

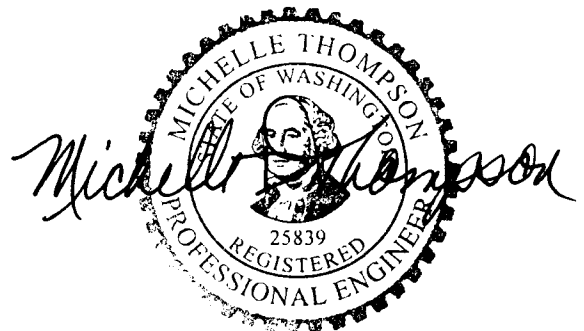
MDT ENGINEERING

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Structural Calculations
For Mawer/Baze-Inoguchi
2723 72nd Ave. SE
Mercer Island, WA 98040

June 25, 2020

REVISED 8/26/20



Building Official: Please accept this engineering packet only for the site noted above.

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Scope of Work

MDT Engineering was asked to provide the structural design for the new structure. Following are the calculations provided:

1. Lateral Analysis
2. Vertical Analysis
3. Foundation Design
4. Structural Notes and Details

We have provided the designer with a digital copy of the structural calculations and detail sheets for your use in obtaining a building permit for the referenced project. The scope of this project is for the design phase only. If additional site inspections are required by the Building Dept., these will be performed at an additional hourly fee of \$125.00 per hour. Also, revisions to the original design by the owner or required by the building department will be billed at an additional hourly fee of \$125.00 per hour. Questions about the attached information should be addressed to MDT Engineering.

Michelle D. Thompson, PE
MDT Engineering, Inc.

STRUCTURAL NOTES

CODES AND SPECIFICATIONS

1. INTERNATIONAL BUILDING CODE, 2015 EDITION, ASCE 7-10
2. INTERNATIONAL RESIDENTIAL CODE, 2015 EDITION
3. SIMPSON STRONG TIE WOOD CONSTRUCTION CONNECTORS 2015-2016
4. FASTENERS IN CONTACT WITH PRESSURE TREATED WOOD MUST BE STAINLESS STEEL, ZMAX(G185HDG PER ASTM A653), BATCH/POST HOT-DIP GALVANIZED (PER ASTM B695, CLASS 55 OR GREATER). UNCOATED AND PAINTED PRODUCTS SHOULD NOT BE USED WITH TREATED WOOD. WHEN USING STAINLESS STEEL HOT-DIP GALVANIZED CONNECTORS, THE CONNECTORS AND FASTENERS SHOULD BE MADE OF THE SAME MATERIAL.

DESIGN CRITERIA

1. WIND LOAD: INTERNATIONAL BUILDING CODE, 2015, ASCE 7-10, ALTERNATE ALL-HEIGHTS METHOD, ULTIMATE DESIGN WIND SPEED = 110 MPH, NOMINAL DESIGN WIND SPEED = 85 MPH, EXPOSURE B, $K_{zt} = 1.9$
2. SEISMIC: INTERNATIONAL BUILDING CODE, 2015, ASCE 7-10
RISK CATEGORY II
SEISMIC IMPORTANCE FACTOR, $I_e=1.0$
MAPPED SPECTRAL RESPONSE ACCELERATION PARAMETERS, $S_s=1.5$, $S_1=0.5$
SITE CLASS D
DESIGN SPECTRAL RESPONSE ACCELERATION PARAMETERS, $S_{ds}=1.0g$, $S_{d1}=0.5g$
SEISMIC DESIGN CATEGORY D2
BASIC SEISMIC FORCE-RESISTING SYSTEM: LIGHT FRAME WALLS WITH WOOD SHEAR WALLS
DESIGN BASE SHEAR, $V = F(S_{ds})(W) / R = 0.1846(W)$
RESPONSE MODIFICATION COEFFICIENT, $R=6.5$
ANALYSIS PROCEDURE USED: SIMPLIFIED ALTERNATIVE STRUCTURAL DESIGN FOR SIMPLE BEARING WALL SYSTEMS
3. ROOF LOAD: DL = 15 PSF LL = 25 PSF (ROOF SNOW LOAD)
4. FLOOR LOAD: DL = 10 PSF LL = 40 PSF
5. DECK LOAD: DL = 10 PSF LL = 60 PSF
6. SOILS: ASSUMED 1500 PSF ALLOWABLE SOIL BEARING
ASSUMED 35 PCF ACTIVE SOIL PRESSURE, 350 PCF PASSIVE PRESSURE, 0.35 COEFFICIENT OF FRICTION
ALL FOOTINGS AND SLABS SHALL BEAR ON UNDISTURBED SOIL OR FILL COMPACTED TO 95% MODIFIED PROCTOR.
7. CONCRETE: 3000 PSI @ 28 DAYS (2500 PSI USED FOR DESIGN)
GRADE 40 REINFORCEMENT
MINIMUM 3" COVER FOR ALL REINFORCEMENT EXCEPT AS NOTED AT RETAINING WALLS OR OTHER DETAILS

TIMBER CONSTRUCTION NOTES

1. LUMBER GRADES AND ALLOWABLE STRESSES SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE ON PLAN:
ALL SAWN LUMBER HF#2 OR BETTER,
Fb = 875 PSI, Fv = 75 PSI, E = 1,300,000
GLULAM BEAMS 24F-V4, Fb = 2400 PSI, Fv = 165 PSI, E = 1,800,000
MICROLAM, LVL Fb = 2600 PSI, Fv = 285 PSI, E = 1,900,000
PARALLAMS, PSL Fb = 2600 PSI, Fv = 290 PSI, E = 2,000,000
2. WHEN TOP PLATE IS INTERRUPTED BY HEADER, HEADER SHALL HAVE STRAP CONNECTORS TO THE TOP PLATE EACH END, USE 2-SIMPSON MSTA24 CONNECTORS, UNLESS NOTED OTHERWISE.
3. ALL SHEAR WALL SHEATHING NAILS AND ANCHORS SHALL BE AS DETAILED ON THE DRAWINGS AND AS NOTED IN THE SHEAR WALL SCHEDULE.
4. FLOOR SHEATHING SHALL BE ¾" MINIMUM APA RATED FLOOR SHEATHING WITH 10d COMMON @ 6" OC AT ALL SUPPORTED PANEL EDGES AND 10d @ 12" OC AT INTERMEDIATE SUPPORTS.
5. ROOF SHEATHING SHALL BE 7/16" MINIMUM APA RATED ROOF SHEATHING WITH 8d COMMON @ 6" OC AT ALL SUPPORTED PANEL EDGES AND 8d @ 12" OC AT INTERMEDIATE SUPPORTS.

GENERAL CONSTRUCTION NOTES

1. CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD. ANY VARIATIONS FROM THE DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE DESIGNER OR THE ENGINEER.
2. ADEQUATE SHORING AND BRACING OF ALL STRUCTURAL MEMBERS DURING CONSTRUCTION SHALL BE PROVIDED. ANY PROPOSED FIELD CHANGES MUST HAVE THE APPROVAL OF THE ENGINEER PRIOR TO CONSTRUCTION.

SHEAR WALL SCHEDULE

MARK	SHEATHING (NOTE 5)	FASTENER SPACING (COMMON OR GALVANIZED BOX)	BOTTOM PLATE NAILING OR ANCHOR BOLTS	FRAMING ANCHORS (NOTES 7 & 8)	ALLOWABLE SHEAR	NOTES
1A	7/16" MIN. APA RATED SHEATHING OR APA RATED SIDING 303 ONE SIDE	8d @ 6"OC	16d @ 8" OC OR ½" A.B. @ 5'-6"OC	RBC @ 32"OC LTP4 @ 48"OC A35 @ 48"OC	130 PLF	1, 2, 3, 11
1	7/16" MIN. APA RATED SHEATHING OR APA RATED SIDING 303 ONE SIDE	8d @ 6"OC	16d @ 6" OC OR ½" A.B. @ 3'-2"OC OR 5/8" A.B. @ 5'-0" OC	RBC @ 18"OC LTP4 @ 30"OC A35 @ 30"OC	242 PLF	1, 2, 3, 11
2	7/16" MIN. APA RATED SHEATHING OR APA RATED SIDING 303 ONE SIDE	8d @ 4"OC	16d @ 4" OC OR ½" A.B. @ 2'-2"OC OR 5/8" A.B. @ 3'-4" OC	RBC @ 12"OC LTP4 @ 18"OC A35 @ 18"OC	353 PLF	1, 2, 3, 11
3	7/16" MIN. APA RATED SHEATHING OR APA RATED SIDING 303 ONE SIDE	8d @ 3"OC	¼" X 5" LAG SCREW @ 8"OC OR ½" A.B. @ 1'-8"OC OR 5/8" A.B. @ 2'-8" OC	RBC @ 10"OC LTP4 @ 15"OC A35 @ 15"OC	456 PLF	1, 2, 3, 4, 9, 10, 11
4	7/16" MIN. APA RATED SHEATHING OR APA RATED SIDING 303 ONE SIDE	10d @ 3"OC	¼" X 5" LAG SCREW @ 6"OC OR ½" A.B. @ 1'-4"OC OR 5/8" A.B. @ 2'-0" OC	RBC @ 8"OC LTP4 @ 12"OC A35 @ 12"OC	558 PLF	1, 2, 3, 4, 9, 10, 11
5	7/16" MIN. APA RATED SHEATHING OR APA RATED SIDING 303 ONE SIDE	10d @ 2"OC	¼" X 5" LAG SCREW @ 5"OC OR ½" A.B. @ 1'-0"OC OR 5/8" A.B. @ 1'-8"OC	RBC @ 6"OC LTP4 @ 10"OC A35 @ 10"OC	716 PLF	1, 2, 3, 4, 9, 10, 11
6	19/32" MIN. APA RATED SHEATHING BOTH SIDES	10d @ 2"OC	¼" X 5" LAG SCREW @ 2"OC OR 3/4" A.B. @ 1'-0" OC	LTP4 @ 6"OC A35 @ 6"OC	1618 PLF	1, 2, 3, 4, 6, 9, 10, 11

1. ALL FASTENERS SHALL MEET THE FOLLOWING CRITERIA: 8d COMMON = 0.131" DIAMETER X 2 ½", 8d GALVANIZED BOX = 0.113 DIAMETER X 2 ½"
10d COMMON = 0.148" DIAMETER X 3", 10d GALVANIZED BOX = 0.128" DIAMETER X 3", 16d COMMON = 0.162" X 3 ½".

2. PANEL EDGES SHALL BE BACKED WITH 2" NOMINAL OR WIDER FRAMING. SPACE FASTENERS @ 12"OC ON INTERMEDIATE SUPPORTS.

3. PROVIDE ALL ANCHOR BOLTS WITH 3" X 3" X ¾" PLATE WASHERS. LOCATE WITHIN ½" OF SHEATHING.

4. AT GARAGE JAMBS, REFER TO LATERAL RESTRAINT PANEL DETAIL 401/51.

5. PROVIDE 7/16" APA RATED SHEATHING (PLYWOOD OR OSB) OR APA RATED SIDING 303 OR INNER SEAL OSB RATED PANEL SIDING ON ALL EXTERIOR WALLS DESIGNATED AS SHEAR WALLS.

6. WHERE PANELS ARE APPLIED ON BOTH SIDES OF A WALL AND NAIL SPACING IS LESS THAN 6" OC ON EITHER SIDE, PANEL JOINTS SHALL BE OFFSET TO FALL ON DIFFERENT FRAMING MEMBERS OR FRAMING SHALL BE 3" NOMINAL OR THICKER AND NAILS ON EACH SIDE SHALL BE STAGGERED.

7. REFER TO TYPICAL SHEAR WALL DETAILS ON STRUCTURAL DETAIL SHEET FOR LOCATION OF FRAMING ANCHORS.

8. AT UPPER FLOOR INTERIOR SHEAR WALLS, REFER TO DETAIL 303/52 OR 304/52.

9. AT SHEAR WALL TYPES 3, 4, 5 AND 6, ALL FRAMING MEMBERS RECEIVING EDGE NAILING FROM ABUTTING PANELS SHALL NOT BE LESS THAN A SINGLE 3X MEMBER. FOR EXAMPLE, PROVIDE A 3X STUD AT VERTICAL JOINTS IN THE SHEATHING.

10. AT SHEAR WALL TYPES 3, 4, 5 AND 6, FOUNDATION SILL PLATES AND BOTTOM PLATES OF SHEAR WALLS, SHALL NOT BE LESS THAN A SINGLE 3X MEMBER. ALSO PROVIDE A 3X MINIMUM WIDTH MEMBER BELOW SHEAR WALL TO RECEIVE LAG SCREWS SUCH AS A 3X RIM JOIST, 3X JOIST OR BEAM OR BLOCKING BELOW SHEAR WALL.

11. FASTENERS AT PRESSURE PRESERVATIVE AND FIRE RETARDANT TREATED WOOD SHALL BE STAINLESS STEEL, G185 HDG, BATCH/POST HOT-DIP GALVANIZED OR MECHANICALLY GALVANIZED.

