Long Beach Remodel

A Senior Project

Presented to

the Faculty of the Architectural Engineering Department

California Polytechnic State University, San Luis Obispo

In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Science

by

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Summary of Long Beach Remodel

For my senior project, I created a set of plans for a remodel of a single family residence located in Long Beach, California. The project mandate included the following:

1) Create a set of as-built drawings (i.e. existing drawings of the building and site)
2) Work with an architect on a proposed design
3) Produce a set of structural drawings and calculations

The house was built in 1949. The prior owner of the house added a detached three-car garage and converted an existing attached garage into a den. The current owner wanted to demolish the den and build a larger family and dining room, and a more functional kitchen.

A surveyor was hired to identify the two front corners of the lot. Without a survey, it would have been difficult to determine exactly where the property lines were located and thus, how to “set” the house on the lot.

Meeting California’s stringent Title 24 Energy Requirements was a challenging aspect of the project, based on the proposed window, glass door, and skylight configuration. Unfortunately, just upgrading the insulation in the floors, walls and ceilings wasn’t enough to meet California’s Title 24 Energy Requirements. We faced a choice of either having to upgrade the existing windows in the house or converting the existing conventional water heater to a more energy efficient tankless model. Due to more favorable economics, we proceeded with the tankless model.

Another challenge we faced was making sure the new roof would plane in properly with the existing roof. The existing roof was framed with 2x4 members, which were of sufficient strength per code when the house was built in 1949. However, under the current code, roof framing members required more strength. Since the owner wanted to expedite construction, we decided to use roof trusses. This also enabled ceiling heights and eaves to match up, without a great deal of labor.

I decided to pursue this project primarily because I wanted “hands on” experience creating a comprehensive set of construction documents. Wood construction is something I can relate to well given my background and find it to be an aesthetically appealing material. I suspect wood design will be an important part of my focus as an engineer.

The documents that follow include a set of as-built drawings, a proposed design and structural drawings and details. I also included in the package that follows a set of calculations for gravity and lateral loads.
1. EXISTING FLUSH TYPE DOORS SHALL BE 1-3/8" THICK MINIMUM WITH SOLID CORE CONSTRUCTION.

2. GLAZED OPENINGS WITHIN 36" OF THE DOOR LOCK WHEN THE DOOR IS IN THE CLOSED POSITION SHALL BE歳 FLOOR TO CEILING Tempered GLASS OR EQUIVALENT BURGLAR RESISTANT MATERIAL. OR SHALL BE PROTECTED BY METAL BARS, SCREENS, OR SHUTTERS HAVING A MINIMUM OPENING OF 2".

3. DOOR STOPS OF SWinging DOORS SHALL BE OF ONE-PIECE CONSTRUCTION WITH THE JAMB OR JOINED TO THE JAMB.

4. ALL FRAME M France WHICH ARE ACCESSIBLE FROM OUTSIDE THE BUILDING SHALL BE EITHER GALVANIZED OR EMBOSSED STEEL WITH A MINIMUM 3-1/4" THICKNESS OR A MINIMUM OF 1/8" THICKNESS OF FIBER-CORE CONSTRUCTION. FRAME SHOULDN'T BE ATTACHED TO THE WALL STRUCTURE WITH LEAD TYPE NAILS.

5. THE STICKER PLATE FOOT LATCHES AND THE HOLDING DEVICE FOR PROJECTING BULLETS MUST BE INSTALLED IN CONSTRUCTION. THE STICKER PLATE (MUST BE SECURED TO THE JAMB AND THE WALL FRAME WITH SCREWS NOT LESS THAN 3" IN LENGTH. CONSTRUCTION SHOULDN'T BE ATTACHED TO THE WALL STRUCTURE WITH LEAD TYPE NAILS.

6. STRAIGHT DEAD BOLTS SHALL HAVE A MINIMUM THROW OF 1" AND AN EMBEDMENT OF NOT LESS THAN 1-1/2" IN THE JAMB. JAMB SUPPORTS SHALL BE 3" X 3" X 1/8" MINIMUM STEEL CHANNEL OR DIAMETER STEEL CHANNEL. ALL NON-REMOVABLE HINGE PINS SHOULDN'T BE ATTACHED TO THE WALL STRUCTURE WITH LEAD TYPE NAILS.

7. CYLINDER GUARDS SHALL BE INSTALLED ON ALL CYLINDER LOCKS. THE CYLINDER GUARD PROJECTS 1-1/2" BEYOND THE FACE OF THE DOOR. THE CYLINDER GUARD MUST HAVE A MINIMUM 1/4" DIAMETER STEEL JAMB STUD WITH 1/4" MINIMUM THICKNESS STEEL CHROMIUM. ALL STEEL JAMB STUDS SHALL BE SECURED TO THE JAMB AND WALL FRAME WITH SCREWS NOT LESS THAN 3" IN LENGTH. CONSTRUCTION SHOULDN'T BE ATTACHED TO THE WALL STRUCTURE WITH LEAD TYPE NAILS.

8. GLAZED CRANK WINDOWS SHALL BE PROVIDED WITH A DEVICE TO AVOID THE UPWARD MOVEMENT OF THE GLAZED PANELS. TO PREVENT RISING AND REMOVING OF THE REMOVABLE PANELS. THE GLAZED PANELS SHALL BE SECURED TO THE WALL FRAME WITH SCREWS NOT LESS THAN 3" IN LENGTH. CONSTRUCTION SHOULDN'T BE ATTACHED TO THE WALL STRUCTURE WITH LEAD TYPE NAILS.
1. THIS PROJECT BUILDING SHALL BE DESIGNED AND CONSTRUCTED IN FULL COMPLIANCE WITH THE 2013 CBC, 2013 CPC, 2013 CMC, AND 2013 CEC.

2. ALL WALLS (INTERIOR & EXTERIOR) TO BE 2X4 WOOD STUDS @ 16" O.C., MIN. U.N.O.

3. PROVIDE 1/2" SPIRAL NAILLUGGED SMOOTH TAPE WITH COMPRESSION PLAIN AND MIN. COAT FINISH THROUGHOUT.

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23. PROVIDE 1/2" SPIRAL NAILLUGGED SMOOTH TAPE WITH COMPRESSION PLAIN AND MIN. COAT FINISH THROUGHOUT.
1. CHIMNEY TO EXTEND A MIN. OF 2'-0" ABOVE ROOF OR PARAPET WITHIN 1.1' OF CHIMNEY CAPS.
2. PROVIDE AN APPROVED SPARK ARRESTER AT ALL CHIMNEY CAPS, NOT LESS THAN FOUR INCHES IN DIAMETER AREA OF OUTLET OF CHIMNEY.
3. ALL EXTERIOR STUCCO SIDING TO BE PAINTED WITH ELASTOMERIC TYPE PAINT.
4. ALL EXTERIOR STUD WALL TO RECEIVE CORROSION RESISTANT WEEP SCREED AT A MIN. OF 6" ABOVE GRADE, OR 2" ABOVE PAVED AREAS.
ELEVATION NOTES

1. CHIMNEY TO EXTEND A MIN. OF 2'-0" ABOVE ROOF OR PARAPET WITHIN 10'-0" RADIUS OF CHIMNEY.
2. PROVIDE AN APPROVED SPARK ARRESTOR AT ALL CHIMNEY CAPS. NOT LESS THAN FOUR TIMES NET FREE AREA OF OUTLET OF CHIMNEY.
3. ALL EXTERIOR STUCCO SIDING TO BE PAINTED WITH ELASTOMERIC TYPE PAINT.
4. ALL EXTERIOR STUD WALL TO RECEIVE CORROSION-RESISTANT WEEP OUTLET AT A MINIMUM OF 4" ABOVE GRADE. See J. erwett. PRK 1/2" TILES, FIG. 25.
1. Roofing shingles to be architectural roof shingles.
2. Roofing nails to be copper, brass or stainless steel, U.N.O.
3. All necessary flashing to be galvanized steel, including ridge, valley, eave, chimney, U.N.O.
4. All gutters to be 4" K-Style galvanized steel, U.N.O.
5. All downspouts to be rectangular and galvanized steel, U.N.O.
6. All concentrated drainage, including roof water to be conducted to an approved location.
7. Overflow drains, if applicable, to be same size as roof drain. Overflow drain to be installed with a baffled open end of above the level of the drain line. Overflow drain shall be installed in accordance with manufacturer’s current recommendations and all pertinent codes and regulations.
8. Provide min. 22" x 30" attic access minimum.
9. Attic ventilation openings to be covered with corrosion-resistant metal mesh with mesh openings of ¼" in dimension.
10. Where eave vents are installed, insulation shall not block the free flow of air. A minimum of 1" of air space shall be provided between the insulation and the roof sheathing. To accommodate the thickness of insulation plus the required 1" clearance, member size may have to be increased for rafter ceiling joists (section 1505.3).
11. Chimney flue to be in wood framed chase; chimney is to terminate in a factory-built spark arrester manufactured by Majestic or equal.
12. Chimney to extend a min. of 2'0" above roof within a 10'0" radius of chimney. All architectural features at chimney top must be permitted with manufacturer’s approval.
13. All plumbing and heating roof vents to be out of view if practical.

**Attic Ventilation (New):**

Code Requirement: 1/150 of attic area.

