MDT ENGINEERING

31403 44th Avenue South
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Structural Calculations
Mawer-Houtchens Carport
6024 SE 22nd St.
Mercer Island, WA 98040

April 2, 2022

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 carport addition to the existing 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 = 40 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

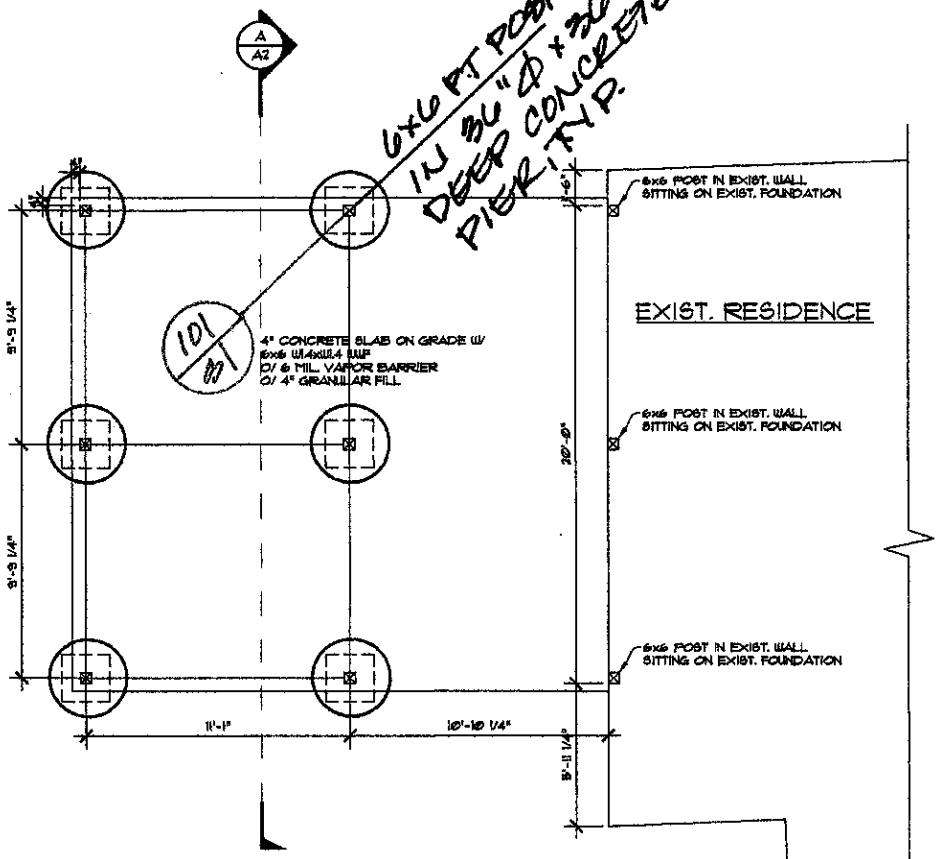
1. LUMBER GRADES AND ALLOWABLE STRESSES SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE ON PLAN:

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.

