MDT ENGINEERING

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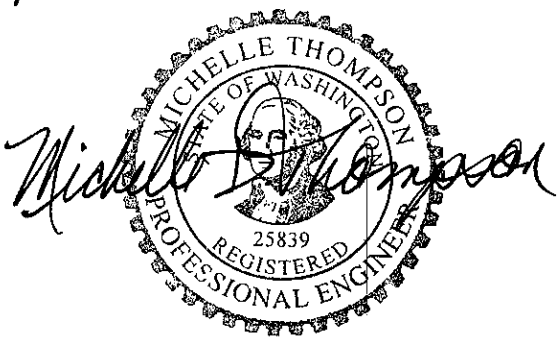
Structural Calculations
Mawer-Houtchens
6024 SE 22nd St.
Mercer Island, WA 98040

April 18, 2022
REVISED 7/8/22
REVISED 7/10/23



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, 2018 EDITION, ASCE 7-16
2. INTERNATIONAL RESIDENTIAL CODE, 2018 EDITION
3. SIMPSON STRONG TIE WOOD CONTRUCTION CONNECTORS 2021-2023
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, 2018, ASCE 7-16, ALTERNATE ALL-HEIGHTS METHOD, ULTIMATE DESIGN WIND SPEED = 110 MPH, NOMINAL DESIGN WIND SPEED = 85 MPH, EXPOSURE C

2. SEISMIC: INTERNATIONAL BUILDING CODE, 2018, ASCE 7-16
   RISK CATEGORY II
   SEISMIC IMPORTANCE FACTOR, Ie=1.0
   MAPPED SPECTRAL RESPONSE ACCELERATION PARAMETERS, Ss=1.5, S1=0.5
   SITE CLASS D
   DESIGN SPECTRAL RESPONSE ACCELERATION PARAMETERS, Sds=1.0g, Sd1=0.5g
   SEISMIC DESIGN CATEGORY D2
   BASIC SEISMIC FORCE-RESISTING SYSTEM: LIGHT FRAME WALLS WITH WOOD SHEAR WALLS
   DESIGN BASE SHEAR, V = F (Sds) (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 30 PCF ACTIVE SOIL PRESSURE, 300 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 ¼" PLATE WASHERS. LOCATE WITHIN ½" OF SHEATHING.
4. AT GARAGE JAMBS, REFER TO LATERAL RESTRAINT PANEL DETAIL 401/S1.
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/S2 OR 304/S2.
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 2018 IBC and ASCE 7-16

Alternate all-heights method

Wind Speed, Vult=110 MPH, Vasd=85 MPH

Exposure C

Pnet = 0.00256(V)(Kz)(Cnet)(Kzt)

Kzt = 1.0

P = 24 PSF

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Lateral Analysis

Seismic Design: Per 2018 IBC and ASCE 7-16, 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

Fa = 1.0 Ss = 1.5

Fv = 1.5 S1 = 0.5 Sm1 = Fv x S1 = 1.5 x 0.5 = 0.75g

Sds = 2/3 x Fa x Ss = 2/3 x 1.0 x 1.5 = 1.0g

Sd1 = 2/3 x Sm1 = 2/3 x 0.75 = 0.5g

From Table 11.6-1, Seismic Design Category D

V = (F x Sds x 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 x 1.0 x W) / 6.5 = 0.1846 x W

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Compare Wind and Seismic Base Shear

Wind: Use maximum wind load of 24 PSF in all directions.

Vwind = (28)(24 PSF) = 672 PLF

Seismic:

Veq = 1.2 (1.0) (W) / 6.5

= 0.1846W

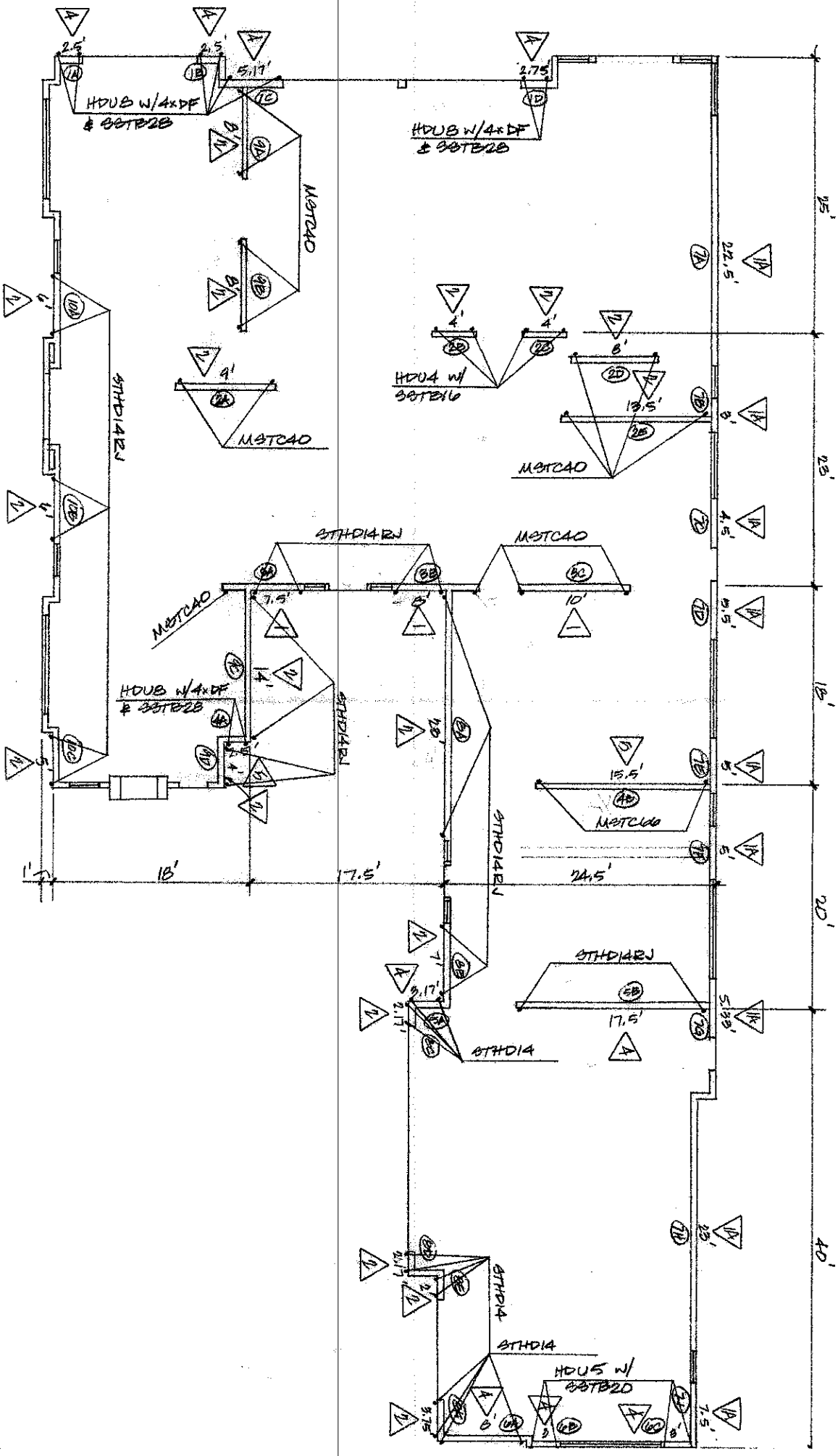
W = Roof: 126 (15) = 1890
Walls: 2(9)(10) = 180
Floor: 126(10) = 1260
Walls: 2(6)(10) = 160
3490