<table>
<thead>
<tr>
<th>Attic Area</th>
<th>Roof Vent Area</th>
<th>Code Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>88 sq ft</td>
<td>0.59 sq ft</td>
<td>1/150 of attic</td>
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Total 0.59 sq ft of additional vent area required.
GENERAL NOTES:
1. ALL EXTERIOR LIGHTING SHALL BE HIGH EFFICIENCY, OR CONTROLLED BY A MOTION SENSOR WITH PHOTOCONTROL.
2. LUMINAIRES THAT ARE RECESSED INTO INSULATED CEILINGS SHALL BE APPROVED FOR ZERO CLEARANCE (IC) AND CERTIFIED AIR TIGHT, AND LABELED AS AIR TIGHT (AT).
3. SMOKE DETECTORS FOR (N) AREAS SHALL BE HARD WIRED WITH BATTERY BACKUP; SMOKE DETECTORS FOR (E) AREAS SHALL BE HARD WIRED OR BATTERY OPERATED; SMOKE DETECTORS SHALL BE FOR CARBON MONOXIDE AS WELL.

DEDICATED REC. OUTLET IN CAB.

S.D.

SPLIT CIRCUIT FOR GD & DW

(E) 200A SERVICE PANEL

50A (N) CARRIER 17" COMPACT A/C TO REPLACE (E) (N) DISCONNECT JBOX

(N) RINNAI TANKLESS WATER HEATER. RU98E W/ GRUNDFOS RECIRC. PUMP. MIN. 0.80 EFF.

JBOX

JBOX

JBOX

JBOX

UNDERCAB. LIGHTS (3 LOCATIONS)

(N) 36" DIRECT VENT GAS FIREPLACE. HEAT N GLO 6000CL FP OUTLET (LOWER RIGHT CORNER)

SWITCHED OUTLET IN EAVE

LONG BEACH, CA

1/4" = 1'-0"
GENERAL NOTES:
1. THE FOLLOWING SPECIFICATIONS SHALL CONFORM TO THE 2012 CBC AND ANY OTHER CITY OR COUNTY ORDINANCES THAT ARE IN FORCE AT THE TIME OF THIS PROJECT.
2. THE SELECTED GENERAL CONTRACTOR SHALL VERIFY ALL CONDITIONS, ELEVATIONS AND CONDITIONS PRIOR TO STARTING ANY FIELDWORK.
3. ANY DEVIATION CAUSED BY THE FIELD CONDITIONS, OR ANY CONDITIONS DIFFERENT FROM THOSE ILLUSTRATED ON THE PLANS SHALL BE BROUGHT TO THE DESIGNED ATTENTION.
4. TYPICAL DETAILS SHALL APPLY WHERE NO SPECIFIC DETAILS OR SECTIONS ARE PROVIDED.
5. DIMENSIONS SHOWN ON PLANS OR DETAILS TAKES PRECEDENCE OVER MEASUREMENT SHOWN.
6. THE SELECTED GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE SATISFACTORY COMPLETION OF ALL WORK IN ACCORDANCE WITH THE PROJECT PLANS AND SPECIFICATIONS.

STRUCTURAL STEEL:
1. STRUCTURAL STEEL SHALL CONFORM TO A 3.8 T (A-9) SPECIFICATIONS AND TO THE SELECTED ARCHITECT'S/ENGINEER'S SPECIFICATIONS.
2. ALL BOLTS SHALL CONFORM TO A 3.8 T (A-9) FOR UNFINISHED BOLTS.
3. ALL BOLTS HELD IN STEELS, MEMBERS SHALL BE TRUE, BURSTS OF HOLES FOR CONNECTIONS WILL NOT BE PERMITTED.
4. PROVIDE FULL BEARING ON UNDERSIZED PORTION OF STEEL BOLTS FOR ALL STEEL CONNECTIONS.
5. PROVIDE LEVERING NUTS FOR ALL BOLTS AT 2'5'6" INTERVALS AND COLUMN BASE PLATES.
6. ALL NUTS FOR STRUCTURAL STEEL CONNECTIONS SHALL BE HEAVY HEXAGONAL NUTS.
7. ALL WELDING SHALL BE INDICATED ON THE DETAILS AND PERFORMED IN A SATISFACTORY COMPLIANCE WITH THE DESIGNER'S ATTENTION.

CONCRETE:
1. CONCRETE FOR SLABS ON GRADE, BEAM FOOTINGS OR PIER SHALL BE FIBER REINFORCED CONCRETE WITH 0.25% VOLUME OF FIBERS OF A MINIMUM STRENGTH OF 1000 PSI AT 28 DAYS, UNLESS NOTED OTHERWISE ON THE PLANS.
2. THE MINIMUM AGGREGATE SIZE SHALL BE 3/4", AND THE MAXIMUM AGGREGATE SIZE SHALL BE 3/4".
3. ALL ANCHOR BOLTS, HOLDOWN BOLTS, DOWELS, AND OTHER REQUIRED INSERTS shall be BURST IN PLACE.
4. THE SELECTED GENERAL CONTRACTOR SHALL TAKE ALL THE NECESSARY MEASURES TO PROVIDE A PROPER COMPACTION OF THE CONCRETE.
5. THE EXCAVATED BOTTOM OF ALL FOOTINGS SHALL EXTEND TO ELEVATIONS SHOWN ON THE PLANS AND THE FOOTINGS SHALL BE FOUND IN COMPLETE, WITHOUT SIDE FORMS AS POSSIBLE.
6. ALL RETAINING BLOCK WALLS SHALL BE PROVIDED WITH AN APPROVED SPECIAL INSPECTION AND TESTING perCBC SECTION 1701, ONLY WHERE SPECIFICALLY NOTED OR DETAILED.

LUMBER:
1. WOOD MEMBERS LESS THAN 4" IN WIDTH SHALL BE 2'-0" IN,width AND 4" OR WIDER SHALL BE #2 GRADE OR BETTER, UNLESS NOTED OTHERWISE ON THE PLANS.
2. UNLESS NOTED OTHERWISE ON THE PLANS, ALL AVAILABLE SHALL BE PER C.B.C., TABLE 2304.1.
3. ALL CONNECTING HARDWARE SHALL BE SAEPOD COMPANY TYPE, LIP LIPPER CONNECTORS TYPE D EQUAL, AND INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER REQUIREMENTS. USA IS.
4. CEI LAMINATED BEAMS SHALL BE IN A GRADE COMBINATION PROVIDING A MINIMUM OF 2000 PSF GRADE D OR MIN. 325 PSF, C.C. REQUIRED.
5. ROOF SHEATHING SHALL BE A MINIMUM 5/8" CDX PLYWOOD WITH EXTERIOR GLUE, GROUP 2. EXPOSED SHEATHING AT ROOF OVERHANG SHALL BE AS INDICATED ON THE ARCHITECT'S/ECONOMIST'S DWG.
6. ALL WOOD MEMBERS LESS THAN 4" IN WIDTH SHALL BE Douglas FIR No. 2 OR BETTER, UNLESS NOTED OTHERWISE ON THE PLANS.
7. ALL WOOD MEMBERS LESS THAN 4" IN WIDTH SHALL BE Douglas FIR No. 2 OR BETTER, UNLESS NOTED OTHERWISE ON THE PLANS.
8. BURST IN COMPLETE AT THE TIME OF INSTALLATION FOR ALL SUPPORTING MEMBERS, UNLESS OTHERWISE NOTED.
9. ALL WOOD MEMBERS SHALL BE CLEAN OF ANY RUST, OR FOREIGN MATERIAL.
10. ALL BOLT HOLES IN STEEL MEMBERS SHALL BE TRUE; BURSTING OF HOLES FOR BOLTS SHALL BE 2" OR WIDER THAN THE NUT DIAMETER.
11. THE MAXIMUM SLUMP SHALL BE 3" WHERE POURED AGAINST FORMS.
12. GLU-LAMINATED BEAMS SHALL BE OF A GRADE COMBINATION PROVIDING A MINIMUM OF 2000 PSF GRADE D OR MIN. 325 PSF, C.C. REQUIRED.
13. THE MAXIMUM AGGREGATE SIZE SHALL BE 3/4", AND MAXIMUM SLUMP SHALL BE 3" WHERE POURED AGAINST FROM.
14. ALL REINFORCING SPLICES SHALL BE LAPPED A MINIMUM OF 30 BAR DIAMETERS.
15. ALL WELDING SHALL BE AS INDICATED ON THE DETAILS AND PERFORMED IN A SATISFACTORY COMPLIANCE WITH THE DESIGNER'S ATTENTION.
16. REBAR NO. 4 and SMALLER SHALL BE OF GRADE 40, and REBAR NO. 5 and SMALLER SHALL BE OF GRADE 60.
17. ALL REINFORCING BARS SHALL BE CLEAN OF ANY RUST, OR FOREIGN MATERIAL.
18. ALL BOLT HOLES IN STEEL MEMBERS SHALL BE TRUE; BURSTING OF HOLES FOR BOLTS SHALL BE 2" OR WIDER THAN THE NUT DIAMETER.
19. ALL WELDING SHALL BE AS INDICATED ON THE DETAILS AND PERFORMED IN A SATISFACTORY COMPLIANCE WITH THE DESIGNER'S ATTENTION.
20. REBAR NO. 4 and SMALLER SHALL BE OF GRADE 40, and REBARS NO. 5 and SMALLER SHALL BE OF GRADE 60. REBAR NO.1 AND SMALLER SHALL BE OF GRADE 10. REBAR NO. 6 and SMALLER SHALL BE OF GRADE 40.
21. ALL REINFORCING SPLICES SHALL BE LAPPED A MINIMUM OF 30 BAR DIAMETERS.
22. ALL WELDING SHALL BE AS INDICATED ON THE DETAILS AND PERFORMED IN A SATISFACTORY COMPLIANCE WITH THE DESIGNER'S ATTENTION.
FOUNDATION NOTES:
1. SEE S-1 FOR GENERAL NOTES.
2. SEE S-3 FOR TYPICAL DETAILS.
3. VERIFY ALL DIMENSIONS ON SITE AND NOTIFY ARCHITECT & ENGINEER OF ANY CONFLICTING DIMENSIONS. ADDITIONAL CONDITIONS.
4. ANCHOR BOLTS TO DEMO AND HDU2 anchors shall be securely held in place prior to foundation inspection.
5. HOLD-DOWNs shall be re-tightened just prior to covering the wall framing.
6. FOUNDATION SILL shall be naturally durable or pressure treated wood members.
7. IF ADVERSE SOIL CONDITIONS ARE ENCOUNTERED, A SOILS INVESTIGATION REPORT MAY BE REQUIRED.
8. CONCRETE STRENGTH FOR FOUNDATION SHALL BE 2,500 PSI MIN.
9. ALLOWS FOR TWO BOLTS PER PIECE OF SILL.
10. ALL CONCRETE IN CONTACT WITH SOIL SHALL BE 1500 PSF OR 2,500 PSI AT 28 DAYS WITH TYPE V CEMENT AND INTERMEDIATE RATIO EQUAL TO 0.45 UNLESS OTHERWISE RECOMMENDED IN SOILS REPORT.
11. MINIMUM ANCHOR BOLT SIZE AND SPACING SHALL BE 5/8" DIAMETER AT 12" O.C. WITH MINIMUM HANGER AND 3" X 3" X 1/4" THICK WASHERS. TYPICAL.
12. FOUNDATION SILL SHALL BE LOCATED AT CENTER OF COLUMNS AND WALLS. UNLESS NOTED OTHERWISE ON PLANS.
13. FOUNDATION SUBGRADES SHALL BE ENTERED INTO A SOILS INVESTIGATION REPORT IF APPLICABLE.
14. THE CONCRETE SLAB ON GRADE HAS NOT BEEN DESIGNED FOR ANY SPECIFIC VEHICLE LOADS. ONLY GENERAL OFFICE OCCUPANCY UNIFORMLY DISTRIBUTED LOADS ARE CONSIDERED.

