES LESS THAN 4:12 ROOF CONSTRUCTION TYPES		ROOF SLOPES 4:12 or GREATER ROOF CONSTRUCTION TYPES	
		CASE 1 SPACED SHEATHING FILL SPACE 30# FELT AND TILE	CASE 2 PLYWOOD,SPACED SHEATHING 30# FELT AND TILE	CASE 1 SPACED SHEATHING FILL SPACE 30 # FELT AND TILE	CASE 2 PLYWOOD, SPACED SHEATHING 30# FELT AND TILE
2X 4	12	9'10"	9' 10"	10' 6"	10' 5"
	16	8' 11"	8' 11"	9' 8"	9' 8"
	24	7'10"	7' 0"	8' 5"	8' 5 "
2 X 6	12	15' 7"	15' 4"	16' 8"	16' 8"
	16	14' 6"	14' 0"	15' 1"	15' 1"
	24	11'11"	11' 8"	12' 10"	12' 7"
2 X 8	12	20' 4"	20' 3"	21'11"	21' 10"
	16	18' 2"	17' 10"	19' 6"	19' 1"
	24	15' 0"	14' 9"	16' 2"	15' 10"
2 X 10	12	25' 1"	24' 8"	26'10"	26' 3"
	16	22' 0"	21' 8"	23' 8"	23' 1"
	24	18' 4"	17' 11"	19' 7"	19' 2"
2 X 12	12	28' 9"	28' 3"	30' 9"	20' 1"
	16	27' 1"	24' 11"	27' 1"	26' 7"
	24	21' 0"	20' 8"	22' 7"	22' 1"

TABLE B: ALLOWABLE SPAN FOR EXISTING RAFTER, FEET
TYPE: VILLA FLAT DOUGLAS FIR NO.2

UBC 1994

RAFTER SIZE	SPACING (INCHES)	ROOF SLOPES LESS THAN 4:12 ROOF CONSTRUCTION TYPES		ROOF SLOPES 4:12 or GREATER ROOF CONSTRUCTION TYPES	
		CASE 1 SPACED SHEATHING FILL SPACE 30# FELT AND TILE	CASE 2 PLYWOOD,SPACED SHEATHING 30# FELT AND TILE	CASE 1 SPACED SHEATHING FILL SPACE 30 # FELT AND TILE	CASE 2 PLYWOOD, SPACED SHEATHING 30# FELT AND TILE
2X 4	12	10' 0"	9'10"	10' 7"	10' 7"
	16	8'11"	8'11"	9' 8"	9' 8"
	24	7'10"	7'10"	8' 5"	7' 9"
2 X 6	12	15' 6"	15' 5"	16' 8"	16' 8"
	16	14' 0"	13' 9"	15' 0"	14' 8"
	24	11' 6"	11' 4"	12' 4"	12' 1"
2 X 8	12	20' 2"	19'10"	21' 6"	21' 1"
	16	17' 7"	17' 3"	18'10"	18' 3"
	24	14' 6"	14' 3"	15' 7"	15' 3"
2 X 10	12	24' 4"	23'11"	25'11"	25' 5"
	16	21' 4"	21' 0"	22' 9"	22' 4"
	24	17' 7"	17' 4"	18'10"	18' 6"
2 X 12	12	27'11"	27' 5"	29' 8"	29' 2"
	16	24' 6"	24' 1'	26' 1"	25' 8"
	24	20' 4"	20' 0"	21' 9"	21' 4"

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TABLE C: ALLOWABLE SPAN FOR DOUBLE RAFTER, FEET
TYPE: FLAT & VILLA • DOUGLAS FIR NO.2