Veq = 0.1846 (3490) = 644/1.4 = 460 PLF

Redundancy Check: Max. increase = 1.3 Veqmax = 1.3 (460) = 598 PLF

Vwind > Veq

Wind Controls ~~**Seismic Controls**~~


HDU8 W/4xDF & SSTB28
HDU8 W/4xDF & SSTB28
M8TC40
STHD14RJ
HDU4 W/ SSTB16
M8TC40
M8TC40
STHD14RJ
M8TC40
M8TC40
HDU8 W/4xDF & SSTB28
STHD14RJ
M8TC66
STHD14RJ
STHD14
STHD14
HDU5 W/ SSTB20
1'
18'
17.5'
24.5'
25'
22.5'
23'
4.5'
5.5'
18'
5'
20'
5.33'
23'
7.5'
40'

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Wind Load	24						
SW#	ib Area Wid	Area He	Total Shear	Wall Length	Total Wall Length	Shear Per Foot	sw type
1	25	6.5	7251	2.50			
	12.5	11.17		2.50			
				5.17			
				2.75			
					12.92	561	4
2	24	17.67	10178	9.00			
				4.00			
				4.00			
				8.00			
				13.50	38.50	264	2
3	20.5	11.17	5496	7.50			
				8.00			
				10.00			
					25.50	216	1
4	21	21.17	10670	2.50			
				15.50			
					18.00	593	5
5	20	14.5	9600	3.17			
	10	11		17.50			
					20.67	464	4
6	20	14.5	6960	8.00			
				3.00			
				3.00			
					14.00	497	4

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Wind Load	24						
SW#	ib Area Wic	Area He	Total Shear	Wall Length	Total Wall Length	Shear Per Foot	sw type
7	12.25	21.17	6224	22.50			
				3.00			
				4.50			
				5.50			
				5.00			
				5.00			
				5.33			
				23.00			
				7.50	81.33	77	1A
8	21	21.17	10670	23.00			
				7.00			
				2.17			
				2.17			
				2.00			
				3.75	40.09	266	2
9	17.75	21.17	9018	8.00			
				8.00			
				14.00			
				4.00	34.00	265	2
10	10	21.17	5081	6.00			
				6.00			
				5.00			
					17.00	299	2

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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
1A	561	2.5	1402.5	150	9	5049	4862	HDU8 W/4XDF
1B	561	2.5	1402.5	150	9	5049	4862	HDU8 W/4XDF
1C	561	5.17	2900.37	150	12.33	6917.13	6529	HDU8 W/4XDF
1D	561	2.75	1542.75	150	12.33	6917.13	6711	HDU8 W/4XDF
2A	264	9	2376	150	9	2376	1701	MSTC40
2B	264	4	1056	150	12.33	3255.12	2955	~~MSTC52~~ HDU4
2C	264	4	1056	150	12.33	3255.12	2955	~~MSTC52~~ HDU4
2D	264	8	2112	150	9	2376	1776	MSTC40
2E	264	13.5	3564	150	9	2376	1364	MSTC40
3A	216	7.5	1620	150	12.33	2663.28	2101	STHD14RJ
3B	216	8	1728	150	12.33	2663.28	2063	STHD14RJ
3C	216	10	2160	150	9	1944	1194	MSTC40
4A	593	2.5	1482.5	150	9	5337	5150	HDU8 W/4XDF
4B	593	15.5	9191.5	150	9	5337	4175	MSTC66
5A	464	3.17	1470.88	150	9	4176	3938	STHD14
5B	464	17.5	8120	150	9	4176	2864	STHD14
6A	497	8	3976	150	9	4473	3873	STHD14
6B	497	3	1491	150	9	4473	4248	HDU5
6C	497	3	1491	150	9	4473	4248	HDU5
7A	77	22.5	1732.5	150	9	693	-995	NO UPLIFT
7B	77	3	231	150	9	693	468	NEGLECT
7C	77	4.5	346.5	150	9	693	356	NEGLECT
7D	77	5.5	423.5	150	9	693	280.5	NEGLECT
7E	77	5	385	150	9	693	318	NEGLECT
7F	77	5	385	150	9	693	318	NEGLECT
7G	77	5.33	410.41	150	9	693	293.25	NEGLECT
7H	77	23	1771	150	9	693	-1032	NO UPLIFT
7J	77	7.5	577.5	150	9	693	130.5	NEGLECT
8A	266	23	6118	150	9	2394	669	STHD14RJ
8B	266	7	1862	150	9	2394	1869	STHD14RJ
8C	266	2.17	577.22	150	9	2394	2231.25	STHD14
8D	266	2.17	577.22	150	9	2394	2231.25	STHD14
8E	266	5	1330	150	9	2394	2019	STHD14
8F	266	3.75	997.5	150	9	2394	2112.75	STHD14
9A	265	8	2120	150	9	2385	1785	MSTC40
9B	265	8	2120	150	9	2385	1785	MSTC40
9C	265	14	3710	150	9	2385	1335	STHD14RJ

