SEISMIC DESIGN CHECK AND DETAIL SKETCHS FOR YONG' HUMB PROJECT

PREPARED BY

X. S. VINCENT WANG P. ENG

APOC ENGINEERING LTD.

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1. BUILDING WEIGHT CALCULATION

WALL:

2×6 @ 16" STUD WALL - PLYWOOD —— 12 PSF

2×4 @ 16" STUD WALL - PLYWOOD —— 11 PSF

ROOFING:

SHINGLE - 2.5 PSF

SHEATHING 1/2" PLYWOOD —— 1.5 PSF

ROOF TRUSS —— 10 PSF (ASSUMED)

CEILING GYPSUM BOARD 2.75 PSF

FLOOR 2×10 FLOOR JOIST FRAMING — 2.9 PSF

SHEATH 5/8" PLYWOOD —— 1.8 PSF

CEILING 5/8" GYPSUM BOARD 2.75 PSF

PARTITION WALL 2×4 STUD - GYPSUM BOARD — 11 PSF

ROOF DEAD LOAD

TOTAL PROJECT AREA = 62' × 30.3' = 1878.6 SQ FT

$W_{roof} = 31.47$ KIPS

SECOND FLOOR WEIGHT

$W_{second} = W_{EXTERIOR} + W_{INTERIOR} + W_{FLOOR}$

$= 9$ kips $+ 18.96$ kips $+ 14.56$ kips

MAIN FLOOR WEIGHT

$W_{MAIN} = W_{EXTERIOR} + W_{INTERIOR} + W_{FLOOR}$

$= 18.96 + 13.99 + 14.56$ (kips)

BASEMENT FLOOR

$W_B = W_{EXTERIOR} + W_{INTERIOR}$

$= 10.41 + 13.99 (KIPS)$

$W_{BUILDING} = \sum_{i=1}^{N} W_i = W_{ROOF} + W_{second} + W_{main} + W_{Base}$

$= 146.3 KIPS$

2. LIVE LOAD (UDL) (CONCENTRATED LOAD)

FLOOR LIVE LOAD	1.9 KPA	4.5 KN
Roof LIVE LOAD	1.0 KPA	1.3 KN

3. SNOW = 2.6 KPA

S_s = 56 PSF (2.6KPA), S_r = 4.8 PSF (0.2KPA)

4. WIND : Q_{50} = 9.8 PSF (0.47 KPa) $\Rightarrow$ 0.47 × 2.5 = 1.18 KPa

5. SEISMIC DATA $S_a(0.2) = 0.9$ $I_E = 1.0$

$R_d = 3.0$. $R_o = 1.7$

6. LOAD COMBINATION

CHECKING 1.0 DEAD + 1.0 EARTH QUAKE

NOTE: SEISMIC DESIGN TO PART 4

GENERAL CONSTRUCTION TO PART 9.23

7. SEISMIC CACCULATION TO PART 4 NCBC2012

SEISMIC WEIGHT.

$W = 0.2 \times W_{snow} + \text{BUILDING WEIGHT}$

$= 113.32 + 650 = 763\ KN$

Assumed THAT SITE CLASS D

$H = 7m \Rightarrow$ FOUNDAMENTAL PERIOD OF BUILDING

$T = 0.05 (H_n)^{3/4} = 0.22\ S$.

WITH $S_{a(0.2)} = 0.97$; $F_a = 1.1$

$T \leq 0.2S \Rightarrow 1.1 \times 0.97 = 1.067$

$T = 0.5\ S \Rightarrow (1.2 \times 0.65,\ 1.1 \times 0.97) = 0.78$ (MIN)

$\Rightarrow T = 0.22 \quad (S(T)) = 1. \quad : M = 1 \quad I = 1$

$$V_{BASE\ SHEAR} = \frac{I M \cdot W}{R_o R_d} \approx 115\ KN$$

SINCE $T_a < 0.7S \Rightarrow F_t = 0$

8. SEISMIC WEIGHT AT EACH LEVEL

BASEMENT : 193KN (WITH ASSUMPTION of ROOFING W)

