

Sugimura & Associates
Architects

Architecture • Planning • Interiors
Landscape Architecture

Letter of Transmittal

Date: April 06, 2006 **Project Number:** 2506
To: Terry Greene, A.I.A.
Address: Public Works Dept
City of Cupertino
10300 Torre Avenue
Cupertino, CA 95014-3255
Attention:
Subject: T.I. & Seismic Project for the City Hall Building

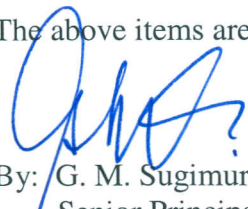
Please find enclosed the following:

<u>Date</u>	<u>Quantity</u>	<u>Description</u>
April 6, '06	one page	"Recap" Cover Letter
~~4.5.06~~ ~~11-6-05~~	13 pages	Structural Calculations for Civic Center
Dec 6, '05	one page	Research on what the CYGNA calculations show & what was assumed for loading, etc.
7		
10	~~two~~ ^{three} pages	Report of Analysis of the existing building with reference to the current Code, the '01 CBC, and its shear protection.
Nov 8, '05		

Note: this is being provided in support of the current invoice submitted by our Structural Engineer, Ahern-Knox & Hyde, Inc.

For your: review and files

The above items are being submitted and delivered by G. Sugimura on 4/06/06.

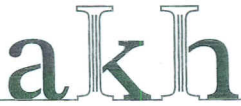
By:  G. M. Sugimura, A.I.A.
Senior Principal

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Principals
Gene M. Sugimura, AIA
Reed C. Grandy, ASIC
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Associates
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Mirella Sion, Assoc. AIA



AHEARN, KNOX & HYDE, INC.
Structural Engineers

Dennis B. Ahearn, S.E.
William S. Knox, S.E.
Tim D. Hyde, S.E.

April 6, 2006

Sugimura & Associates Architects
2155 S. Bascom Avenue, Suite 200
Campbell, CA 95008

Att: Gene Sugimura
Ref: Cupertino City Civic Center Remodel

Dear Gene;

This is a recap of the work our office has performed on this project.

1. Preliminary analysis and framing scheme for the first design presented to us. This was the design that changed the shape of the existing roof to match the adjacent City Hall. This took considerable time for which we received no reimbursement.
2. Seismic analysis of the existing building for conformance to the 2001 California Building Code. After this analysis was completed we were informed that the facility is considered to be an Essential Facility due to the Emergency Operations Center being located in the building. This requirement increased the seismic forces that the structure is required to resist by 25% and our analysis had to be redone. In my letter to you of 11-8-05, I indicated several areas of overstress that would need to be addressed in the remodel to conform to the current code.
3. We were provided with a copy of the structural calculations that CYGNA compiled for the modifications to the building in 1986. We were asked to study these calculations to determine why CYGNA's conclusions differed from our analysis results. As indicated in my letter to you of 12-6-05, we found several errors in their analysis.
4. To date we have expended eighty-seven (87) hours on the above listed work. Although we feel that two weeks of time for the above analysis, meetings and presentation of our findings is entirely reasonable, I understand that there are limited funds available in your agreement with the City of Cupertino. I am therefore reducing our billing to a partial progress billing of forty (40) hours of time.

Please feel free to call me if you have any questions, or would like me to meet with you and the City.

Sincerely,

William S. Knox
Structural Engineer

Enclosures: Final structural analysis, previous letters referenced.

Ahearn, Knox & Hyde, Inc.
Structural Engineers

1505 Meridian Avenue
San Jose, CA 95125
Phone (408) 978-1970
Fax (408) 267-7919

Structural Calculations Cupertino City Civic Center

Project Number:	M05-036	Date:	11-6-05
Project Engineer:	Knox	Code:	2001 CBC
Seismic Zone:	4	Wind Zone:	70 mph
Checked By:		Date:	