SHEAR WALL SCHEDULE:
1. MINIMUM OF TWO BOLTS PER PIECE OF SILL.
2. USE CONCRETE PLATE UNLESS OTHERWISE NOTED.
3. PLYWOOD SHEATHING SHALL BE STRUCTURAL 1 GRADE UNO.
4. PANELS SHALL BE 3/8" THICKNESS IN PLACE ON SCHEDULE.
5. PANELS SHALL BE 3/8" THICKNESS "X" BI-DIRECTIONAL.
6. PANELS SHALL CONFORM TO CODE OF 1" X 1/4" THICK WASHERS.
7. ALL ANCHOR BOLTS TO BE 5/8" DIAMETER MINIMUM "X" 1/4" THICK WASHERS TYPICAL.
8. USE DOUBLE THE ANCHOR BOLTS IN SCHEDULE IF 2" SILL PLATE IS USED INSTEAD OF 3" PLATE.
9. IF IS ACCEPTABLE TO USE S.B. PANEL AS A SUBSTITUTE FOR PLYWOOD PANELS.
FLOOR FRAMING NOTES:

1. SEE S-1 FOR GENERAL NOTES.
2. SEE S-4 FOR TYPICAL DETAILS.
3. SEE ARCHITECTURAL AND MECHANICAL PLANS FOR FLOOR PIERVENT SIZES AND LOCATIONS.
4. VERIFY ALL DIMENSIONS ON SITE AND NOTIFY ARCHITECT AND ENGINEER OF ANY CONFLICTING CONDITIONS AND/OR DIMENSIONS.
5. FACE GRAIN OF PLYWOOD SHALL BE PERPENDICULAR TO SUPPORT. FLOOR SHALL HAVE TONGUE AND GROOVE OR BLOCKED PANEL EDGES.
6. WALL TOP PLATE ELEVATION AT 8'-0" ABOVE F.F. UNLESS OTHERWISE NOTED ON PLANS.
7. FLOOR OSEATION (CASH):
   1" x 12 PFP (PT JOISTS)
8. ELEVATED FLOOR STRUCTURES HAVE NOT BEEN DESIGNED FOR SPECIFIC VIBRATION EFFECTS FROM MECHANICAL EQUIPMENT OR SPECIAL OCCUPANCIES SUCH AS GYMNASIUMS, ADJUNCTS OR DANCE STUDIOS.
ROOF FRAMING NOTES:

1. SEE B-1 FOR GENERAL NOTES.
2. SEE S-1 FOR TYPICAL DETAILS.
3. SEE ARCHITECTURAL AND MECHANICAL PLANS FOR FLOOR PENETRATION SIZES AND LOCATIONS.
4. VERIFY ALL DIMENSIONS ON SITE AND NOTIFY ARCHITECT AND ENGINEER OF ANY CONFLICTING CONDITIONS OR ORDERS.
5. ROOF SHEATHING SHALL CONSIST OF MIN. 1/2" THICK CDX PLYWOOD OR SIMILAR PLYWOOD.
6. ROOF FRAMING/MAUlings TO BE INSPECTED BEFORE COVERING. FACE GRAIN OF PLYWOOD SHALL BE PERPENDICULAR TO SUPPORTS.
7. ROOF DESIGN LOADS:
   1. 15 PSF (AT JOISTS)
   2. 20 PSF
   3. 30 PSF
   4. 40 PSF
   5. 50 PSF
   6. 60 PSF
   7. 70 PSF

ROOF SHEATHING:
- MIN. 1/2" CDX PLYWOOD
- MIN. 10D @ 6" , 12" NAILING FOR PURLINS AND BLOCKED.

VERIFIED:
- 11.01.16
- JH

LONG BEACH, CA

REMODELING PROJECT

Scale: 1/4" = 1'-0"
FLOOR SHEATHING (SEE PLAN)

FLOOR SHEATHING EDGE NAILING
(3) 8D TOE NAIL AT EACH JOIST GIRDER HANGER
SILL NAILING.  16D @ 16" O.C. U.N.O ON SHEAR WALL SCHEDULE
A35 @ 16" O.C. U.N.O. ON PLAN

2X6 P.T. MUD SILL
2X FLOOR JOISTS (SEE PLAN FOR SIZE AND PLACING)
5/8" Ø X 10" A.B. @ 4'-0" O.C. U.N.O ON SHEAR WALL SCHEDULE

WALL EDGE NAILING (SEE PLAN AND SHEAR WALL SCHEDULE)
MIN. 12"
MIN. 18"

EXTERIOR FINISH GRADE
#5 REBAR TOP AND BOTTOM
#5 REBAR TOP AND BOTTOM
MIN. 6"

WALL EDGE NAILING (SEE PLAN AND SHEAR WALL SCHEDULE)
2X SOLID BLOCKING
ROOF RAFTER
PLYWOOD ROOF SHTG. NEED NOT TO CONT. PAST 2X8 BOARD
ROOF E.N.
2X8 BOARD NOTCH AS REQ'D WITH 3-16D PER R/R FOLLOWING LINE OF CALIFORNIA FRAMING
PLYWOOD ROOF SHTG. SEE PLAN EDGE NAILING
DOUBLE TOP PLATE
2X ROOF RAFTER (OR TRUSS)
A35 AT 24" O.C. U.N.O.
ROOF SHEATHING
ROOF E.N.
FREIZE BLOCKING
NOTE: ALT. TO A35'S 16D'S TOE-NAILED AT 6" O.C. U.N.O. FROM BLOCKING TO DOUBLE TOP PLATE

NOTE: VERIFY EXACT HEIGHT REQUIRED FOR FLUSH SUBFLOOR TIE-IN. FLOOR STRUCTURE MAY DIFFER NEW FOUNDATION
STRUCTURE
MIN. 20" LAP
NEW FOUNDATION TO BE POURED
EXISTING FOUNDATION STRUCTURE
MIN. 20" LAP

SIMPSON PB TYPE POST BASE W/ (8) 16D POST (SEE PLAN)
SIMPSON BC TYPE HARDWARE GIRDER (SEE PLAN)
2X6 FLOOR JOIST (SEE PLAN)
(3) 8D TOE NAIL EACH JOIST

DRILL & EPOXY SET (2) 1/2" Ø X 24" LG. DOWELS 4" MIN. INTO EXISTING FOUNDATION LAP SPLICE MIN. 20" TO CONT. REBARS
CLEAN AND DISTRESS SURFACE FOR A GOOD BOND AT TIE-IN AREA

NOTE: VERIFY EXACT HEIGHT REQUIRED FOR FLUSH SUBFLOOR TIE-IN. FLOOR STRUCTURE MAY DIFFER NEW FOUNDATION STRUCTURE
MIN. 20" LAP
NEW FOUNDATION TO BE POURED
EXISTING FOUNDATION STRUCTURE
MIN. 20" LAP

RÉFÉRENCE NUMÉRO DATE

LONG BEACH, CA
1. **Standard Wall Stud Detail** [REF CBC 2326.1.9 & 10]

2. **Double Top Plate Splice & Corner Lap**

3. **Floor & Roof Sheathing**

4. **Interior Non-Bearing Walls**

5. **Exterior and Bearing Walls**

**NOTES:**

1. **Notch and Bore Studs**

   - Maximum 40% of stud width
   - Minimum 5/8" edge distance
   - Studs to be notched or bored away from interior non-bearing walls
   - Bored holes may be up to 1/2" of the stud
   - Studs to be notched at least 1/2" from the floor

2. **TYP. DOUBLE TOP PLATE SPLICE & CORNER LAP**

3. **TYP. NOTCHING & BORING OF STUDS**

4. **Plain Eave Capping & Gable Purlins**

5. **All PLYWOOD SHEETS TO BE 4'-0" x 8'-0" EXCEPT WHERE JOB CONDITIONS PROHIBIT.**

6. **NOTICE: IF WIDER STUDS ARE USED THAN WOULD BE REQUIRED FOR THE APPLICATION THEN ONLY THE REQUIRED STUD WIDTH WILL BE SUBJECT TO THE LIMITATION ON DEPTH OF CUTTING OR NOTCHING**

7. **Min. 5/8".**

8. **Field Nailing**

   - Framing at adjoining panel edges shall be 3-in or wider, and nails shall be staggered where:
     - Nails are spaced 2-in or 2 1/2-in on center
     - 10d nails having penetration into framing of more than 1 5/8-in are spaced 3-in on center

9. **Edge Nailing**

   - Floor joist or rafter boundary

10. **Plywood Thickness and Grade Per Plan**

    - All plywood sheets to be 4'-0" x 8'-0" except where job conditions prohibit.