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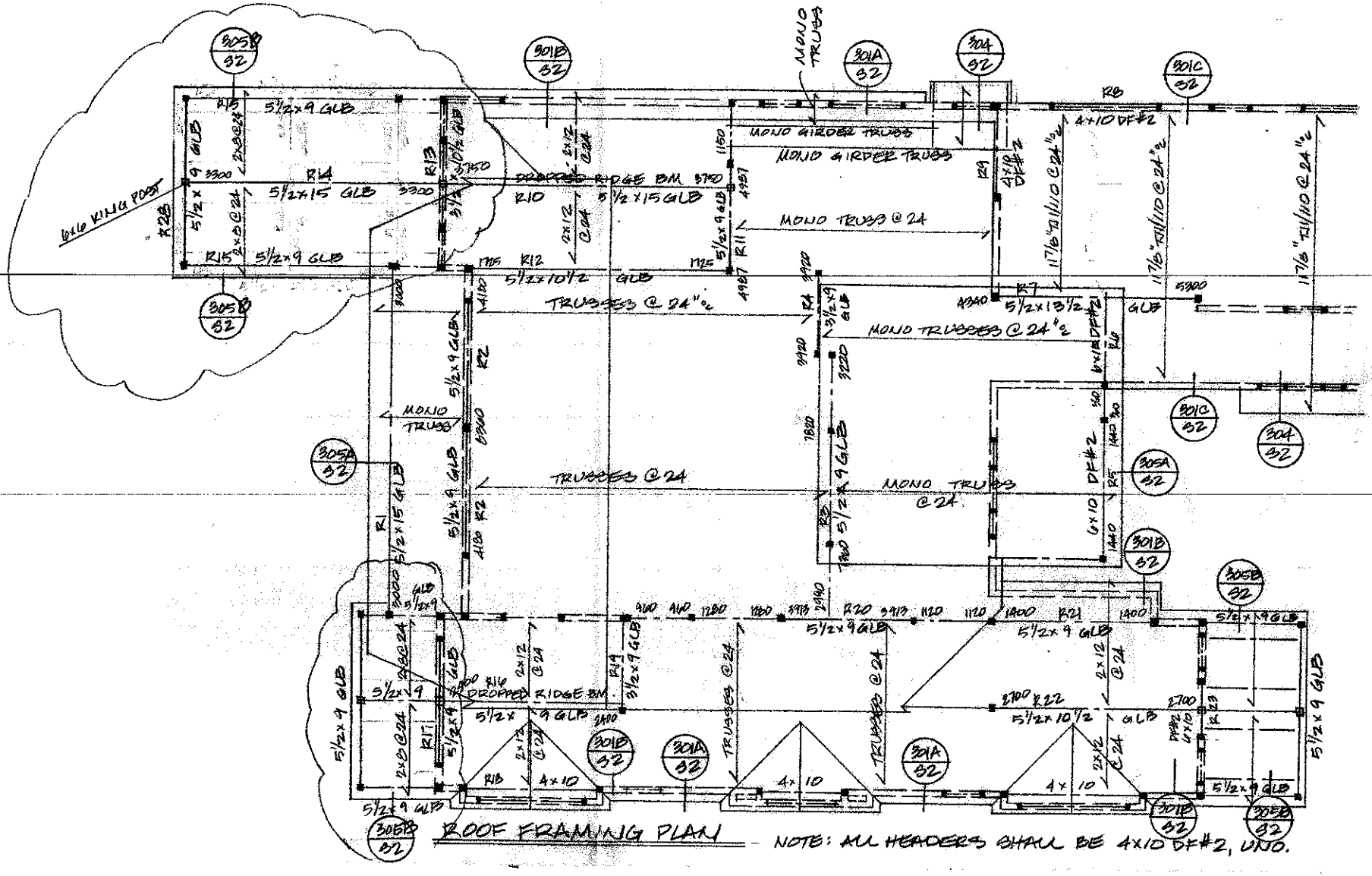
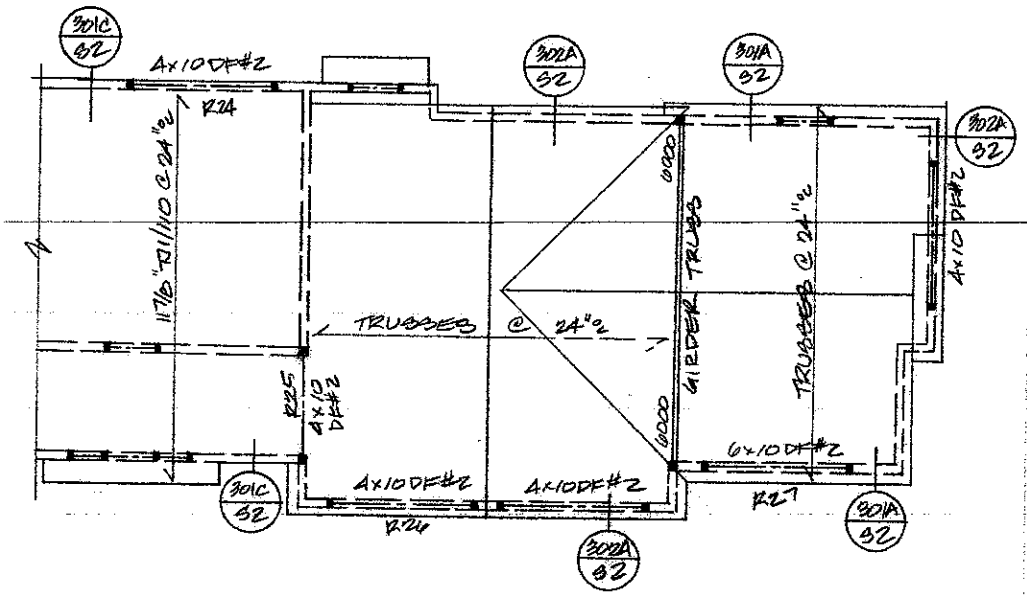
9D	265	4	1060	150	9	2385	2085	STHD14RJ
10A	299	6	1794	150	9	2691	2241	STHD14RJ
10B	299	6	1794	150	9	2691	2241	STHD14RJ
10C	299	5	1495	150	9	2691	2316	STHD14RJ