**Original Signature Required
To Be Valid Seal**

STRUCTURAL LOADS

G1

ROOF TYPE #1: Existing Tile Roof

Slope, in/ft.: 4

Material	Decking	Purlins	Beams	Seismic
Tile Roofing	21.0	21.0	21.0	21.0
Plywood	1.5	1.5	1.5	1.5
3x Decking	8.0	8.0	8.0	8.0
Insulation	0.5	0.5	0.5	0.5
Fire Sprinklers		4.0	3.0	2.0
Ceiling		2.5	2.5	2.5
Purlins		4.0	4.0	4.0
Beams			1.0	1.0
Miscellaneous	5.0	4.0	4.0	2.0
Sub-Total:	36.0	45.5	45.5	42.5
Slope Factor	1.9	2.5	2.5	2.3
TOTAL DEAD LOAD:	37.9	48.0	48.0	44.8

psf

ROOF TYPE #2: Existing Built-up

Slope, in/ft.: 0.25

Material	Decking	Joist	Beams	Seismic
Roofing	4.0	4.0	4.0	4.0
Plywood	1.5	1.5	1.5	1.5
Insulation	0.5	0.5	0.5	0.5
Fire Sprinklers		4.0	3.0	2.0
Joist		3.0	3.0	3.0
HVAC Equipment		5.0	5.0	5.0
Beams			2.0	2.0
Miscellaneous	5.0	5.0	4.0	2.0
Sub-Total:	11.0	23.0	23.0	20.0
Slope Factor	0.0	0.0	0.0	0.0
TOTAL DEAD LOAD:	11.0	23.0	23.0	20.0

psf

FLOOR TYPE #1:

Material	Slab	Joist	Beams	Seismic
Flooring	1.0	1.0	1.0	1.0
Concrete Slab, 3"	38.0	38.0	38.0	38.0
Fire Sprinklers		4.0	3.0	2.0
Ceiling		2.5	2.5	2.5
Joist, 6"x12" @ 36"		29.0	29.0	29.0
Beams			5.0	5.0
Miscellaneous	5.0	5.0	4.0	2.0
Sub-Total:	44.0	79.5	82.5	79.5
Partitions		20.0	20.0	20.0
TOTAL DEAD LOAD:	44.0	99.5	102.5	99.5

psf

WALL TYPE #1:

Stud Wall w/ Gyp Board Each Side

Material	Weight
Studs @ 16" o.c.	1.5
Gypsum Board	5.0
Miscellaneous	1.5
TOTAL WEIGHT:	8.0

psf

WALL TYPE #2:

Stud Wall w/ Gyp Board One Side & Plaster One Side

Material	Weight
Studs @ 16" o.c.	1.5

Gypsum Board	2.5	
Plywood	1.5	
Plaster	10.0	
Miscellaneous	1.5	
TOTAL WEIGHT:	<u>17.0</u>	psf

WALL TYPE #3: 6" Concrete 75 psf

LIVE LOADS: Floor

Office Areas	50	psf
Corridors & Lobbies	100	psf
Assembly, Open	100	psf

LIVE LOADS: Roof	0 - 200	201 - 600	> 600	sq. ft.
Slope < 4:12	20	16	12	psf
Slope 4:12 to < 12:12	16	14	12	psf
Slope > 12:12	12	12	12	psf

SOILS DATA

Firm:

Date:

Address:

Phone:

Recommendations:

Continuous & Spread Footings

Minimum Depth:

Minimum Width:

Dead Load Bearing:

Dead + Live Bearing:

Total Bearing:

Friction Coefficient:

Passive Pressure:

Pier & Grade Beams

Pier Friction:

Dead End Bearing:

Dead + Live Bearing:

Total End Bearing:

Disregard Top Depth:

Active on Footings:

Active of Piers:

Passive Pressure:

Cantilevered Retaining Walls

Active Pressure:

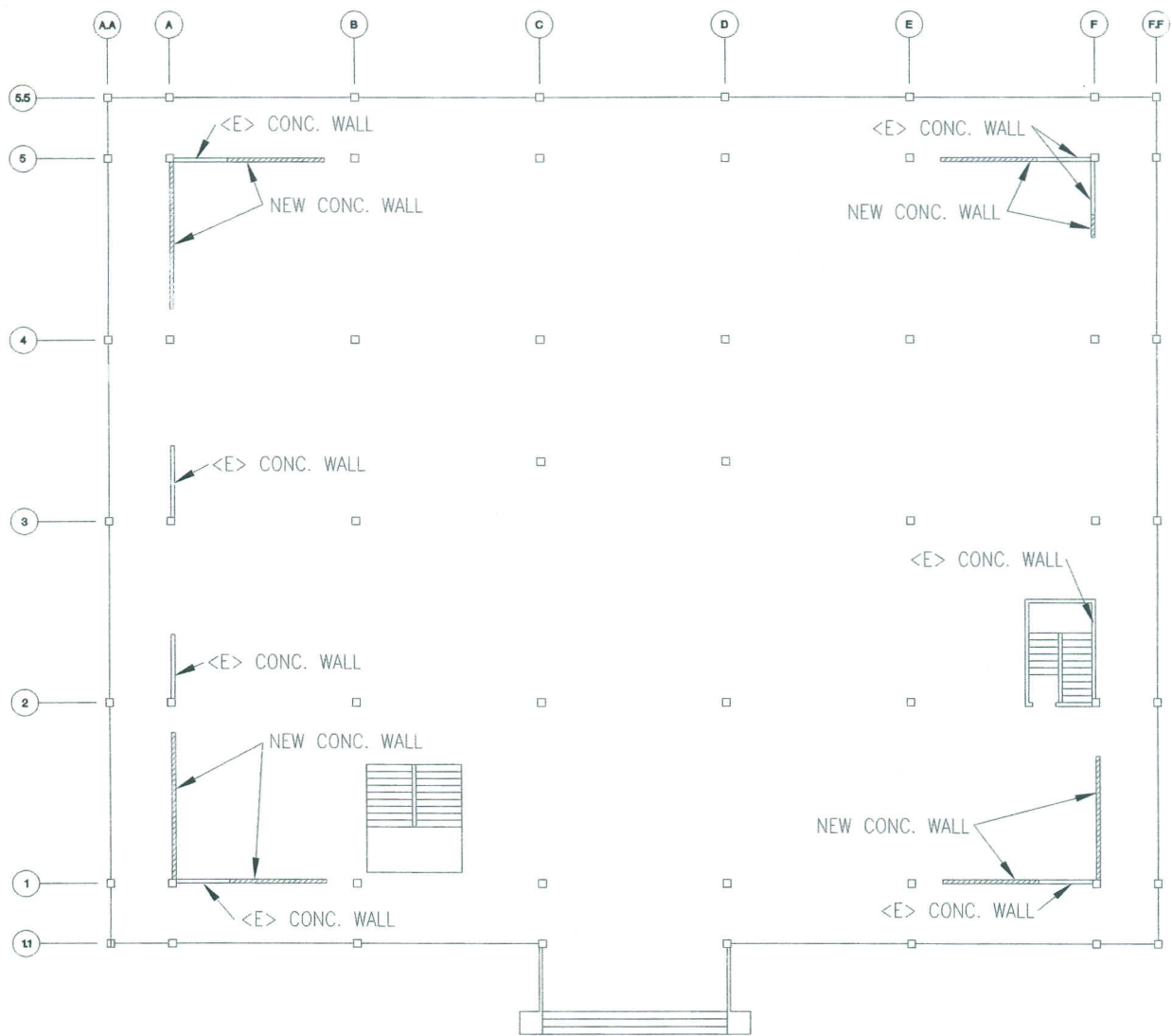
Passive Pressure:

Friction Coefficient:

Restrained Retaining Walls

Active Pressure:

Passive Pressure:



FLOOR PLAN – MAIN LEVEL

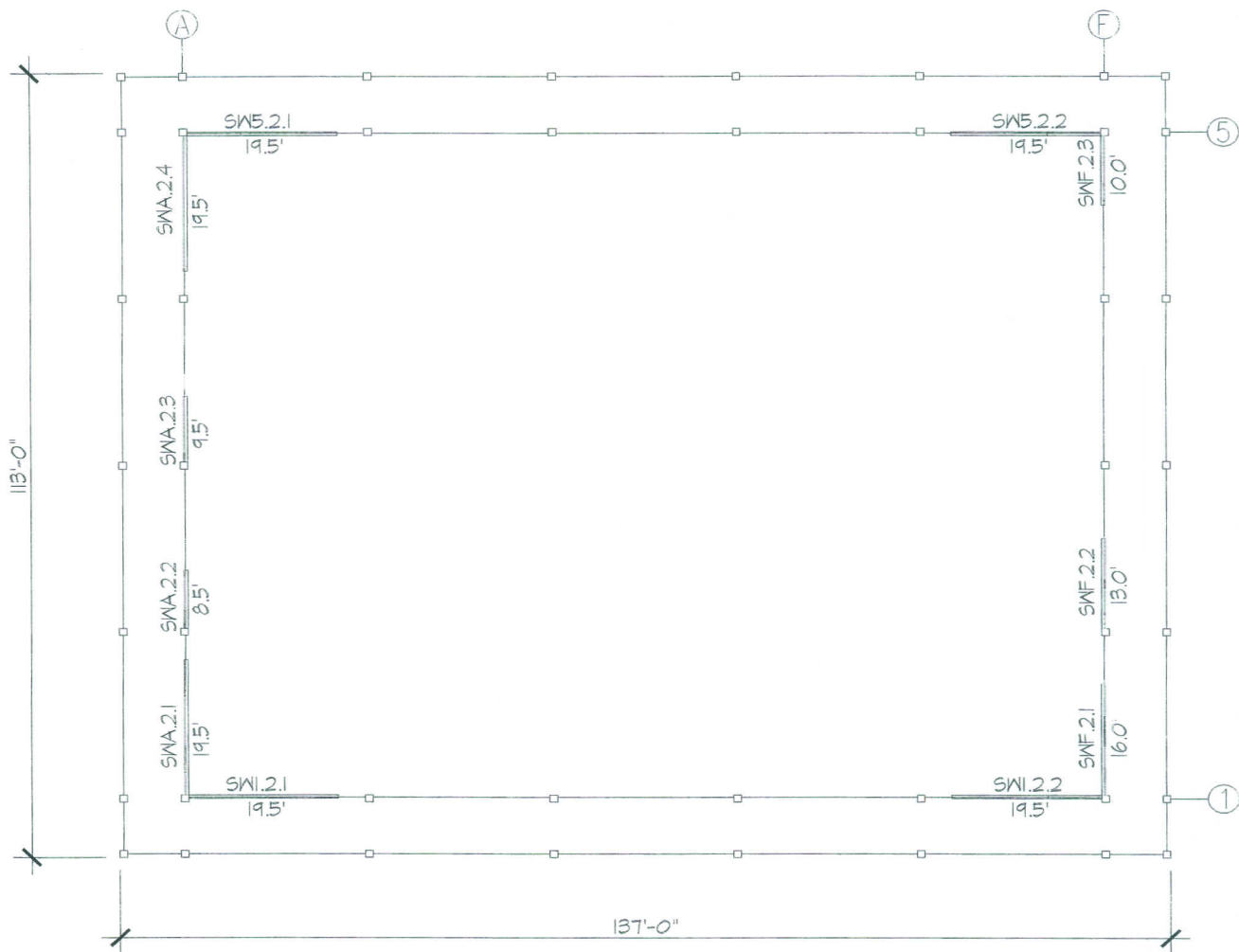
The upper level of the building lateral system consists of existing wood roof diaphragm and concrete shear walls. The lower level consists of a concrete joist floor system over concrete walls & columns. The lower portion was originally a full basement. In 1987 the North side of the building was excavated to the depth of the basement and the North basement wall opened up to a new patio. The building currently houses the City's Emergency Operations Center and is therefore an essential facility.

Earthquake Data:

Nearest fault is the Monte Vista - Shannon fault, 7 km. Distant. Type B fault



LOWER LEVEL PLAN



UPPER LEVEL PLAN

Building Mass:

Roof	Area	Unit Load	Mass
High Roof:	3430	20	68600
Tile Roof:	2810	44.8	125888
Well Roof	6000	19	114000
Mansard:	1450	30	43500
Partitions	11340	5	56700
Total =			408688 lbs

Roof height = 18'

Floor	Area	Unit Load	Mass
Floor	12705	100	1270500
Ext. Walls	1140	100	114000
Partitions	11340	10	113400
Total =			1497900 lbs

Floor height = 12'

Upper Level Seismic Loads:

Wood frame roof with plywood diaphragm. Concrete shear walls

Wall	Length	Rigidity	Relative R
SW1.2.1	19.5	7415	0.5
SW1.2.2	19.5	7415	0.5
		<u>14830</u>	
SW5.2.1	19.5	7415	0.5
SW5.2.2	19.5	7415	0.5
		<u>14830</u>	

Wall	Length	Rigidity	Relative R
SWA.2.1	19.5	7415	0.455
SWA.2.2	8.5	614	0.038
SWA.2.3	9.5	857	0.053
SWA.2.4	19.5	7415	0.455
		<u>16301</u>	
SWF.2.1	16	4096	0.562
SWF.2.2	13	2197	0.301
SWF.2.3	10	1000	0.137
		<u>7293</u>	

Program PL-09: Base Shear

Total Base shear = 73 kips

Load to each shear wall line = 36.5 kips

Wall	Shear	Wall	Shear
SW1.2.1	18.25	SW5.2.1	18.25
SW1.2.2	18.25	SW5.2.2	18.25
"1" Total:	<u>36.50</u>	"5" Total:	<u>36.50</u>