11. **Nailing Per Specifications, Framing Plan Notes and Typical Plywood Nailing Details.**

12. **If blocked diaphragm is required: Provide 2X full depth @ 8'-0" O.C. & 3X4 flat blocking at other panel edges.**

13. **Block, If Required**

14. **Notes:**

   - Notches and holes shall not occur at the same location on a stud.
   - Any stud may be bored with a maximum 60% of the stud width if the stud is doubled and only 2 successive studs are bored.

15. **Interior Non-Bearing Walls**

   - 25% of stud width
   - 40% of stud width
   - Max. bored hole

16. **Exterior and Bearing Walls**

   - 25% of stud width
   - 40% of stud width
   - Max. bored hole

17. **Max. 40% Bearing Walls**

18. **Min. 60% Non-Bearing Walls**

19. **Notches and holes shall not occur at the same location on a stud.**

20. **Any stud may be bored with a maximum 60% of the stud width if the stud is doubled and only 2 successive studs are bored.**

21. **A. Nails are spaced 2-in or 2 1/2-in on center**

22. **B. 10d nails having penetration into framing of more than 1 5/8-in are spaced 3-in on center**

23. **Min. 5/8" Edge Distance.**

24. **Notches and holes shall not occur at the same location on a stud.**

25. **Any stud may be bored with a maximum 60% of the stud width if the stud is doubled and only 2 successive studs are bored.**

26. **Interior Non-Bearing Walls**

27. **Exterior and Bearing Walls**

28. **Max. 40% of Stud Width**

29. **Min. 60% of Stud Width**

30. **Max. Bored Hole**

31. **NOTES:**

   - **Lapped At Corner - Typ.**

   - **2X Top Plates**

   - **16D @ 16" O.C. Typ.**

   - **(20) 16D Nails**

32. **Scale**

33. **Project Number**

34. **Date**

35. **Drawn By**

36. **No.**

37. **Description**

38. **Date**

39. **JH**

40. **LONG BEACH, CA**

41. **REMODELING PROJECT**

42. **STRUCTURAL DETAILS**

43. **S5.1**
STRUCTURAL CALCULATIONS
FOR
LONG BEACH REMODEL

ARCE 415
SR. PROJECT
DECEMBER 1, 2016

JOHN HINRICHS
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**PROJECT DESCRIPTION / DATA**

**Project:** Residential Remodel & Addition

**Location:** Long Beach, CA

**Architect:** --

**Owner:** --

**Jurisdiction:** Long Beach, CA

**Building Code:** 2013 California Building Code (CBC)

Selected IBC References:

- Loads: ASCE 7-10
- Steel: AISC 360-10
  - AISC 341-10 (Seismic)
- Wood: NDS -15
  - NDS Supplement - 15
  - NDS SDPWS -15 (Wind & Seismic)
- Concrete: ACI 318-14
  - ACI 530

**Structural Systems:**

**Vertical**

- Wood stud bearing walls
- Raised foundation with spread footings

**Lateral**

- Wood shear walls

**Soils Engineer:** --

Soils Report No.: --

Soils Report Date: --

Soils Bearing: Assume 1500 PSF bearing capacity per Table 1806-2

Other Soils Data: Assume soil site Class D
STRUCTURAL MATERIALS

Lumber: Visually Graded Douglas Fir – Larch
2x Framing DF-L #2
4x framing DF-L #1
Posts/Timbers DF-L #1
Glu-Lam Beams – Visual Comb. 24F-V4 DF/DF
Hardware: Simpson “Strong-Tie”

Masonry: Grade “N” Units: f’m = 1,500 psi (all cells grouted)

Concrete: (f’c in 28 days)
Roof Deck 3000 psi Lightweight (110 pcf)
Floor Deck 3000 psi Lightweight (110 pcf)
Beams 3000 psi
Columns 4000 psi
Walls 4000 psi
Foundation 2500 psi

Reinforcing: ASTM A615 – Grade 60  ASTM A706 – Grade 60

Steel:
Structural ASTM A992 for WF beams  Fy = 50 ksi
ASTM A36 for channels, angles  Fy = 36 ksi
Pipes ASTM A53  Fy = 35 ksi
Tubes ASTM A500 Grade B  Fy = 46 ksi
Bolts ASTM A307  Per code
ASTM A325SC  Per code
Metal Studs SSMA Member
Studs < 18Ga, Fy = 33ksi
Studs > 16Ga, Fy = 50 ksi

Note: Unless noted otherwise in structural calculations or drawings.
# Building Weights

### Roof Dead Load Take Off (PSF)

<table>
<thead>
<tr>
<th>Material</th>
<th>Unit Weight (PSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp. Roofing</td>
<td>3.6</td>
</tr>
<tr>
<td>Insulation, 10-inch Fiberglass Batt</td>
<td>0.5</td>
</tr>
<tr>
<td>1/2&quot; Plywood / Sheathing</td>
<td>1.5</td>
</tr>
<tr>
<td>Pre-fab Trusses</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Total, Sloped Members</strong></td>
<td><strong>8.5</strong></td>
</tr>
<tr>
<td><strong>Horizontal Conversion</strong></td>
<td><strong>9.0</strong></td>
</tr>
<tr>
<td>Gypsum Wallboard</td>
<td>2.5</td>
</tr>
<tr>
<td>MEP &amp; Misc.</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Total to Rafters/Joists</strong></td>
<td><strong>15.0</strong></td>
</tr>
<tr>
<td>Beams</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Total to Beams</strong></td>
<td><strong>18.0</strong></td>
</tr>
<tr>
<td>Columns (King Post)</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total to Columns</strong></td>
<td><strong>19.0</strong></td>
</tr>
<tr>
<td><strong>LIVE LOADS</strong></td>
<td></td>
</tr>
<tr>
<td>Roof (Reducible)</td>
<td>20.0</td>
</tr>
</tbody>
</table>

### Floor Dead Load Take Off (PSF)

<table>
<thead>
<tr>
<th>Material</th>
<th>Unit Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooring - Hardwood</td>
<td>4.0</td>
</tr>
<tr>
<td>3/4&quot; Plywood / Sheathing</td>
<td>3.0</td>
</tr>
<tr>
<td>Insulation, 6-inch Fiberglass Batt</td>
<td>0.5</td>
</tr>
<tr>
<td>MEP &amp; Misc.</td>
<td>3.0</td>
</tr>
<tr>
<td>Joists 2x6 @ 16&quot; O.C.</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Total to Joists</strong></td>
<td><strong>12.0</strong></td>
</tr>
<tr>
<td>Beams</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Total to Beams</strong></td>
<td><strong>15.0</strong></td>
</tr>
<tr>
<td>Columns</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total to Columns</strong></td>
<td><strong>17.0</strong></td>
</tr>
<tr>
<td><strong>LIVE LOADS</strong></td>
<td></td>
</tr>
<tr>
<td>Residential (Reducible)</td>
<td>40.0</td>
</tr>
</tbody>
</table>

### Exterior Wall Dead Load Take Off (PSF)

<table>
<thead>
<tr>
<th>Material</th>
<th>Unit Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gypsum Wallboard, 1/2&quot;</td>
<td>2.5</td>
</tr>
<tr>
<td>Studs, 2x4 @ 16&quot; O.C.</td>
<td>1.0</td>
</tr>
<tr>
<td>1/2&quot; Plywood / Sheathing</td>
<td>1.5</td>
</tr>
<tr>
<td>Stucco, 7/8&quot;</td>
<td>10.0</td>
</tr>
<tr>
<td>Insulation, 4-inch Fiberglass Batt</td>
<td>0.5</td>
</tr>
<tr>
<td>Misc.</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Total to Joists</strong></td>
<td><strong>18.0</strong></td>
</tr>
</tbody>
</table>

### Interior Wall Dead Load Take Off (PSF)

<table>
<thead>
<tr>
<th>Material</th>
<th>Unit Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gypsum Wallboard, 1/2&quot;</td>
<td>5.0</td>
</tr>
<tr>
<td>Studs, 2x4 @ 16&quot; O.C.</td>
<td>1.0</td>
</tr>
<tr>
<td>Insulation, 4-inch Fiberglass Batt (Sound Barrier)</td>
<td>0.5</td>
</tr>
<tr>
<td>Misc.</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Total to Joists</strong></td>
<td><strong>8.0</strong></td>
</tr>
</tbody>
</table>
NOTES:
- ROOF PITCH: 2:12
- 12" OVERHANG
- 24" TOP CHORDS
- 3 3/4" HEELED CHORDS

LOADING:
- T.C.L.: 14
- B.C.L.: 10
- DURATION: 1.25

ARCHITECTS AND ENGINEERS:
NON-STRUCTURAL DRAWING INTENDED
FOR TRUSS LOCATION INFORMATION ONLY.

