Housing for Weed, CA

Senior Project, ARCE 415
Architectural Engineering Department
California Polytechnic State University, San Luis Obispo

Prepared By:
Ariana Alaniz
December 2017

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General Information

Introduction

Integrated Project Delivery (IPD) is a project delivery approach unlike Traditional delivery. This delivery approach is built on collaborations between the owner, architect, engineer, and the contractors. The cooperation and collaboration of the team will ultimately deliver a project with shared risks and rewards.

Background

Great Northern Services, a local non-profit organization, has asked Cal Poly to partner with them to design and build affordable housing for the community of Weed, California. The community has been devastated by a wildfire in 2014 which has destroyed over 150 homes in addition to several community buildings.

Objectives

The ARCE 415 Senior Project course consists of developing a single family residential design to present to Great Northern Services. The course is composed of several teams that are assembled with ARCE, ARCH and CM students. Each team has one ARCE, one CM, and two ARCH students that work as an Integrated Project Delivery model. Each team will develop a design with an emphasis on resiliency, passive energy, constructability, and cost.

CONNECTHAUS

HOUSING DEVELOPMENT IN WEED, CA | DESIGNED BY CONNECT3
IN PARTNERSHIP WITH GREAT NORTHERN SERVICES

CLIENT: GREAT NORTHERN SERVICES
CONSTRUCTION COST: $158,838
COST/SF: $152/SF
PROJECT DURATION: 94 DAYS
PROJECT ADDRESS: 780 S. DAVIS AVE.

GOALS & OBJECTIVES

COST OF CONSTRUCTION

PICK BUILDING MATERIALS THAT ARE INEXPENSIVE WITHOUT COMPROMISING QUALITY

PLAN OUT THE CONSTRUCTION TO AVOID TIME WASTE

AVOID HIGHER TRANSPORTATION COSTS

TENANT COMFORT

MAXIMIZE VIEWS OF THE SURROUNDING LANDSCAPE

ENSURE THE AMOUNT OF FUNCTIONAL SPACE IN THE HOME IS MAXIMIZED

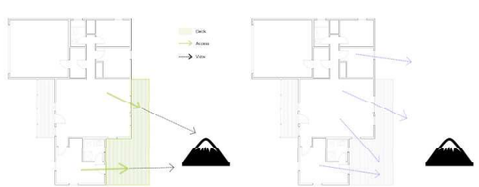
FOSTER PRIVACY FOR EACH FAMILY MEMBER

LONG-TERM COST EFFECTIVENESS

EFFICIENT USE OF MECHANICAL, ELECTRICAL, PLUMBING AND HEATING SYSTEMS

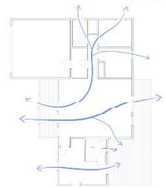
AVOID MAJOR COSTS IN THE LONG RUN WITH PASSIVE SYSTEMS

PICK MATERIALS WITH LONG LIFESPANS AND LOW MAINTENANCE

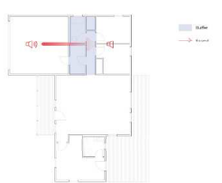


DECK ACCESS

MT. SHASTA VIEW



CROSS VENTILATION



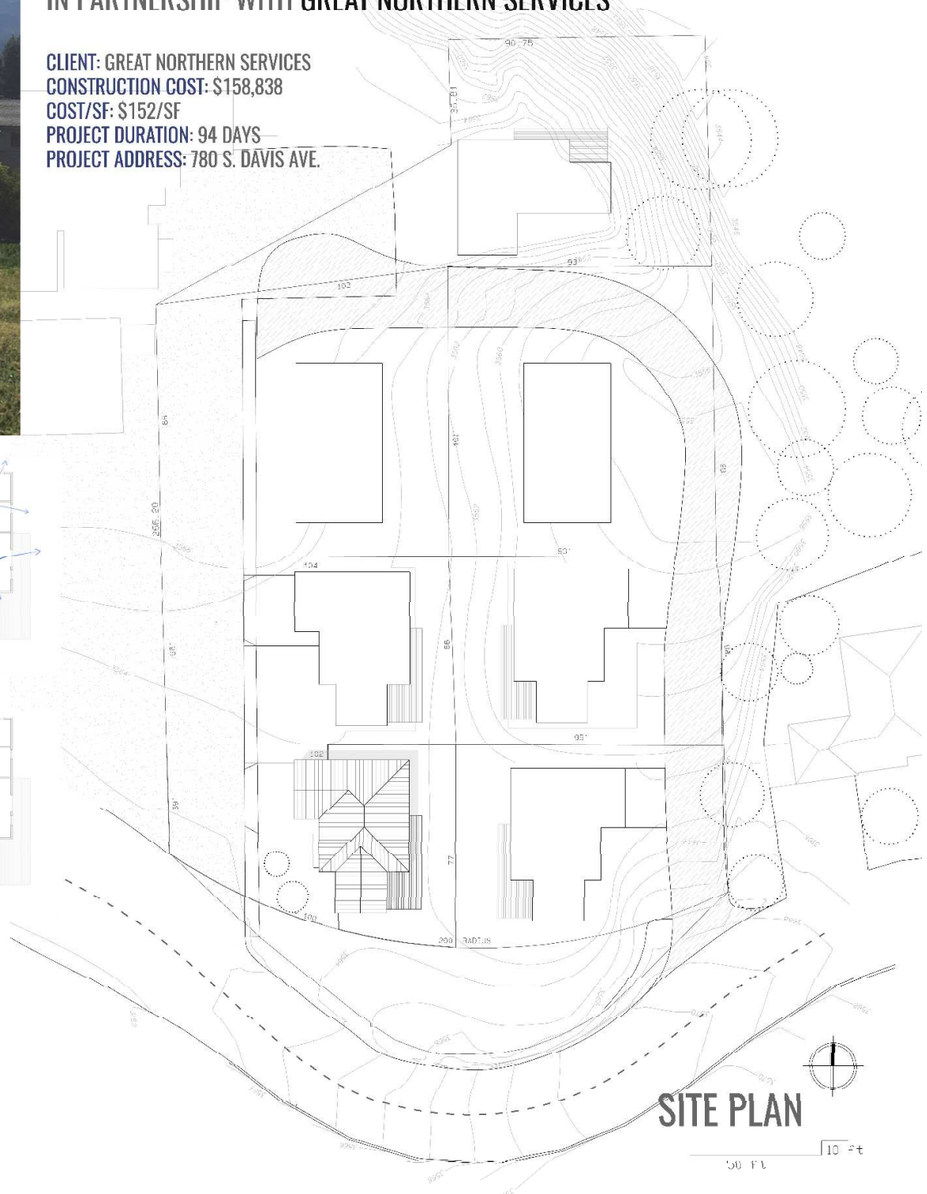
NOISE BUFFER

PRIVACY

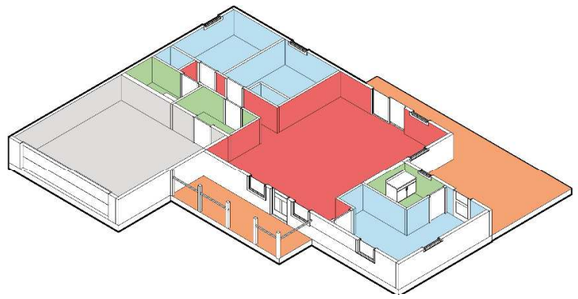
PLUMBING WALL

WIND PROTECTION

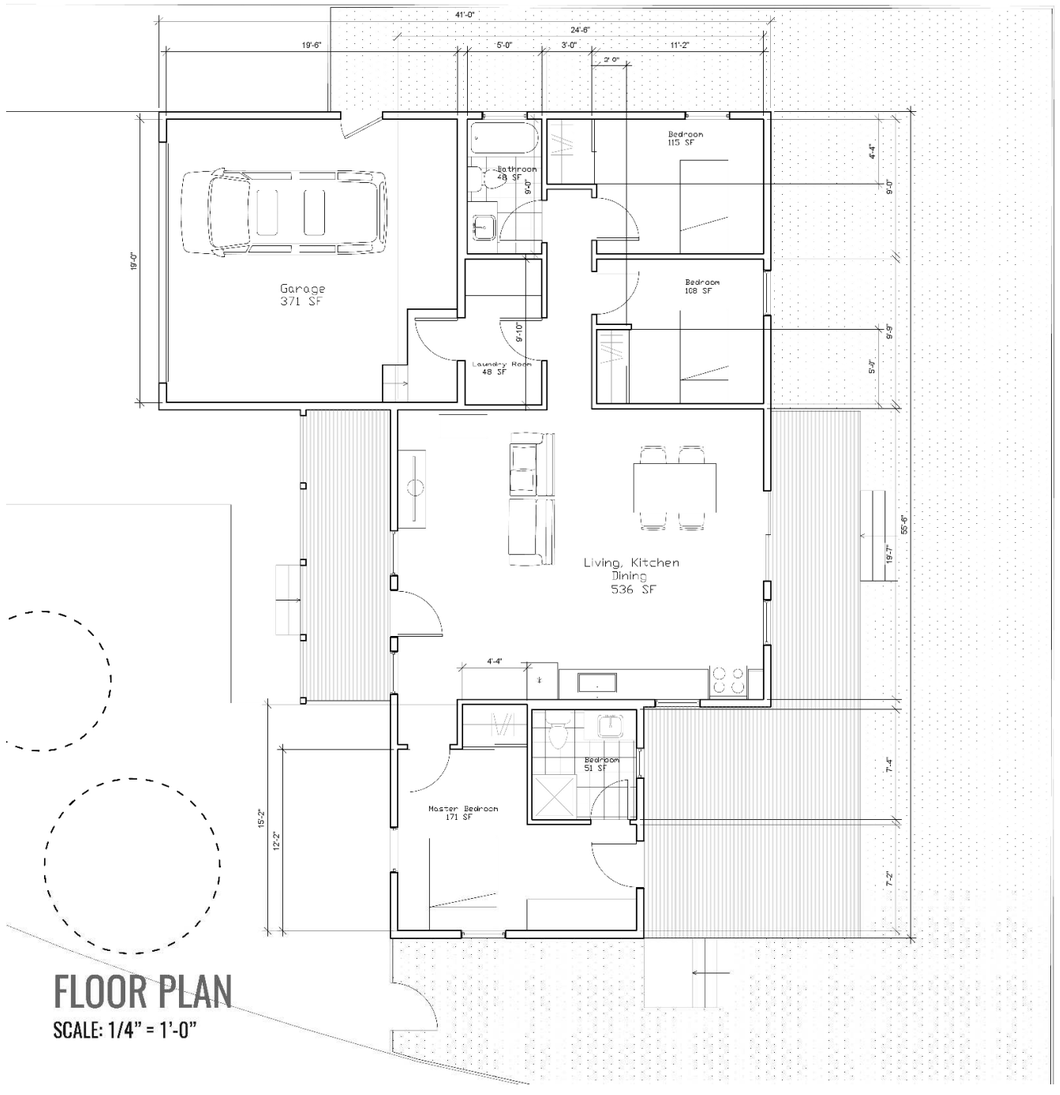
PASSIVE HEATING + COOLING



SITE PLAN



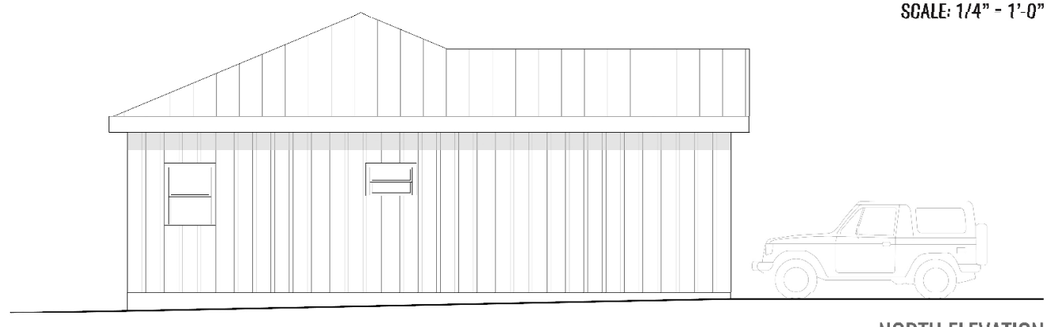
LIVING/KITCHEN/DINING
OUTDOOR LIVING
BATHROOMS/MUDROOM
BEDROOMS
GARAGE



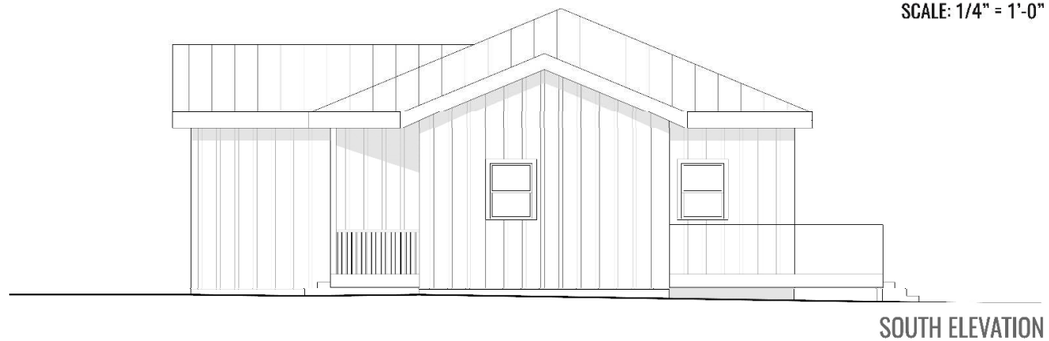
FLOOR PLAN
SCALE: 1/4" = 1'-0"

