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

John Hinrichs

December, 2016

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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. WOOD FLUSH TYPE DOORS SHALL BE 1-3/8" THICK MINIMUM WITH SOLID CORE CONSTRUCTION.

2. GLAZED OPENINGS WITHIN 6' OF THE DOOR LOCK WHEN THE DOOR IS IN THE CLOSED POSITION SHALL BE FIXED TEMPERED GLASS OR APPROVED BULBATURE INERTIANT MATERIAL. DOORS SHALL BE PROTECTED BY METAL BAKE SCREENS OR SHALL HAVE A WEATHERSTRIPPED EDGE OF 2".

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

4. ALL PHIRE-RESISTANT DOORS WHICH ARE ACCESSIBLE FROM OUTSIDE THE SECURED AREA SHALL BE HUNG WITH TWO HINGES EACH SIDE TO THE WALL. HINGES SHALL BE SCHOTT'S "H" TYPE OR EQUIVALENT.

5. THE STICKER PLATE FOOT LATCHES AND THE HOLDING DEVICE FOR PROJECTORS/COMMERCIAL FOR DOOR CONSTRUCTION SHALL BE SECURED TO THE JAMB AND THE WALL, FUMED WITH GLAZES NOT LESS THAN 3/8" IN WEIGHT TO THE WALL OR TO THE JAMB.
### Demolition General Notes:

1. Verify all conditions prior to demolition. Discrepancies between design and existing conditions shall be noted on the demolition plans prior to proceeding with work.

2. Remove all abandoned conduit, piping and equipment.

3. Demolition area denoted items to be demolished.

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### Remodeling Project

**Long Beach, CA**

**Demolition Plan**

**Scale:** 1/4" = 1'-0"

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**Observations**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Unit</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>B. Unobstructed passage 24&quot; WIDE with 30&quot; EXTERIOR DOORS from access to equipment and control panel</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Notes:**

- **A1.1**
- **DEMOLITION PLAN**
- **REMODELING PROJECT**
- **LONG BEACH, CA**
- **SCALE:** 1/4" = 1'-0"
FINISH FLOOR
0' - 0"
PLATE LINE
8' - 0"

(N) 36" DIRECT VENT
GAS FIREPLACE. HEAT N GLO 6000CL

(E) STUCCO SIDING
12'
4'
10' - 0"
2' - 0"
13' - 9"

(N) 200A SERVICE PANEL TO REPLACE (E)
(E) VELUX OPERABLE
(N) VELUX OPERABLE
RELOCATE (E) SLIDING GLASS DOOR TO (N) WALL

12' - 9 3/8"

(N) EXT. STUCCO SIDING TO MATCH (E)
(N) ASPHALT SHINGLE ROOF
(E) ASPHALT SHINGLE ROOF, TYP.
12'
4'

(N) EXT. STUCCO

ELEVATION NOTES
1. CHIMNEY TO EXTEND A MIN. OF 2'-0" ABOVE ROOF OR PARAPET WITHIN 1 1/2' (9") VERTICAL OF CHIMNEY.
2. PROVIDE AN APPROVED SPARK ARRESTER AT ALL CHIMNEY CAPS, NOT LESS THAN FOUR (4) 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 SCREED, SOLID-STATE, TYPICAL, AT A MIN. OF 2'-0" 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 SCREED AT A MINIMUM OF 4" ABOVE GRADE, OR 2" ABOVE PAVED AREAS.
1. Roofing Shingles to be Architectural Roof Shingles.
2. Roofing Nails to be Copper, Brass or Stainless Steel, U.N.O.
3. All Necessary Flashings to be Galv. Steel, U.N.O.
4. Gutters to be 4" K-Style Galv. Steel, U.N.O.
5. All Downspouts to be Rectangular and Galv. Steel, U.N.O.
6. All Concentrated Drainage, including Roof Water, to be connected to an approved location.
7. Overflows, if applicable, to be same size as roof drain. Overflow drain(s) to be installed with the build-out flare. (i.e., above the elevation of the drain line.) Overflows/overflow drain(s) shall be installed in accordance with manufacturer's current recommendations and all pertinent codes and standards.
8. Provide min. 24" x 30" attic access minimum.
9. Attic ventilation openings to be covered with corrosion-resistant metal mesh with mesh openings of 1/4" 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.
- In attic area: 88 sq ft
- Code: 88 / 150 = approx. 0.59 sq ft

Total of 0.59 sq ft of additional vent area required.
GENERAL NOTES:

1. ALL EXTERIOR LIGHTING SHALL BE HIGH EFFICIENCY, OR CONFOLED BY A MOTION SENSOR WITH PHOTOCOREL.

2. LUMINAIRES THAT ARE RECESSED INTO INSULATED CEILINGS SHALL BE APPROVED FOR ZERO CLEARANCE (IC) AND CERTIFIED AIRTIGHT, 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.

S.D.

S.D.

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

50A UNDERCAB. LIGHTS (3 LOCATIONS)

(N) 36" DIRECT VENT GAS FIREPLACE.

HEAT N GLO 6000CL FP OUTLET (LOWER RIGHT CORNER)

SWITCHED OUTLET IN EAVE
GENERAL NOTES:
1. THE FOLLOWING SPECIFICATIONS SHALL CONFORM TO THE 2013 CBC.
2. THE SELECTED GENERAL CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS AND CONDITIONS PRIOR TO STARTING ANY FIELDWORK.
3. ANY DEVIATION CAUSED BY THE FIELD CONDITIONS, OR ANY CONDITIONS DIFFERENT FROM THOSE INDICATED 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 TAKE PRECEDENCE OVER SPECIFICATIONS SHOWN.
6. THE SELECTED GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE SATISFACTORY COMPLETION OF ALL WORK IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS.

STRUCTURAL STEEL:
1. STRUCTURAL STEEL SHALL CONFORM TO A.37.1 (A-36) SPECIFICATIONS AND TO THE LATEST APPROVED EDITION OF THE AISC SPECIFICATIONS FOR HIGH-STEEL BUILDINGS.
2. ALL BOLTS SHALL CONFORM TO A.37.1 (A-36) FOR UNFINISHED STEEL.
3. ALL BOLTS HOLED IN STEEL, MEMBERS SHALL BE TRUE. BURNING OF HOLES FOR CONNECTIONS WILL NOT BE PERMITTED.
4. PROVIDE FULL BEARINGS ON UNSTRESSED PORTION OF BOLT SHANK.
5. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT 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 DURABLE Manner. USE CONTINUOUS INFLATION IN THE SPECIFICATION.
8. ALL FIELD WELDING, OTHER THAN TACK WELDING, THAT IS NOT INDICATED ON THE DETAILS AND PERFORMED IN A DURABLE MANNER SHALL BE TRUE.