Wall	Shear	Wall	Shear
SWA.2.1	16.60	SWF.2.1	20.50
SWA.2.2	1.38	SWF.2.2	11.00
SWA.2.3	1.92	SWF.2.3	5.00
SWA.2.4	16.60	"F" Total:	<u>36.50</u>
"A" Total:	<u>36.50</u>		

Reliability/Redundancy factor = 1.0

Lower Level Seismic Loads:

Concrete floor slab. Concrete shear walls

Wall	Length	Rigidity	Relative R	Wall	Length	Rigidity	Relative R
SW1.1.1	121	1771561	1	SWA.1.1	97.5	926859	1.000
SW5.1.1	8	512	0.271186	SWF.2.1	97.5	926859	1.000
SW5.1.2	6	216	0.114407				
SW5.1.3	6	216	0.114407				
SW5.1.4	6	216	0.114407				
SW5.1.5	6	216	0.114407				
SW5.1.6	8	512	0.271186				
		<u>1888</u>					

Program PL-09: Base Shear

Total Base shear = 327 kips from lower level mass only

Load to each wall line from upper level = $36.5 \times 5.5 / 4.5 = 44.6$ kips

Longitudinal seismic distribution, Program PL-08

Load to each shear wall line

Line	Shear
1	1.1 kips
5	415.4 kips
A	224.7 kips
F	224.7 kips

Reliability/Redundancy factor = 1.0

Roof Diaphragm

Load to Line A = 36.5 kips Diaphragm length = 97 ft.
 Diaphragm shear = 376 plf
 Existing diaphragm is 1/2" plywood w/ 10d @ 6" o.c. all edges, blocked
 Allowable shear = 325 plf
 Overstress = 15.8%

Chord stress = $2 \times 36.5 \times 121 / 8 / 97 = 11.4$ kips
 Existing chord is W16x31 w/ (3) 5/8" M.B. in 1/4" splice plate.
 Allowable load = $3.1 \times 3 \times 1.33 = 12.4$ kips

Maximum collector load = $36.5 / 121 \times 41 = 12.4$ kips
 Allowable load = $3.1 \times 3 \times 1.33 = 12.4$ kips

Shear WallsWall SW1.2.1

Wall length = 19.5 ft. Wall weight = $12 \times 19.5 \times 75 = 17.6$ kips
 Applied Lateral load = 18.25 kips Wall height = 12 ft.
 Wall seismic weight = $0.179 \times 17.6 = 3.1$ kips
 Program

Wall SW1.2.1

Wall length = 16 ft. Wall weight = $12 \times 16 \times 75 = 14.4$ kips
 Applied Lateral load = 20.5 kips Wall height = 12 ft.
 Wall seismic weight = $0.179 \times 14.4 = 2.6$ kips
 Program

Title: Upper Level

Program: PL-9,v2 SEISMIC BASE SHEAR

2001 CBC

Structural System Types

1. Bearing Wall - Light frame w/ plywood shear walls	11. Frame System - Masonry shear walls
2. Bearing Wall - Light frame w/ light shear walls	12. Frame System - Ordinary steel braced frame
3. Bearing Wall - Concrete shear walls	13. Frame System - Special steel braced frame
4. Bearing Wall - Masonry shear walls	14. Moment Frame - Special steel frame
5. Bearing Wall - Light frame w/ tension braces	15. Moment Frame - Special concrete frame
6. Bearing Wall - Steel braced frames	16. Moment Frame - Masonry frame
7. Frame System - Steel eccentric braced frame	17. Moment Frame - Ordinary steel frame
8. Frame System - Light frame w/ plywood shear walls	18. Moment Frame - Special truss steel frame
9. Frame System - Light frame w/ light shear walls	19. Cantilevered Column
10. Frame System - Concrete shear walls	System Type Number: 10

Roof Diaphragm Flexible/Rigid **F** F/RFloor Diaphragm Flexible/Rigid **R** F/R**Irregularity Types** (place an "X" next to all that apply)

	Soft Story, story stiffness < 70% of story above or < 80% of average of the three stories above.
	Mass, story mass > 150% of adjacent stories, except lighter roofs.
	Geometry, length of story resisting system > 130% of adjacent stories, except penthouses.
	Discontinuity, in-plane offset of system > length of system.
	Weak Story, story strength < 80% of story above.
	Torsional, end bay story drift > 1.2 of average story drift for both end bays, except flexible diaph.
	Re-entrant Corners, extension in each direction > 15% of plan dimension in respective direction.
	Diaphragm Discontinuity, openings > 50% or > 50% of stiffness of adjacent stories.
	Out-Of Plane, out-of-plane offset of vertical resisting elements.
	Nonparallel, vertical load frame not parallel to lateral resisting system.