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

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

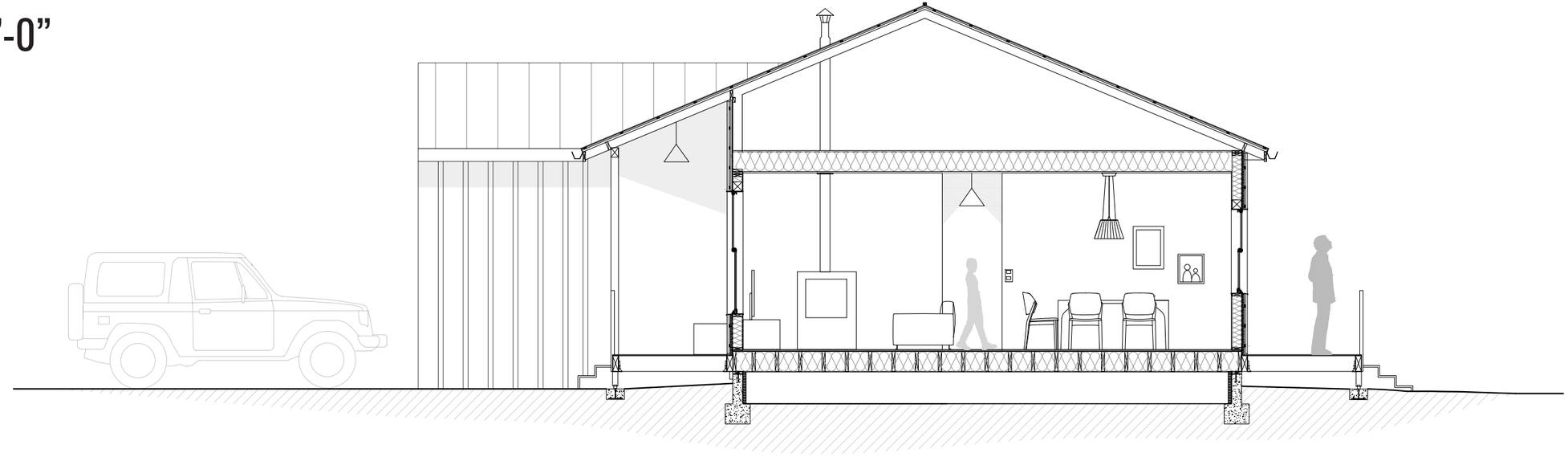


NORTH ELEVATION
SCALE: 1/4" = 1'-0"

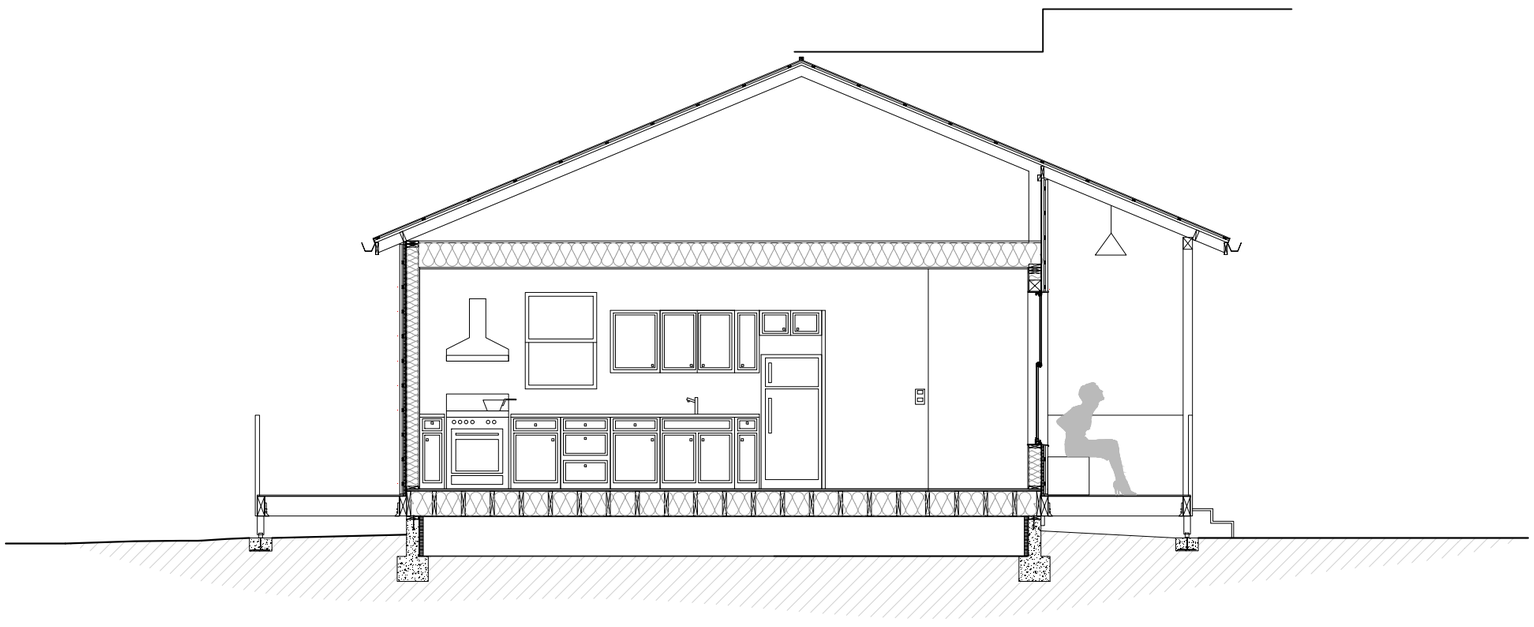


SOUTH ELEVATION
SCALE: 1/4" = 1'-0"

SECTION
SCALE: 1/4” = 1’-0”



SECTION
SCALE: 1/4” = 1’-0”



1.1 GENERAL

1. *APPLICABLE CODE:* 2016 CALIFORNIA BUILDING CODE (CBC).

   A. DESIGN WIND SPEED (ASCE 7-10): 110 MPH, EXPOSURE C.
   B. DESIGN SEISMIC CRITERIA (ASCE 7-10 CH 12):

   SEISMIC IMPORTANCE FACTOR I: 1.0
   SHORT PERIOD MCE ACCELERATION S_S: 0.736
   LONG PERIOD MCE ACCELERATION S_1: 0.328
   SITE COEFFICIENTS F_A & F_V: 1.211 & 1.744, RESPECTIVELY
   RESPONSE MODIFICATION COEFFICIENT R: 6.5
   SOIL PROFILE TYPE: D

2. *GOVERNING CODE AUTHORITY:* BUILDING DEPARTMENT OF WEED

3. *DESIGN INTENT:* CONTRACT DOCUMENTS INDICATE INFORMATION SUFFICIENT TO CONVEY DESIGN INTENT. REVIEW CONTRACT DOCUMENTS AND VERIFY FIELD AND EXISTING CONDITIONS. PROMPTLY NOTIFY STRUCTURAL ENGINEER, PRIOR TO PROCEEDING WITH WORK, IF DESIGN INTENT REQUIRES FURTHER CLARIFICATION.

4. *SUBMITTALS:* REVIEW FOR COMPLETENESS AND COMPLIANCE WITH CONTRACT DOCUMENTS PRIOR TO SUBMISSION TO STRUCTURAL ENGINEER. SUBMIT PRIOR TO FABRICATION. SUBMITTAL REVIEW IS FOR GENERAL CONFORMANCE WITH DESIGN INTENT AND DOES NOT CONSTITUTE AN AUTHORIZATION TO DEVIATE FROM TERMS AND CONDITIONS OF CONTRACT. WHEN INDICATED, PROVIDE A PROFESSIONAL ENGINEER'S SIGNATURE AND SEAL APPLICABLE TO STATE WHERE PROJECT IS LOCATED. MAINTAIN AT SITE A COPY OF REVIEWED AND ACCEPTED SUBMITTALS.

5. *MODIFICATIONS AND SUBSTITUTIONS:* MUST BE ACCEPTED IN WRITING BY STRUCTURAL ENGINEER. NO MODIFICATION OR SUBSTITUTION WILL BE ACCEPTED VIA SHOP DRAWING REVIEW.

6. *CONTRACT DOCUMENTS USE:* PERFORM STRUCTURAL RELATED WORK AND DEVELOP SHOP DRAWINGS CONSIDERING CONTRACT DOCUMENTS IN THEIR ENTIRETY. SEE ARCHITECTURAL DRAWINGS FOR TOP OF FLOOR AND ROOF ELEVATIONS, DEPRESSIONS, SLOPES, OPENINGS, CURBS, DRAINS, TRENCHES, SLAB EDGE LOCATIONS, WALL OVERALL DIMENSIONS AND LOCATIONS OF OPENINGS NOT INDICATED ON STRUCTURAL DRAWINGS. ANY DISCREPANCIES BETWEEN ARCHITECTURAL AND STRUCTURAL DIMENSIONS SHOULD BE CONFIRMED WITH THE STRUCTURAL ENGINEER BEFORE STARTING WORK.

7. *CONSTRUCTION MEANS AND METHODS:* NOT A PART OF CONTRACT DOCUMENTS. PERFORM CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES COMPLYING WITH NATIONAL, STATE AND LOCAL SAFETY ORDINANCES. SITE VISITS (INCLUDING STRUCTURAL OBSERVATION) BY STRUCTURAL ENGINEER DO NOT CONSTITUTE SUPERVISION OF CONSTRUCTION MEANS AND METHODS.

8. *TYPICAL DETAILS:* DETAILS TITLED AS "TYPICAL" ARE APPLICABLE THROUGHOUT PROJECT AND MAY NOT BE SPECIFICALLY REFERENCED HEREIN. CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING THESE DETAILS AND UNDERSTANDING EXTENT OF THEIR APPLICATION PRIOR TO PERFORMING WORK.

1.2 EARTHWORK AND FOUNDATIONS

1. *DESIGN ASSUMPTION:* IN LIEU OF MORE DETAILED SOILS INFORMATION, EXISTING SUBGRADE IS ASSUMED TO BE CLASS "5" IN COMPLIANCE WITH IBC TABLE 1804.2 WITH ALLOWABLE BEARING PRESSURE OF 1,500 PSF.

*THESE VALUES MAY BE INCREASED 33 PERCENT FOR SEISMIC OR WIND LOADING

2. *EXCAVATIONS, BACKFILL AND COMPACTION OF BACKFILL:* COMPLY WITH REQUIREMENTS OF IBC SECTION 1803. CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATION, LAGGING, SHORING, UNDERPINNING AND RELATED PROCEDURES.

3. *MINIMUM FOOTING DEPTHS:* 12 INCHES BELOW ADJACENT GRADE (EXCLUDING LANDSCAPING SOIL) OR FINISH FLOOR, WHICHEVER IS LOWER.

4. *WATER EXPOSURE AT BUILDING PERIMETER FOOTINGS:* AT AREAS WHERE SIDEWALKS OR PAVING DO NOT IMMEDIATELY ADJOIN STRUCTURE, PROVIDE POSITIVE DRAINAGE AWAY FROM STRUCTURE AT BUILDING PERIMETER. LANDSCAPE IRRIGATION IS NOT PERMITTED WITHIN FIVE FEET OF BUILDING PERIMETER FOOTINGS EXCEPT WHEN ENCLOSED IN PROTECTED PLANTERS WITH DIRECT DRAINAGE AWAY FROM STRUCTURE OR WHICH COMPLIES WITH APPLICABLE CODE. DISCHARGE FROM DOWNSPOUTS, ROOF DRAINS AND SCUPPERS IS NOT PERMITTED ONTO UNPROTECTED SOILS WITHIN FIVE FEET OF BUILDING PERIMETER. REFER TO GEOTECHNICAL REPORT FOR COMPLETE REQUIREMENTS.

1.3 CAST-IN-PLACE CONCRETE

1. *APPLICABLE STANDARD:* ACI 301.

2. *PORTLAND CEMENT:* ASTM C150, TYPE II.

3. *NORMAL WEIGHT CONCRETE (145 PCF):* ASTM C33 FOR AGGREGATES OF NATURAL SAND AND ROCK. CONCRETE TO ATTAIN THE FOLLOWING 28-DAY MINIMUM COMPRESSIVE STRENGTH (FC'), OF 2000 PSI.

MAXIMUM AGGREGATE SIZES: 1-1/2 INCHES AT FOUNDATIONS AND SLABS ON GRADE AND 1 INCH ELSEWHERE.

4. *LEAN CONCRETE:* WHERE SPECIFICALLY INDICATED, CONTAINING 2 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.

5. *MAXIMUM SLUMP:* 5 INCHES. 4 INCHES IN FLATWORK.

6. *SHRINKAGE:* ASTM C157, LIMIT TO 0.055 PERCENT.

7. *USE OF CHLORIDES:* NOT PERMITTED.

8. *CONSTRUCTION JOINTS:* PROVIDE KEYS UNLESS DETAILED OTHERWISE. ROUGHEN SURFACE TO ¼ INCH AMPLITUDE. THOROUGHLY CLEAN, REMOVE LAITANCE AND THOROUGHLY WET AND REMOVE STANDING WATER BEFORE PLACING NEW CONCRETE.

9. *CURING:* MAINTAIN CONCRETE ABOVE 50 DEGREES FAHRENHEIT AND IN A MOIST CONDITION FOR A MINIMUM OF 7 DAYS AFTER PLACEMENT UNLESS OTHERWISE ACCEPTED BY STRUCTURAL ENGINEER.

1.4 REINFORCING STEEL

1. *REINFORCING STEEL:*

ALL BARS UNLESS INDICATED OTHERWISE ASTM A615, GRADE 60
BARS TO BE WELDED ASTM A706, GRADE 60

2. *WIRE REINFORCING:*

SMOOTH WELDED WIRE FABRIC ASTM A185
DEFORMED WIRE STIRRUPS (D4 AND LARGER ONLY) ASTM A497

3. *LAP LENGTHS:* AS SHOWN ON DRAWINGS. IF LAP LENGTHS CANNOT BE DETERMINED, VERIFY WITH STRUCTURAL ENGINEER. LAP WIRE FABRIC 1-1/2 SPACES (1 FOOT MINIMUM).

4. *MINIMUM CAST-IN-PLACE CONCRETE COVER:* MIN. COVER, IN.

SLABS ON GRADE CENTER OF SLAB

(A) CONCRETE EXPOSED TO EARTH OR WEATHER (UNFORMED) 3

5. *CHAIRS OR SPACERS:* PLASTIC OR PLASTIC COATED WHEN RESTING ON EXPOSED SURFACES.

6. *BENDING:* BEND COLD UNLESS OTHERWISE ACCEPTED BY ARCHITECT (STRUCTURAL ENGINEER). DO NOT FIELD-BEND REINFORCING STEEL BARS EMBEDDED IN CONCRETE UNLESS OTHERWISE SHOWN ON CONTRACT DOCUMENTS OR PRE-APPROVED BY STRUCTURAL ENGINEER.