CONCRETE:
1. CONCRETE FOR SLABS ON GRADE, BEAM FOOTINGS OR PADS SHALL BE FIBER REINFORCED WITH 3/8" DIAMETER, DEFORMED BARS WITH A VOLUMETRIC PERCENTAGE STRENGTH OF 2600 PSI AT 28 DAYS, UNLESS NOTED OTHERWISE ON THE DETAILS.
2. THE MINIMUM AGGREGATE Size SHALL BE 3/4", AND MAXIMUM GRAVEL SHALL BE 1-1/2".
3. ALL CONCRETE CONCRETE, TREATED WOOD, 4" THICK, OR OTHER MATERIALS TO BE PLACED MUST BE CONCRETE OR CEMENTMIX.
4. THE SELECTED GENERAL CONTRACTOR SHALL TAKE ALL THE NECESSARY MEASURES TO PROVIDE A PROPER COMPOSITION OF THE CONCRETE.
5. THE EXCAVATED BOTTOM OF ALL FOOTINGS SHALL EXTEND TO ELEVATIONS SHOWN ON THE DETAILS, AND THE FOOTINGS SHALL BE FOUND IN WHAT ENCOUNTERED, WITHOUT SIDE FORMS AS POSSIBLE.

REINFORCING STEEL:
1. ALL BOLT HOLES IN STEEL MEMBERS SHALL BE TRUE; BURNING OF HOLES FOR CONNECTIONS WILL NOT BE PERMITTED.
2. WELDING IS TO BE PERMITTED TO ADD REINFORCEMENT TO THE STRUCTURAL STEEL, UNLESS NOTED OTHERWISE ON THE DETAILS.
3. ALL REINFORCING BARS SHALL BE CLEAN OF ANY RUST, OR FOREIGN MATERIALS.
4. ALL REINFORCING BARS SHALL BE APPLIED TO A MINIMUM OF 30 BAR DIAMETER BUT NOT 1/4".
5. CONCRETE CAMBER FOR REINFORCEMENT SHALL BE:
   a. 2" DIA PLATES AGAINST WALL.
   b. 2" FOR FLAT PLATES AGAINST FORMS.
   c. 1" FOR FLAT PLATES AGAINST FORMS.
6. ALL OTHER REINFORCEMENT REQUIREMENTS MAY BE NOTED ON THE DETAILS.
7. THE FOLLOWING SPECIFICATIONS SHALL CONFORM TO THE 2013 CBC.
8. CONCRETE COVERAGE FOR REINFORCEMENT SHALL BE:
   a. MINIMUM OF 6".
   b. MINIMUM OF 12".
   c. MINIMUM OF 24".
9. THE SELECTED GENERAL CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS AND CONDITIONS PRIOR TO STARTING ANY FIELDWORK.
10. THE SELECTED GENERAL CONTRACTOR SHALL TAKE ALL THE NECESSARY MEASURES TO PROVIDE A PROPER COMPOSITION OF THE CONCRETE.

CONCRETE:
1. CONCRETE OR CEMENTMIX SHALL BE SUPPLIED IN 8" HOPES, UNLESS NOTED OTHERWISE ON THE DETAILS.
2. THE SELECTED GENERAL CONTRACTOR SHALL SUPPLY THE CONCRETE OR CEMENTMIX FOR ALL WORK.
3. THE SELECTED GENERAL CONTRACTOR SHALL BUILD THE CONCRETE OR CEMENTMIX FOR ALL WORK.
4. THE SELECTED GENERAL CONTRACTOR SHALL TAKE ALL THE NECESSARY MEASURES TO PROVIDE A PROPER COMPOSITION OF THE CONCRETE.

GENERAL STRUCTURAL NOTES:
1. THE FOLLOWING SPECIFICATIONS SHALL CONFORM TO THE 2013 CBC.
2. ALL BOLT HOLES IN STEEL, MEMBERS SHALL BE TRUE; BURNING OF HOLES FOR CONNECTIONS WILL NOT BE PERMITTED.
3. PROVIDE FULL BEARINGS ON UNSTRESSED PORTION OF BOLT SHANK.
4. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT AND COLUMN BASE PLATES.
5. ALL NUTS FOR STRUCTURAL STEEL CONNECTIONS SHALL BE HEAVY HEXAGONAL NUTS.
6. ALL WELDING SHALL BE INDICATED ON THE DETAILS AND PERFORMED IN A DURABLE MANNER.
7. ALL REINFORCING BARS SHALL BE CLEAN OF ANY RUST, OR FOREIGN MATERIALS.
8. THE MINIMUM AGGREGATE Size SHALL BE 3/4", AND MAXIMUM GRAVEL SHALL BE 1-1/2".
9. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT AND COLUMN BASE PLATES.
10. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT AND COLUMN BASE PLATES.
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12. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT AND COLUMN BASE PLATES.
13. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT AND COLUMN BASE PLATES.
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15. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT AND COLUMN BASE PLATES.
16. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT AND COLUMN BASE PLATES.
17. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT AND COLUMN BASE PLATES.
18. PROVIDE LEVELLING NUTS FOR ALL BOLTS AT MOMENT AND COLUMN BASE PLATES.
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 & other conditions.
4. Anchor bolts, doweils and hold-down anchors shall be securely held in place prior to foundation inspection.
5. Hold-downs shall be retightened 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 foundations shall be 2,000 psi min.
9. All concrete in contact with soil shall be 14" x 2,000 psi at 28 days with Type V cement and intercement ratio equal to 2:1 minimum unless otherwise recommended in soils report.
10. Minimum anchor bolt size and spacing shall be 3/4" diameter at 3' O.C. with minimum 7 1/2" end plate washers, 1/4" minimum thick washers shall be located at center of columns and walls, unless noted otherwise on plans.
11. Footings shall be located at center of columns and walls, unless noted otherwise on plans.
12. Foundation substructure shall be prepared per geotechnical report if applicable.
13. The concrete slab on grade has not been designed for any specific vehicular traffic or crane loads. Only general office occupancy uniformly distributed loads are considered.

SHEAR WALL SCHEDULE NOTES:

1. Minimum of two bolts per piece of sill.
2. Use common nails unless otherwise noted.
3. Plywood sheathing shall be structural 1 grade U.N.O. on schedule.
4. Nailing shall be 32d from edge of panel minimum.
5. Panels shall be 2x6 minimum except egress openings.
6. Panels shall conform to code (6") on plans.
7. All anchor bolts to be 3/4" diameter minimum w/ 1" x 1/8" thick washers typical.
8. Use double the anchor bolts in schedule if 3x sill plate is used instead of 2x plate.
9. If S-5 is acceptable to use G & B panel as substitute for plywood panels.
1. SEE S-1 FOR GENERAL NOTES.
2. SEE S-4 FOR TYPICAL DETAILS.
3. SEE ARCHITECTURAL AND MECHANICAL PLANS FOR FLOOR PENETRATION SIZES AND LOCATIONS.
4. WORK ALL DIMENSIONS ON EBD AND NOTIFY ARCHITECT AND ENGINEER OF ANY CONFLICTING CONDITIONS.
5. FACE GRAIN OF PLYWOOD SHALL BE PERPENDICULAR TO SUPPORTS. FLOOR SHALL HAVE TONGUE AND GROOVE ON BLOCKED PANEL EDGES.
6. WALL TOP PLATE ELEVATION AT 8'-0" ABOVE F.F. UNLESS OTHERWISE NOTED ON PLANS.
7. FLOOR DESIGN LOADS:
   D = 12 PSF (AT JOISTS)
   L = 40 PSF
8. ELEVATED FLOOR STRUCTURES HAVE NOT BEEN DESIGNED FOR SPECIFIC VIBRATION EFFECTS FROM MECHANICAL EQUIPMENT OR SPECIAL OCCUPANCIES SUCH AS GYMNASIUMS, AEROBICS OR DANCE STUDIOS.