Distance to nearest active fault: 7 km.

Fault Type **B** A, B or CSoil type (SD if unknown): **SD** SA, SB, SC, SD or SE (UBC Table 16-J)Occupancy category: **1** 1 - 5 (UBC Tab. 16-K, Determines Importance Factor & Dynamic Req's)Number of stories: **1**Governing Code: **1** 1 = CBC, 2 = DSA, 3 = OSHPD, 4 = BSC (State Buildings)Limitation Notes: **None****Building Mass**

Level	Mass (kips)	Height (ft)
1	408.7	18
2		
3		
4		
Total	408.7	

STATIC DESIGN BASE SHEAR METHOD

Design Base Shear (UBC 30-4) =	0.932	R =	5.5
Max. Required (UBC 30-5) =	0.250	Ca =	0.440
Min. Required (UBC 30-6) =	0.061	Cv =	0.717
Min. Required (UBC 30-7) =	0.081	T =	0.175
Use: Base Shear Factor (Strength) =	0.250	Na =	1.000
Use: Base Shear Factor (ASD) =	0.179	Nv =	1.120
Base Shear =	102.18 kips, Strength Design	I =	1.25
Base Shear =	72.98 kips, Allowable Stress Design		

Dynamic Analysis Check: Dynamic Analysis Is Not Required

Total Base Shear = **102.18** kips, Strength DesignTotal Base Shear = **72.98** kips, Allowable Stress Design**Base Shear Loads**, See following page for design shear loads

Final Loads - Strength Design				Final Loads - Allowable Stress Design			
Level	Load	Sum Load	Diaphragm Fpx	Load	Sum Load	Diaphragm Fpx	
1	102.18	102.18	140.49	72.98	72.98	100.35	kips
2	0.00	0.00	0.00	0.00	0.00	0.00	kips
3	0.00	0.00	0.00	0.00	0.00	0.00	kips
4	0.00	0.00	0.00	0.00	0.00	0.00	kips
FT	0.00			0.00			kips

Title: Lower Level

Program: PL-9,v2 SEISMIC BASE SHEAR

2001 CBC

Structural System Types

1. Bearing Wall - Light frame w/ plywood shear walls	11. Frame System - Masonry shear walls
2. Bearing Wall - Light frame w/ light shear walls	12. Frame System - Ordinary steel braced frame
3. Bearing Wall - Concrete shear walls	13. Frame System - Special steel braced frame
4. Bearing Wall - Masonry shear walls	14. Moment Frame - Special steel frame
5. Bearing Wall - Light frame w/ tension braces	15. Moment Frame - Special concrete frame
6. Bearing Wall - Steel braced frames	16. Moment Frame - Masonry frame
7. Frame System - Steel eccentric braced frame	17. Moment Frame - Ordinary steel frame
8. Frame System - Light frame w/ plywood shear walls	18. Moment Frame - Special truss steel frame
9. Frame System - Light frame w/ light shear walls	19. Cantilevered Column
10. Frame System - Concrete shear walls	System Type Number: 3

Roof Diaphragm Flexible/Rigid R F/R

Floor Diaphragm Flexible/Rigid R F/R

Irregularity Types (place an "X" next to all that apply)

	Soft Story, story stiffness < 70% of story above or < 80% of average of the three stories above.
	Mass, story mass > 150% of adjacent stories, except lighter roofs.
	Geometry, length of story resisting system > 130% of adjacent stories, except penthouses.
	Discontinuity, in-plane offset of system > length of system.
	Weak Story, story strength < 80% of story above.
	Torsional, end bay story drift > 1.2 of average story drift for both end bays, except flexible diaph.
	Re-entrant Corners, extension in each direction > 15% of plan dimension in respective direction.
	Diaphragm Discontinuity, openings > 50% or > 50% of stiffness of adjacent stories.
	Out-Of Plane, out-of-plane offset of vertical resisting elements.
	Nonparallel, vertical load frame not parallel to lateral resisting system.

Distance to nearest active fault: 7 km.