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Lateral Analysis

Wind Design: Per 2015 IBC and ASCE 7-10

Alternate all-heights method

Wind Speed, $V_{ult}=110$ MPH, $V_{asd}=85$ MPH

Exposure B

$P_{net} = 0.00256(V)(K_z)(C_{net})(K_{zt})$ or 16 PSF Minimum

$$K_{zt} = 1.9$$

$$P = 1.9(16 \text{ PSF}) = 30.4 \text{ PSF}$$

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Lateral Analysis

Seismic Design: Per 2015 IBC and ASCE 7-10, Sect. 12.14

Simplified Alternative Structural Design Criteria for Simple Bearing Wall Systems

Risk Category II

Site Class D

Seismic Importance Factor, I = 1.0

$$F_a = 1.0 \quad S_s = 1.5$$

$$F_v = 1.5 \quad S_1 = 0.5 \quad S_{m1} = F_v \times S_1 = 1.5 \times 0.5 = 0.75g$$

$$S_{ds} = \frac{2}{3} \times F_a \times S_s = \frac{2}{3} \times 1.0 \times 1.5 = 1.0g$$

$$S_{d1} = \frac{2}{3} \times S_{m1} = \frac{2}{3} \times 0.75 = 0.5g$$

From Table 11.6-1, Seismic Design Category D

$$V = (F \times S_{ds} \times W) / R$$

W = Dead Load

R = Response Modification Factor

R = 6.5 for light frame walls with wood shear walls

F = 1.0 for 1 story

F = 1.1 for 2 story

F = 1.2 for 3 story

$$V = (1.2 \times 1.0 \times W) / 6.5 = 0.1846 \times W$$

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Compare Wind and Seismic Base Shear

Wind: Use maximum wind load of ^{30.4}~~14~~ PSF in all directions.

$$V_{wind} = (36) (\overset{30.4}{\del{14}} \text{ PSF}) = \del{576} \text{ PLF} \\ 1094 \text{ PLF}$$

Seismic:

$$V_{eq} = 1.2 (1.0) (W) / 6.5$$

$$= 0.1846W$$

$$W = \text{Roof: } 45.33(15) = 680$$

$$\text{Walls: } 2(2)(10) = 140$$

$$\text{Floor: } \del{45.33}(10) = 453$$

$$\text{Walls: } 2(9.5)(10) = 192$$

$$\text{Floor: } 45.33(10) = 453$$

$$\text{Walls: } 2(9)(10) = \underline{180}$$

$$V_{eq} = 0.1846 (2118) = 391 \text{ PLF} / 1.4 = 279 \text{ PLF}$$

$$2118 \text{ PLF}$$

Redundancy Check: Max. increase = 1.3

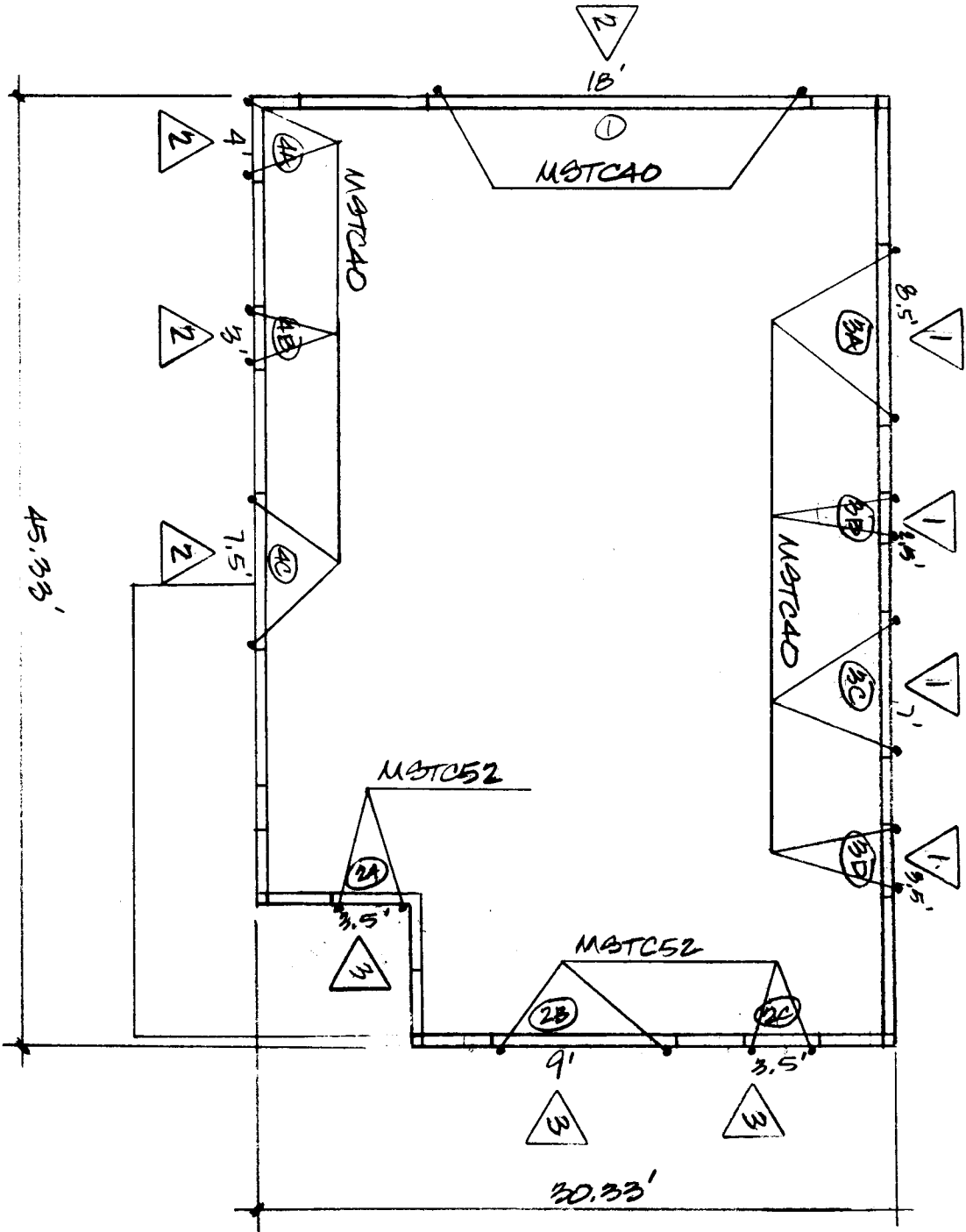
$$V_{eqmax} = 1.3 (279) = 363 \text{ PLF}$$

$$V_{wind} > V_{eq}$$

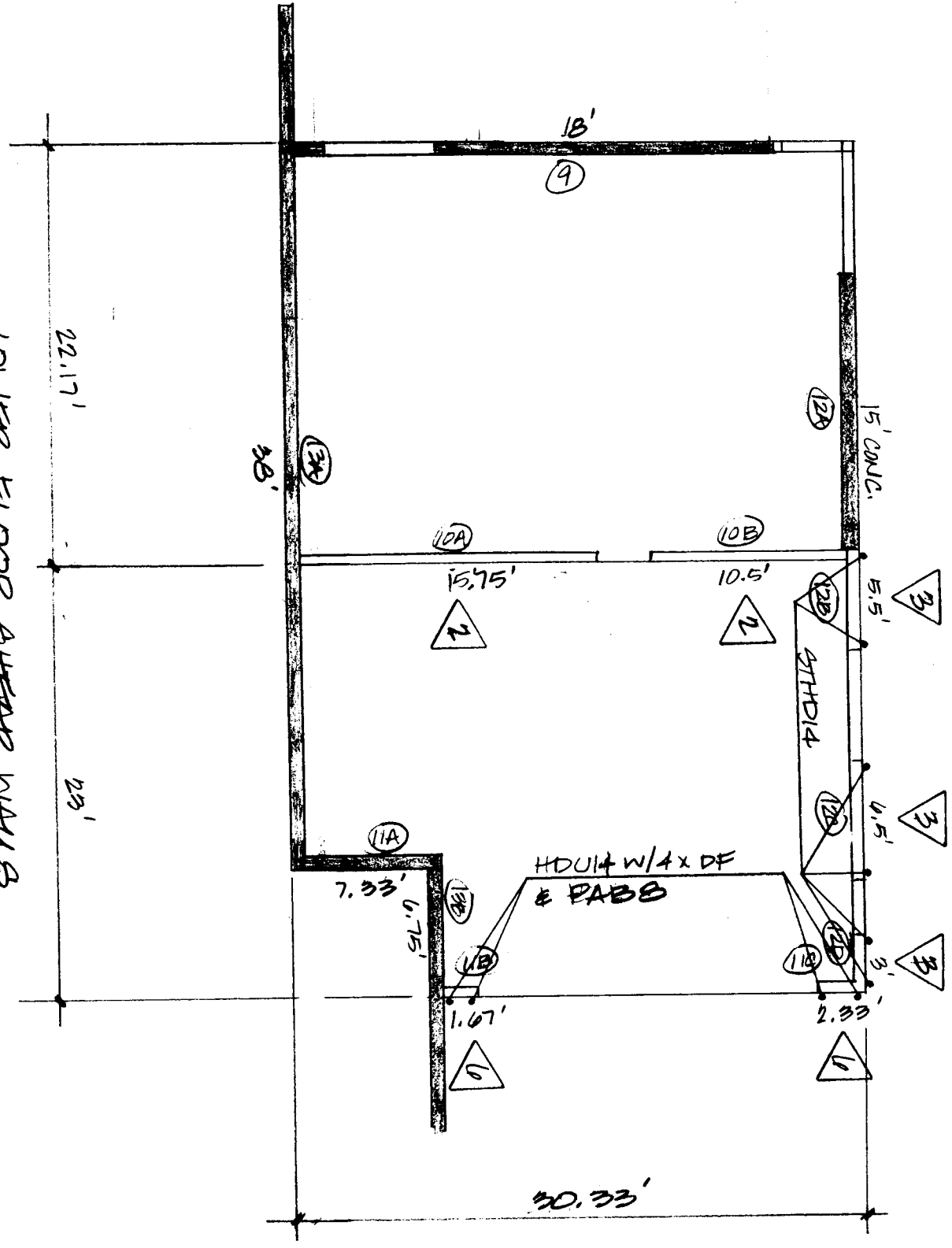
Wind Controls

~~Seismic Controls~~

UPPER FLOOR SHEAR WALLS
1/8" = 1'-0"



LOWER FLOOR SHEAR WALLS
1/8" = 1'-0"



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Wind Load	30.4							
SW#	ib Area	Wio Area	He	Total Shear	Wall Length	Total Wall Length	Shear Per Foot	sw type
1	22.67	11		6258	18.00			
	14.5	3				18.00	348	2
2	22.67	11		6794	9.00			
	11.5	2.25			3.50			
					3.50			
						16.00	425	3
3	15.17	7.5		3459	8.50			
					2.50			
					7.00			
					3.75	21.75	159	1
4	15.17	7.5		3459	4.00			
					3.00			
					7.50	14.50	239	2
5	22.5	10.17		14647	7.50			
	7.25	6.5			8.00			
						15.50	945	6
6	22.5	10.17		13751	3.50			
					2.50			
					9.50	15.50	887	6
7	15.17	10.17		8149	11.33			
					3.00			
					12.50	26.83	304	2

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Wind Load	30.4							
SW#	ib Area	Wio Area	He	Total Shear	Wall Length	Total Wall Length	Shear Per Foot	sw type
8	15.17	10.17		8935	5.25			
	5.75	4.5			5.00			
					3.00	13.25	674	5
9	11.1	10.1		18055	18.00			
						18.00	1003	CONC
10	22.5	10.1		6908	15.75			
					10.50			
						26.25	263	2
11	11.5	10.1		17281	7.33			
					1.67			
					2.33	11.33	1525	6
12	15.33	10.1		12856	15.00			
					5.50			
					6.50			
					3.00	30.00	429	3
13	15.17	10.1		13593	38.00			
					6.75			
						44.75	304	CONC