FLOOR FRAMING NOTES:
ROOF FRAMING NOTES:

1. SEE S-1 FOR GENERAL NOTES.
2. SEE S-3 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 DIMENSIONS.
5. ROOF SHEATHING SHALL CONSIST OF MIN. 1/2" THICK CDX PLYWOOD SFC TO JOISTS 2" X 10" HANGING & BLOCKED.
6. ROOF ENTRANCE SHALL BE INSPECTED BEFORE COVERING. FACE GRAIN OF PLYWOOD SHALL BE PERPENDICULAR TO SUPPORTS.
7. ROOF DESIGN LOADS:
   - D = 15 PSF (AT JOISTS)
   - L = 20 PSF

     1.  
     2.  
     3.  
     4.  
     5.  
     6.  
     7.
**Structural Details**

- **Floor Sheathing (See Plan)**
  - Edge Nailing: (3) 8D Toe Nail at each 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**
  - 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

- **Concrete Pad**
  - Pad Grade
  - Simpson PB Type Post Base with (8) 16D Post (See Plan)
  - Simpson BC Type Hardware

- **Roof Rafter**
  - Plywood roof sheathing need not to continue past 2x8 board
  - Roof edge
  - 2x8 board notch as req'd with 3-16D per r/r following line of California framing

- **Floor Sheathing**
  - 18" SQ.

- **Foundation and Shear Transfer Details**
  - 1 1/2" = 1'-0"1
  - Girder - Pier Detail
  - Note: Alt. to A35's 16D's toe-nailed at 6" O.C. U.N.O. from blocking to double top plate
1. Planed finishers and粗糙的构造
2. All finished sheets to be a 1/2 of 11/16" on edges, ceilings, and dimensions.
3. All finished sheets and dimensions to be 1/2 an inch on edges.
4. If finished sheets or dimensions are not present in the elevation, a note will be added at the top panel.
5. All finished sheets and dimensions to be 1/2 an inch on edges.
6. All finished sheets and dimensions to be 1/2 an inch on edges.

**NOTES:**
- All finished sheets and dimensions to be 1/2 an inch on edges.
- All finished sheets and dimensions to be 1/2 an inch on edges.
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- All finished sheets and dimensions to be 1/2 an inch on edges.

**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 or less at center.

**EDGE NAILING:**
- Floor joist or rafter boundary nailing.
- Wall plywood face grain to run at 90 deg. to joists U.N.O. (stagger sheets).
- Blocking, if required.

**NOTE:**
- Notches and holes shall not occur at the same location on a stud.
- Any stud may be bored with a maximum of 10% of the stud width if the stud is doubled and only 9% of the stud width if the stud is doubled.

**STANDARD WALL STUD DETAIL**
[Ref CBC 2326.1.9 & 10]

**TYP. FLOOR & ROOF SHEATHING**

**TYP. DOUBLE TOP PLATE SPLICE & CORNER LAM**

**LAPED CORNER, TYP.**

**INSTRUMENT SCALE**

**PROJECT NUMBER**

**DATE**

**DRAWN BY**

**DESCRIPTION**

**SCALE**

**NOTE:**
- Plants are not bored with a maximum of 10% of the stud width if the stud is doubled and only 9% of the stud width if the stud is doubled.
STRUCTURAL CALCULATIONS
FOR
LONG BEACH REMODEL

ARCE 415
SR. PROJECT
DECEMBER 1, 2016

JOHN HINRICHGS
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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: Roof Deck 3000 psi Lightweight (110 pcf)
(F’c in 28 days) 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>
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<tbody>
<tr>
<td>Comp. Roofing</td>
<td>3.6</td>
</tr>
<tr>
<td>Insulation, 10-inch Fiberglass Batt</td>
<td>0.6</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>
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<tr>
<td>Beams</td>
<td>3.0</td>
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<tr>
<td><strong>Total to Beams</strong></td>
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<tr>
<td>Columns (King Post)</td>
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<tr>
<td><strong>Total to Columns</strong></td>
<td><strong>19.0</strong></td>
</tr>
</tbody>
</table>

**LIVE LOADS**

| Roof (Reducible)                  | 20.0              |

### 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>
</tbody>
</table>

**LIVE LOADS**

| Residential (Reducible)           | 40.0        |

### 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>
Site Information:
Customer: Stone Truss
Job Description: LONG BEACH REMODEL
Address: LONG BEACH, CA 90815

Job Engineering Criteria:
Design Code: CBC 2013 Res
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 HIP H8</td>
</tr>
<tr>
<td>3</td>
<td>090.16.1728.28457</td>
<td>A2 HIP 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 HIP 9-2-6</td>
</tr>
<tr>
<td>4</td>
<td>090.16.1728.36687</td>
<td>B HIP H6</td>
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</table>
Job Number: T600
LONG BEACH REMODEL
Truss Label: A MONO HIP H8

### Ply: 1

<table>
<thead>
<tr>
<th>Qty</th>
<th>SEGN: 270802 / T42</th>
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<tr>
<td></td>
<td>FROM: SGH</td>
</tr>
<tr>
<td></td>
<td>CHIP:</td>
</tr>
<tr>
<td></td>
<td>Cust: R9282</td>
</tr>
<tr>
<td></td>
<td>JRef: 1VP9282001</td>
</tr>
<tr>
<td></td>
<td>DwNo: 090.16.1729.21503</td>
</tr>
<tr>
<td></td>
<td>BFR: / GWH</td>
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<tr>
<td></td>
<td>03/02/2016</td>
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### Loading Criteria (psf)

<table>
<thead>
<tr>
<th>TCOLL</th>
<th>20.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCDS</td>
<td>14.00</td>
</tr>
<tr>
<td>BCLL</td>
<td>0.00</td>
</tr>
<tr>
<td>BCDL</td>
<td>10.00</td>
</tr>
<tr>
<td>Des Ld</td>
<td>44.00</td>
</tr>
<tr>
<td>NCBCL</td>
<td>10.00</td>
</tr>
<tr>
<td>Soft</td>
<td></td>
</tr>
<tr>
<td>Load Duration</td>
<td>1.25</td>
</tr>
<tr>
<td>Spacing</td>
<td>24.0&quot;</td>
</tr>
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</table>