MAIN FLOOR : 200 KN

SECOND FLOOR : 200KN

$$\sum_{i=1}^{n} W_i H_i = 2553.0\ KN.m$$

9. ESTIMATED LATERAL INERTIAL FORCE

$$F_i = \frac{W_i H}{\sum W_i H_i} \cdot V_B \Rightarrow$$

$F_{BASEMENT} = 17.64\ KN$

$F_{MAIN\ FLOOR} = 49.93\ KN$

$F_{SECOND\ FLOOR} = 82.04\ KN$

10. THE HOUSE IS A REGULAR BUILDING

THE INERTIAL FORCE SHOULD BE DISTRIBUTED BY TRIBUTARY AREA OF EACH FLOOR PLAN

NOTE: BASED ON SHEAR WALL RESISTANCE IN WOOD DESIGN MANUAL (CHAPTER 4. SHEAR WALLS AND DIAPHRAGMS)

11 BEAM SELECTION AT GARAGE DOOR AREA

THE BEAM WILL TAKE LOAD OF WALL WEIGHT AND ROOF LOAD AND SNOW (LOAD TRANSFOR)

SO SIMPLIFY THE LOAD CALCULATION, ESTIMATE

$UDL = 1.58\ KN/m \times 2 = 3.16\ KN/m$ (CONSERVATIVE)

$M = ql^2/8 = 11.83$; $V = 3.16 \times 18 \times 0.30/2 = 8.64\ KN$

REQ. $STIFF = EI_S = 180\ 5WL^3/384 = 1206.187 \Rightarrow$ CHOOSE 133x241 SCL ✓

EQUIVALENT STATIC FORCE MOTHED FOR SEISMIC ANALYSIS

Please use this sheet with BCBC2006

Created By : Xiaosong Wang P.Eng.

A: ANALYTICAL ASSUMPTIONS

1. linear and time invariant system
2. 100% elastic response
3. structural damping ratio: 5%

B: SITE PROPERTIES

		COMMENTS
probability index	2.00%	
years of exceedance	50	
SITE CLASS :	D	as per table BCBC-4.1.8.
reference spectral Sa(0.2):	1.1	
refernece spectral Sa(0.5):	0.78	
reference spectral Sa(1.0):	0.33	
reference spectural Sa(2.0):	0.17	
reference spectral PGA:	0.53	
Fa:	1.06	as per table 4.1.8.4.B
Fv:	1.17	as per table 4.1.8.4.C
I_E:	1.00	as per table 4.1.8.5.

C: STRUCTURAL CONFIGURATION

structural type	SHEAR STUD WALL	
structural regularity	regular	as per table 4.1.8.6
building height (m)	7	
Ta(s)	0.215175854	

D: CRITERIA OF USING THE STATIC METHOD

I_E*Fa*Sa(0.2)	1.166	
Is the static method valid for structure?	Yes	as per 4.1.8.7.