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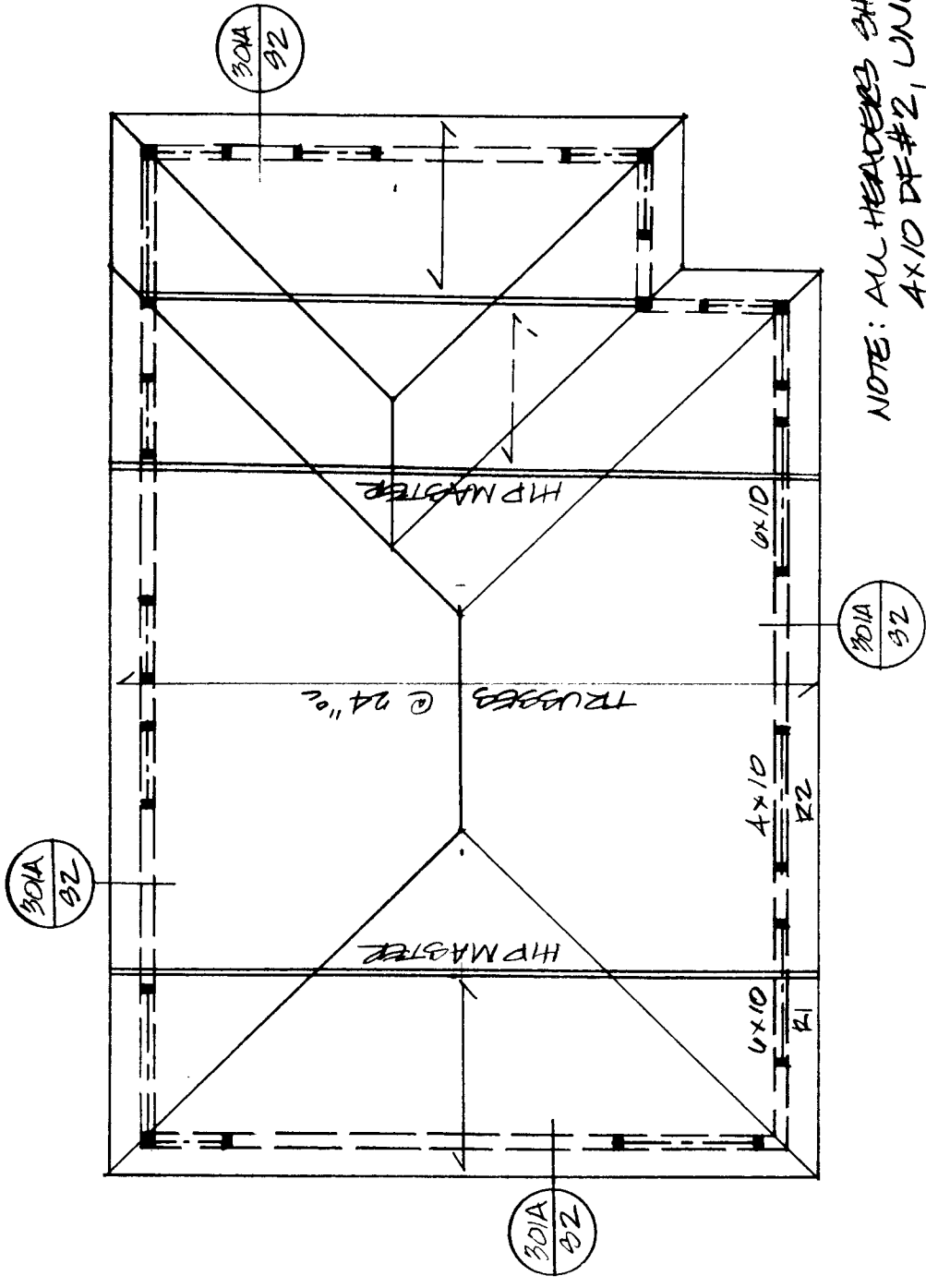
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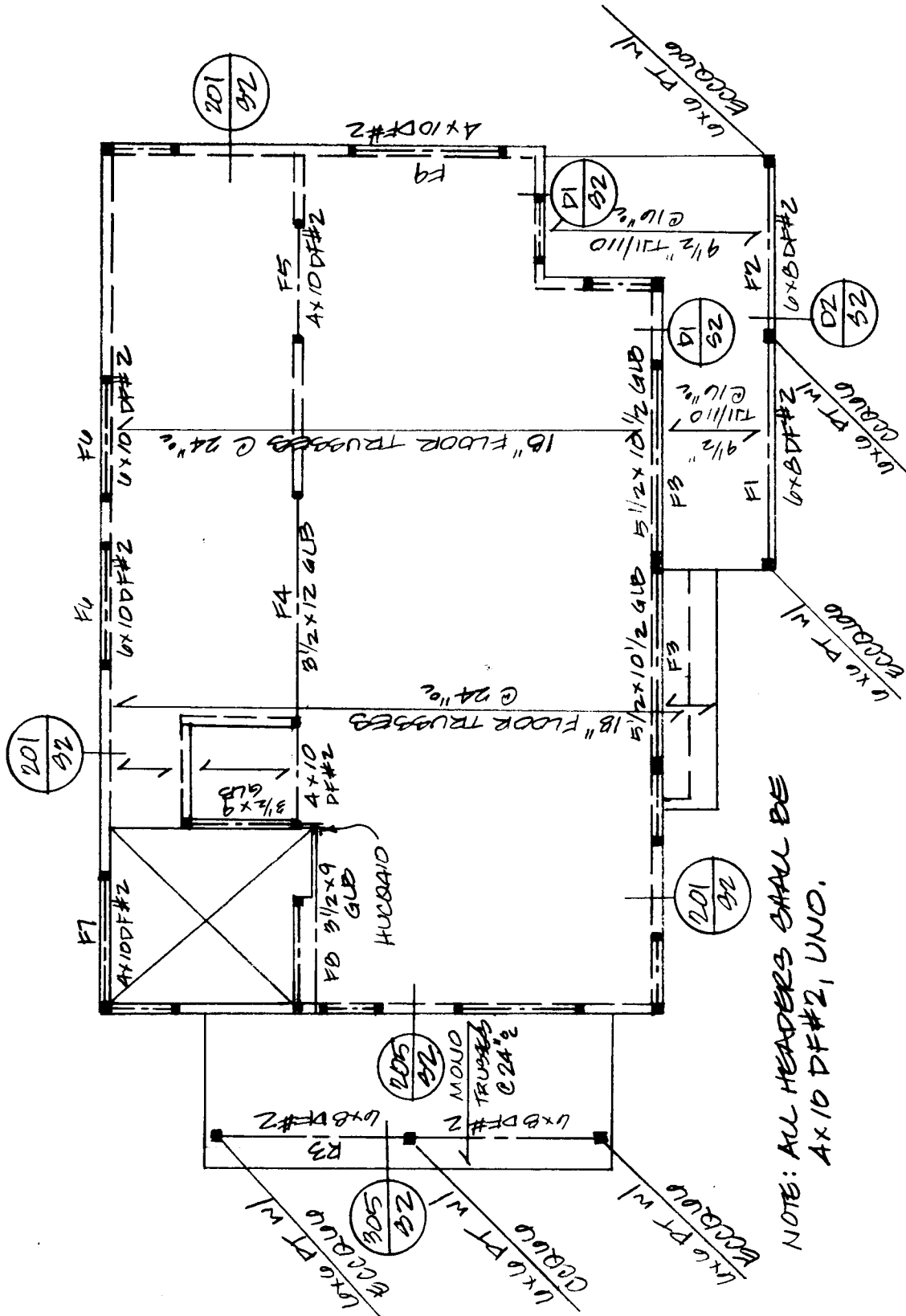
SW	Shear Per Foot	Length (feet)	Total Shear (lbs)	Dead load (lbs)	Wall Height (feet)	Gross Uplift (lbs)	Net Uplift (lbs)	Holddown/ Strap
1	348	18	6264	150	8	2784	1434	MSTC40
2A	425	9	3825	150	8	3400	2725	MSTC52
2B	425	3.5	1487.5	150	8	3400	3138	MSTC52
2C	425	3.5	1487.5	150	8	3400	3138	MSTC52
3A	159	8.5	1351.5	150	8	1272	635	MSTC40
3B	159	2.5	397.5	150	8	1272	1085	MSTC40
3C	159	7	1113	150	8	1272	747	MSTC40
3D	159	3.75	596.25	150	8	1272	991	MSTC40
4A	239	4	956	150	8	1912	1612	MSTC40
4B	239	3	717	150	8	1912	1687	MSTC40
4C	239	7.5	1792.5	150	8	1912	1350	MSTC40
5A	945	7.5	7087.5	250	9.58	9053.1	8116	HDU11 W/4XDF
5B	945	8	7560	250	9.58	9053.1	8053	HDU11 W/4XDF
6A	887	3.5	3104.5	250	9.58	8497.46	8060	HDU11 W/4XDF
6B	887	2.5	2217.5	250	9.58	8497.46	8185	HDU11 W/4XDF
6C	887	9.5	8426.5	250	9.58	8497.46	7309.96	HDU11 W/4XDF
7A	304	11.33	3444.32	250	9.58	2912.32	1496.07	STHD14RJ
7B	304	3	912	250	9.58	2912.32	2537.32	MSTC40
7C	304	12.5	3800	250	9.58	2912.32	1349.82	MSTC40
8A	674	5.25	3538.5	250	9.58	6456.92	5800.67	HDU8
8B	674	5	3370	250	9.58	6456.92	5831.92	HDU8
8C	674	3	2022	250	9.58	6456.92	6081.92	HDU8
9	1003	18	18054	350	9	9027	5877	CONC
10A	263	15.75	4142.25	350	9	2367	-389.25	NO UPLIFT
10B	263	10.5	2761.5	350	9	2367	529.5	NEGLECT
11A	1525	7.33	11178.25	350	9	13725	12442.3	CONC
11B	1525	1.67	2546.75	350	9	13725	13432.8	HDU14 W/4XDF
11C	1525	2.33	3553.25	350	9	13725	13317.3	HDU14 W/4XDF
12A	429	15	6435	350	9	3861	1236	CONC
12B	429	5.5	2359.5	350	9	3861	2898.5	STHD14
12C	429	6.5	2788.5	350	9	3861	2723.5	STHD14
12D	425	3	1275	350	9	3825	3300	STHD14
13A	304	38	11552	350	9	2736	-3914	CONC
13B	304	6.75	2052	350	9	2736	1554.75	CONC

(2)
MSTC
52



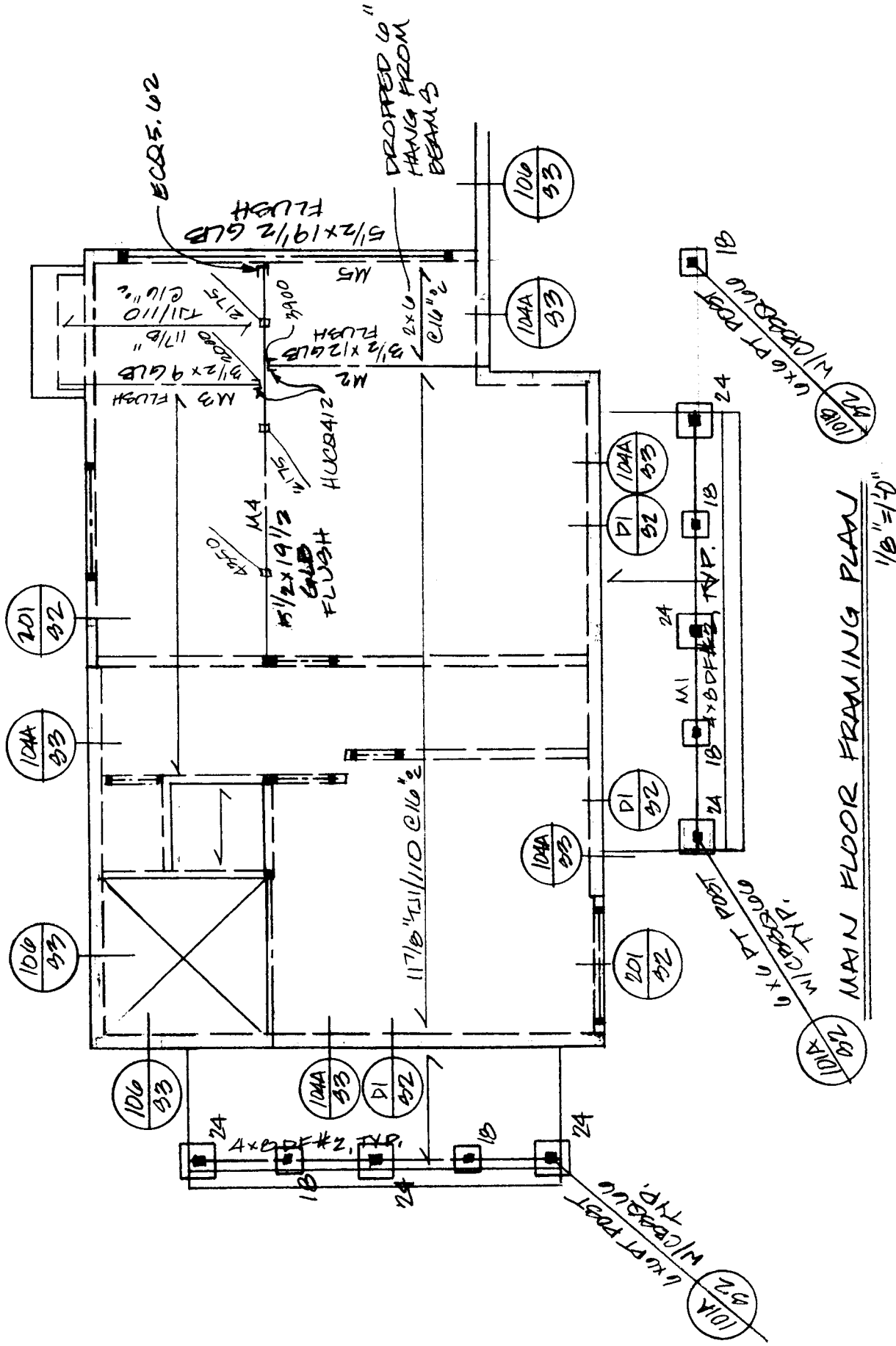
NOTE: ALL HEADERS SHALL BE
4x10 DF#2, UNO.