RAFTER SIZE	SPACING (INCHES)	ROOF SLOPES LESS THAN 4:12 ROOF CONSTRUCTION TYPES		ROOF SLOPES 4:12 or GREATER ROOF CONSTRUCTION TYPES	
		CASE 1 SPACED SHEATHING FILL SPACE #30 FELT AND TILE	CASE 2 PLYWOOD, SPACED SHEATHING 30# FELT AND TILE	CASE 1 SPACED SHEATHING FILL SPACE 30# FELT AND TILE	CASE 2 PLYWOOD, SPACED SHEATHING 30# FELT AND TILE
2-2 x 4	12	11'10"	11' 9"	12' 5"	12' 3"
	16	10'10"	10' 8"	11' 4"	11' 1"
	24	9' 5"	9' 3"	9'10"	9' 9"
2-2 X 6	12	18' 8"	18' 5"	19' 7"	19' 3"
	16	17' 0"	16' 9"	17' 9"	17' 6"
	24	14' 9"	14' 7"	15' 6"	15' 3"
2-2 X 8	12	24' 7"	24' 3"	25' 9"	25' 5"
	16	22' 4"	22' 1"	23' 5"	23' 2"
	24	19' 6"	19' 3"	20' 6"	20' 2"
2-2 X 10	12	31' 4"	31' 0"	32'11"	32' 5"
	16	28' 6"	28' 1"	29'11"	29' 6"
	24	24'10"	24' 6"	26' 1"	25' 9"

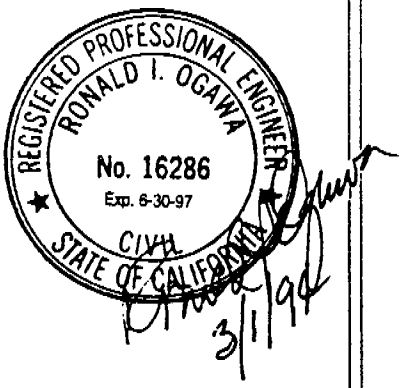
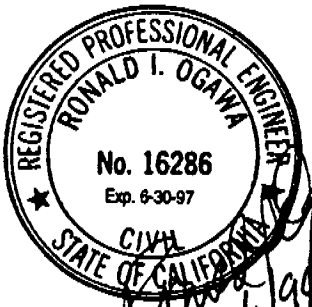


TABLE D: OPEN BEAM RAFTER SCHEDULE FOR ALL TILES FOR ALL LOAD CASES • ROOF SLOPE LESS THAN 4:12



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MAX. RAFTER BEAM SPAN (L)

LUMBER SIZE	MAX. SPACING (OC) LUMBER GRADE	32 IN.	48 IN.	60 IN.	72 IN.
4 x 4	SS #1 #2	8'11" 8' 9"	7'10" 7' 9"	7' 3" 7' 1"	6'10" 6' 9"
4 x 6	SS #1 #2	14' 0" 13' 9"	12' 3" 12' 0"	11' 3" 11' 1"	10' 8" 10' 6"
4 x 8	SS #1 #2	18' 4" 18' 0"	16' 0" 15' 9"	14'10" 14' 7"	14' 0" 13' 9"
4 x 10	SS #1 #2	23' 4" 23' 0"	20' 4" 20' 0"	18'11" 18' 8"	17' 9" 17' 7"
4 x 12	SS #1 #2	28' 3" 27'10"	24' 9" 24' 4"	23' 0" 22' 6"	21' 7" 20' 6"
4 x 14	SS #1 #2	33' 0" 33' 1"	28' 9" 27' 8"	26' 9" 24' 9"	25' 1" 22' 9"
6 x 6	SS #1 #2	15'10" 15' 7"	13'10" 13' 7"	12'10" 12' 7"	12' 1" 11'10"
6 x 8	SS #1 #2	21' 6" 21' 2"	18' 9" 18' 6"	17' 5" 17' 2"	16' 5" 16' 2"
6 x 10	SS #1 #2	27' 0" 26' 7"	23' 7" 23' 2"	21'11" 21' 7"	20' 7" 20' 3"
8 x 8	SS #1 #2	23' 8" 23' 3"	20' 8" 20' 3"	19' 2" 18'10"	18' 1" 17' 9"