E: LOAD DIRECTION

Two orthogonal axe independently?	yes
100% plus 30% orthogonally	no

F: Seismic Effect Reduction Factors

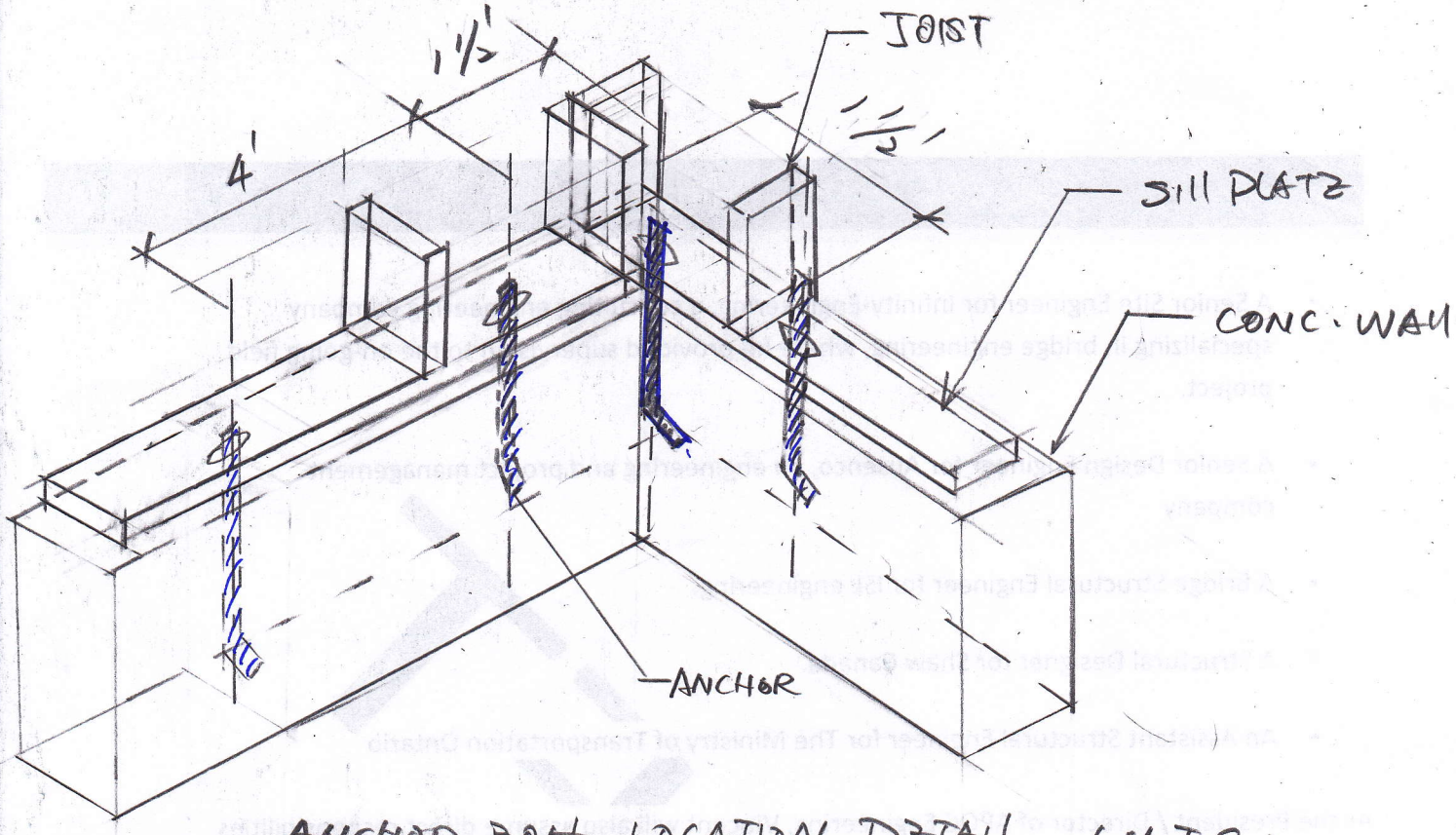
TYPE OF SFRS	shear wall	
R_d	3	as per table 4.1.8.9.
R_o	1.7	as per table 4.1.8.9.
I_E*Fa*Sa(0.2)	1.166	
I_E*Fv*Sa(1.0)	0.3861	
Restrictions (m)	< 15	as per table 4.1.8.9.

G: CALCULATED DESIGN SPECTRAL

a:Fa*Sa(0.2) for <=0.2s	1.166	as per table 4.1.8.9.
b: Fv*Sa(0.5) for <=0.5s	0.9126	as per table 4.1.8.9.
Fv*Sa(1.0) for <=1.0s	0.3861	as per table 4.1.8.9.
Fv*Sa(2.0) for <=2.0s	0.1989	as per table 4.1.8.9.
Fv*Sa(2.0) /2 for >=4.0s	0.09945	as per table 4.1.8.9.