Fault Type B A, B or C

Soil type (SD if unknown): SD SA, SB, SC, SD or SE (UBC Table 16-J)

Occupancy category: 1 1 - 5 (UBC Tab. 16-K, Determines Importance Factor & Dynamic Req's)

Number of stories: 1

Governing Code: 1 1 = CBC, 2 = DSA, 3 = OSHPD, 4 = BSC (State Buildings)

Limitation Notes: None

Building Mass

Level	Mass (kips)	Height (ft)
1	1498	12
2		
3		
4		
Total	1498	

STATIC DESIGN BASE SHEAR METHOD

Design Base Shear (UBC 30-4) =	1.544	R =	4.5
Max. Required (UBC 30-5) =	0.306	Ca =	0.440
Min. Required (UBC 30-6) =	0.061	Cv =	0.717
Min. Required (UBC 30-7) =	0.100	T =	0.129
Use: Base Shear Factor (Strength) =	0.306	Na =	1.000
Use: Base Shear Factor (ASD) =	0.218	Nv =	1.120
Base Shear =	457.72 kips, Strength Design	I =	1.25
Base Shear =	326.94 kips, Allowable Stress Design		

Dynamic Analysis Check: Dynamic Analysis Is Not Required

Total Base Shear = 457.72 kips, Strength Design

Total Base Shear = 326.94 kips, Allowable Stress Design

Base Shear Loads, See following page for design shear loads

Final Loads - Strength Design				Final Loads - Allowable Stress Design			
Level	Load	Sum Load	Diaphragm Fpx	Load	Sum Load	Diaphragm Fpx	
1	457.72	457.72	457.72	326.94	326.94	326.94	kips
2	0.00	0.00	0.00	0.00	0.00	0.00	kips
3	0.00	0.00	0.00	0.00	0.00	0.00	kips
4	0.00	0.00	0.00	0.00	0.00	0.00	kips
FT	0.00			0.00			kips

Program: PC-03 CONCRETE SHEAR WALLDesignation: **SW1.2.1 Existing**

1998 CBC

Input Data:

Wall Length **7** ft.
 Wall Thickness **6** in.
 Unsupported Height **12** ft.

Horizontal Bars **4** (3-9)
 Spacing **12** in.
 Vertical Bars **4** (3-9)
 Spacing **12** in.
 Single or Double Curtain **S** S/D

Left End Bar Size **8** (3-9)
 Number of Bars **2**
 Right End Bar Size **8** (3-9)
 Number of Bars **2**
 Distance From End **4** in.
 Boundary Tie Bars (3-6) if required.

Concrete Strength, f_c **3** ksi
 Reinforcing Yield, F_y **40** ksi

Vertical Loads, kips: (Special = assembly, > 100 psf or garage)

Distance measured from left end of wall, ft.

Load No. Dead, kips Live, kips Distance Special (Y/N)

1	6.3		3.5	
2				
3				
4				
5				

Lateral Loads

Load No. Force, kips Height, ft.

1	18.25	12
2	3.1	6
3		
4		
5		
6		

Note: Program does not calculate wall self weight!

Code Minimum Checks:

Minimum Wall Vertical Reinforcing Ratio: 0.0025 Actual: 0.0028 OK
 Minimum Wall Horizontal Reinforcing Ratio: 0.0025 Actual: 0.0028 OK
 Maximum Vertical Reinforcing Spacing: 18 Actual: 12 OK
 Maximum Horizontal Reinforcing Spacing: 18 Actual: 12 OK
 Double Curtain Reinforcing Check: Single Reinforcing Curtain Allowed
 Hooked Shear Reinforcing Check: Hooked Shear Reinforcing IS Required
 Maximum Axial Load Check: OK

Shear Check:

VU = 29.9 kips ΦV_N = 72.3 kips OK

Bending Check:

MU left = 332.6 ft-kips ΦMN = 365.3 ft-kips OK
 MU right = 332.6 ft-kips ΦMN = 365.3 ft-kips OK

Boundary Member Check:

Boundary Member Required: YES
 Minimum Boundary Member Length = 12.6 in.
 Minimum Boundary Member Thickness = 9.0 in.
 Minimum Boundary Member Steel = 0.6 sq.in. Minimum Number Of Bars = 4
 Actual Boundary Member Steel = 1.6 sq.in. Supplied Number Of Bars = 2
 Maximum Tie Spacing = 0.0 in.
 Length/Width Ratio Of Hoop Ties Shall Not Exceed 3
 Cross Ties Or Hoops Shall Be Spaced 12 in. o.c. Maximum
 Alternate Vertical Bars Shall Be Confined By Cross Tie Or Hoop Corner
 Ties At Vertical Bar Splices Shall Be Spaced At 4 in. o.c. Maximum
 Horizontal Wall Reinforcing Shall Be Hooked At Boundary Edge
 Lap Splices Of Horizontal Reinforcing Not Allowed In Boundary Members

Program: PC-03 CONCRETE SHEAR WALLDesignation: **SWF.2.1**

1998 CBC

Input Data:

Wall Length **16** ft.
 Wall Thickness **6** in.
 Unsupported Height **12** ft.