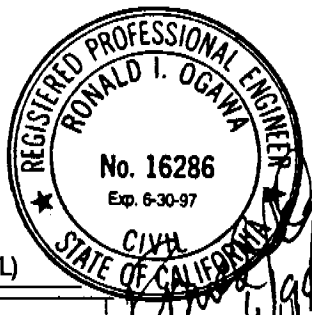

TABLE E: OPEN BEAM RAFTER SCHEDULE FOR ALL TILES FOR ALL LOAD CASES • ROOF SLOPE 4:12 OR GREATER

MAX. RAFTER BEAM SPAN (L)

LUMBER SIZE	MAX. SPACING (OC) LUMBER GRADE	32 IN.	48 IN.	60 IN.	72 IN.
4 x 4	SS #1 #2	9' 6" 9' 2"	8' 3" 8' 0"	7' 9" 7' 5"	7' 3" 7' 0"
4 x 6	SS #1 #2	14'10" 14' 4"	13' 0" 12' 7"	12' 1" 11' 8"	11' 4" 11' 0"
4 x 8	SS #1 #2	19' 1" 18' 5"	16' 8" 16' 1"	15' 5" 14'11"	14' 7" 14' 0"
4 x 10	SS #1 #2	24' 9" 23'11"	21' 8" 20'10"	20' 1" 19' 4"	18'11" 18' 3"
4 x 12	SS #1 #2	30' 0" 29' 0"	26' 3" 25' 3"	24' 4" 23' 6"	22'11" 21' 9"
4 x 14	SS #1 #2	34' 2" 34' 4"	29'10" 29' 4"	27' 9" 26' 3"	26' 1" 23'11"
6 x 6	SS #1 #2	16' 5" 16' 2"	14' 5" 14' 1"	13' 4" 13' 1"	12' 6" 12' 4"
6 x 8	SS #1 #2	21'11" 21' 8"	19' 2" 18'11"	17' 9" 17' 7"	16' 9" 16' 8"
6 x 10	SS #1 #2	28' 0" 27' 7"	24' 6" 24' 1"	22' 8" 22' 4"	21' 5" 21' 1"
8 x 8	SS #1 #2	24' 6" 24' 1"	21' 5" 21' 1"	19'11" 19 7"	18' 9" 18' 5"

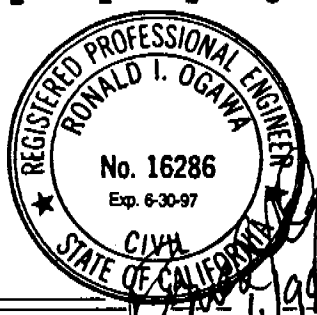

TABLE F-RIDGE BEAM SPANS FOR NO. 1 DOUGLAS FIR LUMBER FOR VILLA AND FLAT TILES

(APPLIES TO ALL LOADING CONDITIONS)