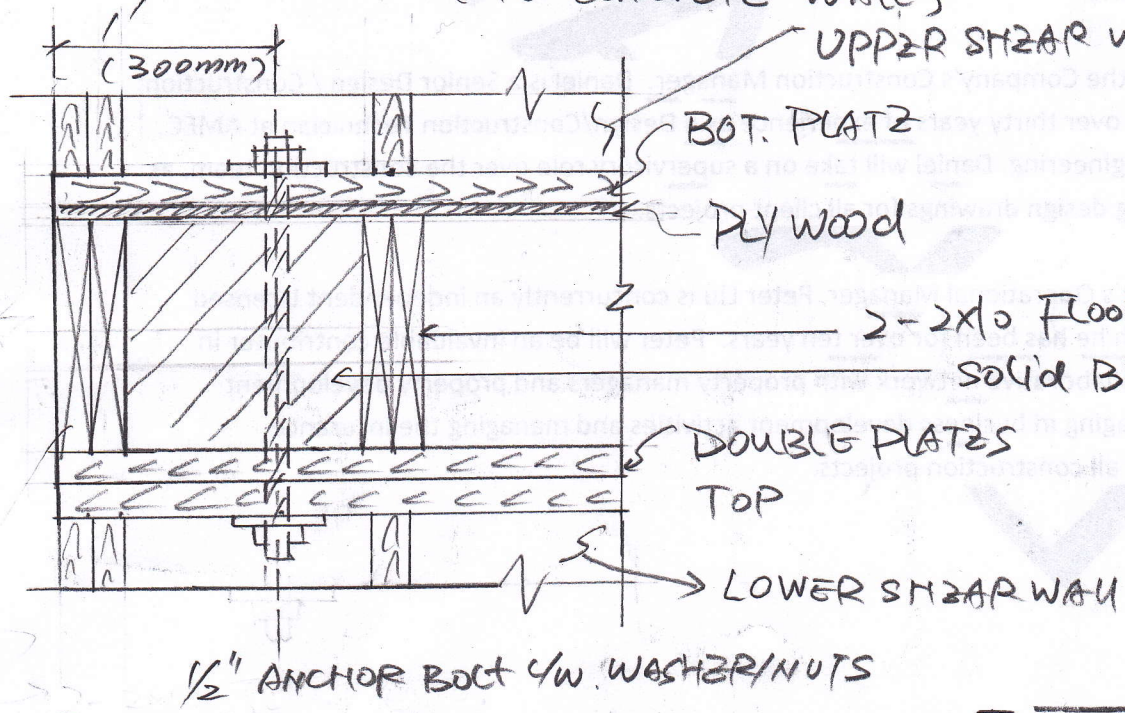
H: SEISMIC EFFECT CALCULATION

S(T<0.2S)	FALSE	
S(0.2S<T<=0.5S)	0	
S(0.5S<T<S=1.0S)	0	
S(1.0S<T<=2.0S)	0	
S(2.0S<T<=4.0S)	0	
S(T>4.0S)	0	
S(Ta)	1	
design spectral ratio	5.862242333	
M_v	1	as per table 4.1.8.11.
J	1	as per table 4.1.8.11.
W	763	seismic weight shall be c
V1(KN)	149.6078431	as per 4.1.8.11.
SFRS LOWER BOUNDRY	29.757	
SFRS UPPER BOUNDRY	116.2951634	
BASE SHEAR V(KN)	116.2951634	as per 4.1.8.11.
F_t	0	
W_x	58	level weight shall be cal
h_x	3.5	level height shall be cal
$\sum (W_i*H_i)$	203	total weighted seismic v
F_x (KN)	116.2951634	
J_x	1	
$\sum F_i*(h_i-h_x)$	814.0661438	overturn moment befor
OVERTURN M_x (KN*M)	814.0661438	overturn moment
torsional effect from eccntricity T_x	n/a	torsional effect will be d