ROOF FRAMING PLAN
1/8" = 1'-0"



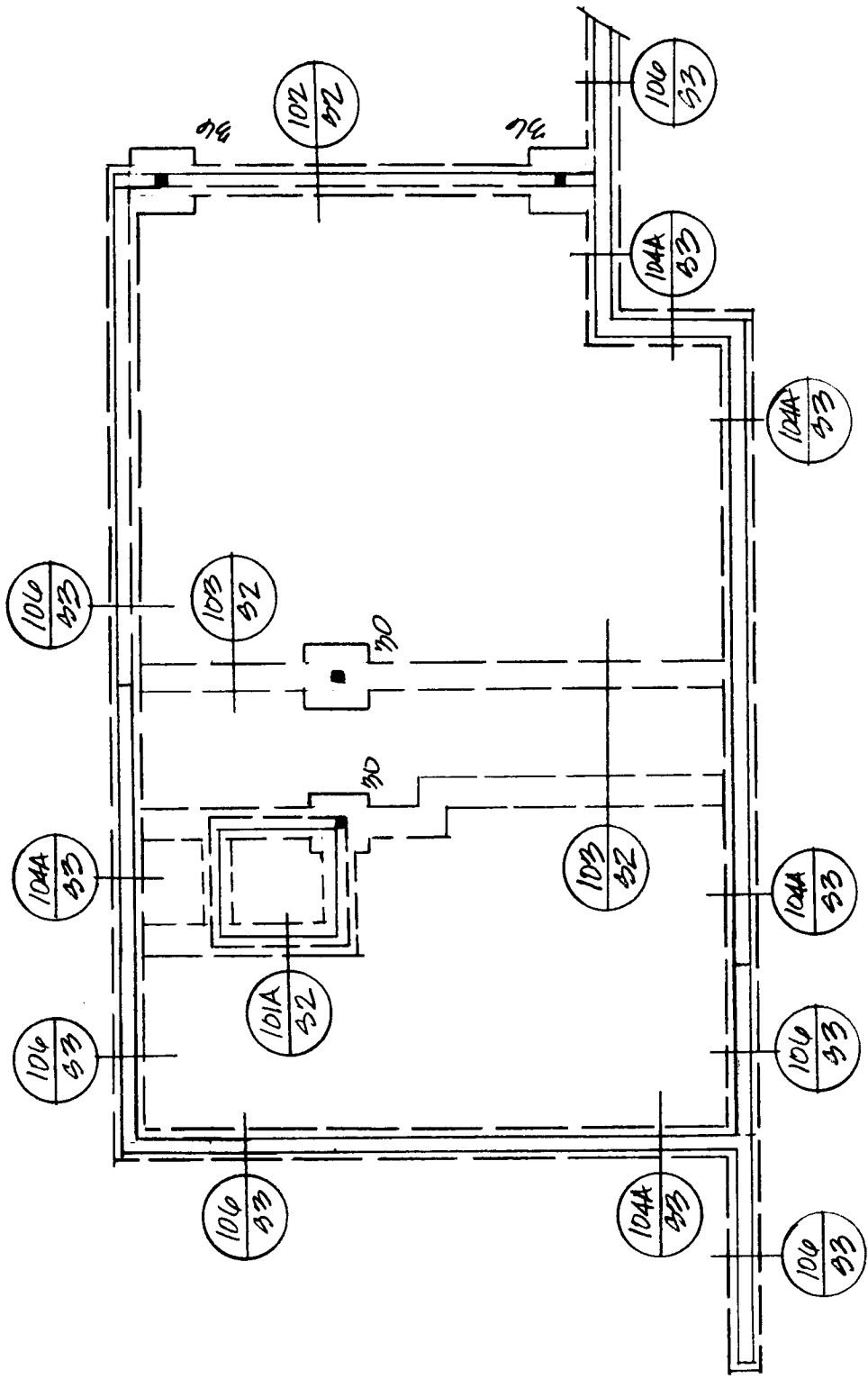
NOTE: ALL HEADERS SHALL BE
4X10 DF#2, UNO.

UPPER FLOOR FRAMING PLAN
1/8" = 1'-0"



MAIN FLOOR FRAMING PLAN
 $1/8" = 1'-0"$

NOTE: ALL HEADERS SHALL BE
 4X10 DF#2, UNO.



FOUNDATION PLAN
 1/8" = 1'-0"

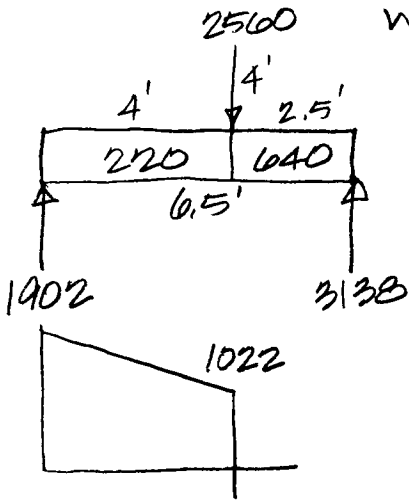
MANAGER/BASE/ROOF

6/20

R1 $l = 6.5'$ $W = 5.5(40) = 220 \text{ PLF } 0-4'$

$P = 4(40)(10) = 2560 \# @ 4'$

$W = 10(40) = 640 \text{ PLF } 4-6.5'$



$M = 5848 \text{ ft}\cdot\#$

$R = 3138 \#$

$S_{REQ} = 70$

$A_{REQ} = 41$

6x10
DF#2

R2 $l = 6.5'$ $W = 10(40) = 640 \text{ PLF}$

$M = 3380 \text{ ft}\cdot\#$

$R = 2080 \#$

$S_{REQ} = 40$

$A_{REQ} = 22$

4x10
DF#2

R3 $l = 10'$ $W = 5.5(40) = 220 \text{ PLF}$

$M = 2750 \text{ ft}\cdot\#$

$R = 1100 \#$

$S_{REQ} = 33$

$A_{REQ} = 13$

6x8
DF#2

MANAGER/BASE/UPPER FLOOR

6/20

F1 $l = 12'$ $W = 3(70) = 210$ PLF

$M = 3780$ $R = 1260$ #

$S_{REQ} = 45$ $A_{REQ} = 18$

6x8
DF#2

F2 $l = 9'$ $W = 6(70) = 420$ PLF

$M = 4253$ $R = 1890$ #

$S_{REQ} = 51$ $A_{REQ} = 15$

6x8
DF#2

F3 $l = 10'$ $W = 9.5(50) + 3(70) + 80 + 16(40) = 1405$ PLF

$M = 17563$ $R = 7025$ #

$S_{REQ} = 76$ $A_{REQ} = 46$

5 1/2 x 10 1/2
GLB

F4 $l = 12'$ $W = 14.5(50) = 725$ PLF

$M = 13050$ $R = 4350$ #

$S_{REQ} = 65$ $A_{REQ} = 33$

3 1/2 x 12
GLB

F5 $l = 6'$ $W = 14.5(50) = 725$ PLF

$M = 3263$ $R = 2175$ #

$S_{REQ} = 45$ $A_{REQ} = 26$

4x10
DF#2

MANAGER / BAZES / UPPER FLOOR

6/20

F6 $l = 6.5'$ $W = 5(50) + 80 + 10(40) = 970$ PLF

$M = 5123'$ #

$R = 3153'$ #

$S_{REQ} = 41$

$A_{REQ} = 37$

6x10
DF#2

F7 $l = 7'$ $W = 5.5(40) + 80 + 5(50) = 550$ PLF

$M = 3369'$ #

$R = 1925'$ #

$S_{REQ} = 40$

$A_{REQ} = 21$

4x10
DF#2

F8 $l = 10'$ $W = 9(50) + 5(50) = 700$ PLF

$M = 8750'$ #

$R = 3500'$ #

$S_{REQ} = 44$

$A_{REQ} = 27$

3 1/2 x 9
GLB

F9 $l = 8'$ $W = 50 + 90 + 5.5(40) = 360$ PLF

$M = 2080'$ #

$R = 1440'$ #

$S_{REQ} = 34$

$A_{REQ} = 16$

4x10
DF#2

MAWER/MAZE/MAIN FLOOR

6/20

M1 $l = 6'$ $W = 4 (70) = 280 \text{ PLF}$
 $M = 12600 \text{ lbf}$ $R = 840 \text{ \#}$
 $S_{REQ} = 18$ $A_{REQ} = 11$

4x8
DF#2

M2 $l = 13'$ $W = 12 (50) = 600 \text{ PLF}$
 $M = 12675 \text{ lbf}$ $R = 3900 \text{ \#}$
 $S_{REQ} = 63$ $A_{REQ} = 30$
 $I_{REQ} = 330$

3 1/2 x 12
GLB

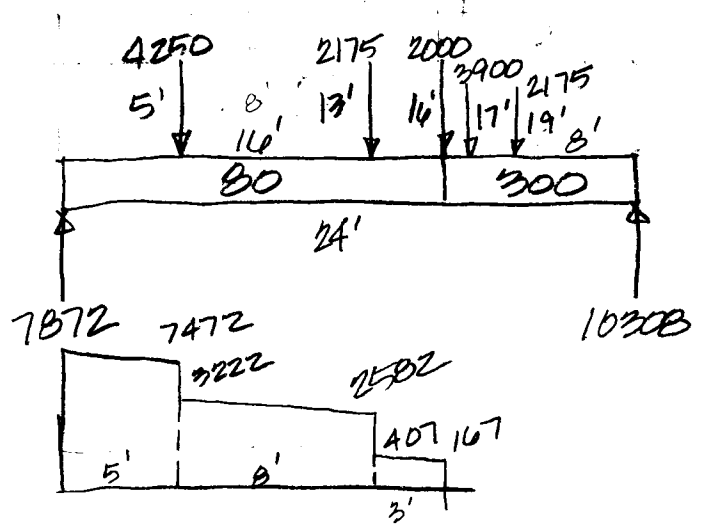
M3 $l = 10'$ $W = 8 (50) = 400 \text{ PLF}$
 $M = 5000 \text{ lbf}$ $R = 2000 \text{ \#}$
 $S_{REQ} = 69/25$ $A_{REQ} = 16$

3 1/2 x 9
GLB

M4 $l = 24'$ $P = 4250 @ 5'$ $P = 2175 @ 13'$
 $P = 2000 @ 16'$ $P = 3900 @ 17'$ $P = 2175 @ 19'$
 $W = 2 (40) = 80 \text{ PLF } 0-16'$ $W = 6 (50) = 300 \text{ PLF } 16-24'$

$M = 62437 \text{ lbf}$ $R = 10308 \text{ \#}$
 $S_{REQ} = 312$ $A_{REQ} = 90$
 $I_{REQ} = 2997$

5 1/2 x 19 1/2
GLB

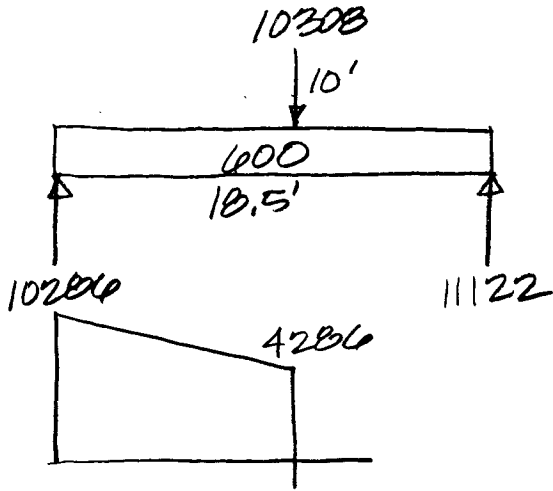


MANAGER/BAZE/MAIN FLOOR

6/20

M5 $l = 18.5'$ $W = 3(50) + 90 + 50 + 90 + 5.5(40) = 600$ PLF

$P = 10308 \# @ 10'$



$M = 72860 \text{ l-}\#$

$R = 11122 \#$

$S_{REQ} = 317$

$A_{REQ} = 81$

$I_{REQ} = 2696$

5 1/2 x 19 1/2
GLB

Use menu item **Settings > Printing & Title Block**
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Project Name/Number : tdsa-barber-6
Title **Coe 9' Restrained Retaining Wall**
Dsgnr: Michelle Thompson
Description....
9' Restrained Retaining Wall

Page : 1
Date: 26 AUG 2020

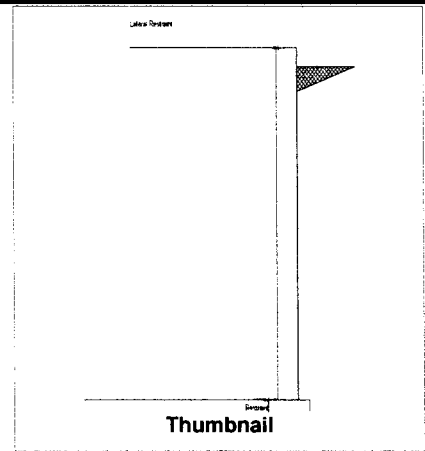
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Restrained Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria		Soil Data	
Retained Height	= 8.83 ft	Allow Soil Bearing	= 2,000.0 psf
Wall height above soil	= 0.50 ft	Equivalent Fluid Pressure Method	
Total Wall Height	= 9.33 ft	At-Rest Heel Pressure	= 30.0 psf/ft
			=
Top Support Height	= 9.33 ft	Passive Pressure	= 350.0 psf/ft
Slope Behind Wal	= 0.00	Soil Density	= 110.00 pcf
Height of Soil over Toe	= 0.33 in	Footing Soil Frictior	= 0.400
		Soil height to ignore for passive pressure	= 0.00 in