LUMBER SIZE	SPAN (FT) A + B	VILLA TILES ROOF SLOPE LESS THAN 4:12	VILLA TILES ROOF SLOPE 4:12 or GREATER	FLAT TILES ROOF SLOPE LESS THAN 4:12	FLAT TILES ROOF SLOPE 4:12 or GREATER
4 X 12 #1 DOUGLAS FIR LUMBER	16	14' 5"	15' 1"	14' 1"	14' 9"
	20	13' 4"	14' 0"	13' 1"	13' 8"
	24	12' 7"	13' 1"	12' 4"	12'10"
	28	12' 0"	12' 6"	11' 9"	12' 3"
	32	11' 5"	12' 0"	11' 2"	11' 8"
	36	11' 0"	11' 6"	10' 9"	11' 3"
	40	10' 7"	11' 1"	10' 4"	10' 9"
4 X 14 #1 DOUGLAS LUMBER	16	17' 0"	17' 9"	16' 8"	17' 3"
	20	15' 9"	16' 6"	15' 5"	16' 1"
	24	14'10"	15' 6"	15' 6"	15' 1"
	28	14' 1"	14' 9"	13' 9"	14' 4"
	32	13' 6"	14' 1"	13' 2"	13' 9"
	36	13' 0"	13' 6"	12' 8"	12' 3"
	40	12' 6"	13' 1"	12' 3"	12' 9"
4 X 16 #1 DOUGLAS FIR LUMBER	16	19' 6"	20' 5"	19' 1"	19'11"
	20	18' 1"	19' 0"	17' 9"	15' 6"
	24	17' 1"	17'10"	16' 9"	17' 5"
	28	16' 3"	17' 0"	15'10"	16' 6"
	32	15' 6"	16' 2"	15' 2"	15'10"
	36	14'11"	15' 7"	14' 7"	15' 2"
	40	14' 5"	15' 0"	14' 1"	14' 8"
6 X 12 #1 DOUGLAS FIR LUMBER	16	16' 9"	17' 6"	16' 6"	17' 2"
	20	15' 7"	16' 3"	15' 3"	15'11"
	24	14' 8"	15' 3"	14' 4"	15' 0"
	28	13'11"	14' 7"	13' 8"	14' 3"
	32	13' 4"	14' 0"	13' 1"	13' 7"
	36	12'10"	13' 4"	12' 6"	13' 1"
	40	12' 5"	12'11"	12' 1"	12' 8"
6 X 14 #1 DOUGLAS FIR LUMBER	16	19' 9"	20' 8"	19' 4"	20' 1"
	20	18' 4"	19' 1"	18' 0"	18' 9"
	24	17' 3"	18' 0"	16'11"	17' 7"
	28	16' 4"	17' 1"	16' 0"	16' 9"
	32	15' 8"	16' 4"	15' 4"	16' 0"
	36	15' 0"	15' 9"	14' 9"	15' 4"
	40	14' 6"	15' 2"	14' 3"	14'10"
6 X 16 #1 DOUGLAS FIR LUMBER	16	22' 8"	23' 8"	22' 3"	23' 1"
	20	21' 0"	22' 0"	20' 7"	21' 6"
	24	19' 9"	20' 8"	19' 5"	20' 2"
	28	18'10"	19' 7"	18' 5"	19' 2"
	32	18' 0"	18' 9"	17' 7"	18' 4"
	36	17' 3"	18' 0"	16'11"	17' 8"
	40	16' 8"	17' 5"	16' 4"	17' 0"

TABLE G-GARAGE DOOR HEADER CHART

GARAGE DOOR HEADER / ALL LOAD CONDTIONS W/NO CEILING

HEADER SIZE	LUMBER GRADE	RAFTER SPAN FEET	<4/12	>4/12
4 X 10	(SS)/(N0. 1)	10	17' 9"/17' 0"	16'10"/16' 3"
		12	17' 0"/16' 0"	16' 2"/15' 6"
		14	16' 5"/15' 1"	15' 6"/16" 1"
		16	15' 7"/14' 4"	15' 0"/14' 6"
		18	14' 4"/13' 8"	14' 7"/14' 0"
		20	13' 2"/13' 1"	14' 2"/13' 7"
4 X 12	(SS)/ NO. 1)	10	21' 7"/20' 9"	20' 6"/19' 9"
		12	20' 8"/20' 0"	19' 8"/18'11"
		14	19'11"/18' 7"	18'11"/18' 3"
		16	18' 2"/16' 9"	18' 3"/17' 7"
		18	17' 4'/15'11"	17' 9"/17' 0"
		20	16' 0"/15' 3"	17' 3"/16' 4"
4 X 14	(SS)/NO. 1)	10	24' 3"/22' 3"	24' 1"/23' 3"
		12	24' 4"/20'10"	23' 2"/22' 3"
		14	21' 6"/19' 9"	22' 3"/21' 1"
		16	20' 5"/18' 9"	21' 6"/20' 0"
		18	19' 6"/17'11"	20'10"/19' 1"
		20	18' 8"/17' 2"	20' 0"/18' 4"
4 X 16	(SS)/NO. 1)	10	27'10"/25' 7"	27' 9"/26' 9"
		12	26' 2"/24' 0"	26' 8"/25' 8"
		14	24' 9"/22' 9"	25' 7'/24' 3"
		16	23' 6"/21' 7"	24' 9"/23' 1"
		18	22' 5"/20' 7"	24' 0"/22' 0"
		20	21' 6"/19' 9"	23' 0"/21' 1"