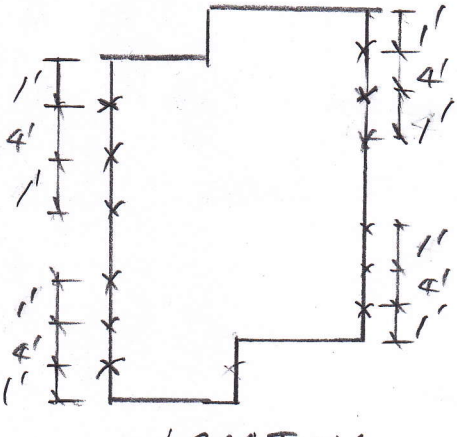


ANCHOR BOLT LOCATION DETAIL (N.T.S)

(TO CONCRETE WALL)

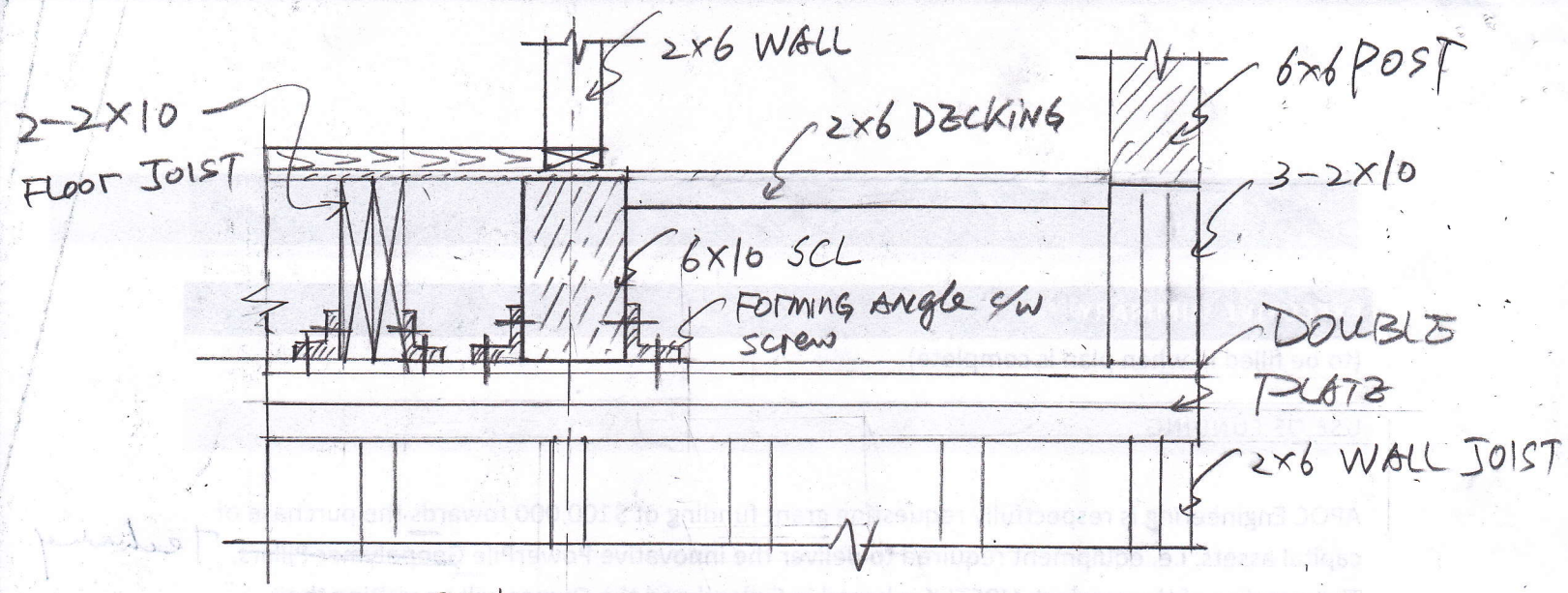