Surcharge Loads		Uniform Lateral Load Applied to Stem		Adjacent Footing Load	
Surcharge Over Heel	= 0.0 psf	Lateral Load	= 0.0 #/ft	Adjacent Footing Load	= 0.0 lbs
>>>Used To Resist Sliding & Overturning		...Height to Top	= 0.00 ft	Footing Width	= 0.00 ft
Surcharge Over Toe	= 0.0 psf	...Height to Bottom	= 0.00 ft	Eccentricity	= 0.00 in
Used for Sliding & Overturning		Load Type	=	Wall to Ftg CL Dist	= 0.00 ft
			(Strength Level)	Footing Type	Line Load
		Wind on Exposed Stem	= 15.0 psf	Base Above/Below Soil at Back of Wall	= 0.0 ft
				Poisson's Ratio	= 0.300
		K_h Soil Density Multiplier	= 0.210 g	Added seismic per unit area	= 0.0 psf

Design Summary		Concrete Stem Construction			
Total Bearing Load	= 1,564 lbs	Thickness	= 8.00 in	F_y	= 40,000 psi
...resultant ecc.	= 1.68 in	Wall Weight	= 100.0 psf	f_c	= 2,500 psi
Soil Pressure @ Toe	= 460 psf OK	Stem is FREE to rotate at top of footing			
Soil Pressure @ Heel	= 1,625 psf OK				
Allowable	= 2,000 psf				
Soil Pressure Less Than Allowable					
ACI Factored @ Toe	= 644 psf				
ACI Factored @ Heel	= 2,276 psf				
Footing Shear @ Toe	= 0.6 psi OK				
Footing Shear @ Heel	= 1.8 psi OK				
Allowable	= 75.0 psi				
Reaction at Top	= 374.7 lbs				
Reaction at Bottom	= 1,080.7 lbs				
Sliding Calcs					
Lateral Sliding Force	= 1,080.7 lbs				

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
Design Height Above Ftg	= 9.33 ft	Stem OK	Stem OK
Rebar Size	= # 4	3.90 ft	0.00 ft
Rebar Spacing	= 12.00 in	# 4	# 4
Rebar Placed at	= Edge	12.50 in	12.00 in
Rebar Depth 'd'	= 5.50 in	Edge	Edge
Design Data		6.00 in	5.50 in
$f_b/FB + f_a/Fa$	= 0.000	0.709	0.000
μActual	= 0.0 ft-#	2,388.4 ft-#	0.0 ft-#
$M_n * \Phi$Allowable	= 3,205.6 ft-#	3,369.0 ft-#	3,205.6 ft-#
Shear Force @ this height	= 636.7 lbs		1,361.2 lbs
Shear....Actual	= 9.65 psi		20.62 psi
Shear....Allowable	= 75.00 psi		75.00 psi

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors	
Building Code	IBC 2015,ACI
Dead Load	1.400
Live Load	1.700
Earth, H	1.700
Wind, W	1.300
Seismic, E	1.000

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Project Name/Number : tdsa-barber-6
Title Coe 9' Restrained Retaining Wall
Dsgnr: Michelle Thompson
Description....
9' Restrained Retaining Wall

Page : 2
Date: 26 AUG 2020

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Restrained Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 2.239 in2
200bd/ft : 200(12)(5.5)/40000 :	0.33 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.240 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 10.00 in #4@ 20.00 in
Provided Area :	0.2 in2/ft	#5@ 15.50 in #5@ 31.00 in
Maximum Area :	1.1176 in2/ft	#6@ 22.00 in #6@ 44.00 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.1401 in2/ft	
(4/3) * As :	0.1868 in2/ft	Min Stem T&S Reinf Area 1.304 in2
200bd/ft : 200(12)(6)/40000 :	0.36 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.240 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1868 in2/ft	#4@ 10.00 in #4@ 20.00 in
Provided Area :	0.192 in2/ft	#5@ 15.50 in #5@ 31.00 in
Maximum Area :	1.2192 in2/ft	#6@ 22.00 in #6@ 44.00 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.935 in2
200bd/ft : 200(12)(5.5)/40000 :	0.33 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.240 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 10.00 in #4@ 20.00 in
Provided Area :	0.2 in2/ft	#5@ 15.50 in #5@ 31.00 in
Maximum Area :	1.1176 in2/ft	#6@ 22.00 in #6@ 44.00 in

Footing Strengths & Dimensions

Toe Width	=	0.42 ft
Heel Width	=	1.08
Total Footing Width	=	1.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f_c	=	2,500 psi
F_y	=	40,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	=	2.00 in
@ Btm.	=	3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 644	2,276 psf
μ' : Upward	= 69	184 ft-#
μ' : Downward	= 19	136 ft-#
μ : Design	= 50	-48 ft-#
Actual 1-Way Shear	= 0.61	1.75 psi
Allow 1-Way Shear	= 75.00	75.00 psi

Other Acceptable Sizes & Spacings:

Toe: None Spec'd	-or-	Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f_c} * S_m$
Heel: None Spec'd	-or-	Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f_c} * S_m$
Key: No key defined	-or-	No key defined
Min footing T&S reinf Area		0.00 in2
Min footing T&S reinf Area per foot		0.00 in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 0.00 in		#4@ 0.00 in
#5@ 0.00 in		#5@ 0.00 in
#6@ 0.00 in		#6@ 0.00 in

Use menu item Settings > Printing & Title Block
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Project Name/Number : tdsa-barber-6
Title Coe 9' Restrained Retaining Wall
Dsgnr: Michelle Thompson
Description....
9' Restrained Retaining Wall

Page : 3
Date: 26 AUG 2020

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Restrained Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

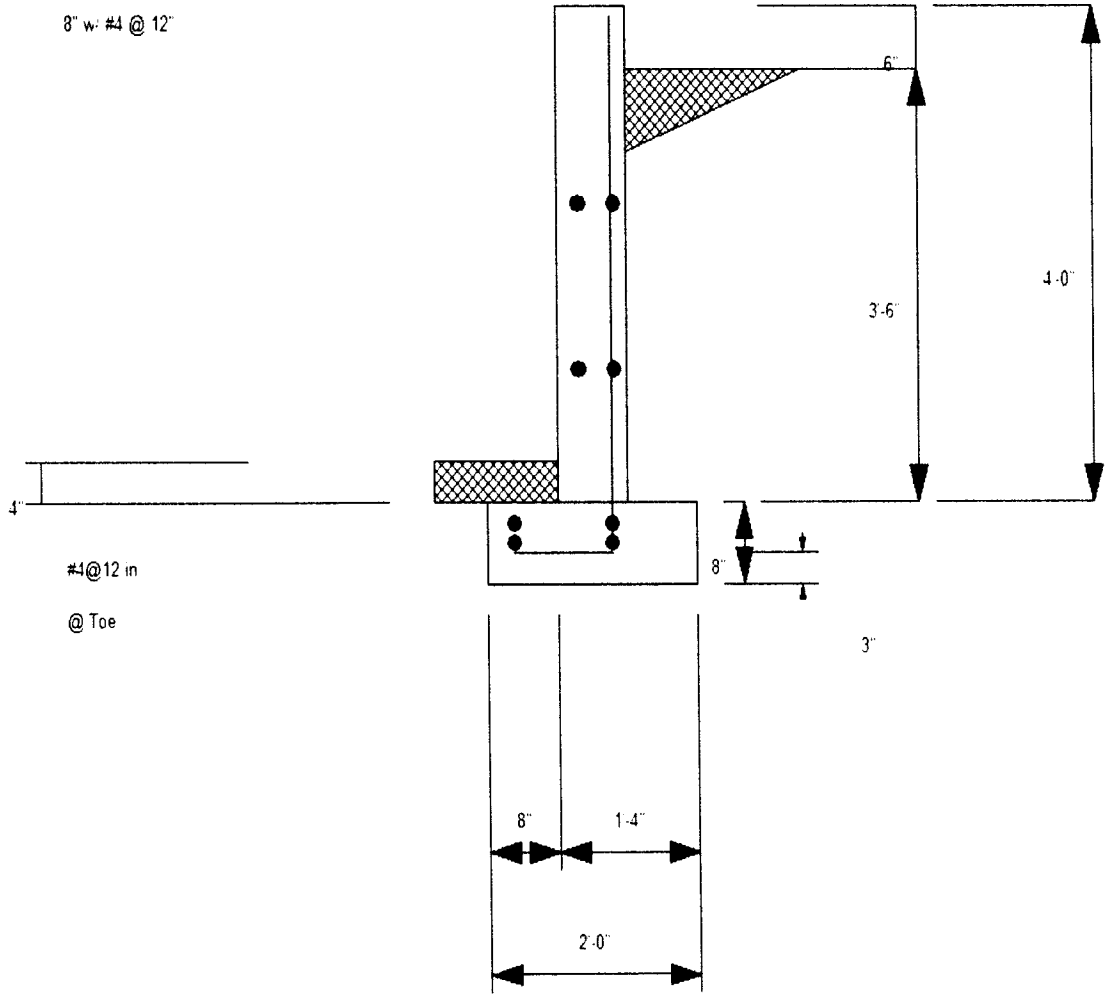
Summary of Forces on Footing : Slab RESISTS sliding, stem is PINNED at footing

Forces acting on footing soil pressure

(taking moments about front of footing to find eccentricity)

Surcharge Over Heel	=	lbs	ft	ft-#
Axial Dead Load on Stem	=	lbs	ft	ft-#
Soil Over Toe	=	1.3 lbs	0.21 ft	0.3 ft-#
Adjacent Footing Load	=	lbs	ft	ft-#
Surcharge Over Toe	=	lbs	ft	ft-#
Stem Weight	=	933.0 lbs	0.75 ft	699.8 ft-#
Soil Over Heel	=	404.7 lbs	1.29 ft	522.7 ft-#
Footing Weight	=	225.0 lbs	0.75 ft	168.8 ft-#
Total Vertical Force	=	1,564.0 lbs	Moment =	1,391.5 ft-#
Net Mom. at Stem/Ftg Interface	=			-218.5 ft-#
Allow. Mom. @ Stem/Ftg Interface	=			1,885.6 ft-#
Allow. Mom. Exceeds Applied Mom.?	=			Yes
Therefore Uniform Soil Pressure	=			1,042.6 psf

Vertical component of active lateral soil pressure IS NOT considered in
the calculation of Sliding Resistance.



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Project Name/Number : tdsa-barber-6

Title TDSA-Barber
Dsgnr: Michelle Thompson
Description....
4' Cantilevered Retaining Wall

Page : 1
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

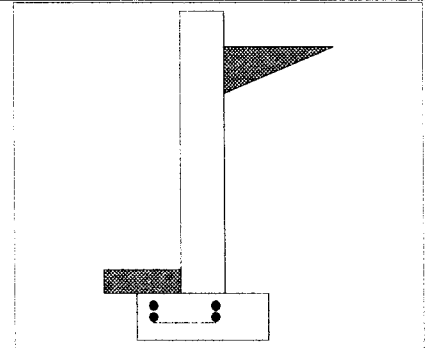
Criteria

Retained Height = 3.50 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 4.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 30.0 psf/ft

Passive Pressure = 538.0 psf/ft
Soil Density, Heel = 128.00 pcf
Soil Density, Toe = 128.00 pcf
Footings/Soil Friction = 0.350
Soil height to ignore for passive pressure = 6.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
Used for Sliding & Overturning

Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft
Load Type = Wind (W)
(Service Level)
Wind on Exposed Stem = 15.0 psf
(Service Level)

Adjacent Footing Load

Adjacent Footing Load = 0.0 lbs
Footing Width = 0.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 0.00 ft
Footing Type = Line Load
Base Above/Below Soil = 0.0 ft
at Back of Wall
Poisson's Ratio = 0.300

Axial Load Applied to Stem

Axial Dead Load = 0.0 lbs
Axial Live Load = 0.0 lbs
Axial Load Eccentricity = 0.0 in

Design Summary

Wall Stability Ratios

Overturning = 3.54 OK
Sliding = 2.15 OK

Total Bearing Load = 927 lbs
...resultant ecc. = 2.78 in

Soil Pressure @ Toe = 786 psf OK
Soil Pressure @ Heel = 142 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 1,100 psf
ACI Factored @ Heel = 198 psf
Footing Shear @ Toe = 3.3 psi OK
Footing Shear @ Heel = 7.3 psi OK
Allowable = 75.0 psi

Sliding Calcs
Lateral Sliding Force = 267.9 lbs
less 100% Passive Force = - 201.8 lbs
less 100% Friction Force = - 375.5 lbs
Added Force Req'd = 0.0 lbs OK
....for 1.5 Stability = 0.0 lbs OK

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 8.00
Rebar Size = # 4
Rebar Spacing = 12.00
Rebar Placed at = Edge

Design Data

fb/FB + fa/Fa = 0.109

Total Force @ Section

Service Level lbs =
Strength Level lbs = 322.1

Moment....Actual

Service Level ft-# =
Strength Level ft-# = 401.0

Moment.....Allowable = 3,655.6

Shear.....Actual

Service Level psi =
Strength Level psi = 4.3

Shear.....Allowable psi = 75.0

Anet (Masonry) in2 =

Rebar Depth 'd' in = 6.25

Masonry Data

f_m psi =

F_s psi =

Solid Grouting =

Modular Ratio 'n' =

Wall Weight psf = 100.0

Short Term Factor =

Equiv. Solid Thick. =

Masonry Block Type = Medium Weight

Masonry Design Method = ASD

Concrete Data

f_c psi = 2,500.0

F_y psi = 40,000.0

Vertical component of active lateral soil pressure IS
NOT considered in the calculation of soil bearing

Load Factors

Building Code IBC 2015,ACI
Dead Load 1.400
Live Load 1.700
Earth, H 1.700
Wind, W 1.300
Seismic, E 1.000

Use menu item Settings > Printing & Title Block
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Project Name/Number : tdsa-barber-6

Title TDSA-Barber
Dsgnr: Michelle Thompson
Description....
4' Cantilevered Retaining Wall

Page : 2
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0225 in2/ft		
(4/3) * As :	0.03 in2/ft	Min Stem T&S Reinf Area 0.768 in2	
200bd/fy : 200(12)(6.25)/40000 :	0.375 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of : Two layers of :	
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	1.27 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.67 ft
Heel Width	=	1.33
Total Footing Width	=	2.00
Footing Thickness	=	8.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.50 ft
f'c =	2,500 psi	Fy = 40,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm= 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	1,100	198 psf
Mu' : Upward	=	2,666	796 ft-#
Mu' : Downward	=	533	4,026 ft-#
Mu: Design	=	100	191 ft-#
Actual 1-Way Shear	=	3.33	7.32 psi
Allow 1-Way Shear	=	40.00	40.00 psi
Toe Reinforcing	=	# 4 @ 12.00 in	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Heel: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Key: No key defined

Min footing T&S reinf Area	0.35	in2
Min footing T&S reinf Area per foot	0.17	in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 13.89 in	#4@ 27.78 in	
#5@ 21.53 in	#5@ 43.06 in	
#6@ 30.56 in	#6@ 61.11 in	

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for your program.