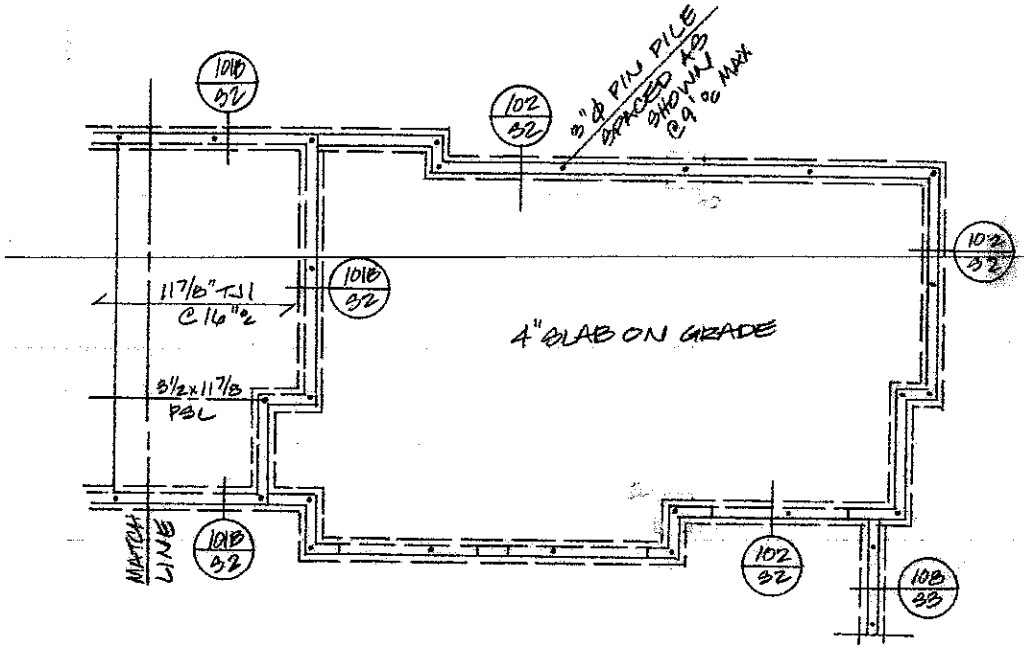
ROOF FRAMING PLAN

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



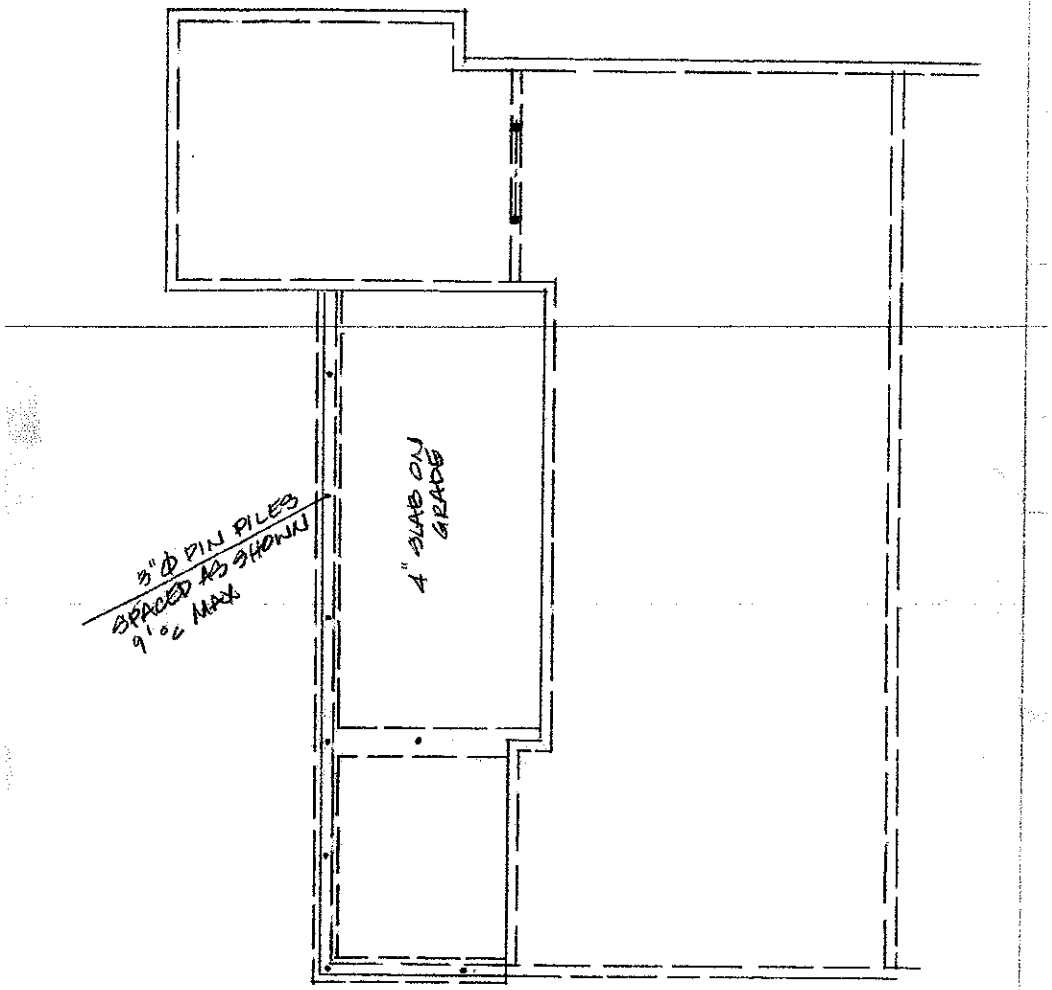
ROOF FRAMING PLAN

SEE MAIN FLOOR PILE LAYOUT FOR PILE LOCATIONS
SEE MAIN FLOOR PATIO PILE LAYOUT FOR PILE LOCATIONS
4" SLAB ON GRADE
11 7/8" TJI @ 16" o/c
3 1/2 x 11 7/8 PSL
4x10
4x12
MATCH LINE
6x6 PT W/ DRIP GROOVE
FOUNDATION & MAIN FLOOR