1.5 ROUGH CARPENTRY

1. *STRUCTURAL LUMBER:* GRADE MARKED DOUGLAS FIR-LARCH STRUCTURAL LUMBER COMPLYING WITH STANDARD GRADING RULES NO. 17 OF THE WEST COAST LUMBER INSPECTION BUREAU. PROVIDE AIR-DRY LUMBER WITH 19 PERCENT MAXIMUM MOISTURE CONTENT.

2. *CLASSIFICATIONS AND GRADES:*

MEMBER	*SIZE CLASSIFICATION*	*GRADE*
RAFTERS AND JOISTS LARGER THAN 2X4	2" TO 4" THICK, 2" AND WIDER	NO. 2
2X4 JOISTS AND RAFTERS	2" TO 4" THICK, 2" AND WIDER	NO. 2
4X BEAMS, HEADERS AND STRINGERS	2" TO 4" THICK, 2" AND WIDER	NO. 2
BEAMS, HEADERS AND STRINGERS LARGER THAN 4X	BEAMS AND STRINGERS	NO. 1
4X POSTS	4" THICK, 4" AND WIDER	NO. 2
POSTS LARGER THAN 4X	POSTS AND TIMBERS	NO. 1
STUDS, PLATES AND BLOCKING	STUD GRADE	

3. *PLYWOOD:* U.S. PRODUCT STANDARD PS X-XX AND CLASSIFIED AS EXPOSURE 1. EACH SHEET OF PLYWOOD SHALL BE IDENTIFIED WITH APPROPRIATE TRADEMARK OF THE AMERICAN PLYWOOD ASSOCIATION.

4. *PRESSURE TREAT STRUCTURAL LUMBER BEARING ON CONCRETE OR MASONRY:* SEE SPECIFICATIONS. PROVIDE HOT DIPPED GALVANIZED OR STAINLESS STEEL FASTENERS AND HARDWARE CONNECTORS AT PRESSURE TREATED STRUCTURAL LUMBER.

5. *NAILS:* COMMON NAILS WITH DIMENSIONAL PROPERTIES INSTALL NAILS IN COMPLIANCE WITH IBC CHAPTER 23, INCLUDING TABLE 2304.9.1

6. *BOLTS:* ASTM A307 BOLTS WITH STANDARD CUT WASHER UNDER BOLT HEAD AND NUT. PROVIDE HOLES FOR BOLTS 1/32 TO 1/16 INCH LARGER THAN NOMINAL BOLT DIAMETER. RE-TIGHTEN BOLTS PRIOR TO APPLICATION OF SHEATHING OR FINISH.

7. *LAG SCREWS:* ANSI/ASME STANDARD B18.2.1 FOR LAG SCREW DIMENSIONS. PRE-DRILL ALL HOLES. HOLE AT SHANK PORTION TO MATCH DIAMETER OF SHANK. HOLES AT THREADED PORTION TO BE 60 TO 75 PERCENT OF SHANK DIAMETER AND EQUAL TO LENGTH OF THREADED PORTION. USE SOAP AND LUBRICANTS TO FACILITATE INSTALLATION. DRIVING WITH HAMMER IS NOT PERMITTED.

8. *PLATE WASHERS:* PROVIDE UNDER HEADS OR NUTS OF BOLTS (INCLUDING ANCHOR BOLTS AT SILL PLATES) AND LAG SCREWS OF THE FOLLOWING SIZES WHEN ANCHORING WOOD:

1/2" DIAMETER 1/8"X2" SQ. 5/8" DIAMETER 1/8"X2-1/2" SQ.
3/4" DIAMETER 3/16"X2-3/4" SQ.7/8" DIAMETER 1/4"X3" SQ.
1" DIAMETER 5/16"X3-1/2" SQ.

9. *WOOD HARDWARE CONNECTORS:* MANUFACTURED BY SIMPSON STRONG-TIE COMPANY, INC.

10. *NOTCHING OR CUTTING STRUCTURAL LUMBER:* NOT PERMITTED UNLESS SPECIFICALLY DETAILED OR INDICATED.

11. *WOOD STUDS:*

   A. TOP PLATE: CONSTRUCT WITH 2 PIECES SAME WIDTH AS STUDS. SPLICE AS INDICATED.
   B. STUD WALL BRACING IN STUD WALLS NOT PLYWOOD SHEATHED: COMPLIANCE WITH IBC SECTION R602.
   C. NOTCHING OR BORING HOLES IN WOOD STUDS: IBC SECTION R602.6
   D. PARTITION SUPPORT AT FLOOR FRAMING: DOUBLE JOISTS UNDER PARTITIONS WHICH ARE PARALLEL TO JOISTS AND PROVIDE SOLID FULL DEPTH BLOCKING UNDER PARTITIONS WHICH ARE PERPENDICULAR TO JOISTS.

1.6 NAILING SCHEDULE (PORTION OF IBC TABLE R602.3(1))

ALL NAILS ARE COMMON NAILS UNLESS WRITTEN ACCEPTANCE BY ARCHITECT (STRUCTURAL ENGINEER) IS ATTAINED.

1. JOIST TO SILL OR GIRDER, TOENAIL 3-8D
2. BRIDGING TO JOIST, TOE NAIL EACH END 2-8D
3. 1"X6" SUBFLOOR OR LESS TO EACH JOIST, FACE NAIL 2-8D
4. WIDER THAN 1"X6" SUBFLOOR TO EACH JOIST, FACE NAIL 3-8D
5. 2" SUBFLOOR TO JOIST OR GIRDER, BLIND AND FACE NAIL 2-16D
6. SOLE PLATE TO JOIST OR BLOCKING, TYPICAL FACE NAIL 16D @ 16" O/C
7. SOLE PLATE TO JOIST OR BLOCKING, AT BRACED WALL PANELS 3-16D PER 16"
8. TOP PLATE TO STUD, END NAIL 2-16D
9. STUD TO SOLE PLATE 4-8D, TOE NAIL OR 2-16D, END NAIL
10. DOUBLE STUDS, FACE NAIL 16D @ 24" O/C
11. DOUBLED TOP PLATES, TYPICAL FACE NAIL 16D @ 16" O/C
12. DOUBLED TOP PLATES, LAP SPLICE 8-16D
13. BLOCKING BETWEEN JOISTS OR RAFTERS TO TOP PLATE, TOE NAIL 3-8D
14. RIM JOIST TO TOP PLATE, TOE NAIL 8D @ 6" O/C
15. TOP PLATES, LAPS AND INTERSECTIONS, FACE NAIL 2-16D
16. CONTINUOUS HEADER, TWO PIECES 16D @ 16" O/C ALONG EACH EDGE
17. CONTINUOUS HEADER TO STUD, TOE NAIL 4-8D
18. RAFTER TO PLATE, TOE NAIL 3-8D
19. 1" BRACE TO EACH STUD AND PLATE, FACE NAIL 2-8D
20. 1"X8" SHEATHING OR LESS TO EACH BEARING, FACE NAIL 2-8D
21. WIDER THAN 1"X8" SHEATHING TO EACH BEARING, FACE NAIL 3-8D
22. 2" PLANKS 2-16D AT EACH BEARING
23. BUILT-UP CORNER STUDS 16D @ 24" O/C
24. BUILT-UP GIRDER AND BEAMS 20D @ 32" O/C AT TOP AND BOTTOM AND STAGGERED 2-20D AT ENDS AND AT EACH SPLICE

STRUCTURAL ENGINEERING:
ARIANA ALANIZ
aralaniz@calpoly.edu

ARCHITECTURAL:
TORI HERTZ
torihertz829@gmail.com

MICHAEL POLLAKOWSKY
michael.pollakowsky@gmail.com

CONSTRUCTION MANAGEMENT:
JEREMIAH ESEED
mjeremiaheseed@gmail.com

Client

Great Northern Services

780 S. DAVIS AVE
WEED, CA 96094
PARCEL #1

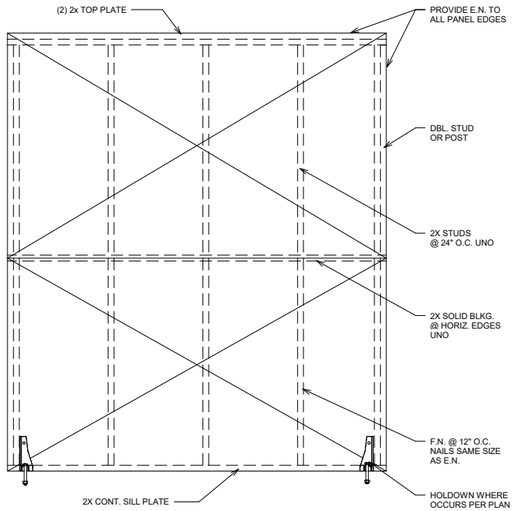
No.	Description	Date
1	CHARRETTE #1	SEPT. 25, 2017
2	CHARRETTE #2	OCT. 9, 2017
3	CHARRETTE #3	OCT. 25, 2017
4	CHARRETTE #4	NOV. 8, 2017

STANDARD NOTES

Project Number	120720.13
Date	DEC. 2017
Drawn By	AA
Checked By	Checker

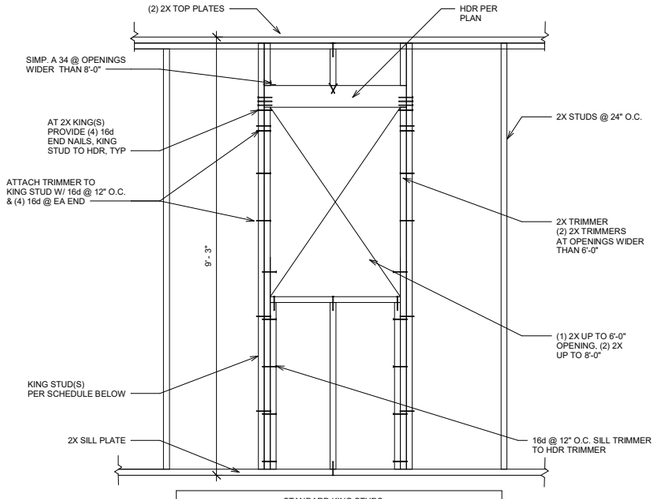
SN-1

Scale



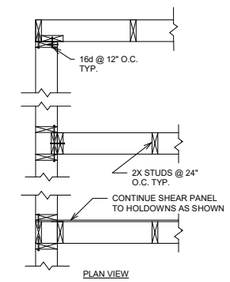
NOTES:
1. VERT. ORIENTATION OF PANELS IS ALLOWED.
2. PROVIDE 3/8" EDGE DISTANCE AT E.N.

G TYP. SHEAR PANEL



STANDARD KING STUDS			
STUD SIZE	3'-0"	6'-0"	12'-0"
2X6	2X	2X	(2) 2X

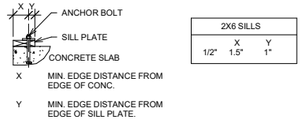
H FRAMING AROUND OPENING



PLAN VIEW

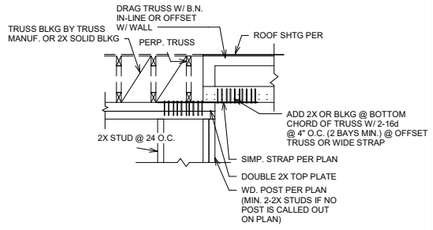
NOTE:
PROVIDE REQUIRED DBL. STUDS OR POSTS WHERE HOLDOWNS OCCUR

D STUD WALL @ INTERSECT

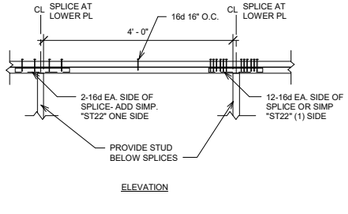


2X6 SILLS		
	X	Y
1/2"	1.5"	1"

F EDGE DISTANCE DETAIL

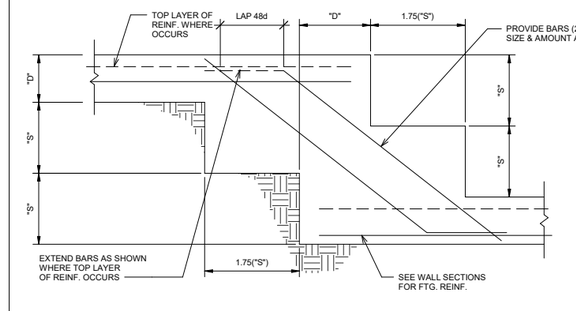


E STRAP TRUSS TO TOP PLATE



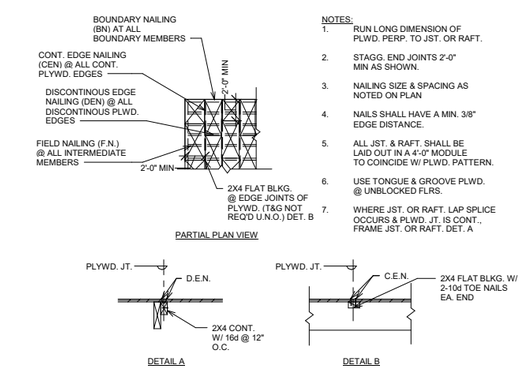
ELEVATION

G TYP. MIN. PLATE SPLICE



NOTES:
1. S ------ --- ------- S INDICATES STEPPED FTG. SYMBOL. SEE PLAN FOR LOCATION
2. "S" DIMENSIONS SHALL NOT EXCEED 1'-6".
3. "D" INDICATED DEPTH OF FTG. AND d INDICATES BAR DIAMETER.