Project Name/Number : tdsa-barber-6

Title TDSA-Barber
Dsgnr: Michelle Thompson
Description....

Page : 3
Date: 26 AUG 2020

4' Cantilevered Retaining Wall

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	260.4	1.39	361.7	Soil Over HL (ab. water tbl)	298.7	1.67	497.8
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.67	497.8
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	7.5	4.42	33.1	Soil Over Toe =	28.4	0.33	9.5
=				Surcharge Over Toe =			
Total	= 267.9	O.T.M. =	394.8	Stem Weight(s) =	400.0	1.00	400.0
				Earth @ Stem Transitions =			
Resisting/Overturning Ratio		= 3.54		Footing Weight =	200.0	1.00	200.0
Vertical Loads used for Soil Pressure =		927.1 lbs		Key Weight =		0.50	
				Vert. Component =	145.6	2.00	291.2
				Total =	1,072.7 lbs	R.M.=	1,398.5

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

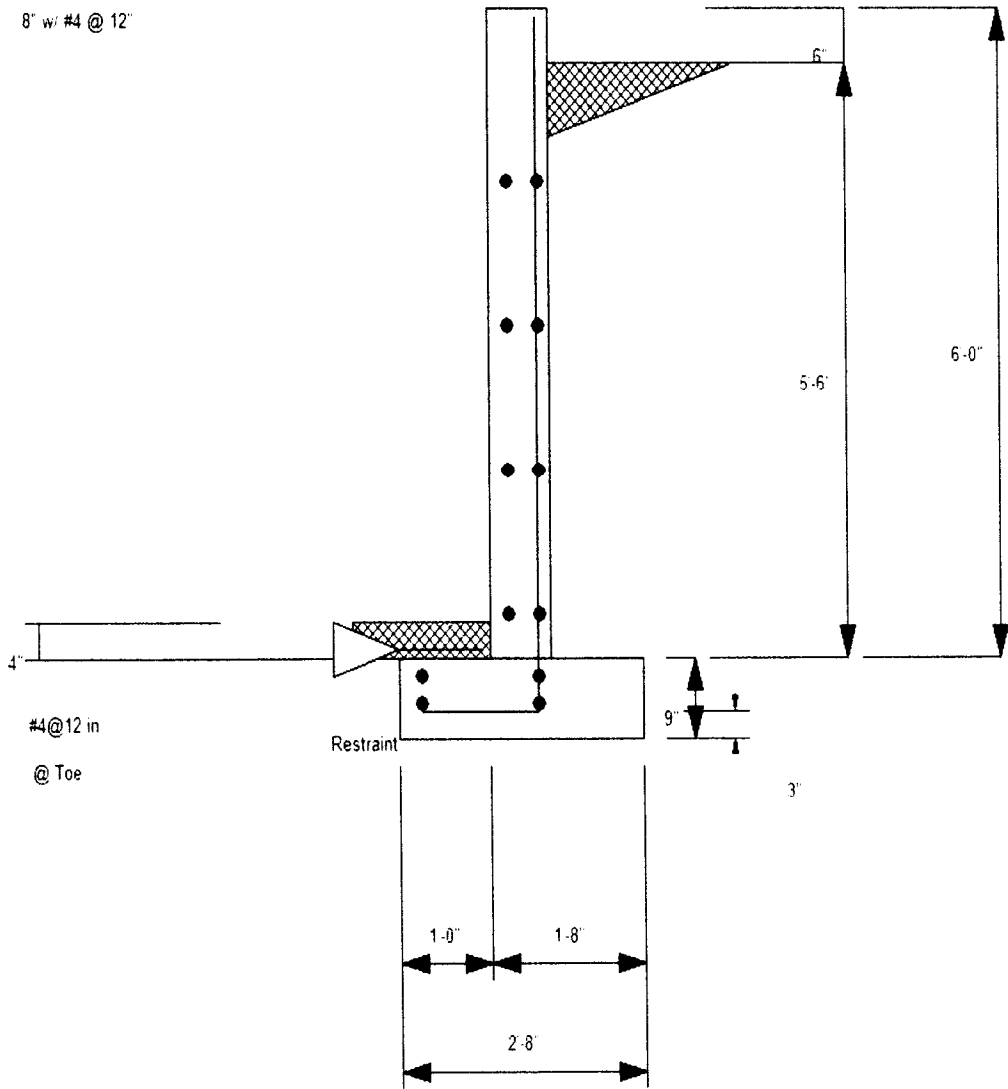
(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.044 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

8" w/ #4 @ 12"



#4@12 in
@ Toe

Restraint

3"

1'-0"

1'-8"

2'-8"

9"

5'-6"

6'-0"

6"

4"

Use menu item **Settings > Printing & Title Block**
to set these five lines of information
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Project Name/Number : tdsa-barber-6

Title **Mawer-Baze**
Dsgnr: **Michelle Thompson**
Description....
6' Cantilevered Retaining Wall

Page : 1
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

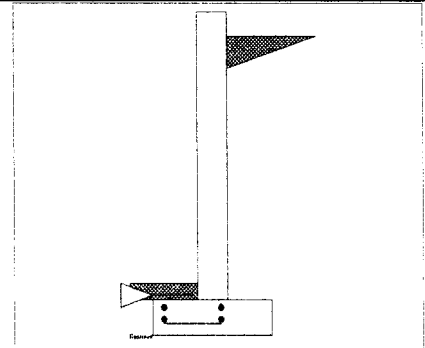
Criteria

Retained Height = 5.50 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 4.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 30.0 psf/ft

Passive Pressure = 538.0 psf/ft
Soil Density, Heel = 128.00 pcf
Soil Density, Toe = 128.00 pcf
Footing||Soil Friction = 0.350
Soil height to ignore for passive pressure = 6.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
Used for Sliding & Overturning

Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft
Load Type = Wind (W)
(Service Level)
Wind on Exposed Stem = 15.0 psf
(Service Level)

Adjacent Footing Load

Adjacent Footing Load = 0.0 lbs
Footing Width = 0.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 0.00 ft
Footing Type = Line Load
Base Above/Below Soil = 0.0 ft
at Back of Wall
Poisson's Ratio = 0.300

Axial Load Applied to Stem

Axial Dead Load = 0.0 lbs
Axial Live Load = 0.0 lbs
Axial Load Eccentricity = 0.0 in

Design Summary

Wall Stability Ratios

Overturning = 2.85 OK
Slab Resists All Sliding !

Total Bearing Load = 1,647 lbs
...resultant ecc. = 5.23 in

Soil Pressure @ Toe = 1,223 psf OK
Soil Pressure @ Heel = 12 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable

ACI Factored @ Toe = 1,713 psf
ACI Factored @ Heel = 16 psf

Footing Shear @ Toe = 8.5 psi OK
Footing Shear @ Heel = 16.3 psi OK
Allowable = 75.0 psi

Sliding Calcs

Lateral Sliding Force = 593.4 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code = IBC 2015,ACI
Dead Load = 1.400
Live Load = 1.700
Earth, H = 1.700
Wind, W = 1.300
Seismic, E = 1.000

Stem Construction

Design Height Above Ftg = 0.00 ft
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 8.00
Rebar Size = # 4
Rebar Spacing = 12.00
Rebar Placed at = Edge

Design Data

fb/FB + fa/Fa = 0.401

Total Force @ Section

Service Level lbs =
Strength Level lbs = 781.1

Moment....Actual

Service Level ft-# =
Strength Level ft-# = 1,470.3

Moment....Allowable

= 3,655.6

Shear....Actual

Service Level psi =
Strength Level psi = 10.4

Shear....Allowable

psi = 75.0

Anet (Masonry)

in2 =
Rebar Depth 'd' in = 6.25

Masonry Data

f_m psi =
F_s psi =
Solid Grouting =
Modular Ratio 'n' =
Wall Weight psf = 100.0
Short Term Factor =
Equiv. Solid Thick. =
Masonry Block Type = Medium Weight
Masonry Design Method = ASD

Concrete Data

f_c psi = 2,500.0
F_y psi = 40,000.0

Use menu item Settings > Printing & Title Block
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for your program.

Project Name/Number : tdsa-barber-6

Title Mawer-Baze
Dsgnr: Michelle Thompson
Description....
6' Cantilevered Retaining Wall

Page : 2
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0826 in2/ft	
(4/3) * As :	0.1102 in2/ft	Min Stem T&S Reinf Area 1.152 in2
200bd/fy : 200(12)(6.25)/40000 :	0.375 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	1.27 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	1.00 ft
Heel Width	=	1.67
Total Footing Width	=	2.67
Footing Thickness	=	9.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.58 ft
f'c =	2,500 psi	Fy = 40,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 1,713	16 psf
Mu' : Upward	= 9,007	1,371 ft-#
Mu' : Downward	= 1,304	13,545 ft-#
Mu: Design	= 324	696 ft-#
Actual 1-Way Shear	= 8.45	16.26 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= # 4 @ 12.00 in	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, Tu	=	0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs

If torsion exceeds allowable, provide
supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Heel: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Key: No key defined

Min footing T&S reinf Area	0.52 in2
Min footing T&S reinf Area per foot	0.19 in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 12.35 in	#4@ 24.69 in
#5@ 19.14 in	#5@ 38.27 in
#6@ 27.16 in	#6@ 54.32 in

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Project Name/Number : tdsa-barber-6

Title Mawer-Baze
Dsgnr: Michelle Thompson
Description....

Page : 3
Date: 26 AUG 2020

6' Cantilevered Retaining Wall

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	585.9	2.08	1,220.7	Soil Over HL (ab. water tbl)	704.1	2.17	1,525.8
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.17	1,525.8
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	7.5	6.50	48.8	Soil Over Toe =	42.7	0.50	21.3
=				Surcharge Over Toe =			
Total	= 593.4	O.T.M. =	1,269.5	Stem Weight(s) =	600.0	1.33	800.1
				Earth @ Stem Transitions =			
				Footing Weight =	300.0	1.33	400.1
				Key Weight =		0.58	
				Vert. Component =	327.6	2.67	873.7
				Total =	1,974.4 lbs	R.M.=	3,621.0

Resisting/Overturning Ratio = **2.85**
Vertical Loads used for Soil Pressure = 1,646.8 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