EXIST.
14'-6 3/4"

ROOF TRUSS LAYOUT
LONG BEACH REMODEL
XXX
LONG BEACH, CA

STONE TRUSS
760-521-4918
951-255-6958
Site Information:
Customer: Stone Truss
Job Description: LONG BEACH REMODEL
Address: City, State, Zip: LONG BEACH, CA 90815

Job Engineering Criteria:
Design Code: CBC 2013 Res
View Version: 15.01.01.0611.00
Job Ref #: 1VPB2920001
Wind Standard: ASCE 7-10
Wind Speed (mph): 110
Roof Load (psf): 20.00-14.00-0.00-
Floor Load (psf): None

This package contains a job notes page, 5 truss drawings and 1 details.

<table>
<thead>
<tr>
<th>Item</th>
<th>Seal #</th>
<th>Truss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>090.16.1728.21503</td>
<td>A MONO H1P H8</td>
</tr>
<tr>
<td>3</td>
<td>090.16.1728.29487</td>
<td>A2 H1P H12</td>
</tr>
<tr>
<td>5</td>
<td>090.16.1728.41957</td>
<td>B1 COMN</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Seal #</th>
<th>Truss</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>090.16.1728.25540</td>
<td>A1 H1P 9-2-6</td>
</tr>
<tr>
<td>4</td>
<td>090.16.1728.36857</td>
<td>B H1P H6</td>
</tr>
</tbody>
</table>
**Loading Criteria (psf)**

<table>
<thead>
<tr>
<th>TCOL</th>
<th>20.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCDL</td>
<td>14.00</td>
</tr>
<tr>
<td>BCLL</td>
<td>0.00</td>
</tr>
<tr>
<td>BCCL</td>
<td>10.00</td>
</tr>
</tbody>
</table>

**Des Ld.**

<table>
<thead>
<tr>
<th>Des Ld</th>
<th>44.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCDesLd</td>
<td>10.00</td>
</tr>
</tbody>
</table>

**Load Duration:** 1.25

**Spacing:** 24.0"

**Wind Criteria**

Wind Std: ASCE 7-10

- Speed: 110 mph
- Enclosure: Closed
- Risk Category: II
- EXP C
- Mean Height: 15.00 ft
- TCDL: 8.4 psf
- BCLL: 0.0 psf
- MWFRS Parallel Dist: 0 to h2
- C&D Dist: 3.00 ft
- Loc. from endwall: Any
- GSP: 0.18
- Wind Duration: 1.33

**Snow Criteria**

- Pw: NA
- C1: NA
- CAT: NA
- NA: NA
- Snow Duration: NA

**Def/CI Criteria**

- PP'Deflection in loc/ delt/ NA
- VERT(PP): 0.053 C 999 240
- VERT(TL): 0.184 C 939 180
- HORZ(TL): 0.019 F
- Creep Factor: 2.0
- Max TC: 1.20
- Max BC: 0.734
- Max Web CTI: 0.730

**Maximum Reactions (lbs)**

<table>
<thead>
<tr>
<th>Loc R</th>
<th>U</th>
<th>RW</th>
<th>Rh</th>
<th>RL</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>1413</td>
<td>161</td>
<td>461</td>
<td>-</td>
<td>142</td>
</tr>
<tr>
<td>F</td>
<td>1802</td>
<td>112</td>
<td>367</td>
<td>-</td>
<td>135</td>
</tr>
</tbody>
</table>

**Wind reactions based on C&C**

- B: Min Brn Width Req = - 1.5
- F: Min Brn Width Req = 1.9

**Bearing B & F are a rigid surface.**

**Maximum Top Chord Forces Per Lb (lbs)**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - D</td>
<td>210 - 2687 B - C</td>
</tr>
<tr>
<td>1 - C</td>
<td>173 - 2878</td>
</tr>
</tbody>
</table>

**Maximum Bot Chord Forces Per Lb (lbs)**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B + H</td>
<td>2670 - 210 - 135</td>
</tr>
<tr>
<td>H - G</td>
<td>2104 - 135</td>
</tr>
</tbody>
</table>

**Maximum Web Forces Per Lb (lbs)**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B - D</td>
<td>684 - 689 D - F</td>
</tr>
<tr>
<td>H - D</td>
<td>183 - 2534</td>
</tr>
</tbody>
</table>

**Additional Notes**

Building designer is responsible for conventional framing.

**Lumber**

- Top chord 2x4 DF-L #1&Bot(g)
- Bot chord 2x4 DF-L #1&Bot(g)
- 2x4 x4 DF-L Standard(g)

**Plating Notes**

Connectors in green lumber (g) designed using NDS/TPI reduction factors.

**Loading**

- #1 hip with 7-10-15 setback supports jack trusses, or rafters and posts, spanning between this truss and the end wall. Corner(s) framed with a hipJack supporting corner rafters and posts, or open-end jacks.
- Use this design for common hip trusses (24") OC.
- Extend sloping TC of truss and jack to hip rafter.
- Support extensions every 4.00 ft to flat TC. Spacing of support originates from #1 hip. Attach 2x4 lateral bracing to flat TC @ 32" OC with 2-16d Box or Gun Nail@0.15'-3.5" (mm) and diagonally brace per Dwg. BRCAL/HIP1014. Support hip rafter with cripples at 5'-14" OC.

**Purlins**

In lieu of structural panels or rigid ceiling use purlins to brace all flat TC @ 32" OC, all BC @ 120" OC.

**Wind**

Member designed based on both MWFRS and C&C.

Right end vertical not exposed to wind pressure.

---

**IMPORTANT**

Read and follow all notes on this drawing! FURNISH ALL CONTRACTORS INCLUDING THE INSTALLERS.

Trusses require extreme care in fabricating, handling, shipping, installing and bracing. Refer to and follow the latest edition of BCSI (Building Component Safety Information), by TPI and SBCA for safety practices to performing these functions. Installers shall provide temporary bracing per BCSI. Unless noted, the trusses shall have properly attached structural sheathing and bottom chord shall have properly attached rigid ceiling. Locations shown for permanent lateral restraint of webs shall have bracing installed per BCSI sections 83, 87, or B10 as applicable. Apply plates to each face of truss and position as shown above and on the Joint Details, unless noted otherwise. Refer to drawings 160A-2 for standard plate positions.

Alpine, a division of TBI Building Components Group Inc. shall not be responsible for any deviation from this drawing or any failure to build the trusses in conformance with ANSI/TPI-1. For handling, shipping, installing and bracing of trusses, a copy of this drawing and cover page listing the drawing indicates acceptance of professional engineering responsibility solely for the design shown. The suitability and use of this drawing as any structure is the responsibility of the Building Designer.

**WARNING**: READ AND FOLLOW ALL NOTES ON THIS DRAWING!

**IMPORTANT**: FURNISH THIS DRAWING TO ALL CONTRACTORS INCLUDING THE INSTALLERS

Trusses require extreme care in hoisting, handling, shipping, installing and bracing. Refer to and follow the latest edition of BCSI (Building Component Safety Information) by TPI and SBCA for safety practices prior to performing these functions. Installers shall provide temporary bracing per BCSI. Unless noted otherwise, top chord shall have properly attached structural sheathing and bottom chord shall have a properly attached rigid ceiling. Locations shown for permanent lateral restraint of webs shall have bracing installed per BCSI sections B3, B7, or B10, as applicable, Apply plates to each face of truss and position as shown above and on the Joint Details, unless noted otherwise. Refer to drawings 160A-2 for standard plate positions.

Alpine, a division of ITW Building Components Group Inc., shall not be responsible for any deviation from this drawing, any failure to build the trusses in accordance with ANSI/TPI 1 or for handling, shipping, installation and bracing of trusses. A seal on this drawing or cover page listing this drawing indicates acceptance of professional engineering responsibility solely for the design shown. The suitability and use of this drawing for any structure is the responsibility of the Building Designer per ANSI/TPI 1 Sec. 2.