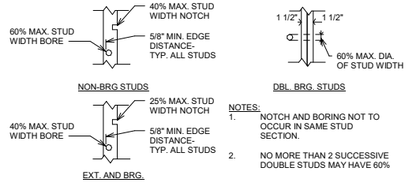
A STEPPED FOOTING



PARTIAL PLAN VIEW

NOTES:
1. RUN LONG DIMENSION OF PLWD. PERP. TO JST. OR RAFT.
2. STAGG. END JOINTS 2'-0" MIN AS SHOWN.
3. NAILING SIZE & SPACING AS NOTED ON PLAN
4. NAILS SHALL HAVE A MIN. 3/8" EDGE DISTANCE.
5. ALL JST. & RAFT. SHALL BE LAID OUT IN A 4'-0" MODULE TO COINCIDE W/ PLWD. PATTERN.
6. USE TONGUE & GROOVE PLWD. @ UNBLOCKED FLRS.
7. WHERE JST. OR RAFT. LAP SPLICE OCCURS & PLWD. JT. IS CONT., FRAME JST. OR RAFT. DET. A

B TYP. FLOOR/ROOF PLYWOOD DETAIL



NOTES:
1. NOTCH AND BORING NOT TO OCCUR IN SAME STUD SECTION.
2. NO MORE THAN 2 SUCCESSIVE DOUBLE STUDS MAY HAVE 60%

C TYP. NOTCHING & BORING OF STUDS

STRUCTURAL ENGINEERING:
ARIANA ALANIZ
aralaniz@calpoly.edu

ARCHITECTURAL:
TORI HERTZ
torihertz829@gmail.com

MICHAEL POLLAKOWSKY
michael.pollakowsky@gmail.com

CONSTRUCTION MANAGEMENT:
JEREMIAH ESEED
mjeremiahseed@gmail.com

Client

Great Northern Services

780 S. DAVIS AVE
WEED, CA 96094
PARCEL #1

No.	Description	Date
1	CHARRETTE #1	SEPT. 25, 2017
2	CHARRETTE #2	OCT. 9, 2017
3	CHARRETTE #3	OCT. 25, 2017
4	CHARRETTE #4	NOV. 8, 2017

STANDARD DETAILS

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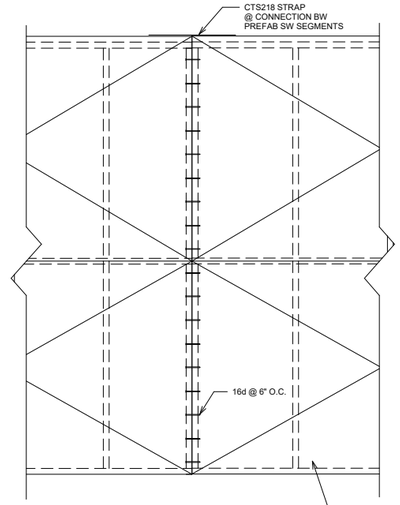
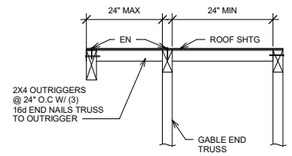
SN-2

Scale 3/4" = 1'-0"

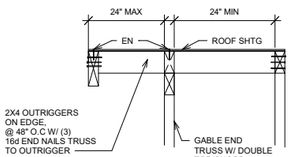


NOTES:
1. VERT. ORIENTATION OF PANELS IS ALLOWED.
2. PROVIDE 3/8" EDGE DISTANCE AT E.N.

I CONNECTION BW SW SEGMENTS



FLAT OUTRIGGERS



OUTRIGGERS ON EDGE

J TRUSS OUTRIGGER

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ARIANA ALANIZ
aralaniz@calpoly.edu

ARCHITECTURAL:
TORI HERTZ
torihertz829@gmail.com

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SN-3

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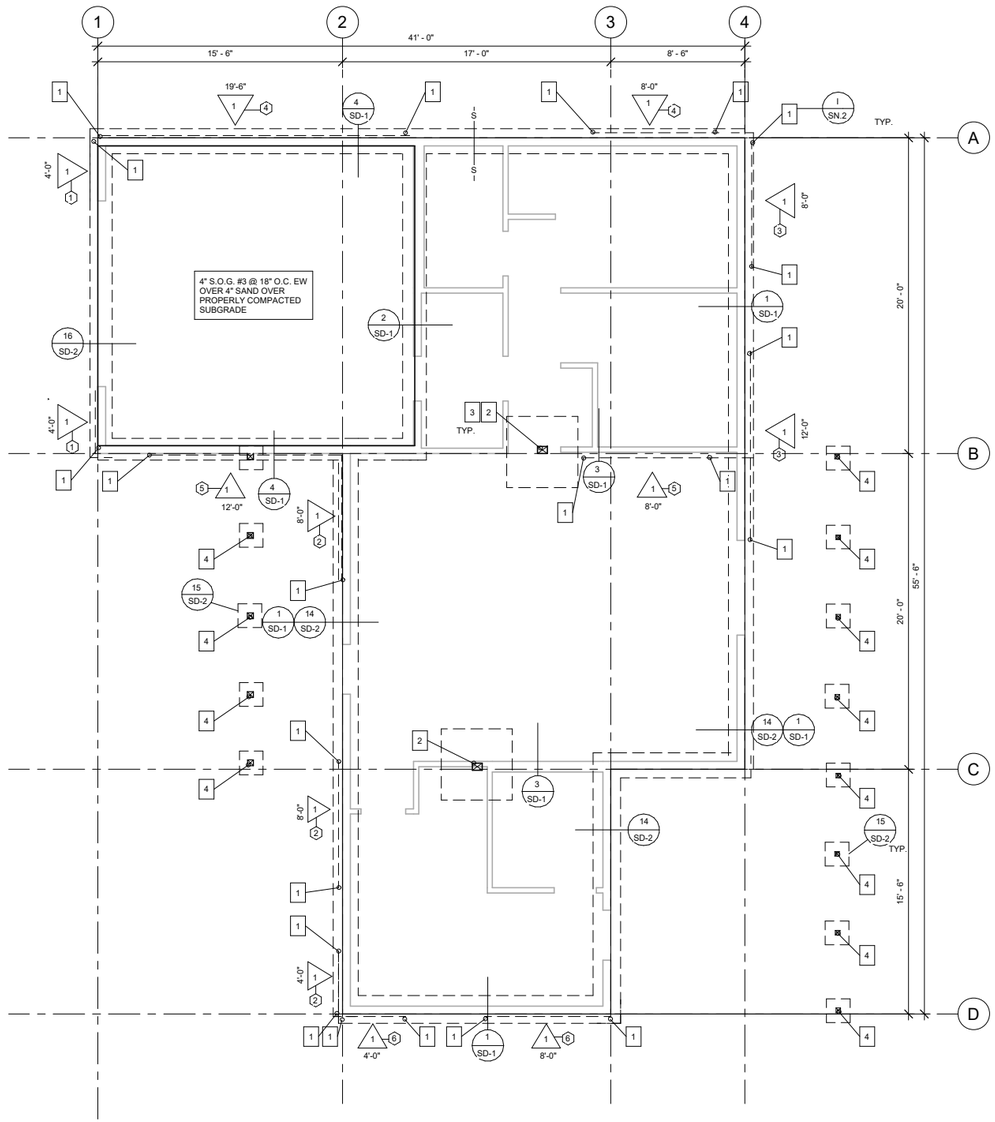

1 Foundation Plan
1/4" = 1'-0"

FOUNDATION NOTES

1. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO VERIFY ALL DIMENSIONS WITH THE ARCHITECTURAL FLOOR PLAN AND NOTIFY THE ARCHITECT AND ENGINEER OF ANY DISCREPANCIES PRIOR TO STARTING WORK.
2. THE GENERAL CONDITIONS, SPECIFICATIONS, GENERAL NOTES ON SHEET , GENERAL STRUCTURAL DETAILS AND THE FOLLOWING APPLY TO THE WORK OF THE FOUNDATION.
3. FOOTINGS ARE TO BE EXAMINED AND CERTIFIED IN WRITING BY THE PROJECT SOILS/ GEOLOGY ENGINEER PRIOR TO PLACEMENT OF CONCRETE.
4. ALL SLAB REINFORCEMENT SHOULD BE SUPPORTED ON CHAIRS TO PROVIDE PLACEMENT AT MID DEPTH OF SLAB.
5. ALL SHEARWALL LENGTHS ARE MINIMUM. REFER TO ARCH PLANS FOR ACTUAL WALL LENGTHS.

FOOTING & SLAB SCHEDULE	
LOCATION	DESIGN
EXT. CONT. FOOTING	15" W X 12" D W/ 2-# 3 T&B (UNO ON PLANS)
SLAB ON GRADE	4" THICK ACTUAL W/ #3 @ 18" O.C. E.W. @ MID DEPTH
INTERIOR PAD FOOTING	42" SQ. X 12" D W/ 3-#4 BARS EA WAY
DECK PAD FOOTING	18" SQ. X 12" D W/ 2-#3 BARS EA WAY
STEM WALL	6" W W/ 3-#3 EA.

FOUNDATION LEGEND

- LENGTH / # — INDICATES SHEAR WALL TYPE AND LOCATION. REFER TO SHEARWALL SCHEDULE ON FLOOR FRAMING PLAN FOR CONSTRUCTION AND NAILING REQUIREMENTS.
- INDICATES KEYNOTE SPECIFICATION. REFER TO KEYNOTE SCHEDULE ON THIS SHEET
- INDICATES DETAIL REFERENCE
  REFER TO DENOTED SHEET #
- S — S — INDICATES STEPPED FOOTING. REFER TO **DET. A/SN-2**
- INDICATES ANCHOR BOLT PLACEMENT. REFER TO ANCHOR BOLT SCHEDULE ON THIS SHEET FOR SPACING

KEYNOTES

1. HDU2 HOLDOWN TO MINIMUM 3" THICK WOOD MEMBER W/ (6) 1/4" X 2 1/2" SDS SCREWS. CAPACITY: 3075#
2. 6x6 POST P.T.D.F.
3. SIMPSON STRONG TIE POST BASE CBS66.
4. 4X4 POST W/ SIMSPON POST BASE EPB66

ANCHOR BOLT SCHEDULE		
ANCHOR BOLT NO.	CONSTRUCTION	SILL PLATE
1	1/2" A.B. @ 36" O.C.	2X
2	1/2" A.B. @ 36" O.C.	2X
3	1/2" A.B. @ 48" O.C.	2X
4	1/2" A.B. @ 48" O.C.	2X
5	1/2" A.B. @ 24" O.C.	2X
6	1/2" A.B. @ 24" O.C.	2X

NOTES:
1. FOR EXTERIOR NON-SHEAR WALL USE 5/8" A.B. @ 48" O.C. MIN
2. FOR INTERIOR NON-SHEAR WALL USE 0.145" DIA. SHOT PINS @ 24" O.C. MIN
3. USE SQUARE PLATE WASHERS PER THE FOLLOWING TABLE:

APPROVED PLATE WASHERS FOR SILL PLATE ANCHOR BOLTS AND HOLD-DOWN POST BOLTS	
BOLT	PLATE WASHER SIZE
1/2"	3/16" X 2" X 2"

STRUCTURAL ENGINEERING:
ARIANA ALANIZ
aralaniz@calpoly.edu

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FOUNDATION PLAN

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S-1.1

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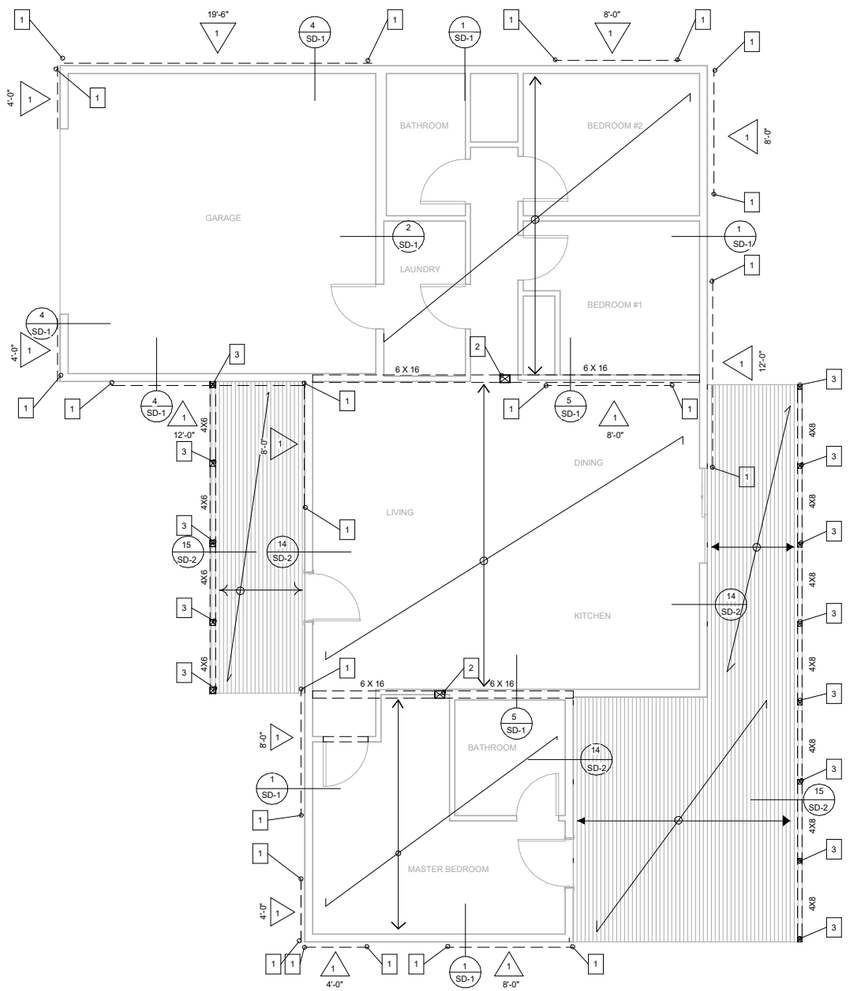

1 Floor Framing Plan
1/4" = 1'-0"

FLOOR FRAMING NOTES

1. THE GENERAL CONDITIONS, SPECIFICATIONS, GENERAL NOTES ON SHEET SN-1 , GENERAL STRUCTURAL DETAILS AND THE FOLLOWING APPLY TO THE WORK OF THE FLOOR FRAMING.
2. CONTRACTOR SHALL CHECK FLOOR FRAMING DIMENSIONS AGAINST THE ARCHITECTURAL PLAN AND NOTIFY THE ARCHITECT AND ENGINEER OF ANY OMISSIONS BEFORE STARTING WORK.
3. ALL WALLS AT THIS LEVEL ARE TO BE 2X6 STUD @ 24" O.C. U.N.O.
4. SEE ARCHITECTURAL PLANS FOR PLUMBING WALLS.
5. USE SIMPSON LUS210 FOR FLOOR JOIST TO FLUSH BEAM CONNECTION, U.N.O.
6. USE SIMPSON HU26 FOR FRONT PORCH JOIST TO BEAM AND SIMPSON LUS28 FOR DECK JOISTS TO BEAM.
7. USE SIMPSON FULL DEPTH HU HANGER FOR BEAM TO BEAM CONNECTIONS, U.N.O.
8. SHEAR PANELS MAY BE INSTALLED ON EITHER SIDE OF THE WALL. REFER TO DET. D/SN-2
9. ALL SHEARWALL LENGTHS ARE MINIMUM. SEE ARCHITECTURAL PLAN FOR ACTUAL WALL LENGTHS.