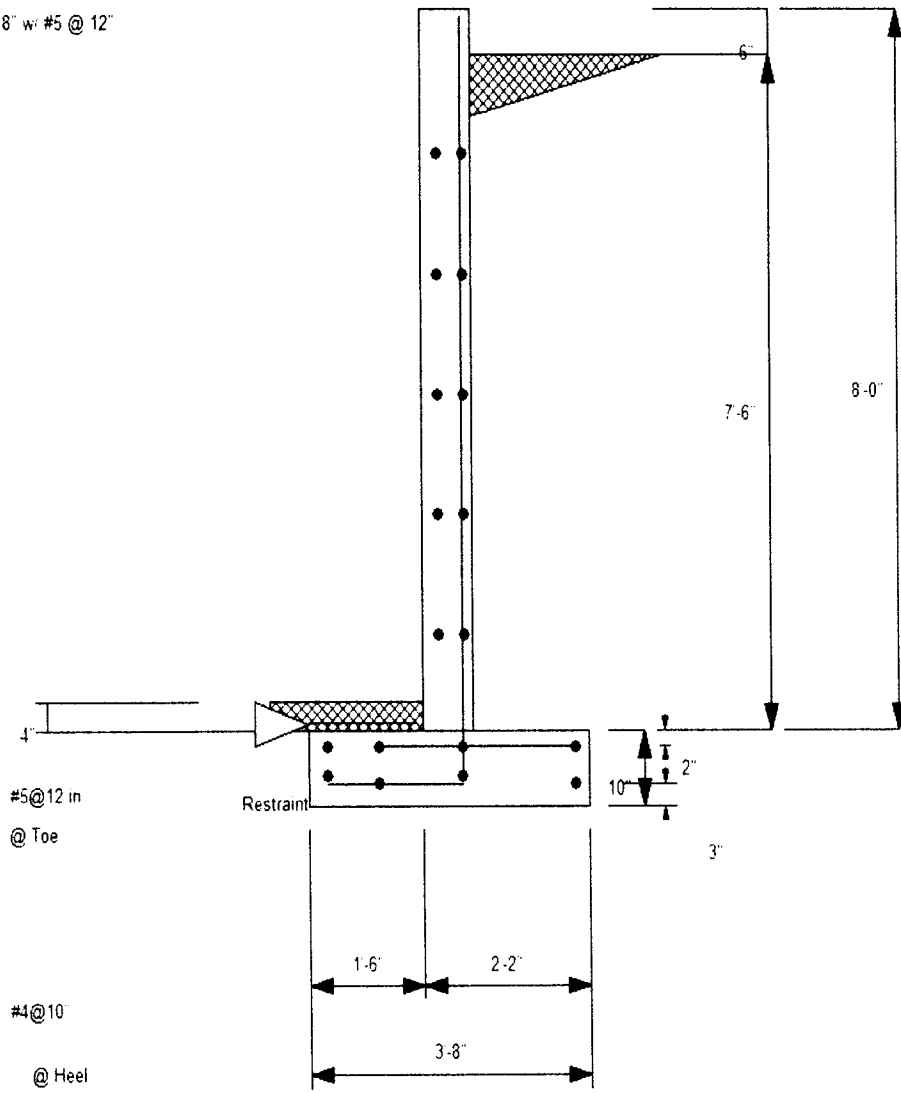
Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.076 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

8" w/ #5 @ 12"



#5 @ 12 in
@ Toe

Restraint

#4 @ 10"
@ Heel

Use menu item **Settings > Printing & Title Block**
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Project Name/Number : tdsa-barber-6

Title **Mawer-Baze**
Dsgnr: **Michelle Thompson**
Description....
8' Cantilevered Retaining Wall

Page : 1
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

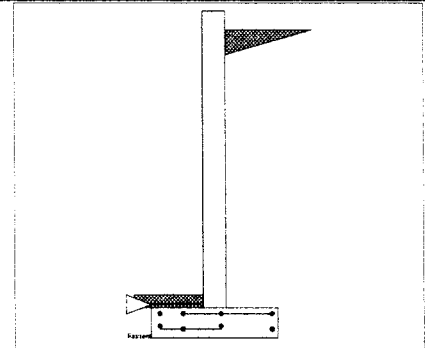
Criteria

Retained Height = 7.50 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 4.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 30.0 psf/ft

Passive Pressure = 538.0 psf/ft
Soil Density, Heel = 128.00 pcf
Soil Density, Toe = 128.00 pcf
Footing||Soil Friction = 0.350
Soil height to ignore for passive pressure = 6.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
Used for Sliding & Overturning

Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft
Load Type = Wind (W)
(Service Level)
Wind on Exposed Stem = 15.0 psf
(Service Level)

Adjacent Footing Load

Adjacent Footing Load = 0.0 lbs
Footing Width = 0.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 0.00 ft
Footing Type = Line Load
Base Above/Below Soil = 0.0 ft
at Back of Wall
Poisson's Ratio = 0.300

Axial Load Applied to Stem

Axial Dead Load = 0.0 lbs
Axial Live Load = 0.0 lbs
Axial Load Eccentricity = 0.0 in

Design Summary

Wall Stability Ratios

Overturning = 2.94 OK
Slab Resists All Sliding !

Total Bearing Load = 2,763 lbs
...resultant ecc. = 6.37 in

Soil Pressure @ Toe = 1,408 psf OK
Soil Pressure @ Heel = 99 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 1,971 psf
ACI Factored @ Heel = 138 psf
Footing Shear @ Toe = 18.2 psi OK
Footing Shear @ Heel = 27.8 psi OK
Allowable = 75.0 psi

Sliding Calcs

Lateral Sliding Force = 1,049.2 lbs

Vertical component of active lateral soil pressure IS
NOT considered in the calculation of soil bearing

Load Factors

Building Code = IBC 2015,ACI
Dead Load = 1.400
Live Load = 1.700
Earth, H = 1.700
Wind, W = 1.300
Seismic, E = 1.000

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 8.00
Rebar Size = # 5
Rebar Spacing = 12.00
Rebar Placed at = Edge

Design Data

fb/FB + fa/Fa = 0.661

Total Force @ Section

Service Level lbs =
Strength Level lbs = 1,444.1

Moment....Actual

Service Level ft-# =
Strength Level ft-# = 3,661.5

Moment....Allowable

= 5,527.6

Shear....Actual

Service Level psi =
Strength Level psi = 19.4

Shear....Allowable

psi = 75.0

Anet (Masonry)

in2 =
Rebar Depth 'd' in = 6.19

Masonry Data

f_m psi =
F_s psi =
Solid Grouting =
Modular Ratio 'n' =
Wall Weight psf = 100.0
Short Term Factor =
Equiv. Solid Thick. =
Masonry Block Type = Medium Weight
Masonry Design Method = ASD

Concrete Data

f_c psi = 2,500.0
F_y psi = 40,000.0

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : tdsa-barber-6

Title Mawer-Baze
Dsgnr: Michelle Thompson
Description....
8' Cantilevered Retaining Wall

Page : 2
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015, ACI 318-14, ACI 530-13

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.208 in ² /ft	
(4/3) * As :	0.2773 in ² /ft	Min Stem T&S Reinf Area 1.536 in ²
200bd/fy : 200(12)(6.1875)/40000 :	0.3713 in ² /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in ² /ft
0.0018bh : 0.0018(12)(8) :	0.1728 in ² /ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.2773 in ² /ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.31 in ² /ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	1.2573 in ² /ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	2.17
Total Footing Width	=	3.67
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.83 ft
f _c =	2,500 psi	F _y = 40,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 1,971	138 psf
Mu' : Upward	= 23,241	5,244 ft-#
Mu' : Downward	= 3,170	38,337 ft-#
Mu: Design	= 923	2,008 ft-#
Actual 1-Way Shear	= 18.24	27.77 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 5 @ 12.00 in	
Heel Reinforcing	= # 4 @ 10.00 in	
Key Reinforcing	= None Spec'd	
Footing Torsion, Tu	=	0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 11.10 in, #5@ 17.21 in, #6@ 24.43 in, #7@ 33.32 in, #8@ 43.88 in, #9@ 5
Heel: #4@ 11.10 in, #5@ 17.21 in, #6@ 24.43 in, #7@ 33.32 in, #8@ 43.88 in, #9@ 5
Key: No key defined

Min footing T&S reinf Area	0.79	in ²
Min footing T&S reinf Area per foot	0.22	in ² /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 11.11 in		#4@ 22.22 in
#5@ 17.22 in		#5@ 34.44 in
#6@ 24.44 in		#6@ 48.89 in

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Project Name/Number : tdsa-barber-6

Title Mawer-Baze
Dsgnr: Michelle Thompson
Description....
8' Cantilevered Retaining Wall

Page : 3
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	1,041.7	2.78	2,893.5	Soil Over HL (ab. water tbl)	1,440.2	2.92	4,201.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.92	4,201.0
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	7.5	8.58	64.4	Soil Over Toe =	64.0	0.75	48.0
=				Surcharge Over Toe =			
Total	1,049.2	O.T.M. =	2,957.9	Stem Weight(s) =	800.0	1.83	1,466.8
				Earth @ Stem Transitions =			
				Footing Weight =	458.4	1.83	840.5
				Key Weight =		0.83	
				Vert. Component =	582.4	3.67	2,135.8
				Total =	3,345.0 lbs	R.M.=	8,692.1

Resisting/Overturning Ratio = **2.94**
Vertical Loads used for Soil Pressure = 2,762.6 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

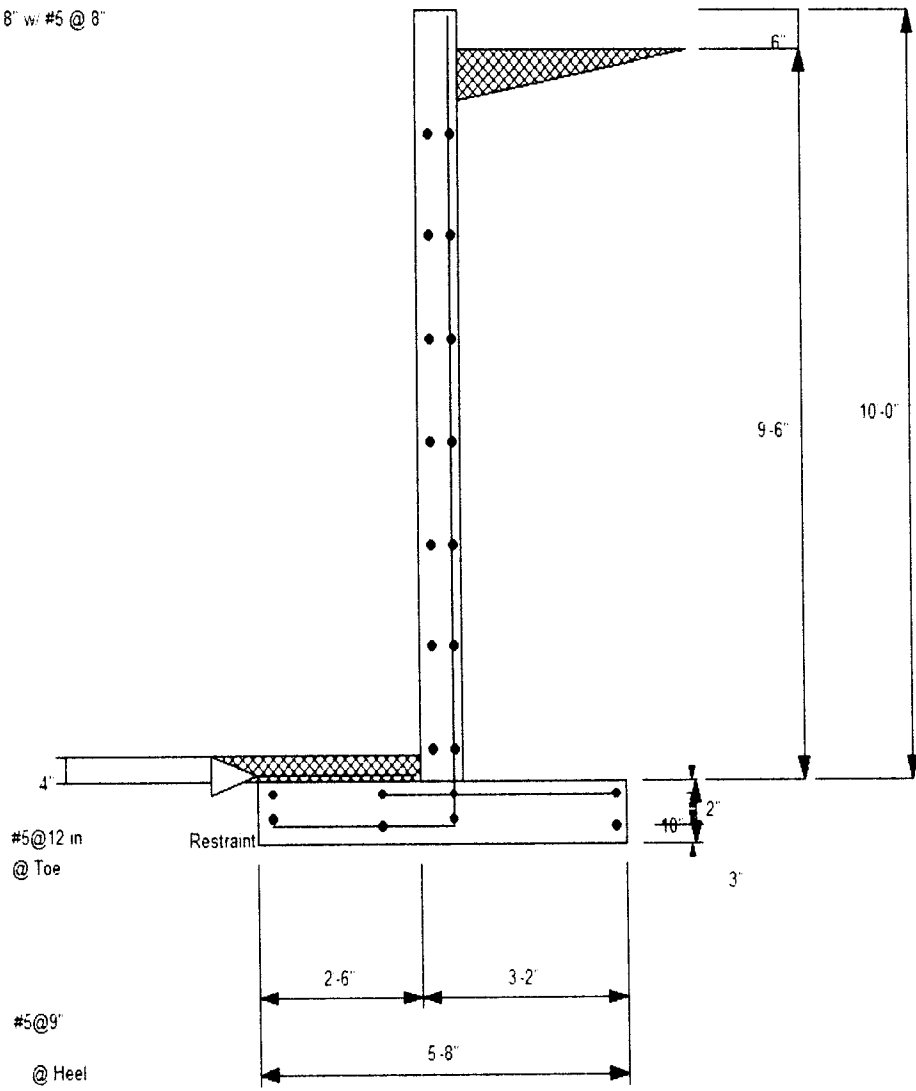
Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.085 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe because the wall would then tend to rotate into the retained soil.

8" w/ #5 @ 8"



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to set these five lines of information
for your program.

Project Name/Number : tdsa-barber-6

Title Mawer-Baze
Dsgnr: Michelle Thompson
Description....
10' Cantilevered Retaining Wall

Page : 1
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

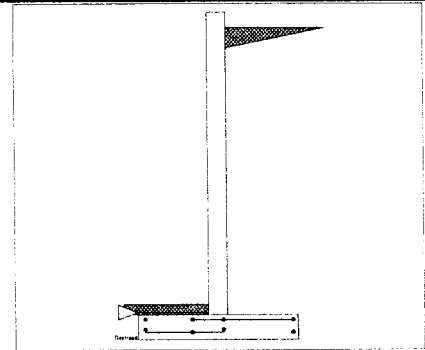
Criteria

Retained Height = 9.50 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 4.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 30.0 psf/ft

Passive Pressure = 538.0 psf/ft
Soil Density, Heel = 128.00 pcf
Soil Density, Toe = 128.00 pcf
Footing||Soil Friction = 0.350
Soil height to ignore for passive pressure = 6.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
Used for Sliding & Overturning

Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft
Load Type = Wind (W)
(Service Level)
Wind on Exposed Stem = 15.0 psf
(Service Level)

Adjacent Footing Load

Adjacent Footing Load = 0.0 lbs
Footing Width = 0.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 0.00 ft
Footing Type = Line Load
Base Above/Below Soil = 0.0 ft
at Back of Wall
Poisson's Ratio = 0.300

Axial Load Applied to Stem

Axial Dead Load = 0.0 lbs
Axial Live Load = 0.0 lbs
Axial Load Eccentricity = 0.0 in

Design Summary

Wall Stability Ratios

Overturning = 4.20 OK
Slab Resists All Sliding !