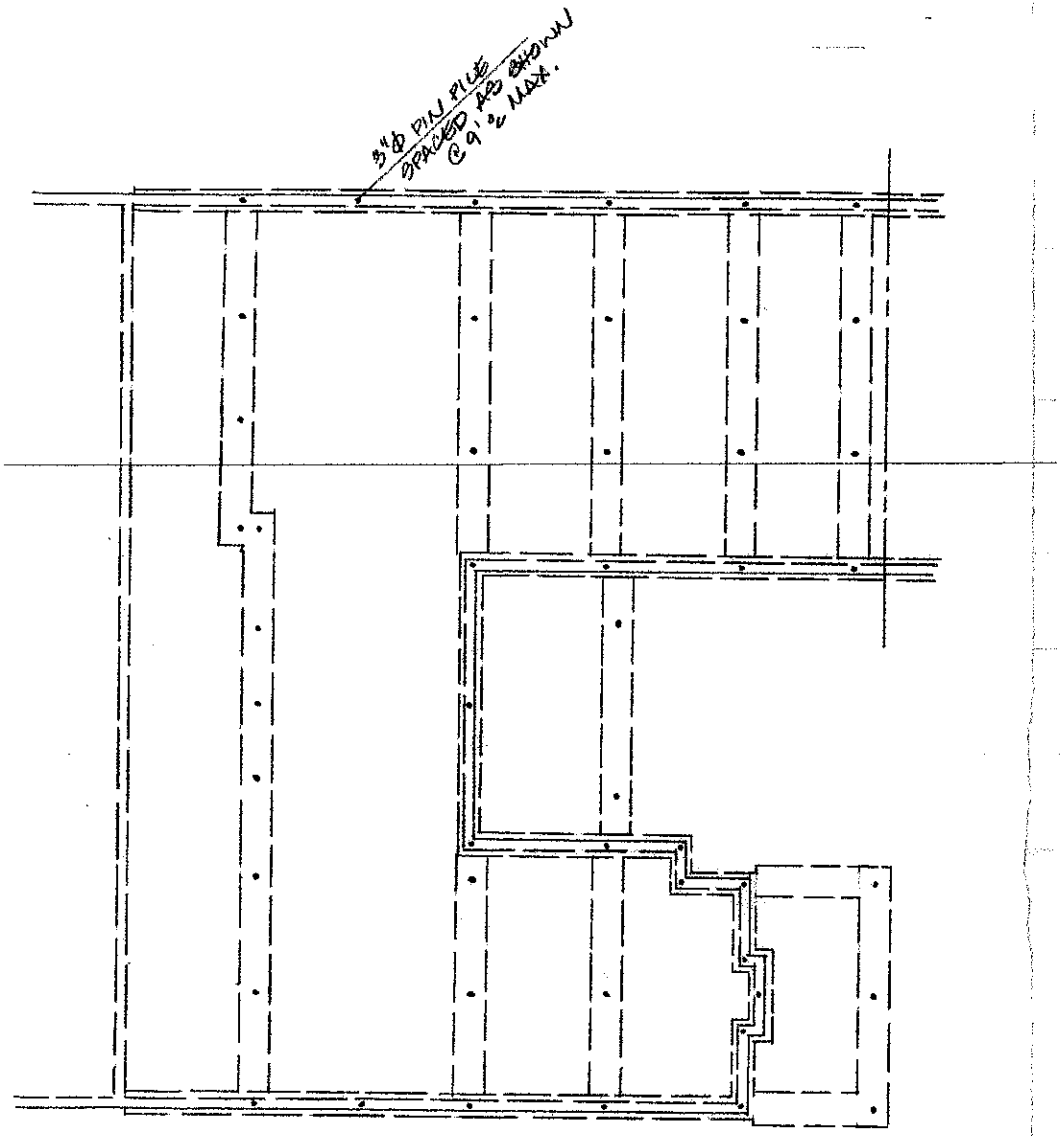


GARAGE FDN & PILE LAYOUT

3"ϕ PIN PILE CAPACITY = 12000 #

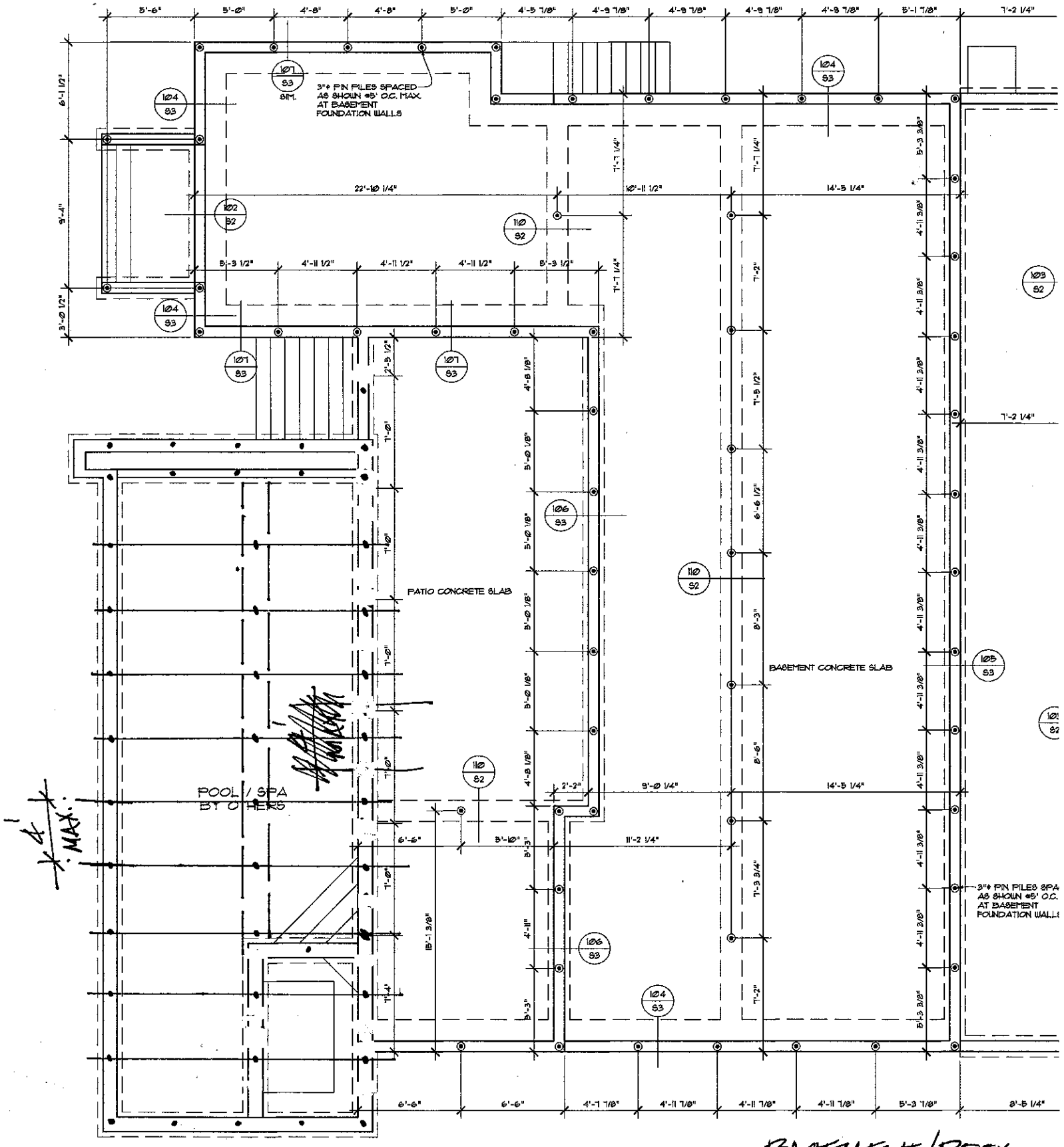


MAIN FLOOR PATIO PILE LAYOUT



MAIN FLOOR PILE LAYOUT

3"Ø PIN PILE
CAPACITY = 12000#



NOTE:
TO REDUCE THE POTENTIAL OF SLAB SETTLEMENT AND DISTRESS, THE GOETECHNICAL ENGINEER RECOMMENDS REMOVING A MINIMUM OF 1-FOOT OF EXISTING SOIL BELOW THE SLAB, AND PLACING 1-FOOT OF PROPERLY COMPACTED FREE-DRAINING GRANULAR STRUCTURAL FILL PER GEOTECHNICAL REPORT SECTION 6.4

BASEMENT / POOL
PIN PILE PLAN (1 OF 2)

SCALE: 1/4" = 1' - 0"

MAWER/HOUTCHENS/ROOF 4/22

R1 $l = 30'$ $W = 5(40) = 200$ PLF

$M = 22500'\text{-}\#$ $R = 3000\#$

$S_{REQ} = 98$ $A_{REQ} = 22$

$I_{REQ} = 1350$

5½ x 15 GLB