### Wind Criteria

<table>
<thead>
<tr>
<th>Wind Std</th>
<th>ASCE 7-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>110 mph</td>
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<tr>
<td>Enclosure</td>
<td>Closed</td>
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<tr>
<td>Risk Category</td>
<td>II</td>
</tr>
<tr>
<td>EXP</td>
<td>C</td>
</tr>
<tr>
<td>Mean Height</td>
<td>15.0 ft</td>
</tr>
<tr>
<td>TCUD</td>
<td>8.4 psf</td>
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<tr>
<td>BCLL</td>
<td>6.0 psf</td>
</tr>
<tr>
<td>MWFRS Parallel Dist</td>
<td>0 to 2</td>
</tr>
<tr>
<td>C &amp; D Dist</td>
<td>3.00 ft</td>
</tr>
<tr>
<td>Loc from endwall</td>
<td>Any</td>
</tr>
<tr>
<td>Gsp</td>
<td>0.18</td>
</tr>
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### Snow Criteria (Pg, Pf in PSF)

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<tr>
<th>Pg</th>
<th>NA</th>
<th>Cf</th>
<th>NA</th>
<th>CAT</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pf</td>
<td>NA</td>
<td>Ce</td>
<td>NA</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Lu</td>
<td>NA</td>
<td>Cs</td>
<td>NA</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Snow Duration</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### Code / Misc Criteria

<table>
<thead>
<tr>
<th>Bidg Code</th>
<th>CBC 2013 Res</th>
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<tbody>
<tr>
<td>TPI Std</td>
<td>2007</td>
</tr>
<tr>
<td>Rep Factors Used</td>
<td>No</td>
</tr>
<tr>
<td>Plate Type(s)</td>
<td>WAVE</td>
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<tr>
<td>VIEW Ver</td>
<td>16.01.01.C0611.00</td>
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</tbody>
</table>

### Def/CSI Criteria

<table>
<thead>
<tr>
<th>PP Deflection in loc of U/L def</th>
<th>NA</th>
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</thead>
<tbody>
<tr>
<td>VERT(1)</td>
<td>0.053 C</td>
</tr>
<tr>
<td>VERT(1L)</td>
<td>0.184 C</td>
</tr>
<tr>
<td>HORZ(1)</td>
<td>0.019 F</td>
</tr>
<tr>
<td>HORZ(1L)</td>
<td>0.065 F</td>
</tr>
<tr>
<td>CFS Factor</td>
<td>2.0</td>
</tr>
<tr>
<td>Max TC Csf</td>
<td>0.860</td>
</tr>
<tr>
<td>Max BC Csf</td>
<td>0.734</td>
</tr>
<tr>
<td>Max Web Csf</td>
<td>0.730</td>
</tr>
</tbody>
</table>

### Additional Notes

Building designer is responsible for conventional framing.

### Lumber

Top chord 2x4 DF-L #1 & B/et (g)
Bot chord 2x4 DF-L #1 & B/et (g)
Wtch 2x4 DF-L Standard (g)

### Plating Notes

Connectors in green lumber (g) designed using N30/TP1 reduction factors.

### Loading

#1 hip with 7-10-15 setback supports jack trusses, or rafters and joists, spanning between this truss and the end wall. Correct (s) framed with a hipJack supporting corner rafters and joists, or open-end joists.

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 (0.125x3.5 mm) and diagonally brace per Dwg BRCAL/HIP/104. 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 @ 12° OC.

### Wind

Member designed based on both MWFRS and C&C.

Right end vertical not exposed to wind pressure.

---

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

**IMPORTANT** FURNISH THIS DRAWING TO 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 prior to performing these functions. Installers shall provide temporary bracing per BCSI. Unless noted, all wall and floor trusses shall have properly attached structural sheathing and bottom chord shall have a properly attached rigid ceiling. Locations shown for permanent lateral restraint of web shall have webbing installed per BCSI sections 53, 87, or 810 as applicable. Apply plates to each face of truss and position as shown above and on the Job Details, unless noted otherwise. Refer to drawings 16A-2 for standard plate positions.

Alpine, a division of TVJ 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/ITI-1, or for handling, shipping, installing and bracing of trusses. A copy of this drawing is the responsibility of the designer. The suitability and use of this drawing is the responsibility of the Building Designer per ANSI/ITI Sec. 2.

For more information see the job's general notes page and these web sites: ALPINE: www.alpineinc.com TPI: www.tipnet.org SBCA: www.sbcaindustry.com ICC: www.iccsafe.org
**WARNING**: READ AND FOLLOW ALL NOTES ON THIS DRAWING!

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

Trusses require extreme care in handling, hoisting, 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 BC/SC. 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 63.97, or 610 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 100A-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 as specified, 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 the web sites: ALPINE: www.alpineite.com; TPI: www.tpiert.org; SBCA: www.albciindustry.com; ICC: www.iccsafe.org

---

**Loading Criteria**

TCUL: 20.00
TCOL: 14.00
BCLL: 0.00
BCDL: 10.00
Des Ld: 44.00
NCBCLL: 10.00
Softs: 2.00
Load Duration: 1.25
Spacing: 30.0°

---

**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
BCDL: 6.0 psf
MWFRS Parallel Dist: 0 to h/2
C&D Class: C
Loc. from endwall: Any
G: 0.16
Wind Duration: 1.33

---

**Snow Criteria**

Pg: NA
Ch: NA
Cat: NA

---

**Def/CSI Criteria**

PP Deflection in loc. Ldef / L
VERT(L): 0.031 C 999 240
VERT(TL): 0.106 C 999 180
HORZ: 0.016 G - -
Creep Factor: 2.0
Max TC CSI: 0.287
Max BC CSI: 0.826
Max Web CSI: 0.270
Plate Type(s): WAVE

---

**Maximum Reactions (lbs)**

B 921 / 188 / 581 / - / - / 198 / 3.5
G 797 / 15 / 464 / - / - / - / 3.5

---

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

D - E 157 - 1003 C - D 115 - 1117
B - C 256 - 1678

---

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

Chords Tens.Comp. Chords Tens Comp.
B - H 1551 - 358 H - G 653 - 82

---

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

Webs Tens.Comp. Webs Tens Comp.
C - H 224 - 598 E - G 114 - 534
H - E 499 - 102

---

**Lumber**

Top chord 2x4 DF-L #1 & 26(3)
Bot chord 2x4 DF-L #1 & 26(3)
Webs 2x2 DF-L Standard(3)

---

**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 allo sloping TC @ 24° OC, all flat TC @ 32° OC, all BC @ 120° OC.

---

**Wind**

Member design based on both MWFRS and C&D.