For more information see this job's general notes page and these web sites: ALPINE: www.alpinete.com; TPI: www.tifert.org; SBCA: www.abci.com; ICC: www.iccsafe.org

---

**Loading Criteria**
- TCCL: 20.00
- TCDL: 14.00
- BCLL: 10.00
- BCDL: 10.00
- Des Ld: 44.00
- NCCL: 10.00
- Soft: 2.00
- Load Duration: 1.25
- Spacing: 30.0

**Wind Criteria**
- Wind Std: ASCE 7-10
- Speed: 110 mph
- Enclosure: Closed
- EXP: C
- Mean Height: 15.00 ft
- TCDL: 8.4 psf
- BCDL: 6.0 psf
- MWFRS Parallel Dist: 0 to n/2
- C&D Dist: 0.00 ft
- Loc. from endwall: Any
- G:spf: 0.18
- Wind Duration: 1.33

**Snow Criteria**
- Pg: NA
- Ch: NA
- CAT: NA
- Pts: NA
- Ch: NA
- Lu: NA
- Ch: NA
- Snow Duration: NA

**Code / Misc Criteria**
- Bldg Code: CBC 2013 Res
- TPI Std: 2007
- Rep Factors Used: No
- Plate Type(s): WAVE

**Maximum Reactions (lbs)**
- Loc: R / U / Rw / Rh / RL / W
  - B: 921 / 188 / 581 / - / 198 / 3.5
  - G: 797 / 15 / 464 / - / - / 3.5
- Wind reactions based on C&C
- Min Brg Wbrk Req = 1.5
- Min Brg Wbrk Req = 1.5
- Beams B & G are a rigid surface

Members not listed have forces less than 375#

**Maximum Top Chord Forces Per Ply (lbs)**
- Chords: Tens. Comp.
- B - D: 157 - 1003
- B - C: 256 - 1678

**Maximum Bot Chord Forces Per Ply (lbs)**
- Chords: Tens. Comp.
- B - H: 1551 - 308
- B - G: 693 - 82

**Maximum Web Forces Per Ply (lbs)**
- Webs: Tens. Comp.
- C - H: 224 - 595
- H - E: 499 - 102

---

**Lumber**
- Top chord 2x4 DF-L #1ABet(g)
- Bot chord 2x4 DF-L #1ABet(g)
- Webs 2x2 DF-L Standard(g)

**Plating Notes**
- Connectors in green lumber (g) designed using NDS/TPI reduction factors.

**Loading**
- Bottom chord checked for 10.00 psf non-concurrent live load.

**Purlins**
- In lieu of structural panels or rigid ceiling use purlins to brace all sloping TC @ 24° OC, all flat TC @ 32° OC, all BC @ 120° OC.

**Wind**
- Member design based on both MWFRS and C&C.
- Right end vertical not exposed to wind pressure.

---

**Alpine Building Components Group Inc. P.O. Box 8525A Roseville, CA 95682 Phone: 916-783-6500 Fax: 916-783-6501 Web: www.alpinete.com**
Def/CSI Criteria
PP Deflection in loc L/def L/F
VERT(0): 0.031 G 999 240
VERT(T): 0.015 G 999 180
HORZ(LL): 0.010 G - -
HORZ(TL): 0.005 G - -
Creep Factor: 2.0
Max TC CSI: 0.137
Max BC CSI: 0.452
Max Web CSI: 0.179

VIEW Ver: 15.01.01C 0611.00

Maximum Reactions (lbs)
Loc R / U / Rw / Rh / RL / W
B 733 / 196 / 441 / 146 / 135
F 648 / 152 / 394 / 135

Wind reactions based on C&C
B Min Br. Width Req = 1.5
F Min Br. Width Req = 1.5

Bearings B & F are a rigid surface.

Members not listed have forces less than 375#.

Maximum Top Chord Forces Per lbf (lbs)
Chords Tens.Comp. Tens. Comp.
B - C 317 - 1382 D - E 234 - 1059
C - D 221 - 1059 E - F 326 - 1398

Maximum Bot Chord Forces Per lbf (lbs)
Chords Tens.Comp. Tens. Comp.
B - G 1279 - 259 G - F 1259 - 254

Maximum Web Forces Per lbf (lbs)
Webs Tens.Comp.
D - G 440 - 28

Lumber
Top chord 2x4 DF-L #1&Bet.(g)
Bot chord 2x4 DF-L #1&Bet.(g)
Vetros 3x4x4x7 Standard(6)g

Plating Notes
Connectors in green lumber (g) designed using
NDS/TPC reduction factors.

Loading
Bottom chord checked for 10.00 psf non-concurrent live load.

Purlins
In lieu of rigid ceiling use purlins to brace BC @ 120" OC

Wind
Member design based on both MWFRS and C&C.

---

**WARNING** READ AND FOLLOW ALL NOTES ON THIS DRAWING!

**IMPORTANT** FURNISH THIS DRAWING TO ALL CONTRACTORS INCLUDING THE INSTALLERS

Trusses require extreme care in fairing, handling, shipping, installing and bracing. Refer to and follow the latest edition of ECSI (Building Component Safety Information) by TPI and SBCC (for safety practices prior to performing these functions. Installers shall provide temporary bracing per ECSI. Unless noted otherwise top chord shall have properly attached structural sheathing and bottom chord shall have a properly attached rigid ceiling. Locations shown for permanent lateral restraint of webs shall have bracing installed per ECSI sections B3, B7 or B10, as applicable. Apply plates to each face of truss and position as shown above and on the Joint Details, unless noted otherwise. Refer to drawings 160-A-2 for standard plate dimensions.

Alpine, a division of ITW Building Components Group Inc. shall not be responsible for any deviation from this drawing and any failure to build the trusses in conformance with ANSI/TPI 1, or for handling, shipping, installing, and bracing of trusses. A seal on this drawing or cover page listing this drawing, indicates acceptance of professional engineering responsibility solely for the design shown. The suitability and use of this drawing for any structure is the responsibility of the Building Designer per ANSI/TPI 1 Sec. 2.

For more information see this job's general notes page and these web sites: ALPINE, www.alpineinc.com; TPI: www.tpiinc.org; SBCC: www.sbcindustry.com; ICC: www.iccsafe.org
Permanent braking

Permanent Diagonal bracing

START OF TOP CHORD EXTENSIONS (SLOPING TO FLAT)
FLAT TOP CHORD (TYPICAL)
PURLINS, CONTINUOUS
START OF TOP CHORD EXTENSIONS (SLOPING TO FLAT)

PERMANENT BRACING

#1 HIP
SET BACK
ROOF SHEATHING.
BRACED BAY

Cripple Support Layout

B-B
PITCHED AND SHEATHED CHORD AREA.

WIND: Maximum wind speed 120 mph, Exp. C, Cat. II, 30 ft. mean roof height and 5 psf min. dead load. Connect cripples to rafter extensions with (6) 10d nails (0.128 x 3") and to top chord of hip truss and purlin with (3) 10d nails. OR: Butt cripples to jack rafter and hip truss top chord, and provide connection for 360° uplift each end (1TWBGBC H125 clip with 8d nails (0.131 x 15") or equivalent.)

(A) Hip truss top chord. (B) 2X4 continuous purlin, 24" o/c typ.
(C) CRIPPLES (o = Cripple Location. 4" o/c, cripple spacing shown.)

Cripples support extended top chords of end jacks, hip jacks, and hips.

Material: 2X4 SPF, HF, DF-L, or SaPine Standard/Std/13 min. grade.
Max. cripple length = 6'3". Max. 40 psf Snow Load = 14 psf Ice Load.
(D) Cripples and horizontal false top chords may be built into truss.

CALIFORNIA HIP PERMANENT BRACING DETAIL - END JACKS SUPPORTED 48" o/c

Section A-A

Section B-B

Cripple Connections

See truss drawings for specific design information.
**Roof Beams**

**HD-1 & HD-2**

\[ W = 556 \text{ PlF} \]

\[ \theta = 0.01 \text{ in} \]

*HD-1 has similar loading as HD-2*

\[ L_R = L_0 R_1 R_2 \]

\[ R_1 = 1.0 \text{ (Ta < 2005E)} \]

\[ R_2 = 1.0 \text{ (F = 4)} \]

\[ L_R = L_0 = 20 \text{ BF} \]

\[ W = (18 \text{ BF} + 20 \text{ BF}) 14' + 18 \text{ BF} \left( \frac{16}{12} \right) = 556 \text{ PlF} \]

\[ V = \frac{W L}{2} = \frac{556 (8)}{2} = 2220 \# \]

\[ M = \frac{W L^2}{8} = \frac{556 (8^2)}{8} = 4450 \# \text{in} \]

**Deflection**

\[ \Delta_2 = \frac{2W L^4}{384EI} = \frac{8 \times 12}{384 \times 12^3} = 0.0607'' \]

\[ I_{req} = \frac{5WL^4}{384EI} = \frac{5(20 \times 14) b^4 l^2}{384(1.7 \times 10^6) 0.76} = 38 \text{ in}^4 \]

\[ \Delta_{DL} = \frac{L}{180} = \frac{8 \times 12}{180} = 0.53'' \]

\[ I_{req} = \frac{5(556) b^4 l^2}{384(1.7 \times 10^6) 0.53} = 57 \text{ in}^4 \text{ Controls} \]

**Try:** \[ 4 \times 10 \text{ DE-L #1} \]

\[ I = 230.8 \text{ in}^4 \]

\[ S = 49.91 \text{ in}^3 \]

\[ A = 32.38 \text{ in}^2 \]
\[ C_l = 1.0 \Rightarrow \frac{d}{L} = \frac{1.0}{4} = 0.25 \quad \text{Per KDS 4.4.1} \]

**Check Bonding**

\[ f_b = \frac{f_c}{E} = \frac{4450 \times 12}{49.9} = 1070 \text{ psi} \]

\[ F_b = F_b \cdot C_F = (1000 \text{ psi})(1.25) \cdot 1.20 = 1500 \text{ psi} \]

\[ F_b = 1070 \text{ psi} < F_b = 1500 \text{ psi} \quad \text{OK} \]

**Check Shear**

\[ f_s = \frac{3v}{2k} = \frac{3(2220)}{2(32.38)} = 103 \text{ psi} \]

\[ F_s = F_s \cdot C_F = (180)(1.25) = 225 \text{ psi} \]

\[ F_s = 103 \text{ psi} < F_s = 225 \text{ psi} \quad \text{OK} \]