Horizontal Bars **4** (3-9)
 Spacing **12** in.
 Vertical Bars **4** (3-9)
 Spacing **12** in.
 Single or Double Curtain **S** S/D

Left End Bar Size **8** (3-9)
 Number of Bars **2**
 Right End Bar Size **8** (3-9)
 Number of Bars **2**
 Distance From End **4** in.
 Boundary Tie Bars **(3-6) if required.**

Concrete Strength, f'_c **3** ksi
 Reinforcing Yield, F_y **40** ksi

Vertical Loads, kips: (Special = assembly, > 100 psf or garage)

Distance measured from left end of wall, ft.

Load No. Dead, kips Live, kips Distance Special (Y/N)

1	14.4		8	
2				
3				
4				
5				

Lateral Loads

Load No. Force, kips Height, ft.

1	20.5	12
2	2.6	6
3		
4		
5		
6		

Note: Program does not calculate wall self weight!

Code Minimum Checks:

Minimum Wall Vertical Reinforcing Ratio: 0.0012 Actual: 0.0028 OK
 Minimum Wall Horizontal Reinforcing Ratio: 0.0020 Actual: 0.0028 OK
 Maximum Vertical Reinforcing Spacing: 18 Actual: 12 OK
 Maximum Horizontal Reinforcing Spacing: 18 Actual: 12 OK
 Double Curtain Reinforcing Check: Single Reinforcing Curtain Allowed
 Hooked Shear Reinforcing Check: Hooked Shear Reinforcing Not Required
 Maximum Axial Load Check: OK

Shear Check:

VU = 32.3 kips ΦV_N = 152.3 kips OK

Bending Check:

MU left = 366.2 ft-kips ΦM_N = 871.5 ft-kips OK
 MU right = 366.2 ft-kips ΦM_N = 871.5 ft-kips OK

Boundary Member Check:

Boundary Member Required: NO

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Program: PC-03 CONCRETE SHEAR WALLDesignation: **SW1.2.1**

1998 CBC

Input Data:

Wall Length **19.5** ft.
 Wall Thickness **6** in.
 Unsupported Height **12** ft.

Horizontal Bars **4** (3-9)
 Spacing **12** in.
 Vertical Bars **4** (3-9)
 Spacing **12** in.
 Single or Double Curtain **S** S/D

Left End Bar Size **8** (3-9)
 Number of Bars **2**
 Right End Bar Size **8** (3-9)
 Number of Bars **2**
 Distance From End **4** in.
 Boundary Tie Bars **(3-6) if required.**

Concrete Strength, f_c **3** ksi
 Reinforcing Yield, F_y **40** ksi

Vertical Loads, kips: (Special = assembly, > 100 psf or garage)

Distance measured from left end of wall, ft.

Load No. Dead, kips Live, kips Distance Special (Y/N)

1	17.6		9.75	
2				
3				
4				
5				

Lateral Loads

Load No. Force, kips Height, ft.

1	18.25	12
2	3.1	6
3		
4		
5		
6		

Note: Program does not calculate wall self weight!

Code Minimum Checks:

Minimum Wall Vertical Reinforcing Ratio: 0.0012 Actual: 0.0028 OK
 Minimum Wall Horizontal Reinforcing Ratio: 0.0020 Actual: 0.0028 OK
 Maximum Vertical Reinforcing Spacing: 18 Actual: 12 OK
 Maximum Horizontal Reinforcing Spacing: 18 Actual: 12 OK
 Double Curtain Reinforcing Check: Single Reinforcing Curtain Allowed
 Hooked Shear Reinforcing Check: Hooked Shear Reinforcing Not Required
 Maximum Axial Load Check: OK

Shear Check:

VU = 29.9 kips ΦV_N = 185.6 kips OK

Bending Check:

MU left = 332.6 ft-kips ΦM_N = 1068.4 ft-kips OK
 MU right = 332.6 ft-kips ΦM_N = 1068.4 ft-kips OK

Boundary Member Check:

Boundary Member Required: NO

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