Right end vertical not exposed to wind pressure.
Loading Criteria (psf)
- TdCtL: 20.00
- TdCtl: 14.00
- BCtL: 0.00
- BCtl: 10.00
- Des Ld: 44.00
- NCBtCl: 10.00
- Softs: 2.00
- Load Duration: 1.25
- Spacing: 30.00''

Wind Criteria
- Wind Std: ASCE 7-10
- Speed: 110 mph
- Enclosure: Closed
- Risk Category: II
- EXP: C
- Mean Height: 15.0 ft
- TdCtL: 4.8 psf
- BCtL: 6.0 psf
- MWPRS Parallel Dist: 0 to 2
- C&C Dist: 3.0 ft
- Loc from endwall: Any
- Gbps: 0.18
- Wind Duration: 1.33

Snow Criteria (Pg/Pf in PSF)
- Pd: NA
- Pf: NA
- Ch: NA
- C & N: NA
- CAT: NA
- SN: NA
- SN: NA
- SN: NA

Defl/CSI Criteria
- PP: Deflection in loc
- VERT(1L): 0.034 H 229 240
- VERT(2L): 0.115 H 999 180
- HORZ(1L): 0.009 F - F
- HORZ(2L): 0.031 F - F
- Creep Factor: 2.0
- Max TC CSI: 0.35
- Max BC CSI: 0.505
- Max Web CSI: 0.555

Maximum Reactions (lbs)
- Loc R / U / Rrw / Rh / RL / W
- B 923 / 172 / 50 / 123 / 123 / 3.5
- F 576 / 59 / 490 / - / -
- Wind reactions based on C&C
- B Min Brw Rq 1.5
- F Min Brw Rq 1.5
- Bearings B & F are a rigid surface.

Maximum Top Chord Forces Per Ply (lbs)
- D - E 91 - 534 C - D 42 - 839
- B - C 130 - 1652

Maximum Bot Chord Forces Per Ply (lbs)
- B - H 1478 - 273 H - G 1470 - 277

Maximum Web Forces Per Ply (lbs)
- G - G 205 - 1023 E - F 74 - 767
- G - E 814 - 140

"WARNING" READ AND FOLLOW ALL NOTES ON THIS DRAWING!
"IMPORTANT" FURNISH THIS DRAWING TO 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 SBCCA 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 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 1600-A-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 truss in conformance with ANSI/TPI 1, or for handling, shipping, installing and bracing of trusses, shall nullify any warranty 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.alpinewtruss.com; TPI: www.tifint.org; SBCCA: www.sbcindustry.com; ICC: www.iccsafe.org

03/31/2016
**Lumber**
- Top chord 2x4 DF-L #1&Bet (g)
- Bot chord 2x4 DF-L #1&Bet (g)
- Vents 2x4 DF-L Standard(g)

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

---

**Maximum Reactions (lbs)**
- Maximum Top Chord Forces Per Chord (lbs)
  - B - C: 317 - 1382
  - C - D: 221 - 1058
- Maximum Bot Chord Forces Per Chord (lbs)
  - B - G: 1279 - 259
  - G - F: 1259 - 254
- Maximum Web Forces Per Chord (lbs)
  - Webs: 326 - 1398

---

**Def/ISI Criteria**
- PP Deflection in loc L/def L = 0.031 G 999 180
- HORIZ(TL): 0.010 G - -
- Creep Factor: 2.0
- Max TC CSI: 0.137
- Max BC CSI: 0.452
- Max Web CSI: 0.179

---

**Loading Criteria (psf)**
- TCCL: 20.00
- TCDD: 14.00
- BCL: 10.00
- BCDL: 6.0 psf

**Snow Criteria (psf)**
- SN: NA
- CN: NA
- SN: NA
- CN: NA
- SN: NA
- CN: NA

---

**WAVE**

---

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

**IMPORTANT** FURNISH THIS DRAWING TO 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 TPsi and SBCCA for safety practices prior to performing these functions. Installers shall provide temporary bracing per BCSI. Unless noted otherwise, truss 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. Provide purlins 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 sections.

Alpine, a division of ITW Building Components Group Inc, shall not be responsible for any deviation from this drawing or failure to build the trusses in conformance with ANSI/TPsi 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/TPsi 1 Sec.2.

For more information see the job's general notes page and these web sites: ALPINE: www.alpineltr.com; TPsi: www.tpsihn.org; SBCCA: www.sbcaindusity.com; ICC: www.iccsafe.org
Permanent Bracing

START OF TOP CHORD EXTENSIONS (SLOPING TO FLAT)

FLAT TOP CHORD (TYPICAL)
PURLINS, CONTINUOUS

START OF TOP CHORD EXTENSIONS (SLOPING TO FLAT)

Permanent Diagonal bracing

Permanent diagonal bracing forms braced bays. Repeat at all hip ends. Maximum interval equals 20 ft. Note: The first braced bay at the 1st hip can be excluded when the following conditions are met:
1) Continuous purlins are attached to the flat top chord of the 1st hip.
2) The end jacks are sheathed with properly attached structural panels.

Note: Conventional framing, including cripples and their connections, is not the responsibility of the truss designer, plate manufacturer, or truss fabricator. Persons erecting trusses are cautioned to seek advice of a local professional engineer regarding conventional framing. Trusses shall be designed for the appropriate tributary area.

Cripple Support Layout

CRIPPLE SUPPORT LAYOUT

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. Butt cripples to jack rafter and hip truss top chord, and provide connection for 360° uplift each end (ITWBCG N12.5 clip with 8d nails (0.131 x 1.5”) or equivalent.)

(A) Hip truss top chord. (B) 2x4 continuous purlin, 24” o/c typ.
(C) CRIPPLES a – Cripple Location. (4” o/c, cripple spacing shown).
(D) CRIPPLES support extended top chords of end jacks, hip jacks, and hips. Material: 2x4 SPF, HF, DF-L, or SaPine Standard Stud/43 min. grade.
Max. cripple length = 6’-3”. Max. 40 psf Snow Load + 14 psf Dead Load.
(E) Cripples and horizontal false top chords may be built into truss.

Section B-B

Cripple Connections

End jack, cripple, and jack extensions to flat top chord of an alternating hip truss.

Setback

Setback

Common Trusses

Hip rafters

B-B

CALIFORNIA HIP SYSTEM TRUSSES

Section A-A

FIELD APPLIED CRIPPLE

SED" D METAL" CRIPPLES IN PLANE OF TRUSSES (TYPICAL)

CHORD EXTENSION (TYPICAL)

Common

End jack, cripple, and jack extensions to flat top chord of an alternating hip truss.

Setback

Setback

10d nail, typ.

Cripple (C)

Purlin (B)

Top chord (A)

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

REF CALIF. BRACE

DATE 10/01/14

DRWG BRCALHIP1014

Design Crit: NDS-2012

Spacing: 24” o/c, typ.