FLOOR FRAMING LEGEND

- INDICATES 2X12 DF-1 @ 12" O.C.
- INDICATES 2X10 DF-2 @ 12" O.C.
- INDICATES 2X6 DF-2 @ 16" O.C.
- INDICATES SPAN OF FLOOR JOISTS.
- LENGTH / # — INDICATES SHEAR WALL TYPE AND LOCATION. REFER TO SHEARWALL SCHEDULE FOR CONSTRUCTION AND NAILING REQUIREMENTS.
- INDICATES KEYNOTE SPECIFICATION. REFER TO KEYNOTE SCHEDULE ON THIS SHEET
- INDICATES BEAM OR HEADER
- INDICATES DETAIL REFERENCE / REFER TO DENOTED SHEET #
- INDICATES 2X4 DECKING

SHEARWALL SCHEDULE

TYPE	APA RATED SHEATHING	SILL PLATE	SOLE PLATE CONNECTION	
			TO BEAM	TO RIM
1	3/8" ONE FACE W/ 8d @ 6 OC EDGE 12" OC FIELD	2X	16d @ 6" OC	16d @ 6" OC

NOTES:
1. FRAMING AT ADJOINING PANEL EDGES SHALL BE 3" NOMINAL OR WIDER AND NAILS SHALL BE STAGGERED WHERE NAILS ARE SPACED 3" OR LESS ON CENTER
2. PANEL JOINTS SHALL BE OFFSET TO FALL ON DIFFERENT FRAMING MEMBERS OR FRAMING SHALL BE 3" NOMINAL OR THICKER AND NAILS SHALL BE STAGGERED.

KEYNOTES

1. (2) 2x DF-2 POSTS AT END OF SW
2. 6x6 POST BELOW W/ PC6Z POST CAP
3. 4x4 POST BELOW W/ BC4 POST CAP

STRUCTURAL ENGINEERING:
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aralaniz@calpoly.edu

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michael.pollakowsky@gmail.com

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FLOOR FRAMING PLAN

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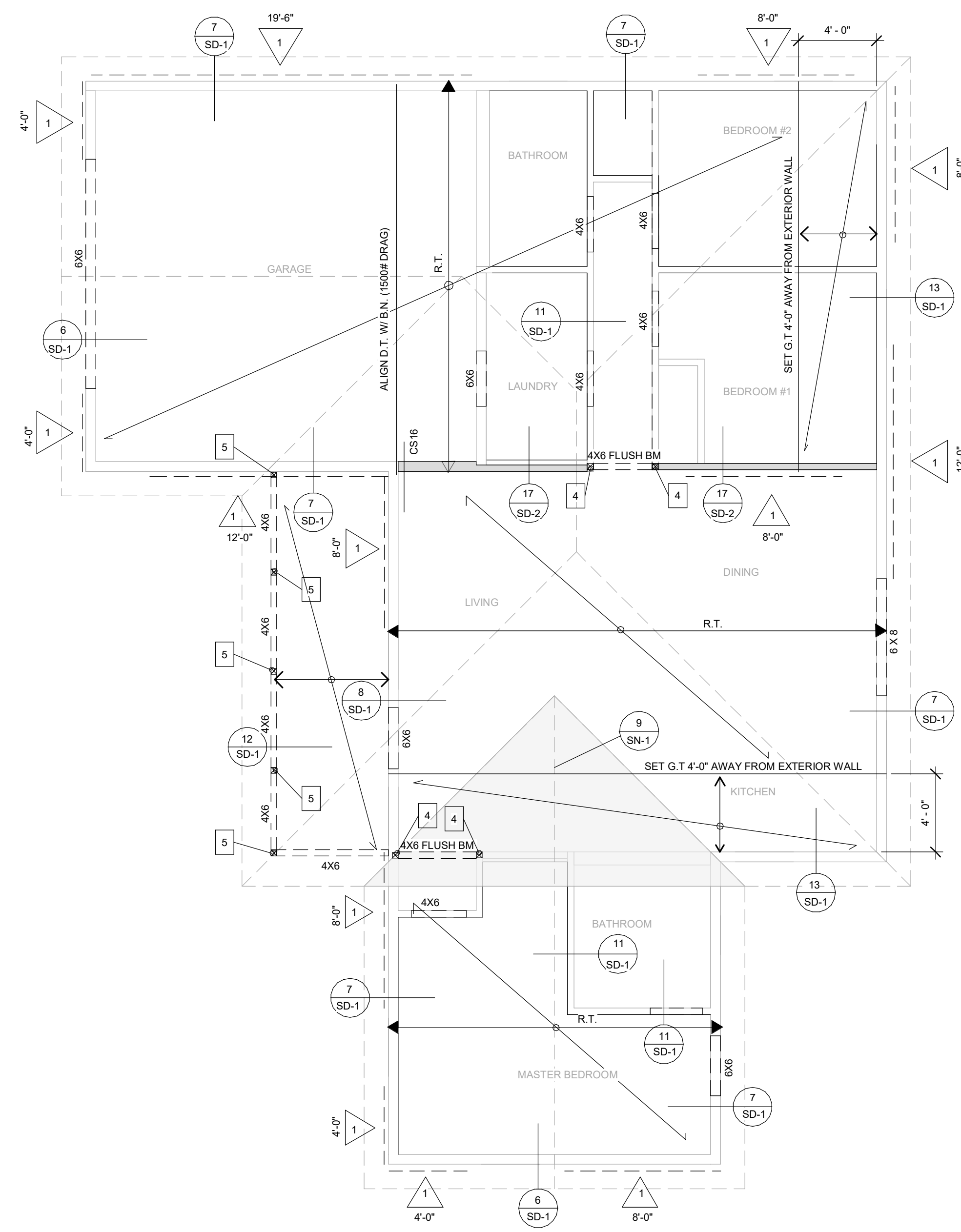
S-1.2

Scale: As indicated



① Roof Framing Plan
1/4" = 1'-0"

ROOF FRAMING NOTES

1. THE GENERAL CONDITIONS, SPECIFICATIONS AND GENERAL NOTES
2. ON SHEET SN-1 , GENERAL STRUCTURAL DETAILS AND THE FOLLOWING APPLY TO THE WORK OF THE ROOF FRAMING.
3. CONTRACTOR SHALL CHECK ROOF FRAMING AGAINS THE ARCHITECTURAL PLAN AND NOTIFY THE ARCHITECT AND ENGINEER OF ANY OMISSIONS AND/OR DISCREPENCIES BEFORE STARTING WORK.
4. ALL 2X-4X SAWN LUMBER TO BE DF-2 AND ALL 5X AND BIGGER TO BE DF-1 U.N.O.
5. SEE ARCHITECTURAL PLANS FOR LOCATIONS OF PLUMBING WALLS.
6. SHEATHING GRADE ON DIAPHRAGM 15/32" W/ 8d NAILS, 6" BOUNDARY NAILING AND 12" AT ALL OTHER EDGES.
7. HEADERS SUPPORTING ROOF LOADS SHALL HAVE AT LEAST 2X TRIMMER CONTINOUS TO THE SILL PLATE U.N.O.
8. HEADERS SPANNING 8'-0" OR MORE SHALL HAVE AT LEAST 2-2X TRIMMERS CONTINOUS TO THE SILL PLATE AND 2-2X KING STUDS, U.N.O.
9. ALL SHEAR CONNECTOR AND BLOCKING AT PLATE LEVEL MUST BE INSTALLED PRIOR TO THE INSTALLATION OF ROOF SHEATHING.
10. ROOF SHEATHING SHALL BE SPECIFIED ON DET. B/SN-2
11. INTERIOR NON-BEARING WALL TOP PLATE MAY BE 1X4 OVER 2X4.
12. GT= GIRDER TRUSS W/ 2-2X @ SUPPORTS U.N.O.
13. ROOF TRUSSES SHALL BE DESIGNED FOR THE FOLLOWING LOADS:
    DL: 15 PSF
    LL: 20 PSF
    SL: 60 PSF
14. U.N.O. ALL GABLE END TRUSS SHALL BE DESIGNED TO CARRY 180 PLF. ALONG FULL LENGTH OF THE TOP CHORD AND BE CAPABLE OF TRANSFERRING THE LOAD TO THE SHEARWALL BELOW (WHERE OCCURS) WITHOUT THE USE OF STUCCO.
15. TRUSS MANUFACTURER SHALL SUBMIT TRUSS DESIGN AND SHOP DRAWINGS TO THE ENGINEER OF RECORD FOR APPROVAL PRIOR TO FABRICATION.
16. SEE DETAIL 9/ SD-2 ON SHEET FOR CALIFORNIA FRAMING REQUIREMENTS.
17. TRUSS TO TRUSS CONNECTIONS AND TRUSS TO GIRDER CONNECTIONS AND OTHER RELATED CONNECTIONS SHALL BE DESIGNED AND SPECIFIED BY THE TRUSS MANUF'R.
18. BALLOON FRAME INDICATES WALL CONTINOUS FROM SILL PLATE TO TOP PLATE DIRECTLY BELOW BOTTOM CHORD OF TRUSS.
19. ALL WALLS TO BE FRAMED W/ CONTINOUS STUDS TO BOTTOM CHORD OF TRUSSES U.N.O.
20. FOR ALL CS COILED STRAPS USE 8d NAILS ON EVERY OTHER NAIL HOLE.
21. USE MSTA36 TO CONNECT TOP PLATES AT ALL PLATE BREAKS U.N.O. AND 12-16d NAILS PER DETAIL E/SN-2 AT TOP PLATE SPLICES.
22. SHEAT PANELS MAY BE INSTALLED ON EITHER SIDE OF THE WALL.
23. SIMPSON LTP4 CONNECTOR MAY BE USED IN PLACE OF SIMPSON A35F.
24. ALL SHEARWALL LENGTHS ARE MINIMUM. REFER TO ARCHITECTURAL FLOOR PLANS FOR ACTUAL WALL LENGTHS.

ROOF FRAMING LEGEND

- INDICATES MANUFACTURED ROOF TRUSS @ 24" O.C. U.N.O.
- D.T. W/ B.N. (# DRAG) — INDICATES DRAG TRUSS TO BE DESIGNED TO RESIST THE SPECIFIED LOAD APPLIED UNIFORMLY ALONG TOP CHORD OF TRUSS & TRANSFERRED TO SHEARWALL OR DRAG STRAP BELOW. BOUNDARY NAILING TO BE INSTALLED AT ROOF SHEATHING ACROSS FULL LENGTH OF TRUSS.
- INDICATES 2X4 DF-2 @ 24" O.C. AT ROOF AND 2X4 DF-2 @ 16" O.C. AT PORCH
- INDICATES SPAN OF TRUSSES OR RAFTERS.
- LENGTH # — INDICATES SHEAR WALL TYPE AND LOCATION. REFER TO SHEARWALL SCHEDULE FOR CONSTRUCTION AND NAILING REQUIREMENTS.
- INDICATES LOCATION OF CALIFORNIA FRAMING. SEE DETAIL
- INDICATES INTERIOR BEARING WALL
- INDICATES BEARING BEAM OR HEADER
- INDICATES KEYNOTE SPECIFICATION. REFER TO KEYNOTE SCHEDULE ON THIS SHEET
- R.T. — PRE-FABRICATED ROOF TRUSSES. SEE ROOF NOTES
- INDICATES DETAIL REFERENCE
  REFER TO DENOTED SHEET #

KEYNOTES

4 DOUBLE 2x STUD POST

5 4X4 POST

connect 3

STRUCTURAL ENGINEERING:
ARIANA ALANIZ
aralaniz@calpoly.edu

ARCHITECTURAL:
TORI HERTZ
torihertz829@gmail.com

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ROOF FRAMING PLAN

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S-1.3

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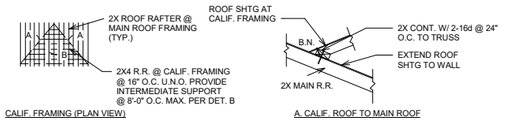
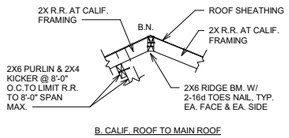
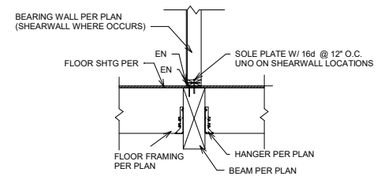
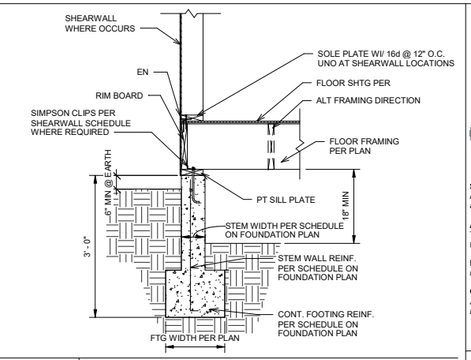