Total Bearing Load = 4,855 lbs
...resultant ecc. = 2.35 in

Soil Pressure @ Toe = 1,034 psf OK
Soil Pressure @ Heel = 679 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 1,448 psf
ACI Factored @ Heel = 951 psf
Footing Shear @ Toe = 28.0 psi OK
Footing Shear @ Heel = 39.6 psi OK
Allowable = 75.0 psi

Sliding Calcs

Lateral Sliding Force = 1,609.2 lbs

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 8.00
Rebar Size = # 5
Rebar Spacing = 8.00
Rebar Placed at = Edge

Design Data

fb/FB + fa/Fa = 0.908

Total Force @ Section

Service Level lbs =
Strength Level lbs = 2,311.1

Moment....Actual

Service Level ft-# =
Strength Level ft-# = 7,382.8

Moment....Allowable

= 8,121.3

Shear.....Actual

Service Level psi =
Strength Level psi = 31.1

Shear.....Allowable

psi = 75.0

Anet (Masonry)

in2 =

Rebar Depth 'd'

in = 6.19

Masonry Data

fm psi =
Fs psi =
Solid Grouting =
Modular Ratio 'n' =
Wall Weight psf = 100.0
Short Term Factor =
Equiv. Solid Thick. =
Masonry Block Type = Medium Weight
Masonry Design Method = ASD

Concrete Data

fc psi = 2,500.0
Fy psi = 40,000.0

Vertical component of active lateral soil pressure IS
NOT considered in the calculation of soil bearing

Load Factors

Building Code IBC 2015,ACI
Dead Load 1.400
Live Load 1.700
Earth, H 1.700
Wind, W 1.300
Seismic, E 1.000

Use menu item **Settings > Printing & Title Block**
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Project Name/Number : tdsa-barber-6

Title **Mawer-Baze**
Dsgnr: **Michelle Thompson**
Description....
10' Cantilevered Retaining Wall

Page : 2
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.4193 in2/ft	
(4/3) * As :	0.5591 in2/ft	Min Stem T&S Reinf Area 1.920 in2
200bd/ft : 200(12)(6.1875)/40000 :	0.3713 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.4193 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.465 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	1.2573 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	2.50 ft
Heel Width	=	3.17
Total Footing Width	=	5.67
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.83 ft
f _c =	2,500 psi	F _y = 40,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 1,448	951 psf
Mu' : Upward	= 51,574	38,405 ft-#
Mu' : Downward	= 8,804	116,095 ft-#
Mu: Design	= 3,015	5,925 ft-#
Actual 1-Way Shear	= 27.99	39.61 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 5 @ 12.00 in	
Heel Reinforcing	= # 5 @ 9.00 in	
Key Reinforcing	= None Spec'd	
Footing Torsion, Tu	=	0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.36 in, #5@ 14.51 in, #6@ 20.59 in, #7@ 28.09 in, #8@ 36.98 in, #9@ 46
Heel: #4@ 5.98 in, #5@ 9.27 in, #6@ 13.17 in, #7@ 17.96 in, #8@ 23.65 in, #9@ 29.
Key: No key defined

Min footing T&S reinf Area	1.22	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 11.11 in		#4@ 22.22 in
#5@ 17.22 in		#5@ 34.44 in
#6@ 24.44 in		#6@ 48.89 in

Use menu item Settings > Printing & Title Block to set these five lines of information for your program.

Project Name/Number : tdsa-barber-6

Title Mawer-Baze
 Dsgnr: Michelle Thompson
 Description...
 10' Cantilevered Retaining Wall

Page : 3
 Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,601.7	3.44	5,516.9	Soil Over HL (ab. water tbl)	3,040.3	4.42	13,429.4
HL Act Pres (be water tbl)				Soil Over HL (bei. water tbl)		4.42	13,429.4
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	7.5	10.58	79.4	Soil Over Toe =	106.7	1.25	133.4
				Surcharge Over Toe =			
				Stem Weight(s) =	1,000.0	2.83	2,833.6
				Earth @ Stem Transitions =			
Total	= 1,609.2	O.T.M. =	5,596.2	Footing Weight =	708.4	2.83	2,007.3
				Key Weight =		0.83	
				Vert. Component =	895.5	5.67	5,075.1
Resisting/Overturning Ratio		= 4.20		Total =	5,750.9 lbs	R.M.=	23,478.8
Vertical Loads used for Soil Pressure =		4,855.4 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

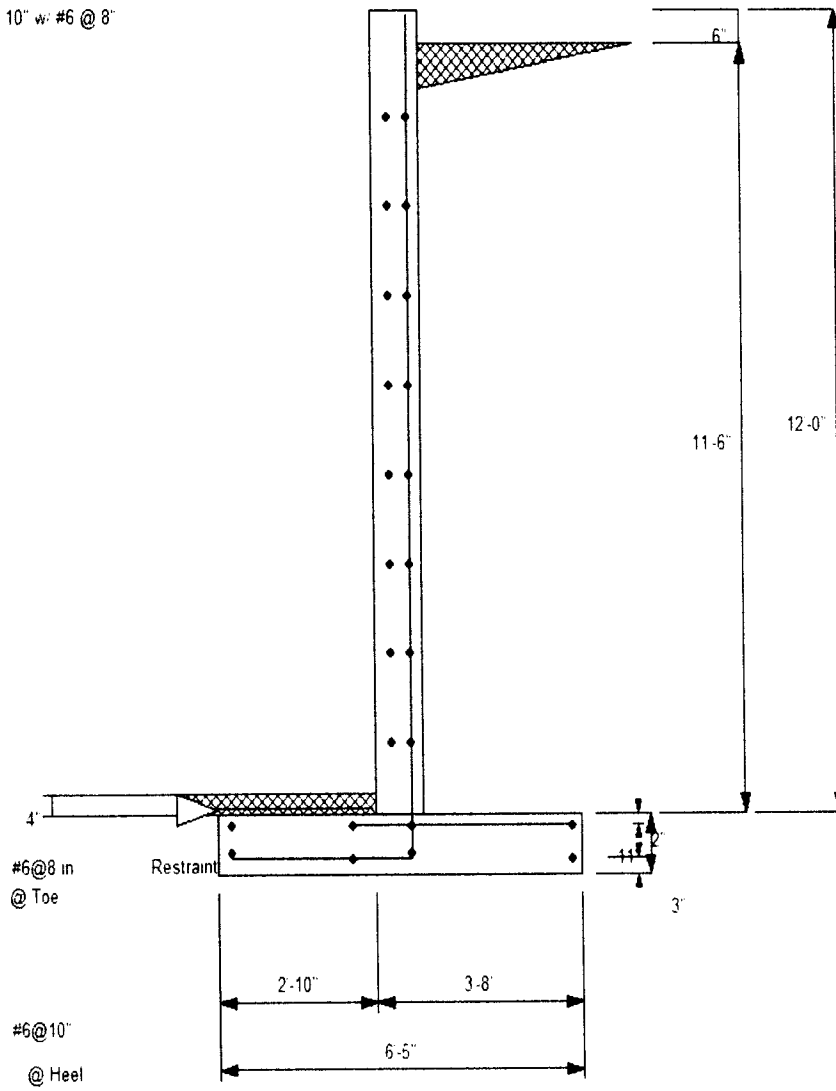
Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
 Horizontal Defl @ Top of Wall (approximate only) 0.051 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe because the wall would then tend to rotate into the retained soil.

10" w/ #6 @ 8"



Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : tdsa-barber-6
Title Mawer-Baze
Dsgnr: Michelle Thompson
Description....
12' Cantilevered Retaining Wall

Page : 1
Date: 26 AUG 2020

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

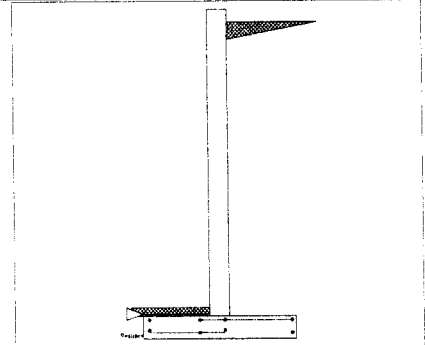
Criteria

Retained Height = 11.50 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 4.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 30.0 psf/ft

Passive Pressure = 538.0 psf/ft
Soil Density, Heel = 128.00 pcf
Soil Density, Toe = 128.00 pcf
Footing||Soil Friction = 0.350
Soil height to ignore
for passive pressure = 6.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load = 0.0 lbs
Axial Live Load = 0.0 lbs
Axial Load Eccentricity = 0.0 in

Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft
Load Type = Wind (W)
(Service Level)
Wind on Exposed Stem = 15.0 psf
(Service Level)

Adjacent Footing Load

Adjacent Footing Load = 0.0 lbs
Footing Width = 0.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 0.00 ft
Footing Type = Line Load
Base Above/Below Soil = 0.0 ft
at Back of Wall
Poisson's Ratio = 0.300

Design Summary

Wall Stability Ratios

Overturning = 3.80 OK
Slab Resists All Sliding !

Total Bearing Load = 6,611 lbs
...resultant ecc. = 4.42 in

Soil Pressure @ Toe = 1,385 psf OK
Soil Pressure @ Heel = 676 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable

ACI Factored @ Toe = 1,939 psf
ACI Factored @ Heel = 946 psf

Footing Shear @ Toe = 36.3 psi OK
Footing Shear @ Heel = 51.4 psi OK
Allowable = 75.0 psi

Sliding Calcs

Lateral Sliding Force = 2,320.1 lbs

Vertical component of active lateral soil pressure IS
NOT considered in the calculation of soil bearing

Load Factors

Building Code = IBC 2015,ACI
Dead Load = 1.400
Live Load = 1.700
Earth, H = 1.700
Wind, W = 1.300
Seismic, E = 1.000

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 10.00
Rebar Size = # 6
Rebar Spacing = 8.00
Rebar Placed at = Edge

Design Data

fb/FB + fa/Fa = 0.926

Total Force @ Section

Service Level lbs =
Strength Level lbs = 3,382.1

Moment....Actual

Service Level ft-# =
Strength Level ft-# = 13,042.0

Moment....Allowable

= 14,069.5

Shear.....Actual

Service Level psi =
Strength Level psi = 37.0

Shear.....Allowable

psi = 75.0

Anet (Masonry)

in2 =

Rebar Depth 'd'

in = 7.63

Masonry Data

f_m psi =
F_s psi =
Solid Grouting =
Modular Ratio 'n' =
Wall Weight psf = 125.0
Short Term Factor =
Equiv. Solid Thick. =
Masonry Block Type = Medium Weight
Masonry Design Method = ASD

Concrete Data

f_c psi = 2,500.0
F_y psi = 40,000.0

Bottom

Stem OK

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Project Name/Number : tdsa-barber-6

Title Mawer-Baze
Dsgnr: Michelle Thompson
Description...
12' Cantilevered Retaining Wall

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Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.595 in2/ft		
(4/3) * As :	0.7934 in2/ft	Min Stem T&S Reinf Area 2.880 in2	
200bd/fy : 200(12)(7.625)/40000 :	0.4575 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.240 in2/ft	
0.0018bh : 0.0018(12)(10) :	0.216 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.595 in2/ft	#4@ 10.00 in	#4@ 20.00 in
Provided Area :	0.66 in2/ft	#5@ 15.50 in	#5@ 31.00 in
Maximum Area :	1.5494 in2/ft	#6@ 22.00 in	#6@ 44.00 in

Footing Data

Toe Width	=	2.79 ft
Heel Width	=	3.63
Total Footing Width	=	6.42
Footing Thickness	=	11.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.83 ft
f _c =	2,500 psi	F _y = 40,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 1,939	946 psf
Mu' : Upward	= 83,937	50,980 ft-#
Mu' : Downward	= 11,797	179,034 ft-#
Mu: Design	= 4,638	9,298 ft-#
Actual 1-Way Shear	= 36.26	51.42 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 6 @ 8.00 in	
Heel Reinforcing	= # 6 @ 10.00 in	
Key Reinforcing	= None Spec'd	
Footing Torsion, Tu	=	0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs

If torsion exceeds allowable, provide
supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 6.44 in, #5@ 9.99 in, #6@ 14.18 in, #7@ 19.34 in, #8@ 25.47 in, #9@ 32.
Heel: #4@ 4.70 in, #5@ 7.28 in, #6@ 10.34 in, #7@ 14.11 in, #8@ 18.58 in, #9@ 23.
Key: No key defined

Min footing T&S reinf Area	1.52	in2
Min footing T&S reinf Area per foot	0.24	in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 10.10 in	#4@ 20.20 in	
#5@ 15.66 in	#5@ 31.31 in	
#6@ 22.22 in	#6@ 44.44 in	

Use menu item **Settings > Printing & Title Block**
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Project Name/Number : tdsa-barber-6

Title **Mawer-Baze**
Dsgnr: **Michelle Thompson**
Description....
12' Cantilevered Retaining Wall

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Cantilevered Retaining Wall

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Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	2,312.6	4.14	9,571.6	Soil Over HL (ab. water tbl)	4,109.8	5.02	20,636.4
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		5.02	20,636.4
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	7.5	12.67	95.0	Soil Over Toe =	119.1	1.40	166.3
=				Surcharge Over Toe =			
Total	= 2,320.1	O.T.M. =	9,666.6	Stem Weight(s) =	1,500.0	3.21	4,813.0
				Earth @ Stem Transitions =			
				Footing Weight =	882.4	3.21	2,831.2
				Key Weight =		0.83	
				Vert. Component =	1,293.0	6.42	8,297.7
				Total =	7,904.3 lbs	R.M.=	36,744.6

Resisting/Overturning Ratio = 3.80
Vertical Loads used for Soil Pressure = 6,611.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.072 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe because the wall would then tend to rotate into the retained soil.