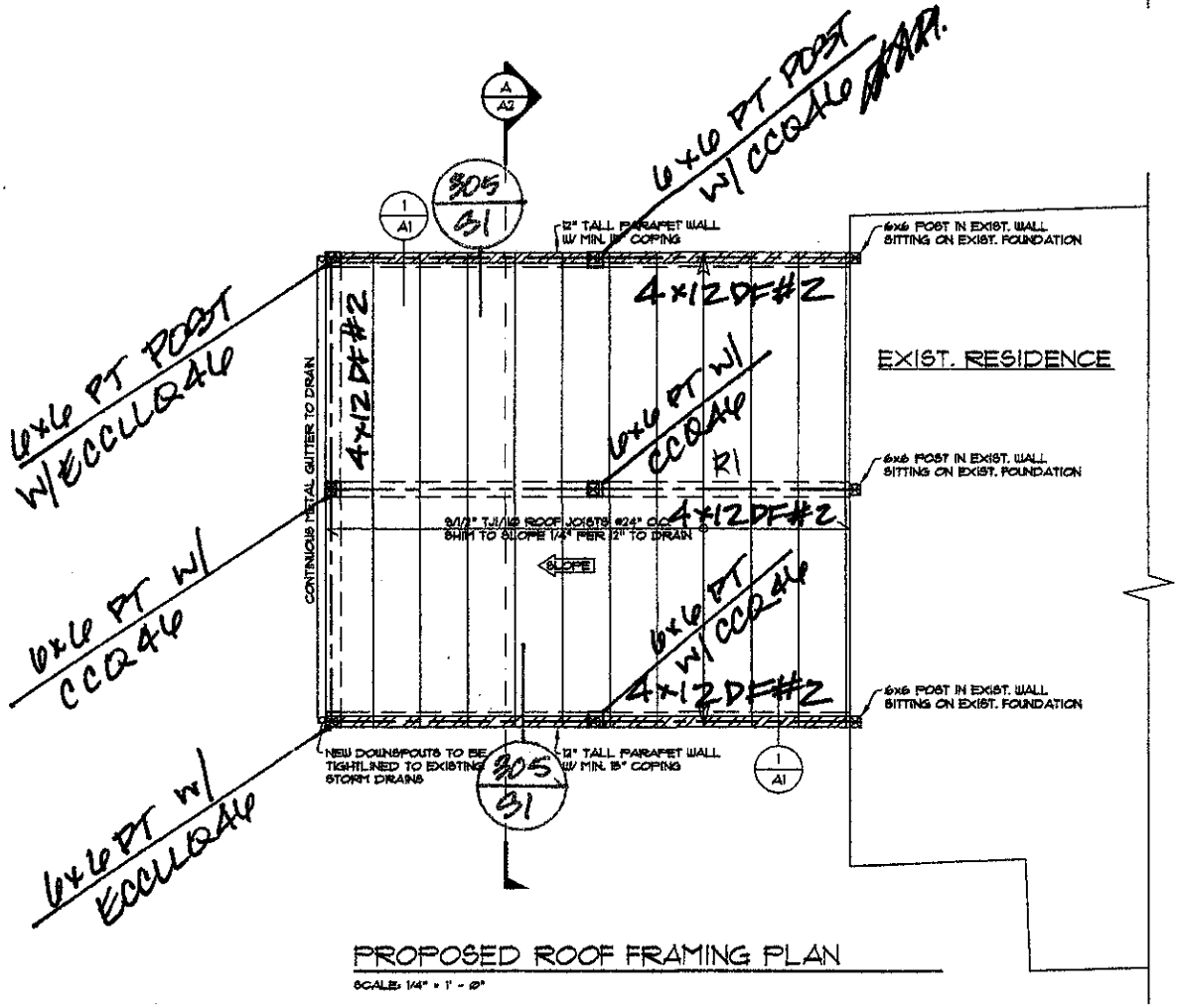
GENERAL CONSTRUCTION NOTES

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.



PROPOSED FOUNDATION PLAN

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



PROPOSED ROOF FRAMING PLAN

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

MAWER/HOUTCHENS CARPORT

3/22

R1 $l = 11'$ $W = 10(40) = 400$ PLF

$M = 6050'\text{-}\#$ $R = 2200\#$

$S_{REQ} = 72$ $A_{REQ} = 25$

4×12
DF#2

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Lateral Analysis

Wind Design: Per 2018 IBC and ASCE 7-10

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 = (5)(24 PSF) = 120 PLF

Seismic:

Veq = 1.2 (1.0) (W) / 6.5

= 0.1846W

W = Roof: 20(15) = 300PLF

Walls:

Floor:

Walls:

Veq = 0.1846 (300) = 55/1.4 = 40 PLF

Redundancy Check: Max. increase = 1.3 Veqmax = 1.3 (40) = 52 PLF

Vwind > Veq

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

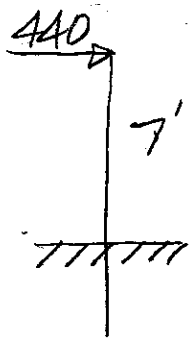
MAWER / HOUTCHENS CARPORT 3/22

LATERAL:

WIND LOAD = 24 PSF

$V = (4' + 1')(24)(11') = 1320\#$

$V_{POST} = 1320/3 = 440\#/POST$



$M = 3080'\text{-}\#$ $R = 440\#$

$S_{REQ} = 26.4$ $A_{REQ} = 6$

6×6 PT POST

$$d = \sqrt{\frac{4.25(440)(7)}{150(3)(3.0)}} = 3'$$

USE 6×6 P.T. POST IN 36" ϕ × 3' DEEP CONCRETE PIER