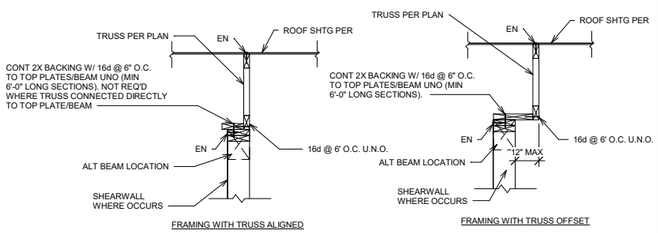
9	CALIFORNIA FRAMING



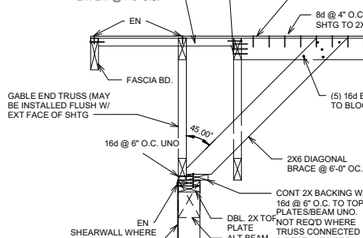
5	BEARING ON FLOOR FRAMING



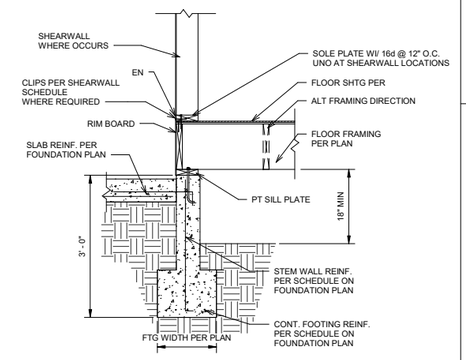
1	CONT. FOOTING AT PERIMETER



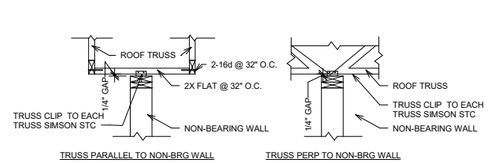
10	ROOF TRUSS AT INTERIOR- PARALLEL



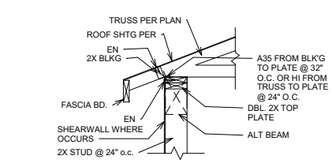
6	ROOF TRUSS AT EXT. WALL-END



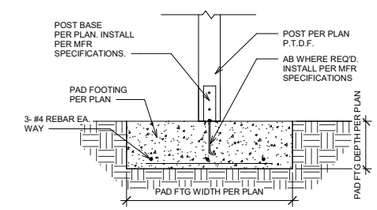
2	CONT. FOOTING AT GARAGE



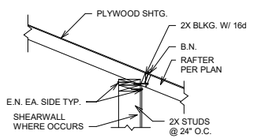
11	TRUSS AT NON-BEARING WALL



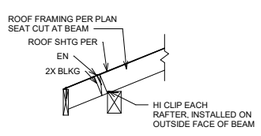
7	ROOF TRUSS AT EXTERIOR WALL



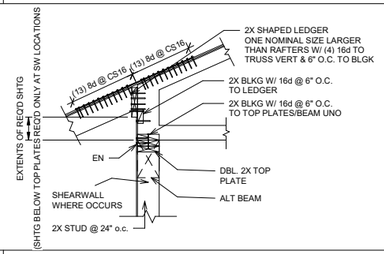
3	PAD FOOTING



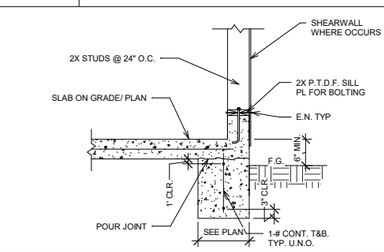
13	RAFTER TO EXT. WALL



12	RAFTER EAVE



8	RAFTER TO TRUSS CONNECTION



4	EXTERIOR FOOTING

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ARIANA ALANIZ
aralaniz@calpoly.edu

ARCHITECTURAL:
TORI HERTZ
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SD-1

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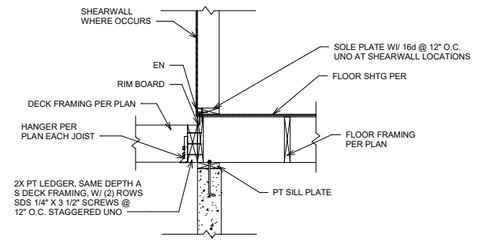
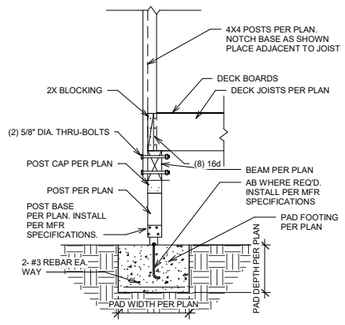
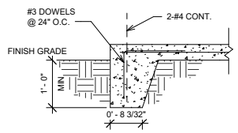


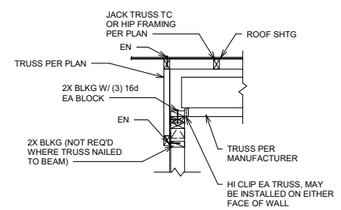
14 DECK LEDGER



15 FOOTING AT DECK



16 S.O.G. SLAB EDGE



17 ROOF FRAMING @ INT.- PERP.

STRUCTURAL ENGINEERING:
ARIANA ALANIZ
aralaniz@calpoly.edu

ARCHITECTURAL:
TORI HERTZ
torihertz829@gmail.com

MICHAEL POLLAKOWSKY
michael.pollakowsky@gmail.com

CONSTRUCTION MANAGEMENT:
JEREMIAH ESEED
mjeremiaheseed@gmail.com

Client

Great Northern Services

780 S. DAVIS AVE
WEED, CA 96094
PARCEL #1

No.	Description	Date
1	CHARRETTE #1	SEPT. 25, 2017
2	CHARRETTE #2	OCT. 9, 2017
3	CHARRETTE #3	OCT. 25, 2017
4	CHARRETTE #4	NOV. 8, 2017

STRUCTURAL DETAILS

Project Number	120720.13
Date	DEC. 2017
Drawn By	AA
Checked By	Checker

SD-2

Scale 3/4" = 1'-0"

California Polytechnic University, SLO
San Luis Obispo, CA 93407

S. Davis Avenue Parcel #1

to be constructed in Weed, CA

Structural Calculations per 2016 CBC

Client	Great Northern Services (GNS)
Designer	AA

California Polytechnic University, SLO
San Luis Obispo, CA 93407

Table of Contents

California Polytechnic University, San Luis Obispo
By AA
Dec. 1, 2017

Page	**PI-1**
Sheet	**Project Information**

Project Information

Project Info		**Client Info**
Project Name	Community Housing	Great Northern Services (GNS)
Project Location	Weed, CA	310 Boles Street
Lot	Parcel 1	Weed, CA 96094

Soils and Foundation Information

Foundation Type

Concrete Stem Wall with continous footing

Soils Criteria

Site Class	D	
Vertical Bearing Capacity	1500	psf
Lateral Bearing Capacity	100	pcf
Coeff. of Friction	0.25	
Depth below grade to Frost Line	12	in
Min. Ftng Depth below frost line	12	in

Wind Design Information

Basic Wind Speed (V)	110	mph
Exposure Category	C	
Roof Pitch	5:12	
Risk Category	II	
Importance Factor (I)	1.0	
Directionality Factor (Kd)	0.85	
Internal Pressure Coeff. (GCpi)	0.18	

Seismic Design Information

Design Category	D	
Response Modification, R	6.5	
Design Spectral Respose Acc. S_{DS}	0.594	g
Design Spectral Response at 1.0s S_{D1}	0.381	g
1-Second Acceleration, S_1	0.328	g
Rho, Left to Right	1.3	
Rho, Front to Back	1.3	
Deflection Amplification Factor, Cd	4.0	

California Polytechnic University, San Luis Obispo
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Page G-1
Sheet Gravity Loads

Structual Calculation Package

Project Information

Community Housing
Weed, CA
Parcel 1

Loading Information

Roof Loads		Floor Loads	
Roofing (metal)	3.0 psf	Flooring	4.0 psf
Sheathing (1/2-in plywood)	1.7 psf	Sheathing	2.0 psf
Framing	3.3 psf	Framing (2x12 @ 12" oc)	6.0 psf
Insulation	1.5 psf	Insulation	1.5 psf
Ceiling	2.5 psf	Misc.	4.0 psf
Sprinklers	1.0 psf		
Misc.	2.0 psf		
TOTAL DL	15.0 psf	**TOTAL DL**	17.5 psf
TOTAL LL	20.0 psf	**TOTAL LL**	40.0 psf

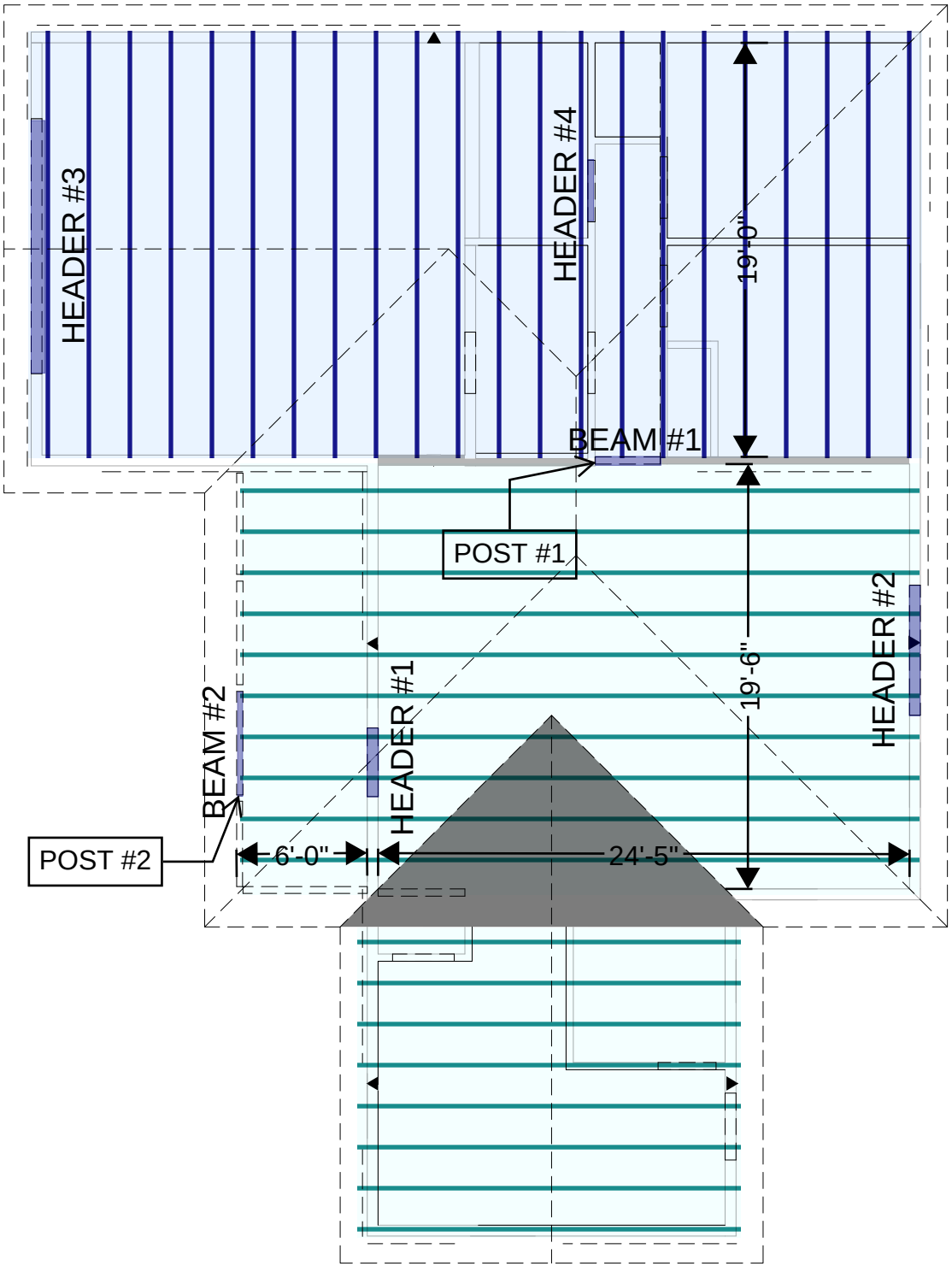
Snow Loads

Roof Load (Flat)	60 psf
Ground Load	86 psf

Exterior Wall Loads		Interior Wall Loads	
Board and Batten	6.0 psf		
Gyp Board (One Face)	2.5 psf	Gyp Board (Ea Face)	5.0 psf
Sheathing (1/2)	1.7 psf	Framing (2x4)	1.0 psf
Framing (2x6)	1.3 psf	Insulation	1.0 psf
Insulation	1.0 psf	Misc	0.5 psf
Misc.	0.5 psf		
TOTAL DL	13.0 psf	**TOTAL DL**	7.5 psf

Building Weight			
	Height	Dimensions	Weight (lb)
Roof	-	1909	28635
Floor	-	1590	27825
Exterior Wall	9	179.5	21001.5
Interior Wall	9	125.5	8471.25
Snow Load per ASCE 7 Sec. 12.7.2	-	1909	22908
Total (lb)			**108840.75**

Page RKP-1
Sheet Roof Key Plan



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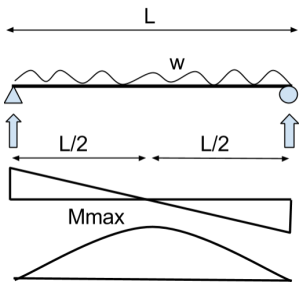
Page	B-1
Sheet	Calculated Beams

BEAM #1 Hall Flush Beam Span: 3' - 0"

Loading		Trib. Width	10.0 ft
Roof Dead	15	psf	150.0 plf
Roof Live	20	psf	
Roof Snow	60	psf	510.0 plf
Total W			660.0 plf
Shear, V	990.00	lbs	
Flexure, M	742.50	lbs-ft	

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$		(NDS 2015 Table 4.31)		
Assumptions:	Fb		900	DF-2
	C_D		1.15	
	C_F		1.1	
	F'b		1138.5	
Req'd S		7.826	in. cubed	
Try 4x6 DF-2	S		17.65	in. cubed
	A		19.25	sq. in
	I		48.53	in^4
fb		**504.82**	**psi**	
Verify:	C_F		1.3	
F'b		**1345.500**	**psi**	**Demand<Capacity, OK for flexure**



Shear

F'v=$F_v C_D C_M C_t C_i$		(NDS 2015 Table 4.31)	
Fv	170		
F'v	**195.5**	**psi**	
fv	**77.14**	**psi**	**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.015**	**in**	
Allow. Deflection	**0.2**	**in**	**Demand<Capacity, OK for deflection**

USE 4x6 DF-2 FOR BEAM #1

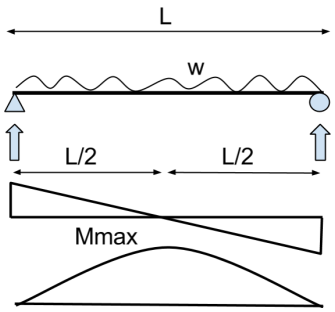
Page B-2
Sheet Calculated Beams

BEAM #2 Porch Beam Span: 5' - 0"