ALPINE AN ITW COMPANY

15388 Lakeshore Drive

Ebart City, MI 49201

CIVIL

No. C 60005

03/31/2016

STATE OF CALIFORNIA

For more information see this job’s general notes page and these web sites:

ALPINE: www.alpineinc.com

ITW: www.itw.com

RRC: www.rrcinternational.org

ISI: www.iso.org
**RooF Beams**

**HDR-1 & HDR-2**

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

\[ \uparrow 8' \text{-0}'' \uparrow \]

* HDR-1 Has Similar Loading as HDR-2

\[ L_{TF} = 60 \text{ Plf} \]

\[ L_2 = 1.0 \ (P < 200 \text{ SF}) \]

\[ R_2 = 1.0 \ (F < 4) \]

\[ L_{TF} = 40 = 20 \text{ Plf} \]

\[ W = (18 \text{ Plf} + 20 \text{ Plf}) 14' + 18 \text{ Plf} (\frac{1}{2}) = 556 \text{ Plf} \]

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

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

**Deflection**

\[ \Delta_2 \leq \frac{L}{240} = \frac{8 \times 12}{240} = 0.16'' \]

\[ I_{req} = \frac{5wl^4}{384EI} = \frac{5(20 \times 14)8^4(12^3)}{384(1.7 \times 10^6)0.46} = 38 \text{ in}^4 \]

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

\[ I_{req} = \frac{5(556)8^4(12^3)}{384(1.7 \times 10^6)0.33} = 57 \text{ in}^4 \]

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

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

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

\[ A = 32.38 \text{ in}^2 \]
\[ C_L = 1.0 \Rightarrow \frac{d}{b} = \frac{1.0}{4} = 0.25 \quad \text{Per NDS 4.4.1} \]

**Check Bending**

\[ F_b = \frac{W}{C_F} = \frac{4450 \times \text{ksi}}{49.91} = 89.7 \text{ ksi} \]

\[ F_b' = F_b \times C_F = (89.7 \text{ ksi}) \times 1.25 = 112.1 \text{ ksi} \]

\[ F_b = 1070 \text{ psi} < F_b' = 112.1 \text{ ksi} \quad \text{OK} \]

**Check Stress**

\[ F_u = \frac{3V}{2A} = \frac{3 \times 2220}{2 \times 32.38} = 103 \text{ ksi} \]

\[ F_u' = F_u \times C_F = 103 \times 1.25 = 129 \text{ ksi} \]

\[ F_u = 103 \text{ ksi} < F_u' = 129 \text{ ksi} \quad \text{OK} \]

Use \( F < 10 \text{ DF-L #1 (Hor1 & Hor2)} \)
\[ \text{Height 3} \]
\[ w = 556 \text{ PSI} \]
\[ 24'' \]

\[ \text{Load} \]
\[ L_1 = 40 \text{ kips} \]
\[ L_2 = 1.0 \text{ kips/ft} \]
\[ L_s = 20 \text{ kips} \]
\[ W = (18 \text{ kips} + 20 \text{ kips}) 14'' \]
\[ + 18 (14/12)'' = 556 \text{ kips} \]
\[ V = \frac{wL^2}{2} = \frac{556(2.33)^2}{2} = 648 \text{ kips} \]
\[ M = \frac{wL^2}{8} = \frac{556(2.33)^2}{8} = 578 \text{ kips-ft} \]

\[ \text{Deflection} \]
\[ \Delta_L = \frac{L}{240} = \frac{2.33 \times 12}{240} = 0.12'' \]

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

\[ \Delta_{PQ} = \frac{L}{180} = \frac{2.33 \times 12}{180} = 0.16'' \]

\[ I_{PQ} = \frac{5wL^4}{384 EI} = \frac{5(556)(2.33)^4}{384(1.7 	imes 10^6)(0.12)} = 1.34 \text{ in}^4 \]

\[ \text{Try 4 x 4 DF - L #1} \]

\[ I = 12.25 \text{ in}^4 \]
\[ S = 7.05 \text{ in}^2 \]
\[ A = 12.25 \text{ in}^2 \]
$C_L = 1.0 \Rightarrow \frac{q}{k} = \frac{4}{4} = 1.0 \quad \text{PERpendicular to DS} \quad 4.4.1$

**Check Bending**

\[ F_b = \frac{M_b}{s} = \frac{378 \times 12}{7.15} = 634 \text{ PSI} \]
\[ F'_b = F_b \times C_D = (1000 \times 1.25 \times 1.50) = 1875 \text{ PSI} \]
\[ F_b = 634 \text{ PSI} < F'_b = 1875 \text{ PSI} \quad \text{OK} \]

**Check Shear**

\[ F_V = \frac{3V}{2A} = \frac{3 \times 648}{2 \times 12.25} = 79.3 \text{ PSI} \]
\[ F'_V = F_V \times C_D = (180 \times 1.25) = 225 \text{ PSI} \]
\[ F_V = 79.3 \text{ PSI} < F'_V = 225 \text{ PSI} \quad \text{OK} \]

Use 4x4 BE-L roof (H2D3)
HDL 4

$w = 556$ P fractures

↑ 4" 3" ↑

$L_f = 40' \times 1.0$

$t_2 = 1.0 \text{ (T - 6.25)'}$

$P_2 = 1.0 \text{ (P - 4)'}$

$L_f = 40' = 20 \text{ PSF}$

$w = (18 \text{ PSF} + 20 \text{ PSF}) 14' +$

$18 \text{ PSF} (\frac{4}{14})' = 556 \text{ PSF}$

$V = \frac{wL}{2} = \frac{556 (4.25)}{2} = 1160 \text{ lbs}$

$M = \frac{wL^2}{8} = \frac{556 (4.25)^2}{8} = 1260 \text{ in.-lbs}$

DEFLECTION

$\Delta_c = \frac{wL^4}{240E} = \frac{4.25 \times 12}{240} = 0.21"$

$I_{PQ} = \frac{5wL^4}{384E} A_z = \frac{5 (2044) 4.25^4 12}{384 (1.7 \times 10^6) 0.21} = 5.76 \text{ in.}^4$

$\Delta_{DL} = \frac{wL^2}{180} = \frac{4.25 \times 12}{180} = 0.198"$

$I_{PQ} = \frac{5wL^4}{384E} A_z = \frac{5 \times 556 \times 4.25^4 12}{384 (1.7 \times 10^6) 0.28} = 8.57 \text{ in.}^4$

Try 4" 6" DE - #1

$I = 48.53 \text{ in.}^4$

$L = 17.65 \text{ ft}^3$

$A = 19.25 \text{ in.}^2$
$c_2 = 1.0 \Rightarrow \frac{c}{b} = \frac{6}{4} = 1.5 \quad \text{Per AASHTO 4.4.1}$

**Check Bending**

\[ F_b = \frac{M}{I} = \frac{1200 \times 4^2}{17.65} = 857 \text{ psi} \]

\[ F'_b = F_b \cdot 0.75 = 1000 \times (1.25) \times 0.75 = 1625 \text{ psi} \]

\[ F_b = 857 \text{ psi} \quad \Rightarrow \quad F'_b = 1625 \text{ psi} \quad \text{OK} \]

**Check Shear**

\[ F_v = \frac{3V}{2A} = \frac{3 (1180)}{2 (19.25)} = 91.9 \text{ psi} \]

\[ F'_v = F_v \cdot 0.75 = 180 \times 0.75 = 225 \text{ psi} \]

\[ F_v = 91.9 \text{ psi} \quad \Rightarrow \quad F'_v = 225 \text{ psi} \quad \text{OK} \]