R2 $l = 11'$ $W = 19(40) = 760$ PLF

$M = 11495'\text{-}\#$ $R = 4180\#$

$S_{REQ} = 50$ $A_{REQ} = 29$

$I_{REQ} = 252$

5½ x 9 GLB

R3 $l = 10'$ $W = 23(40) = 920$ PLF

$M = 11500'\text{-}\#$ $R = 4600\#$

$S_{REQ} = 50$ $A_{REQ} = 31$

$I_{REQ} = 230$

5½ x 9 GLB

R4 $l = 7'$ $W = (15.5 + 12.5)(40) = 1120$ PLF

$M = 6860'\text{-}\#$ $R = 3920\#$

$S_{REQ} = 30$ $A_{REQ} = 24$

3½ x 9 GLB

R5 $l = 12'$ $W = (4.5 + 1.5)(40) = 240$ PLF

$M = 4320'\text{-}\#$ $R = 1440\#$

$S_{REQ} = 52$ $A_{REQ} = 19$

6 x 10 DF#2

MAWER/HOUTCHENS/ROOF 4/22

R6 $l = 8'$ $W = 14(40) = 560$ PLF

$M = 4480'^{\#}$ $R = 2240^{\#}$

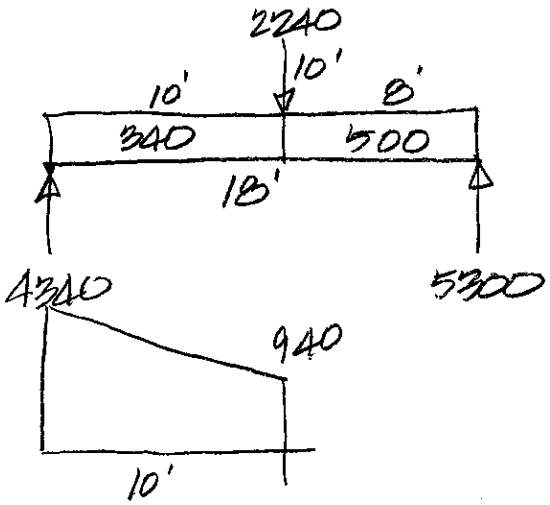
$S_{REQ} = 54$ $A_{REQ} = 28$

6x10 DF#2

R7 $l = 18'$ $W = 8.5(40) = 340$ PLF 0-10'