Loading		Trib. Width	3.0 ft
Roof Dead	15 psf		45.0 plf
Roof Live	20 psf		
Roof Snow	60 psf		153.0 plf
Total W			198.0 plf
Shear, V	495.00 lbs		
Flexure, M	618.75 lbs-ft		

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$		(NDS 2015 Table 4.31)		
Assumptions:	Fb		900	DF-1
	C_D		1.15	
	C_F		1.1	
	F'b		1138.5	
Req'd S		6.522	in. cubed	
Try 4x6 DF-2	S		17.65	in. cubed
	A		19.25	sq. in
	I		48.53	in^4
fb		**420.68**	**psi**	
Verify:	C_F		1.3	
F'b		**1345.500**	**psi**	**Demand<Capacity, OK for flexure**



Shear

F'v=$F_v C_D C_M C_t C_i$	(NDS 2015 Table 4.31)		
Fv	170		
F'v	**195.5**	**psi**	
fv	**38.57**	**psi**	**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$	(NDS 2015 Table 4.31)		
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.036**	**in**	
Allow. Deflection	**0.333**	**in**	**Demand<Capacity, OK for deflection**

USE 4x6 DF-2 FOR BEAM #2

California Polytechnic University, San Luis Obispo
By AA
Dec. 1, 2017

Page	EH-1
Sheet	Exterior Typical Headers

HEADER #1 Front Door Header Span: 3' - 0"

Loading		Trib. Width	15.3	ft
Roof Dead	15	psf	228.8	plf
Roof Live	20	psf		
Roof Snow	60	psf	777.8	plf
Total W			1006.5	plf
Shear, V	1509.75	lbs		
Flexure, M	1132.31	lbs-ft		

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$		(NDS 2015 Table 4.31)		
Assumptions:	Fb		1350	DF-1
	C_D		1.15	D+S
	C_F		1.0	Assumed
	F'b		1552.5	
Req'd S		8.752	in. cubed	
Try 6x6 DF-1	S		27.73	in. cubed
	A		30.25	sq. in
	I		76.26	in^4
fb		**490.00**	**psi**	
Verify:	C_F		1.0	
F'b		**1552.500**	**psi**	**Demand<Capacity, OK for flexure**

Shear

F'v=$F_v C_D C_M C_t C_i$		(NDS 2015 Table 4.31)	
Fv	170		
F'v	**195.5**	**psi**	
fv	**74.86**	**psi**	**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.015**	**in**	
Allow. Deflection	**0.2**	**in**	**Demand<Capacity, OK for deflection**

USE 6x6 DF-1 FOR HEADER #1

Page EH-2
Sheet Exterior Headers

HEADER #2 Sliding Door Header Span: 6' - 0"

Loading		Trib. Width	12.3 ft
Roof Dead	15 psf		183.8 plf
Roof Live	20 psf		
Roof Snow	60 psf		624.8 plf
Total W			808.5 plf
Shear, V	2425.50 lbs		
Flexure, M	3638.25 lbs-ft		

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$			(NDS 2015 Table 4.31)	
Assumptions:	Fb		1350	DF-1 B-S
	C_D		1.15	D+S
	C_F		1.0	Assumed
	F'b		1552.5	
Req'd S		28.122	in. cubed	
Try 6x8 DF-1	S		51.56	in. cubed
	A		41.25	sq. in
	I		193.4	in^4
fb		**846.76**	**psi**	
Verify:	C_F		1.0	
F'b		**1552.500**	**psi**	**Demand<Capacity, OK for flexure**

Shear

F'v=$F_v C_D C_M C_t C_i$			(NDS 2015 Table 4.31)	
Fv		170		
F'v		**195.5**	**psi**	
fv		**88.20**	**psi**	**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$			(NDS 2015 Table 4.31)	
E		1600000	psi	
E'		1600000	psi	
Deflection		**0.076**	**in**	
Allow. Deflection		**0.4**	**in**	**Demand<Capacity, OK for deflection**

USE 6x8 DF-1 FOR HEADER #2

Page	EH-3
Sheet	Exterior Headers

HEADER #3 Garage Header Span: 12' - 0"

Loading		Trib. Width	2.0 ft
Roof Dead	15 psf		30.0 plf
Roof Live	20 psf		
Roof Snow	60 psf		102.0 plf
Total W			132.0 plf
Shear, V	198.00 lbs		
Flexure, M	148.50 lbs-ft		

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$		(NDS 2015 Table 4.31)		
Assumptions:	Fb		1350	DF-1 B-S
	C_D		1.15	D+S
	C_F		1.0	Assumed
	F'b		1552.5	
Req'd S		1.148	in. cubed	
Try 6x6 DF-1	S		27.73	in. cubed
	A		30.25	sq. in
	I		76.26	in^4
fb		**64.26**	**psi**	
Verify:	C_F		1.0	
F'b		**1552.500**	**psi**	**Demand<Capacity, OK for flexure**

Shear

F'v=$F_v C_D C_M C_t C_i$		(NDS 2015 Table 4.31)	
Fv	170		
F'v	**195.5**	**psi**	
fv	**9.82**	**psi**	**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.505**	**in**	
Allow. Deflection	**0.8**	**in**	**Demand<Capacity, OK for deflection**

USE 6x6 DF-1 FOR HEADER #3

California Polytechnic University, San Luis Obispo
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Page IH-1
Sheet Interior Headers

Header #4 Bedroom Header Span: 3' - 0"

Loading		Trib. Width	2.0 ft
Roof Dead	15 psf		30.0 plf
Roof Live	20 psf		
Roof Snow	60 psf		102.0 plf
Total W			132.0 plf
Shear, V	198.00 lbs		
Flexure, M	148.50 lbs-ft		

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$			(NDS 2015 Table 4.31)	
Assumptions:	Fb		900	DF-2
	C_D		1.15	
	C_F		1.1	
	F'b		1138.5	
Req'd S		1.565 in. cubed		
Try 4x6 DF-2	S		17.65	in. cubed
	A		19.25	sq. in
	I		48.53	in^4
fb		**100.96 psi**		
Verify:	C_F		1.3	
F'b		**1345.500 psi**		**Demand<Capacity, OK for flexure**

Shear

F'v=$F_v C_D C_M C_t C_i$		(NDS 2015 Table 4.31)	
Fv	170		
F'v	**195.5 psi**		
fv	**15.43 psi**		**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$		(NDS 2015 Table 4.31)	
E	1600000 psi		
E'	1600000 psi		
Deflection	**0.003 in**		
Allow. Deflection	**0.2 in**		**Demand<Capacity, OK for deflection**

USE 4x6 DF-2 FOR HEADER #4

Page RR-1
Sheet Roof Rafters

Roof Rafters Span: 4'-0" **Slope** **5:12**

Loading		Trib. Width	2.00 ft
Roof Dead	15 psf		30.0 plf
Roof Live	20 psf		
Roof Snow	60 psf		102.0 plf
Total W			134.5 plf
Shear, V	269.02 lbs		
Flexure, M	269.02 lbs-ft		

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$			(NDS 2015 Table 4.31)	
Assumptions:	Fb		900	DF-2
	C_D		1.15	
	C_F		1	
	C_r		1.15	
	F'b		1190.25	
Req'd S		2.712	in. cubed	
Try 2x4 DF-2	S		3.063	in. cubed
	A		5.25	sq. in
	I		5.36	in^4
fb		**1053.93**	**psi**	C_F 1.0
F'b		**1190.250**	**psi**	**Demand<Capacity, OK for flexure**

Shear

F'v=$F_v C_D C_M C_t C_i$		(NDS 2015 Table 4.31)	
Fv	180		
F'v	**207**	**psi**	
fv	**76.86**	**psi**	**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.090**	**in**	
Allow. Deflection	**0.26667**	**in**	**Demand<Capacity, OK for deflection**

USE 2x4 DF-2 @ 24" O.C. FOR ROOF RAFTERS

Page PR-1
Sheet Porch Rafters

Porch Rafters Span: 6'-0" **Slope** **5:12**

Loading		Trib. Width	1.33 ft
Roof Dead	15 psf		20.0 plf
Roof Live	20 psf		
Roof Snow	60 psf		68.0 plf
Total W			89.7 plf
Shear, V	179.34 lbs		
Flexure, M	179.34 lbs-ft		

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$			(NDS 2015 Table 4.31)	
Assumptions:	Fb		900	DF-2
	C_D		1.15	
	C_F		1	
	C_r		1.15	
	F'b		1190.25	
Req'd S		1.808	in. cubed	
Try 2x4 DF-2	S		3.063	in. cubed
	A		5.25	sq. in
	I		5.36	in^4
fb		**702.62**	**psi**	C_F 1.5
F'b		**1785.375**	**psi**	**Demand<Capacity, OK for flexure**

Shear

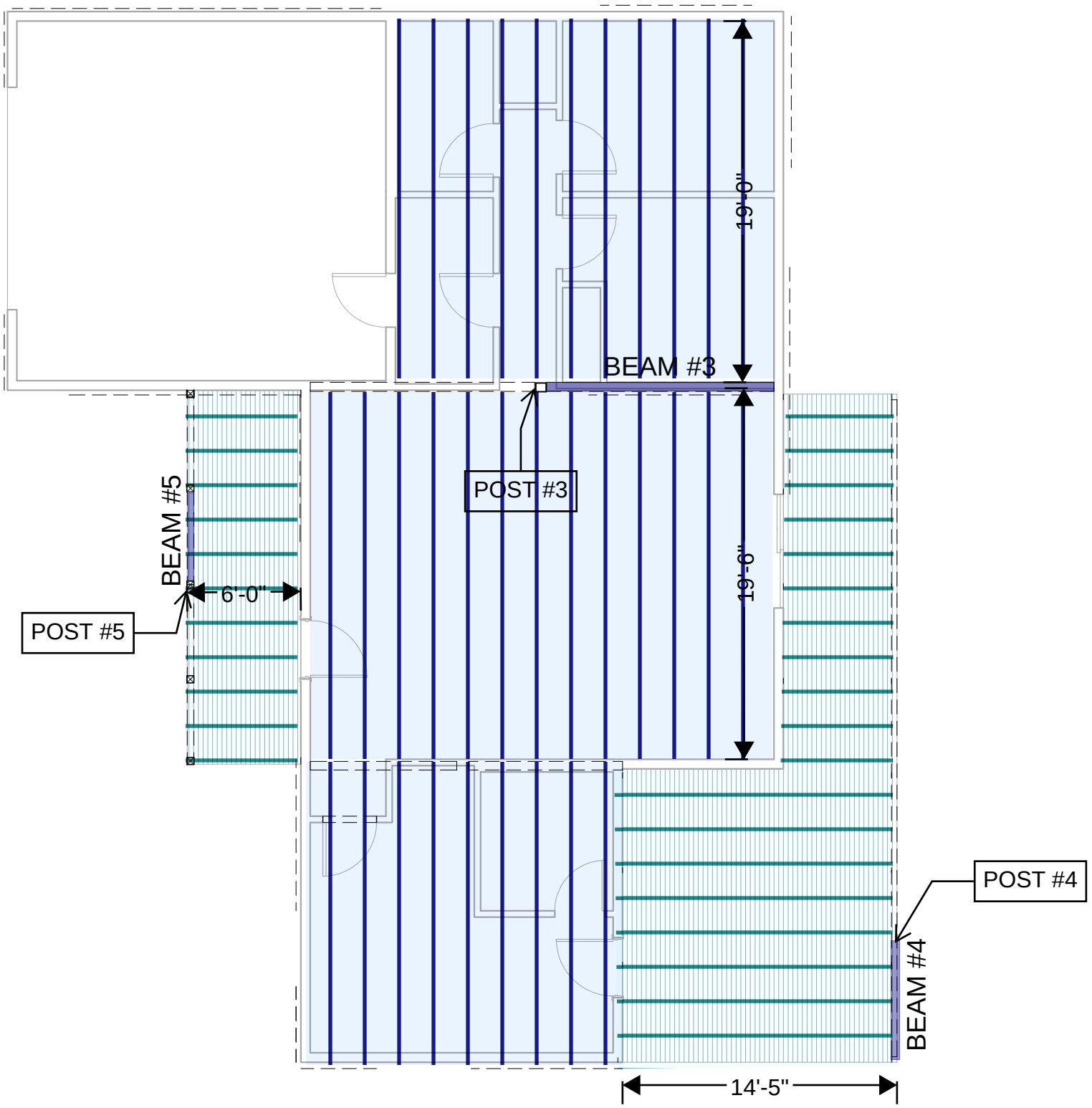
F'v=$F_v C_D C_M C_t C_i$			(NDS 2015 Table 4.31)	
Fv		180		
F'v		**207**	**psi**	
fv		**51.24**	**psi**	**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$			(NDS 2015 Table 4.31)	
E		1600000	psi	
E'		1600000	psi	
Deflection		**0.305**	**in**	
Allow. Deflection		**0.4**	**in**	**Demand<Capacity, OK for deflection**

USE 2x4 DF-2 @ 16" O.C. FOR PORCH RAFTERS

Page FKP-1
Sheet Floor Key Plan



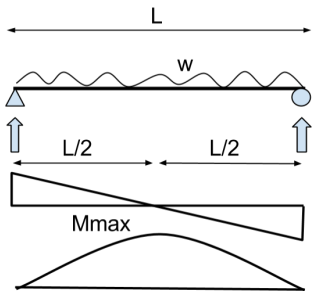
Page	B-3
Sheet	Floor Beams

BEAM #3 Floor Beam Span: 12.25 ft

Loading		Trib. Width	19.250 ft
Floor Dead	17.5 psf		336.9 plf
Floor Live	40 psf		770 plf
Total W			1106.9 plf
Shear, V	6779.61 lbs		
Flexure, M	20762.55 lbs-ft		

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$			(NDS 2015 Table 4.31)	
Assumptions:	Fb		1350	DF-1
	C_D		1.0	D+L
	C_F		1.0	
	F'b		1350	
Req'd S		184.556	in. cubed	
Try 6x16 DF-1	S		220.2	
	A		85.25	
	I		1707	
fb		**1131.47**	**psi**	
Verify:	C_F		0.969	
F'b		**1307.530**	**psi**	



Shear

F'v=$F_v C_D C_M C_t C_i$		(NDS 2015 Table 4.31)	
Fv	170		
F'v	**170**	**psi**	
fv	**119.29**	**psi**	**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.205**	**in**	
Allow. Deflection	**0.817**	**in**	**Demand<Capacity, OK for deflection**

USE 6x16 DF-1 FOR BEAM #3

California Polytechnic University, San Luis Obispo
By AA
Dec. 1, 2017

Page	FJ-1
Sheet	Floor Joists

Floor Joists Span: 20'-0" assuming @ 12" o.c.