**Use 4x10 DF-L #1 (Hand 1 and Hand 2)**
**Deflection**

\[ \Delta_L = \frac{L^3}{24E} = \frac{2.33 \times 1.2^3}{240} = 0.12'' \]

\[ I_{gca} = \frac{5wL^4}{384EI} = \frac{5 \times (20 \times 14) \times 2.33^4 \times 1^3}{384 \times (1.7 \times 10^6) \times 0.12} = 0.91 \text{ in}^4 \]

\[ \Delta_{L+L} = \frac{L^3}{180} = \frac{2.33 \times 1.2^3}{180} = 0.16'' \]

\[ I_{gca} = \frac{5wL^4}{384EI} = \frac{5 \times 556 \times 2.33^4 \times 1^3}{384 \times (1.7 \times 10^6) \times 0.16} = 1.36 \text{ in}^4 \]

Try 4x4 DF-L #1

\[ I = 12.51 \text{ in}^4 \]

\[ S = 7.15 \text{ in}^3 \]

\[ A = 12.25 \text{ in}^2 \]
\[ C_L = 1.0 \Rightarrow \frac{d}{b} = \frac{4}{4} = 1.0 \quad \text{PER REDS 4.4.1} \]

**Check Bending**

\[ F_b = \frac{M_b}{s} = \frac{378 \times 12}{7.15} = 634 \text{ PSI} \]

\[ F'_b = F_b \times C_D = 1000 \times (1.25) (1.5) = 1875 \text{ PSI} \]

\[ F_b = 634 \text{ PSI} \leq F'_b = 1875 \text{ PSI} \quad \text{OK} \]

**Check Shear**

\[ F_v = \frac{3v}{2A} = \frac{3 \times 648}{2 \times 12.25} = 79.3 \text{ PSI} \]

\[ F'_v = F_v \times C_D = 180 \times (1.25) = 225 \text{ PSI} \]

\[ F_v = 79.3 \text{ PSI} \leq F'_v = 225 \text{ PSI} \quad \text{OK} \]

**USE 4x4 BE-L #1 (H2D3)**
**Deflection**

\[ \Delta_L = \frac{6}{240} \left( \frac{4.25xL^2}{240} \right) = 0.21" \]

\[ I_{tot} = \frac{5wl^4}{384E} = \frac{5(240)(4.25)(2)^3}{384(1.7)(106)0.21} = 5.76 in^4 \]

\[ \Delta_{DL} = \frac{L}{180} = \frac{4.25xL^2}{180} = 0.28" \]

\[ I_{tot} = \frac{5wl^4}{384E} = \frac{5(556)(4.25)(2)^3}{384(1.7)(106)0.28} = 0.57 in^4 \]

Try 4" x 6" DF - #1

\[ I = 48.53 in^4 \]
\[ S = 17.65 in^3 \]
\[ A = 19.25 in^2 \]
\( c_2 = 1.0 \Rightarrow \frac{c}{b} = \frac{6}{4} = 1.5 \)  \( \text{Per NDS 4.4.1} \)

**Check Bending**

\[ F_b = \frac{M}{c} = \frac{160 \times 12}{17.65} = 857 \text{ psi} \]

\[ F_1 = F_b c_2 c_f = 1000 (1.25) (0.3) = 1625 \text{ psi} \]

\[ F_2 = 857 \text{ psi} < F_1 = 1625 \text{ psi} \quad \text{OK} \]

**Check Shear**

\[ F_v = \frac{3u}{2a} = \frac{3}{2} \left( \frac{1180}{19.25} \right) = 91.9 \text{ psi} \]

\[ F_1 = F_v c_2 = 180 (1.25) = 225 \text{ psi} \]

\[ F_v = 91.9 \text{ psi} < F_1 = 225 \text{ psi} \quad \text{OK} \]

\[ \text{Use 4x6 DF-L #1 (HDR-F)} \]
Floor Framing

FJ-1

\[ w = 69.3 \text{ P.L.} \]

\[ \Delta = 7.00'' \]

\[ A_t = 7' \times (\frac{1}{2}) = 10 \text{ SF} \]

\[ k_{11} A_t = 20 \text{ SF} \leq 400 \text{ SF} \]

\[ \Rightarrow \text{ No Production Allowed} \]

\[ w = (12.75 \text{ SF} + 40.75 \text{ SF})(\frac{1}{2}) = 69.3 \text{ P.L.} \]

\[ V = \frac{wL}{2} = \frac{69.3}{2} = 24.3'' \]

\[ M = \frac{wL^2}{8} = \frac{69.3}{8} (7^3) = 425'' \]

Deflection

\[ A_L = \frac{10}{360} = \frac{2 \times 12}{360} = 0.23'' \]

\[ I_{GLQ} = \frac{5wL^4}{384EA_L} = \frac{5(40 \times \frac{1}{2})7^4 (12^3)}{384 \times (1.6 \times 10^6) 0.23} = 7.83''^4 \text{ inch}^4 \]

\[ \Delta_{DLQ} = \frac{10}{240} = \frac{7 \times 12}{240} = 0.35'' \]

\[ I_{DOL} = \frac{5wL^4}{384EA_{DL}} = \frac{5(69.3)7^4 (12^3)}{384 \times (1.6 \times 10^6) 0.35} = 6.69''^4 \text{ inch}^4 \]

Try 2x6 DEF-L #2

\[ I = 20.8''^4 \]

\[ S = 7.56''^3 \]

\[ A = 8.25''^2 \]
CHECK BENDING

\[ f_b = \frac{M}{S} = \frac{425 \times 12}{7.56} = 675 \text{ psi} \]

\[ f_b = f_{1d} C_b P_b = 900 (1.0) 1.3 (1.15) = 1350 \text{ psi} \]

\[ f_b = 675 \text{ psi} < f_b = 1350 \text{ psi} \quad \text{OK} \]

CHECK SHEAR

\[ f_v = \frac{2V}{2A} = \frac{2 (243)}{2 (8.25)} = 44.2 \text{ psi} \]

\[ f_v' = f_v C_d = 180 (1.0) = 180 \text{ psi} \]

\[ f_v = 44.2 \text{ psi} < f_v' = 180 \text{ psi} \quad \text{OK} \]

CHECK TORSION

\[ c_b = \frac{\frac{c_b + \frac{h}{2}}{2}}{c_b} = \frac{4 + \frac{5}{2}}{4} = 1.09 \]

\[ A = c_b b = 4 (2) = 8 \text{ in}^2 \]

\[ f_{c,t} = \frac{P}{A} = \frac{243}{8} = 30.4 \text{ psi} \]

\[ f_{c,t}' = f_{c,t} C_b = 625 (1.09) = 681 \text{ psi} \]

\[ f_{c,t} = 30.4 \text{ psi} < f_{c,t}' = 681 \text{ psi} \quad \text{OK} \]

USG 2X6 DF-L #2 (FT-L)
FB-1

\[ W = 770 \text{ lb} \]

\[ 6'0'' \]

\[ T_a = 6' \times 14' = 84\text{ SF} \]

\[ L_{ul} T_a = 84 \times 2 = 168\text{ SF} \times 400\text{ SF} \]

\[ \Rightarrow \text{No Reduction Allowed} \]

\[ W = (15.75'\text{F} + 40\text{pcf}) 14' = 770\text{ lb} \]

\[ V = \frac{W}{2} = \frac{770}{2} = 385 \text{ } \frac{lbf}{in} \]

\[ M = \frac{W \times L}{8} = \frac{770 \times 6}{8} = 3467.5 \text{ } \frac{lbf}{in^2} \]

**Deflection**

\[ \Delta_L \leq \frac{6L^4}{384EI} = \frac{6 \times 12^4}{384 \times 3.84 \times 10^6} = 0.120'' \]

\[ I_{col} = \frac{5WL^4}{384EI} = \frac{5 \times 770 \times 14^4}{384 \times (1.7 \times 10^6) \times 0.38} = 4.8 \text{ in}^4 \text{ (continuous)} \]

\[ \Delta_{BTL} \leq \frac{6L^4}{240EIA_{col}} = \frac{6 \times 12^4}{240 \times 3.84 \times 10^6} = 0.130'' \]

\[ I_{col} = \frac{5WL^4}{384EI_{BTL}} = \frac{5 \times 770 \times 14^4}{384 \times (1.7 \times 10^6) \times 0.38} = 4.4 \text{ in}^4 \]

**Try 4x10 DF-L #1**

\[ I = 230.8 \text{ in}^4 \]

\[ S = 49.91 \text{ in}^3 \]

\[ A = 32.38 \text{ in}^2 \]
CHECK BENDING

\[ f_b = \frac{M}{c} = \frac{3470 \times 12}{49.91} = 834\text{ psi} \]

\[ f'_b = F_b c_0 c_p = 1000 \times 1 \times 1.2 = 1200\text{ psi} \]

\[ f_b = 834\text{ psi} < f'_b = 1200\text{ psi} \quad \text{OK} \]

CHECK SHORT

\[ f_v = \frac{3v}{2A} = \frac{3 \times 23(1)}{2 \times 32.38} = 107\text{ psi} \]

\[ f'_v = F_v c_0 = 180 \times 1 = 180\text{ psi} \]

\[ f_v = 107\text{ psi} < f'_v = 180\text{ psi} \quad \text{OK} \]

USE 4 x 10 BF-L #1 (FB-1)
Foundations

Wall Footings (FTG-1)

Loads

\[(5\text{ psf} + 20\text{ psf}) \times 7' = 245\text{ plf}\]
\[18\text{ psf} \times 8' = 144\text{ plf}\]
\[(1.2\text{ psf} + 40\text{ psf}) \times 3.5' = 182\text{ plf}\]
\[150\text{ plf} (1' \times 0.5' + 2' \times 0.5') = 225\text{ plf}\]
\[796\text{ plf}\]

Maximum FTG. Width = \(\frac{796\text{ plf}}{1500\text{ psf}} = 0.53'\)

Minimum Foot. 24" x 6" x 0.0018 = 0.26 in²

Use #5 Bar (0.31 in²)

Use 12" wide by 6" thick wall FTG. W/ 1-#5 const. 751 plf. Top/ Bed.