**Use 4x6 DF-L #1 (HDR-6)**
**Floor Framing**

**F-1**  
\[ W = 69.3 \text{ lb/ft} \]

\[ \Delta = 7.00'' \]

**Deflection**

\[ \Delta_L = \frac{5wL^4}{384EI} = \frac{5(40 \times \frac{12}{12}) 7^4 12^3}{384(1.6 \times 10^6)(0.35)} = 7.83 \text{ in.}^4 \]  

\[ \Delta_{DL} = \frac{wL^2}{24EI} = \frac{7 \times 12^2}{24(1.6 \times 10^6)(0.35)} = 0.35'' \]

\[ \Delta_{DL} = \frac{5wL^4}{384EI} = \frac{5(69.3) 7^4 12^3}{384(1.6 \times 10^6)(0.35)} = 6.69 \text{ in.}^4 \]

Try 2x6 BF-L #2

\[ I = 20.8 \text{ in.}^4 \]
\[ s = 7.56 \text{ in.}^3 \]
\[ A = 8.25 \text{ in.}^2 \]
**Check Bonding**

\[ f_6 = \frac{M}{s} = \frac{425 \times 12}{756} = 6.25 \text{ ksi} \]

\[ F_6 = F_6 \cdot \phi = 900 (1.0) 1.3 (1.15) = 1350 \text{ ksi} \]

\[ F_6 = 675 \text{ ksi} < F_6 = 1350 \text{ ksi} \quad \text{OK} \]

**Check Shear**

\[ f_v = \frac{3V}{2A} = \frac{3 (243)}{2 (8.25)} = 44.2 \text{ ksi} \]

\[ F_v = F_v \cdot \phi = 180 (1.0) = 180 \text{ ksi} \]

\[ F_v = 44.2 \text{ ksi} < F_v = 180 \text{ ksi} \quad \text{OK} \]

**Check Torsion**

\[ c_6 = \frac{d_6 + \frac{d_6}{2}}{d_6} = \frac{4 + \frac{4}{2}}{4} = 1.09 \]

\[ A = \pi d_b = 4 (2) = 8 \text{ in}^2 \]

\[ f_c = \frac{P}{A} = \frac{243}{8} = 30.4 \text{ ksi} \]

\[ F_c' = F_c \cdot \phi = 625 (1.09) = 681 \text{ ksi} \]

\[ F_c = 30.4 \text{ ksi} < F_c' = 681 \text{ ksi} \quad \text{OK} \]

**Use 2 x 6 DF-L #2 (FT-1)**
FB-1

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

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

\[ k = \frac{T_a}{A} = 84 \times 2 = 168 \text{ sf/ft} 400 \text{ sf} \]

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

\[ W = (15\times 13 + 40\times 14) 14' = 770 \text{ kip} \]

\[ V = \frac{W}{2} - 770 \times 6 = 2310 \text{ kip} \]

\[ M = \frac{Wz}{2} - 770 \times (6^2) - 3470 \text{ kip-ft} \]

**Deflection**

\[ \Delta_x = \frac{Wx}{360} = \frac{6 \times 12}{360} = 0.20'' \]

\[ I_{top} = \frac{5WL^4}{384EI_x} = \frac{5 \times (40 \times 14) 6^4 (1.7 \times 10^{6}) 0.20}{384 \times (1.7 \times 10^{6})} = 48.0 \text{ in}^4 \text{ continuous} \]

\[ \Delta_{DL} = \frac{W}{240} = \frac{6 \times 12}{240} = 0.130'' \]

\[ I_{top} = \frac{5WL^4}{384EI_{DL}} = \frac{5 \times (770) 6^4 (1.7 \times 10^{6}) 0.30}{384 \times (1.7 \times 10^{6})} = 44 \text{ in}^4 \]

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

\[
f_b = \frac{M}{x} = \frac{3470 \times 2}{49.91} = 834 \text{ psi}
\]

\[
f_b' = f_b \cdot b \cdot c_p = 1000 (1.2) \cdot 2 = 1200 \text{ psi}
\]

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

CHECK STIFFEN

\[
f_v = \frac{3v}{2A} = \frac{3(230)}{2(32.38)} = 107 \text{ psi}
\]

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

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

USE 4 x 10 DE-1 #1 (FB-1)
Foundations

Wall Footings (FTG-1)

Loads

\[(5 \text{ BF} + 20 \text{ BF}) \times 7' = 245 \text{ PLF}\]
\[18 \text{ PSF} \times 8' = 144 \text{ PLF}\]
\[(12 \text{ PSF} + 40 \text{ PSF}) \times 3.5' = 182 \text{ PLF}\]
\[150 \text{ PLF} (1' \times 0.5' + 2' + 0.5') = 225 \text{ PLF}\]
\[
\frac{796 \text{ PLF}}{1,500 \text{ PSF}} = 0.53'\

Maximum FTG. Width = 0.53'

Minimum Foot. 24" x 6" x 0.060" = 0.24 \text{ in}^2

Use #5 Bar (0.31 \text{ in}^2)

Use 12" wide by 6" thick wall FTG. 17" x 4.5 in. header. 70 YDP (FTD).

Pier Footings (FTG-2)

Loads

\[(15 \text{ PSF} + 60 \text{ PSF}) \times 6' \times 7' = 2310 \text{ #}\]
\[
\frac{2310 \text{ #}}{1500 \text{ PSF}} = 1.54 \text{ SF}\]

Use 18" sq. FTGs.
\[ V = C_s W \text{ (lbs) Seismic Base Shear.} \]

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**Calculate $C_s$:**

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<tr>
<td>$C_s$ min</td>
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**Solutions**

| $C_s$ | 0.162 |

**Use $C_s = 0.2$**
**Building Weights**

**Roof**

$$15 \text{ psf} \left[ (15.5' \times 25') + (17' \times 17') + (11' \times 1.5') + (11' \times 15') \right] = 25,700 \text{#}$$

**Int. Walls**

$$8 \text{ psf} \left[ (62.25' \times 4') + (83.25' \times 4') \right] = 4650 \text{#}$$

**Ext. Walls**

$$18 \text{ psf} \left( 2x \times 45.5' + 2x \times 42.25' + 2x \times 2' \right) \times 4' = 13,600 \text{#}$$

**Bldg. Wt.**

$$49,000 \text{#}$$

---

**Diaphragm**

$$F_{pk} = \frac{\Sigma E_i \Sigma W_{pk}}{\Sigma E_i W_{i}} = \text{Building is 1-story}$$

$$F_{pk} = 0.2 \Sigma W_{pk}$$

---

**Limits**

$$0.45 \leq x \leq 0.4, (1.051) \Sigma W_{pk} = 0.420 W_{pk} > F_{pk} \text{ ok}\)$$

$$0.2 \leq x \leq 0.2, (1.051) \Sigma W_{pk} = 0.210 W_{pk} > F_{pk}$$

$$F_{pk} = 0.210 W_{pk}$$
Diaphragm Design

\[ F_{pc} = 0.210 \times \frac{w_{pc}}{1.4} = 0.210 \times \frac{0.340 \times 10^4}{1.4} = 8390 \, \text{lb} \]

\[ F_{p_{roof}} = \frac{F_{pc}}{\text{roof area}} = \frac{8390 \, \text{lb}}{1500 \, \text{sf}} = 5.60 \, \text{psf} \]