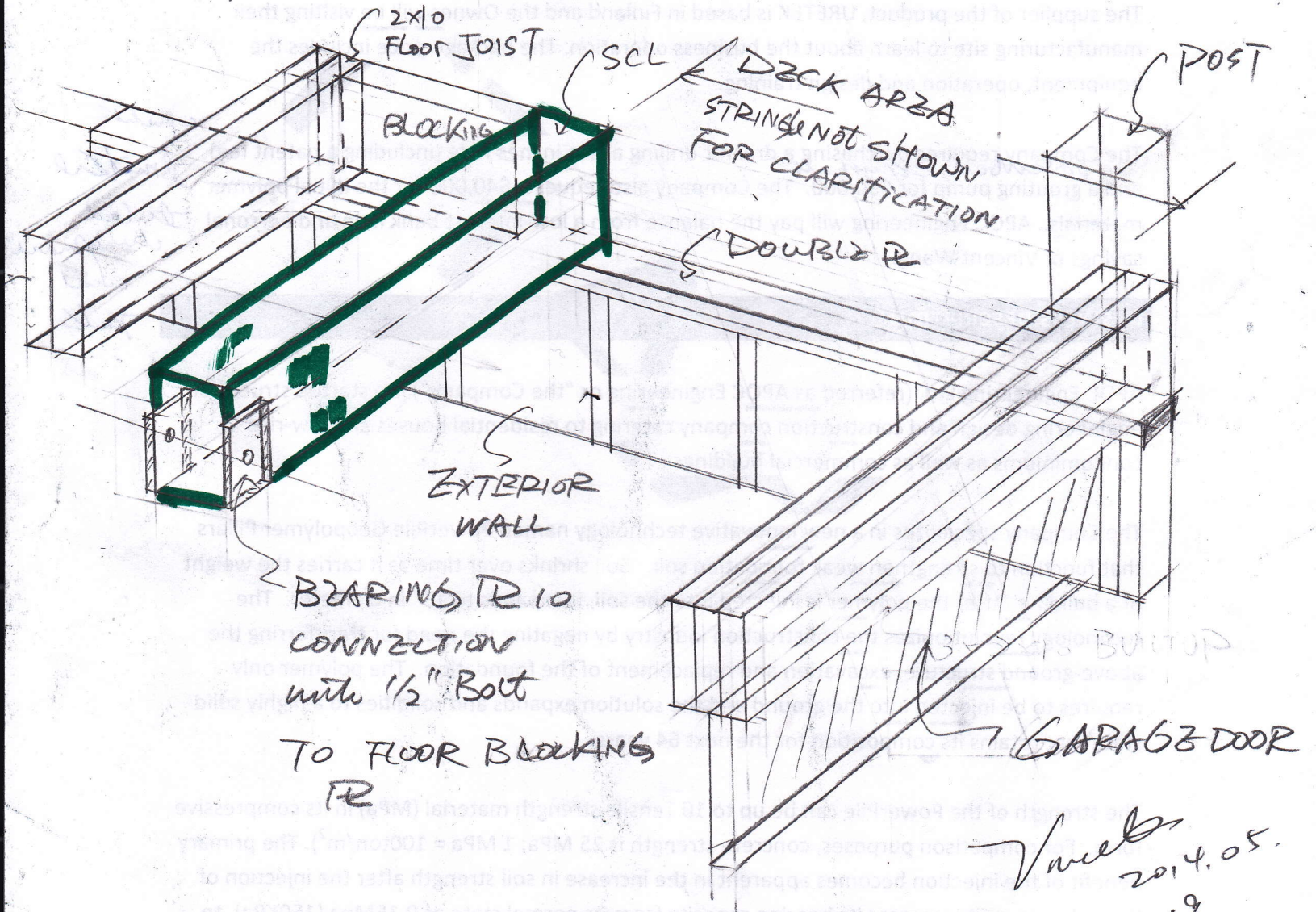
SHEAR WALL CONNECTION DETAIL



LOCATION

2014.05-18





2014.05.19

GARAGE DOOR AREA SKETCHS