Pier Footings (FTG-2)

Loads

\[(5\text{ psf} + 40\text{ psf}) \times 6' \times 7' = 2310\text{ #}\]
\[\frac{2310\#}{1500\text{ psf}} = 1.54\text{ SF}\]

Use 18" sq. FTGs.
**V = CsW (lbs) Seismic Base Shear.**

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### Solutions

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Use $Cs = 0.2$
**Building Weights**

**Roof**
\[ 15 \text{ psf} \left[ (14.5' \times 26.25') + (19' \times 13.75') + (11' \times 1.5') + (11' \times 15') \right] = 254700 \text{#} \]

**Int. walls**
\[ 8 \text{ psf} \left[ (6.25' \times 4') + (8.375' \times 4') \right] = 4650 \text{#} \]

**Ext. walls**
\[ 18 \text{ psf} \left( 2x'45.5' + 2x'47.25' + 2x'2' \right) \times 4' = 13600 \text{#} \]

**Bldg. wt**
\[ 43000 = W \]

**Diaphragm**

\[ F_{pk} = \frac{\sum E_i}{\sum E_i} \times w_{pk} = 2 \text{ Building is 1-story} \]

\[ F_{pk} = 0.2 \times w_{pk} \]

**Limits**

\[ 0.45 \times 0.5 I \times w_{pk} = 0.4 \times (1.05) \times (w_{pk}) = 0.420 \text{ w}_{pk} > F_{pk} 0k \]

\[ 0.25 \times 0.5 I \times w_{pk} = 0.2 \times (1.05) \times (w_{pk}) = 0.210 \text{ w}_{pk} > F_{pk} 0k \]

\[ F_{pk} = 0.210 \text{ w}_{pk} \]
Diaphragm Design

\[ F_{pc} = 0.2 \times 10 \times \frac{w_{pc}}{(1.5 \times 5000)} = 8390 \text{#} \]

\[ F_{pooq} = \frac{F_{pc}}{\text{roof area}} = \frac{8390 \text{#}}{1500 \text{ sf}} = 5.60 \text{ PsF} \]

\[ N_{N CS} = 5.60 \text{ PsF} \times \frac{(1500 \text{ sf})}{(2 \times 41.75)} = 88.9 \text{ PlF} \]

Use \( \frac{1}{8} \)" CR W/ 10D @ 6' C C 12" Blocked 4" CF

\[ U_h = 290 \text{ PlF} > U_{NC} \quad \text{OK} \]

\[ N_{E W} = 5.60 \text{ PsF} \times \frac{(1500 \text{ sf})}{(2 \times 45.5)} = 92.3 \text{ PlF} \quad \text{OK} \]
SHEAR WALL DESIGN

N-S DIRECTION

\[ V = 5.60 \, \text{PSF} \]

@ GRIDLINE 1, \[ V_1 = 5.60 \, \text{PSF} \times 28.25' \times \frac{15.75'}{2} = 1210'\# \]
\[ V_1 = \frac{1210'}{12' + 4'} = 76 \, \text{PSF} \]

USE SHEARWALL 1 PER SCHEDULE \( (V_a = 280 \, \text{PSF}) \) OK

@ GRIDLINE 2, \[ V_2 = 5.60 \, \text{PSF} \times 28.25' \times \left( \frac{15.75'}{2} + \frac{15'}{2} \right) = 2160'\# \]
\[ V_2 = \frac{2160'}{12'} = 180 \, \text{PSF} \]

USE SHEARWALL 1 PER SCHEDULE \( (V_a = 280 \, \text{PSF}) \)

@ GRIDLINE 3, \[ V_3 = 5.60 \, \text{PSF} \times 47.25' \times \left( \frac{15'}{2} + \frac{8.75'}{2} \right) \]
\[ = 4078'\# \]
\[ V_3 = \frac{4078'}{8.5'} = 478 \, \text{PSF} \]

USE SHEARWALL 2 PER SCHEDULE \( (V_a = 510 \, \text{PSF}) \) OK

@ GRIDLINE 4, \[ V_4 = 5.60 \, \text{PSF} \times 26.25' \times \frac{13.75'}{2} = 1380'\# \]
\[ V_4 = \frac{1380'}{6'} = 230 \, \text{PSF} \]

USE SHEARWALL 1 PER SCHEDULE \( (V_a = 280 \, \text{PSF}) \) OK
E-W DIRECTION

@ GUIDLINE A, \( V_A = 5.60 \text{ psf} \times 43.5' \times \frac{28.25'}{2} = 3600'\# \)
\[ V_A = \frac{3600'\#}{11.5} = 313' \text{ plf} \]
USE SHEARWALL 2 PER SCHEDULE (\( V_A = 516' \text{ plf} \))

@ GUIDLINE B, \( V_B = 5.60 \text{ psf} \times 41' \times \left( \frac{28.25'}{2} + \frac{17'}{2} \right) \)
\[ = 5190'\# \]
\[ V_B = \frac{5190'\#}{10'} = 519' \text{ plf} \]
USE SHEARWALL 3 PER SCHEDULE (\( V_B = 665' \text{ plf} \))

@ GUIDLINE C, \( V_C = 5.60 \text{ psf} \times 14.75' \times \frac{17'}{2} = 678'\# \)
\[ V_C = \frac{678'\#}{41} = 170' \text{ plf} \]
USE SHEARWALL 1 PER SCHEDULE (\( V_C = 280' \text{ plf} \))
Shopping OTM

AC-5 WALLS

Loadline 1

\[ V = 76 \text{ PSF} \times 6' = 462 \text{#} \]

\[ UPLIFT = \left[ 912^2 \times 8' - 0.467 \left( 15 \text{ PSF} \times 7.38' \times \frac{12'^2}{2} + 18 \text{ PSF} \times 8' \times \frac{12'^2}{2} \right) \right] + 12 \]

\[ = 449.4 \text{#} \]

\[ U = 76 \text{ PSF} \times 4' = 304 \text{#} \]

\[ UPLIFT = \left[ 304^2 \times 8' - 0.467 \left( 15 \text{ PSF} \times 4' \times \frac{4'^2}{2} + 18 \text{ PSF} \times 8' \times \frac{4'^2}{2} \right) \right] + 4 \]

\[ = 418 \text{#} \]

Use Simple HDU 2 Holdown

\[ T_a = \frac{3075}{7} = 441 \text{#} \quad \text{OK} \]

Floorlive 2

\[ V = 2(60\#) \]

\[ UPLIFT = \left[ 2(60\#) \times 8' - 0.467 \left( 15 \text{ PSF} \times 7.38' \times \frac{12'^2}{2} + 18 \text{ PSF} \times 8' \times \frac{12'^2}{2} \right) \right] + 12 \]

\[ = 126 \text{#} \]

Use Simple HDU 2 Holdown \quad \text{OK} \]
Ground 3

\[ V = 4070 \text{#} \]

\[ U_p \text{ lift} = \left[ \frac{4070 \times 8 - 0.467 \left( \frac{15 \times 8^2}{4} + 18 \times 8 \times 8 \times \frac{8^2}{2} \right) + 8.5}{1} \right] \text{HIPCOND} \]

\[ = 3440 \text{#} \]

USE SIMPSON HDU4 HOLDOWN OK

\[ T_a = 4065 \text{#} > T = 3440 \text{#} \]

Ground 4

\[ V = 1380 \text{#} \]

\[ U_p \text{ lift} = \left[ \frac{1380 \times 8 - 0.467 \left( \frac{15 \times 8^2}{4} + 18 \times 8 \times 8 \times \frac{8^2}{2} \right) + 6}{9} \right] \text{HIPCOND} \]

\[ = 1580 \text{#} \]

USE SIMPSON HDU2 HOLDOWN OK
**E-W Walls**

**Guideline A**

\[ U = 3(3) \text{ PLF} \times 3.5' = 1100 \text{ #} \]

\[ \text{Uplift} = \left( \frac{1100 \times 8' - 0.467(15.75 \times 3.5 \times 3.5^2 + 18 \text{ BF} \times 8 \times 3.5^2)}{4} \right) + \frac{2}{3} \text{ Hipoff} + \text{ Hipoff Condition Act.} \]

\[ = 2380 \text{ #} \]

*Uplift forces for other two walls on Guideline A are similar.*

*Use Simpson Hdw 2 Holdown OK.*

**Guideline B**

\[ U = 5.19 \text{ PLF} \times 3' = 1556 \text{ #} \]

\[ \text{Uplift} = \left( \frac{1560 \times 8' - 0.467(15.75 \times 3 \times 3.5^2 + 18 \text{ BF} \times 8 \times 3.5^2)}{4} \right) + 3 \text{ Hipoff} \]

\[ = 4040 \text{ #} \]

*Uplift forces for other two walls on Guideline B are similar.*

*Use Simpson Hdw 4 Holdown*

\[ T_a = 4565 \text{ #} > T = 4040 \text{ #} \text{ OK} \]


GRIDLINE C

\[ V = 678 \text{#} \]

\[ UPLIFT = \left[ 678 \times 8' - 0.467 \left( 15.75 \times 4' \times \frac{4'}{2} + 15 \times 8' \times 8' \times \frac{4'}{2} \right) \right] \frac{f}{f} \]

= 1190#

USE SIMPSON HDU2 HOLDOWN  OK