N-S Dir.

\[ N_{N-S} = \frac{5.60 \, \text{psf} \times 1500 \, \text{sf}}{2 \times 47.25} = 88.9 \, \text{plf} \]

Use 1/2" OSB w/ 10d @ 6", 6", 12", blocked all 2 ft

\[ U_n = 290 \, \text{plf} > U_{ns} \quad \text{OK} \]

E-W Dir.

\[ N_{E-W} = \frac{5.60 \, \text{psf} \times 1500 \, \text{sf}}{2 \times 45.5} = 92.3 \, \text{plf} \quad \text{OK} \]
USE 1/4" CBX
4/10d @ 6" 6" 12"
BlockOD
Shorewall Design

N-S Direction

\[ U = 5.60 \text{ PFE} \]

@ GRIDLINE 1, \[ V_1 = 5.60 \text{ PFE} \times 28.25' \times \frac{15.25'}{2} = 1210\# \]

\[ V_1 = \frac{1210\#}{(12' + 4')} = 76 \text{ PFE} \]

USE SHOREWALL 1 FOR SCHEDULE \((U_a = 280 \text{ PFE})\) OK

@ GRIDLINE 2, \[ V_2 = 5.60 \text{ PFE} \times 28.25' \times \left( \frac{15.25'}{2} + \frac{12'}{2} \right) = 2160\# \]

\[ V_2 = \frac{2160\#}{12'} = 180 \text{ PFE} \]

USE SHOREWALL 1 FOR SCHEDULE \((U_a = 280 \text{ PFE})\)

@ GRIDLINE 3, \[ V_3 = 5.60 \text{ PFE} \times 47.25' \times \left( \frac{12'}{2} + \frac{8.75'}{2} \right) \]

\[ = 4070\# \]

\[ V_3 = \frac{4070\#}{8.5'} = 478 \text{ PFE} \]

USE SHOREWALL 2 FOR SCHEDULE \((U_a = 510 \text{ PFE})\) OK

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

\[ V_4 = \frac{1380\#}{6'} = 230 \text{ PFE} \]

USE SHOREWALL 1 FOR SCHEDULE \((U_a = 280 \text{ PFE})\) OK
E-W Direction

- Guideline A: \[ V_A = 5.60 \text{ PSF} \times 45.5' \times \frac{28.25'}{2} = 3600\text{#} \]
  \[ V_\alpha = \frac{3600\text{#}}{11.5} = 313 \text{ PFL} \]
  Use Shortwall 2 Per Schedule (\( V_\alpha = 510 \text{ PFL} \))

- Guideline B: \[ V_B = 5.60 \text{ PSF} \times 41' \times \left( \frac{28.25'}{2} + \frac{17'}{2} \right) \]
  \[ = 5190\text{#} \]
  \[ V_B = \frac{5190\text{#}}{10'} = 519 \text{ PFL} \]
  Use Shortwall 3 Per Schedule (\( V_\alpha = 665 \text{ PFL} \))

- Guideline C: \[ V_C = 5.60 \text{ PSF} \times 14.25' \times \frac{17'}{2} = 678\text{#} \]
  \[ V_\alpha = \frac{678\text{#}}{41} = 167 \text{ PFL} \]
  Use Shortwall 1 Per Schedule (\( V_\alpha = 280 \text{ PFL} \))
**Short Wall Out**

Use Seismic Cond Comb:

\[(0.6 - 0.14S_D) DL + 0.7 CV\]

\[0.6 - 0.14(1.251) = 0.467\]

**Guideline 1**

\[V = 76 P + K + 1 = 912^*\]

\[UPLIFT = 912^* - 0.467\left(15\text{ PSF}\times7.38\times\frac{1}{2} + 18\text{ PSF}\times8\times\frac{1}{2}\right)\]

\[= 49.4^*\]

\[V = 76 P + K + 4 = 304^*\]

\[UPLIFT = 304^* - 0.467\left(15\text{ PSF}\times4\times\frac{1}{2} + 18\text{ PSF}\times8\times\frac{1}{2}\right)\]

\[= 418^*\]

**Use Simpson HDU 2 Holdown**

\[T_a = 3075 > T = 418^*\]

**Guideline 2**

\[V = 2(60)^*\]

\[UPLIFT = 2(60)^* - 0.467\left(15\text{ PSF}\times7.38\times\frac{1}{2} + 18\text{ PSF}\times8\times\frac{1}{2}\right)\]

\[= 120^*\]

**Use Simpson HDU 2 Holdown**
Grading 3
\[ U = 4070 \text{#} \]
\[ U_{\text{UPLFT}} = [4070 \times 8' - 0.467(15 \times 7' \times 8.5^2 + 18 \times 8' \times 8.5^2)] + 8.5 \text{#} \]
\[ = 3440 \text{#} \]

Use Simpson Hold Down Hold Down = OK

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

Grading 4
\[ U = 1380 \text{#} \]
\[ U_{\text{UPLFT}} = [1380 \times 8' - 0.467(15 \times 6' \times 6^2 + 18 \times 8' \times 6^2)] + 6 \text{#} \]
\[ = 1580 \text{#} \]

Use Simpson Hold Down Hold Down = OK
E-W WALLS

GRIDLINE A

\[ V = \frac{3}{3} \text{pcf} \times 3.5' = 1100 \text{ #} \]

\[ \text{UPLIFT} = \left[ 1100 \times 8' - 0.467 \left( 15 \text{pcf} \times 3.5 \times \frac{3.5^2}{2} + 18 \text{pcf} \times 8' \times \frac{3.5^2}{2} \right) \right] \div 3 \]

\[ = 2380 \text{ #} \]

UPLIFT FORCES FOR OTHER TWO WALLS ON GRIDLINE A ARE SIMILAR.

USE SIMPSON HOUR Houda Holdown OK

GRIDLINE B

\[ V = 519 \text{pcf} \times 3' = 1560 \text{ #} \]

\[ \text{UPLIFT} = \left[ 1560 \times 8' - 0.467 \left( 15 \text{pcf} \times 3 \times \frac{3^2}{2} + 18 \text{pcf} \times 8' \times \frac{3^2}{2} \right) \right] \div 3 \]

\[ = 4040 \text{ #} \]

UPLIFT FORCES FOR OTHER TWO WALLS ON GRIDLINE B ARE SIMILAR.

USE SIMPSON HOUR4 Holdown

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

\[ V = 678 \, \text{ft}^3 \]

\[ \text{UPLIFT} = \left[ 678 \times 8' - 0.467 \left( 15 \times 4' \times \frac{4'}{2} + 16 \times 8' \times \frac{8'}{2} \right) \right] \times \text{f} \]

\[ = 1190 \, \text{ft}^3 \]

USE SIMPSON H-02 HOLDWELL OK