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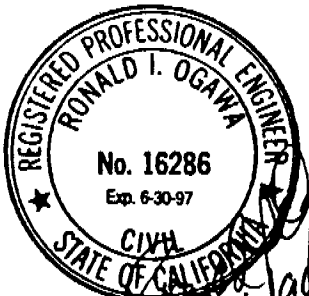
GLOSSARY

Aggregate	Crushed stone, or crushed gravel, or any granular mineral material.
Asphalt felt	An asphalt coated or asphalt saturated felt.
Battens	1 in x 2 in strips of wood 4 feet long, which are nailed to the roof in which the tiles hang.
Bearing Wall	Wall or walls of a building in which weight is placed upon from above. Each bearing wall requires a solid concrete footing for base of support.
Bird Stop	A specially designed piece of sheet metal that actually fit into the barrel or the hole of the Villa tile to prevent birds from entering cavity under tile.
Cap Sheet	A granulated coated surface used as a top ply of a Built Up roof membrane.
Ceiling Joist	The horizontal structural member made to support the ceiling dry wall.
Counter Flashing	An anti-corrosion formed metal designed to cover and protect the upper edge of a base flashing.
Cross Ties	Horizontal members that ties rafters together directly above the ceiling joist, near the Top Plate.
Dead Load	Permanent load placed on a roof structure such as roof tiles, air conditioning equipment, sheathing, felt, nails, etc.
Deck	The surface to which the roofing system is applied or installed.
Drain	A device designed to allow water to flow out of a roof area.
Eaveriser	A sheet metal piece made to elevate the first course of flat tile so the same angle is maintained on all the courses.
Edge Venting	A continuous perimeter roof venting system designed to expelled moisture.
Exposure	The exposed weathered portion of the tile, never to exceed 13 1/2"
Factory Mutual	An agency that regulates the fire classification and the wind uplift resistance for insurance companies in the U.S.A..
Felt	A flexible sheet used as underlayment sometimes called "tar paper". It comes in various weights.
Flashing	A corrosion resistant metal designed to seal membrane transition at walls, expansion joints, drains gravel stops, etc.
Headlap	The distance at which one piece of field tile overlap the tile below it. The minimum headlap for all concrete tile should be at least 3 inches.
Hip	The point of a roof at which two pitches of each roof meet, creating a peak.
Live Load	A nonpermanent load on a roof structure, such as wind, snow, etc.
Nailer	Commonly a piece of 2" x 4" or 2" x 3" nailed on its edge at the top of the hip or the ridge. It is usually the nailing support for trim and ridge tile.
Penny	Usually designated by the letter "d"— refers to the nail size measurement
Perlite	A lightweight aggregate used in the mixture of lightweight concrete product.
Pitch	Generally refer to as the slope of the roof. It represents the angle of steepness of the a roof. Example: 4:12 indicates that for every 12 feet of horizontal span, the roof rises vertically 4 feet.
Purlin	Usually a piece of 2" x 4' min spanning horizontally across to provide support for the adjacent rafters.
Pond	A roof area that is improperly drained.
Rafter	A structural member made to support the roof sheathing and other roofing materials.
Rafter Tie	A horizontally structural member designed to "tie" or hold rafters in place.
Rake	A curved or straight angle concrete finishing tile installed on gable end of a structure.
Ridge	The highest horizontal member of a pitched roof to which the rafters are nailed.
Scab	Two members nailed together on each side to provide additional support, can either joist or rafters.
Slope	Synonymous with pitch. See PITCH.
Span	The horizontal distance between two points.
Square	The measure representing 100 square feet of roof area.
Strut	A structural member that supports roof purlins. By code they are required to be a minimum of 2" x 4".
Valley	The slope intersection of two roof surfaces.
Wind Clips	Small metal device made to hold the nose of the tile down in high wind.



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