$W = 12.5(40) = 500$ PLF 10-18'

$P = 2240^{\#}$ @ 10'



$M = 26400'^{\#}$ $R = 5300^{\#}$

$S_{REQ} = 115$ $A_{REQ} = 38$

$I_{REQ} = 950$

5½x13½ GLB

RB $l = 9.5'$ $W = 8.5(40) = 340$ PLF

$M = 38336'^{\#}$ $R = 1615^{\#}$

$S_{REQ} = 46$ $A_{REQ} = 19$

4x10 DF#2

MAWER/HOUTCHENS/ROOF 4/22

R9 $l = 8'$ $W = 12(40) = 480$ PLF

$M = 3840'\text{-}\#$ $R = 1920\#$

$S_{REQ} = 46$

4×10 DF#2

R10 $l = 25'$ $W = 7.5(40) = 300$ PLF

$M = 23438'\text{-}\#$ $R = 3750\#$

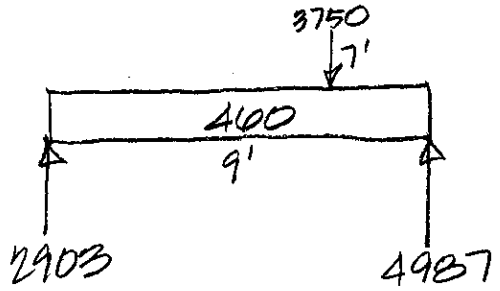
$S_{REQ} = 102$ $A_{REQ} = 27$

$I_{REQ} = 1172$

5½×15 GLB

R11 $l = 9'$ $W = 11.5(40) = 460$ PLF

$P = 3750\#$ @ $7'$



$M = 9161'\text{-}\#$ $R = 4987\#$

$S_{REQ} = 40$ $A_{REQ} = 37$

5½×9 GLB

R12 $l = 23'$ $W = 3.75(40) = 150$ PLF

$M = 9919'\text{-}\#$ $R = 1725\#$

$S_{REQ} = 43$ $A_{REQ} = 13$

$I_{REQ} = 456$

5½×10½ GLB

MAWER/HOUTCHENS/ROOF 4/22

R13 $l = 7.5'$ $P = 3750 + 3300 = 7050^{\#}$

$M = 13219\ ^{'\#}$ $R = 13525^{\#}$

$S_{REQ} = 58$ $A_{REQ} = 28$

$3\frac{1}{2} \times 10\frac{1}{2}$ GLB

R14 $l = 22'$ $W = 7.5(40) = 300$ PLF

$M = 18150\ ^{'\#}$ $R = 3300^{\#}$

$S_{REQ} = 79$ $A_{REQ} = 23$

$I_{REQ} = 798$

$5\frac{1}{2} \times 15$ GLB

R15 $l = 19'$ $W = 4.75(40) = 190$ PLF

$M = 8574\ ^{'\#}$ $R = 1805^{\#}$

$S_{REQ} = 37$ $A_{REQ} = 13$

$I_{REQ} = 326$

$5\frac{1}{2} \times 9$ GLB

R16 $l = 16'$ $W = 7.5(40) = 300$ PLF

$M = 9600\ ^{'\#}$ $R = 2400^{\#}$

$S_{REQ} = 42$ $A_{REQ} = 17$

$I_{REQ} = 307$

$5\frac{1}{2} \times 9$ GLB

MAWER/HOUTCHENS/ROOF 4/22

R17 $l = 11'$ $P = 2400 + 300(3.5') = 3450\#$

$M = 9488'\#$ $R = 1725\#$

$S_{REQ} = 41$ $A_{REQ} = 14$

$I_{REQ} = 209$

5½ x 9 GLB

R18 $l = 12'$ $W = 4(40) = 160$ PLF

$M = 2000'\#$ $R = 960\#$

$S_{REQ} = 34$ $A_{REQ} = 12$

4 x 10 DF#2

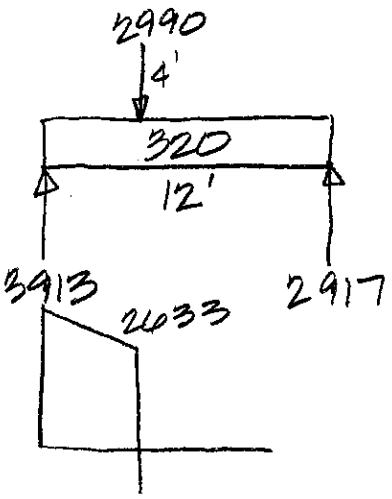
R19 $l = 8'$ $P = 2400\#$

$A_{REQ} = 19$

3½ x 9 GLB

R20 $l = 12'$ $W = 8(40) = 320$ PLF

$P = 2990\#$ @ 4'



$M = 13092'\#$ $R = 3913\#$

$S_{REQ} = 57$ $A_{REQ} = 29$

$I_{REQ} = 314$

5½ x 9 GLB

MAWER/HOUTCHENS/ROOF 4/22

R21 $\ell = 14'$ $W = 5(40) = 200$ PLF

$M = 4900'^{\#}$ $R = 1400^{\#}$

$S_{REQ} = 21$

5½ x 9 GLB

R22 $\ell = 18'$ $W = 7.5(40) = 300$ PLF

$M = 12150'^{\#}$ $R = 2700^{\#}$

$S_{REQ} = 53$ $A_{REQ} = 20$

$I_{REQ} = 437$

5½ x 10½ GLB

R23 $\ell = 5'$ $P = 2700 + 300(4.5) = 4050^{\#}$

$M = 5063'^{\#}$ $R = 2025^{\#}$

$S_{REQ} = 61$ $A_{REQ} = 31$

6 x 10 DF#2

R24 $\ell = 9.5'$ $W = 8.5(40) = 340$ PLF

$M = 3836'^{\#}$ $R = 1615^{\#}$

$S_{REQ} = 46$ $A_{REQ} = 19$

4 x 10 DF#2

R25 $\ell = 7'$ $W = 12.5(40) = 500$ PLF

$M = 3063'^{\#}$ $R = 1750^{\#}$

$S_{REQ} = 36$ $A_{REQ} = 19$

4 x 10 DF#2

MAWER/HOUTCHENS/ROOF 4/22

R26 $l = 9.5'$ $W = 2(40) = 80$ PLF

$M = 902'^{\#}$ $R = 380^{\#}$

4x10 DF#2

R27 $l = 9.5'$ $W = 12.5(40) = 500$ PLF

$M = 5641'^{\#}$ $R = 2375^{\#}$

$S_{REQ} = 67$ $A_{REQ} = 28$

6x10 DF#2

R28 $l = 15'$ $P = 3300^{\#}$

$M = 12375'^{\#}$ $R = 1650^{\#}$

$S_{REQ} = 54$ $A_{REQ} = 13$

$I_{REQ} = 371$

5½x9 GLB

MAWER/HOUTCHENS/FLOOR

4/22

F1 $l = 15'$ $W = 12.5(50) = 625$ PLF

$M = 17578'^{\#}$ $R = 4688^{\#}$

$I_{REQ} = 475$

$3\frac{1}{2} \times 11\frac{7}{8}$ PSL

F2 $l = 6.5'$ $W = 11.5(50) = 575$ PLF

$M = 3037'^{\#}$ $R = 1869^{\#}$

$S_{REQ} = 42$ $A_{REQ} = 23$

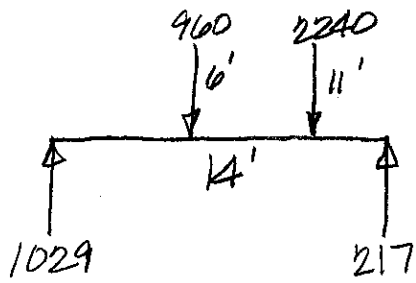
4×10 DF#2

F3 $l = 8.5'$ $W = 575$ PLF

$M = 5193'^{\#}$ $R = 2444^{\#}$

$3\frac{1}{2} \times 11\frac{7}{8}$ PSL

F4 $l = 14'$ $P = 960^{\#}$ @ $6'$ $P = 2240^{\#}$ @ $11'$



$M = 6174'^{\#}$ $R = 2171^{\#}$

$I_{REQ} = 156$

$3\frac{1}{2} \times 11\frac{7}{8}$ PSL

F5 $l = 14'$ $P = 5033^{\#}$ @ $7'$

$M = 17616'^{\#}$ $R = 2517^{\#}$

$3\frac{1}{2} \times 11\frac{7}{8}$ PSL

MAWER/HOUTCHENS/FLOOR 4/22

F6 $l = 7.5'$ $W = 11(50) = 550$ PLF

$M = 3867'\#$ $R = 2063\#$

$S_{REQ} = 53$ $A_{REQ} = 24$

4×12 DF#2

F7 $l = 4.5'$ $W = 12(50) + 460 = 1060$ PLF

$M = 2683'\#$ $R = 2385\#$

$S_{REQ} = 37$ $A_{REQ} = 25$

4×10 DF#2

F8 $l = 6'$ $W = 9(50) = 450$ PLF

$M = 2025'\#$ $R = 1350\#$

$S_{REQ} = 28$ $A_{REQ} = 16$

4×10 DF#2

MAWER/HOUTCHENS/FLOOR 4/22

F6/F6: 2063(2) = 4126/1500 = 2.75SF ⟹ 24"⊞

F5/F6: 2597 + 2517 + 2063(2) = 9240/1500 = 6.16SF
⟹ 30"⊞

MAWER/HOUTCHENS/PILE FOUNDATION

WALL LOADS @ GARAGE:

ROOF: 12.5 (40) =	500
WALL = 9 (10) =	90
STEM = .67 (2) (150) =	201
FTG = 1.0 (1.33) (150) =	200
	991 PLF

3" Φ PILE ⇒ 12000 #

MAX SPACING = 12000/991 = 12'

USE 8' SPACING:

$M = 991 (8)^2/8 = 7928'\text{-}\#$

USE 16" x 12" FOOTING W/
3 #4 TOP & BOT
& #4 ⊓ @ 18" c

MAWER/HOUTCHENS/PILE FOUNDATION 7/22

WALL LOADS @ BASEMENT:

ROOF = 19 (40)	=	760
WALL = 12 (10)	=	120
FLOOR = 4.5 (50)	=	225
WALL = 9 (.67) (150)	=	904
FTG = 1.0 (1.33) (150)	=	200
		2209 PLF

PILE SPACING = 12000/2209 = 5.43' ⇒ 5' o.c. MAX.

M = 2209 (5)²/8 = 6903 ft-#

USE | 16" x 12" FOOTING w/ 3 #4 TOP & BOT & #4 ⊓ @ 18" o.c.

WALL LOADS @ POOL:

WALL = 8' (11/12) (150)	=	1100
FTG = 1.0 (1.33) (150)	=	200
SLAB = .33 (150) (3.75)	=	186
WATER = 62.41 (6') (3.75)	=	1404
		2890 PLF

PILE SPACING = 12000/2890 = 4.15' ⇒ 4' MAX.