Loading		Trib. Width	1.00 ft
Floor Dead	17.5	psf	17.5 plf
Floor Live	40	psf	40.0 plf
Total W			57.5 plf
Shear, V	575.00	lbs	
Flexure, M	2875.00	lbs-ft	

Bending				
F'b= $F_bC_DC_MC_tC_LC_FC_rC_i$		(NDS 2015 Table 4.31)		
Assumptions:	Fb		1000	DF-1
	C_D		1	D+L
	C_F		1	
	C_r		1.15	
	F'b		1150	psi
Req'd S		30.000	in. cubed	
Try 2x12 DF-2	S		31.64	in. cubed
	A		16.88	sq. in
	I		178	in^4
fb		**1090.39**	**psi**	
Verify:	C_F		1.000	
F'b		**1150.000**	**psi**	**Demand<Capacity, OK for flexure**

Shear			
F'v=$F_vC_DC_MC_tC_i$		(NDS 2015 Table 4.31)	
Fv	180		
F'v	**180**	**psi**	
fv	**51.10**	**psi**	**Demand<Capacity, OK for shear**

Deflection			
E'=$EC_MC_tC_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.727**	**in**	
Allow. Deflection	**1.000**	**in**	**Demand<Capacity, OK for deflection**

USE 2x12 DF-1 @ 12" O.C. FOR FLOOR JOISTS

California Polytechnic University, San Luis Obispo
By AA
Dec. 1, 2017

Page	DB-1
Sheet	Deck Beams

BEAM #4 Deck Beam MAX Span: 5' - 0"

Loading			MAX Trib. Width	7.25	ft
Floor Dead		17.5 psf		126.9	plf
Floor Live		60 psf		435	plf
Total W				561.9	plf
Shear, V		1404.69 lbs			
Flexure, M		1755.86 lbs-ft			

Bending				
F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$			(NDS 2015 Table 4.31)	
Assumptions:	Fb		900	DF-2
	C_D		1.15	D+S
	C_F		1.0	
	F'b		1035	
Req'd S		20.358	in. cubed	
Try 4x8 DF-2	S		30.66	
	A		26.25	
	I		111.1	
fb		**687.22**	**psi**	
Verify:	C_F		1.046	
F'b		**1082.695**	**psi**	

Shear			
F'v=$F_v C_D C_M C_t C_i$		(NDS 2015 Table 4.31)	
Fv	170		
F'v	**195.5**	**psi**	
fv	**80.27**	**psi**	**Demand<Capacity, OK for shear**

Deflection			
E'=$E C_M C_t C_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.044**	**in**	
Allow. Deflection	**0.278**	**in**	**Demand<Capacity, OK for deflection**

USE 4x8 DF-2 FOR BEAM #4 Deck Beam

Page	DB-2
Sheet	Front Porch Beams

BEAM #5 Deck Beam MAX Span: 6' - 0"

Loading		MAX Trib. Width	3.00 ft
Floor Dead	17.5 psf		52.5 plf
Floor Live	60 psf		180 plf
Total W			232.5 plf
Shear, V	697.50 lbs		
Flexure, M	1046.25 lbs-ft		

Bending				
F'b= $F_bC_DC_MC_tC_LC_FC_rC_i$		(NDS 2015 Table 4.31)		
Assumptions:	Fb	900	DF-2	
	C_D	1.15	D+S	
	C_F	1.0		
	F'b	1035		
Req'd S	12.130	in. cubed		
Try 4x6 DF-2	S	17.65		
	A	19.25		
	I	48.53		
fb	**711.33**	**psi**		
Verify:	C_F	1.080		
F'b	**1117.862**	**psi**		

Shear			
F'v=$F_vC_DC_MC_tC_i$		(NDS 2015 Table 4.31)	
Fv	170		
F'v	**195.5**	**psi**	
fv	**54.35**	**psi**	**Demand<Capacity, OK for shear**

Deflection			
E'=$EC_MC_tC_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.087**	**in**	
Allow. Deflection	**0.333**	**in**	**Demand<Capacity, OK for deflection**

USE 4x6 DF-2 FOR BEAM #5 Front Porch Beam

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Page	DJ-1
Sheet	Deck Joists

Deck Joists MAX Span: 14'-6" assuming @ 12" o.c.

Loading		Trib. Width	1.00 ft
Floor Dead	17.5 psf		17.5 plf
Snow Load	60 psf		60.0 plf
Total W			77.5 plf
Shear, V	561.88 lbs		
Flexure, M	2036.80 lbs-ft		

Bending				
F'b= $F_bC_DC_MC_tC_LC_FC_rC_i$			(NDS 2015 Table 4.31)	
Assumptions:	Fb		900	DF-2
	C_D		1.15	D+S
	C_F		1	
	C_r		1.15	
	F'b		1190.25	psi
Req'd S		20.535	in. cubed	
Try 2x10 DF-2	S		21.39	in. cubed
	A		13.88	sq. in
	I		98.93	in^4
fb		**1142.66**	**psi**	
Verify:	C_F		1.020	
F'b		**1214.608**	**psi**	**Demand<Capacity, OK for flexure**

Shear			
F'v=$F_vC_DC_MC_tC_i$		(NDS 2015 Table 4.31)	
Fv	180		
F'v	**207**	**psi**	
fv	**60.72**	**psi**	**Demand<Capacity, OK for shear**

Deflection			
E'=$EC_MC_tC_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.487**	**in**	
Allow. Deflection	**0.725**	**in**	**Demand<Capacity, OK for deflection**

USE 2x10 DF-2 @ 12" O.C. FOR DECK JOISTS

Page	DJ-2
Sheet	Front Porch Joists

Deck Joists MAX Span: 6'-0" assuming @ 16" o.c.

Loading		Trib. Width	1.33 ft
Floor Dead	17.5 psf		23.3 plf
Snow Load	60 psf		80.0 plf
Total W			103.3 plf
Shear, V	310.00 lbs		
Flexure, M	465.00 lbs-ft		

Bending

F'b= $F_b C_D C_M C_t C_L C_F C_r C_i$			(NDS 2015 Table 4.31)	
Assumptions:	Fb		900	DF-2
	C_D		1.15	D+S
	C_F		1	
	C_r		1.15	
	F'b		1190.25	psi
Req'd S		4.688	in. cubed	
Try 2x6 DF-2	S		7.563	in. cubed
	A		8.25	sq. in
	I		20.8	in^4
fb		**737.80**	**psi**	
Verify:	C_F		1.080	
F'b		**1285.541**	**psi**	**Demand<Capacity, OK for flexure**

Shear

F'v=$F_v C_D C_M C_t C_i$		(NDS 2015 Table 4.31)	
Fv	180		
F'v	**207**	**psi**	
fv	**56.36**	**psi**	**Demand<Capacity, OK for shear**

Deflection

E'=$E C_M C_t C_i$		(NDS 2015 Table 4.31)	
E	1600000	psi	
E'	1600000	psi	
Deflection	**0.091**	**in**	
Allow. Deflection	**0.300**	**in**	**Demand<Capacity, OK for deflection**

USE 2x6 DF-2 @ 16" O.C. FOR FRONT PORCH JOISTS

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Page	P-1
Sheet	Calculated Posts

Post #1 (BEAM #1) Height: 9'-0"

Loading

Axial Load, P	990.00	lbs	Ref.	B-1

Bucking Capacity

Capacity	*F'c = Fc (Cd)(Cm)(Ct)(CF)(Ci)(Cp)*		(NDS 2015 Ed. Table 4.3.1)
Fc	1350	psi	NDS Table 4A
C_D	1.15	D+S	
C_F	1.0	assumed, will verify	
Ci	1.0		
Cp	0.98	assumed, will verify	
Capacity, F'c	1521.45	psi	

Buckling Design

$f_c = P/A_g$			
$A_{req} = P/F'c$		0.65	sq. in.
Try 2x4 DF-#2	A	5.25	sq. in.

Buckling Demand

	fc	**188.57**	**psi**

Buckling Capacity

Verify Cp	Emin'	580000	
	le	108	
	d	3.5	in
	F_{cE}	500.7124486	in
	Fc*	1552.5	
	F_{cE}/ Fc*	0.32	
	Cp	0.297353	
Verify C_F	C_F	1.0	
	F'c	**401.43**	**psi**

Buckling Demand < Buckling Capacity **OK**

USE 2- 2x STUD POST #1

Page	P-2
Sheet	Calculated Posts

Post #2 (BEAM #2) Height: 9'-0"

Loading

Axial Load, P	495.00	lbs	Ref.	B-2

Bucking Capacity

Capacity	*F'c = Fc (Cd)(Cm)(Ct)(CF)(Ci)(Cp)*		(NDS 2015 Ed. Table 4.3.1)
Fc	1350	psi	NDS Table 4D
C_D	1.15	D+S	
C_F	1.0	assumed, will verify	
Ci	1.0		
Cp	0.98	assumed, will verify	
Capacity, F'c	1521.45	psi	

Buckling Design

$f_c = P/A_g$			
$A_{req} = P/F'c$		0.33	sq. in.
Try 4x4 DF-#2	A	12.25	sq. in.

Buckling Demand

fc	**40.41**	**psi**

Buckling Capacity

Verify Cp	Emin'	580000	
	le	36	
	d	7.5	in
	F_{cE}	20692.70833	in
	Fc*	1350	
	F_{cE}/ Fc*	15.33	
	Cp	0.986430	
Verify C_F	C_F	1.0	
	F'c	**1331.68**	**psi**

Buckling Demand < Buckling Capacity **OK**

USE 4X4 DF-2 POST #2

Page	P-3
Sheet	Calculated Posts

Post #3 (BEAM #3) Height: 1'-6"

Loading

Axial Load, P	13559.22	lbs	Ref.	B-3

Bucking Capacity

Capacity		*F'c = Fc (Cd)(Cm)(Ct)(CF)(Ci)(Cp)*		(NDS 2015 Ed. Table 4.3.1)
Fc	1000	psi	NDS Table 4D	
C_D	1.0	D+L		
C_F	1.0	assumed, will verify		
Cp	0.98	assumed, will verify		
Capacity, F'c	980	psi		

Buckling Design

$f_c = P/A_g$				
$A_{req} = P/F'c$			13.84	sq. in.
Try 6x6 DF-#1		A	30.25	sq. in.

Buckling Demand

	fc	**448.24**	**psi**

Buckling Capacity

Verify Cp	Emin'	580000	
	le	12	
	d	5.5	in
	F_{cE}	100152.7083	in
	Fc*	1000	
	F_{cE}/ Fc*	100.15	
	Cp	0.997991	
Verify C_F	C_F	1.0	
	F'c	**997.99**	**psi**

Buckling Demand < Buckling Capacity **OK**

USE 6 x 6 DF-1 POST #3

Page	P-4
Sheet	Calculated Posts

Post #4 (BEAM #4) Height: 1'-6"

Loading

Axial Load x2 , P	2809.38	lbs	Ref.	B-4

Bucking Capacity

Capacity		*F'c = Fc (Cd)(Cm)(Ct)(CF)(Ci)(Cp)*		(NDS 2015 Ed. Table 4.3.1)
Fc	1350	psi	NDS Table 4D	
C_D	1.15	D+S		
C_F	1.0	assumed, will verify		
Cp	0.98	assumed, will verify		
Capacity, F'c	1323	psi		

Buckling Design

$f_c = P/A_g$				
$A_{req} = P/F'c$			2.12	sq. in.
Try 4x4 DF-#2		A	12.25	sq. in.

Buckling Demand

	fc	**229.34**	**psi**

Buckling Capacity

Verify Cp	Emin'	580000	
	le	12	
	d	5.5	in
	F_{cE}	100152.7083	in
	Fc*	1350	
	F_{cE}/ Fc*	74.19	
	Cp	0.997282	
Verify C_F	C_F	1.0	
	F'c	**1346.33**	**psi**

Buckling Demand < Buckling Capacity **OK**

USE 4 x 4 DF-2 POST #4

Page	P-5
Sheet	Calculated Posts

Post #5 (BEAM #2+5) Height: 1'-6"

Loading

Axial Load x2 , P	990.00	lbs	REF.	B-2
Axial Load x2 , P	1395.00	lbs	REF.	B-5
P	2385.00	lbs		

Bucking Capacity

Capacity		*F'c = Fc (Cd)(Cm)(Ct)(CF)(Ci)(Cp)*		(NDS 2015 Ed. Table 4.3.1)
Fc	1350	psi	NDS Table 4D	
C_D	1.15	D+S		
C_F	1.0	assumed, will verify		
Cp	0.98	assumed, will verify		
Capacity, F'c	1323	psi		

Buckling Design

$f_c = P/A_g$				
$A_{req} = P/F'c$			1.80	sq. in.
Try 4x4 DF-#2		A	12.25	sq. in.

Buckling Demand

	fc	**113.88**	**psi**

Buckling Capacity

Verify Cp	Emin'	580000	
	le	12	
	d	5.5	in
	F_{cE}	100152.7083	in
	Fc*	1350	
	F_{cE}/ Fc*	74.19	
	Cp	0.997282	
Verify C_F	C_F	1.0	
	F'c	**1346.33**	**psi**

Buckling Demand < Buckling Capacity **OK**

USE 4 x 4 DF-2 POST #5

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Page C-1
Sheet Connections

Joists to Beam

Joist Size	Location	C_D	Demand (lbs)	Type	Fasteners	Capacity (lbs)
2x6	Front Porch	1.15	310.00	HU26	(2) 10d x 1 1/2"	670
2x10	Deck	1.15	561.88	LUS28	(4) 10d	1255
2x12	Floor	1.0	575.00	LUS210	(4) 10d	1340

Beam to Post

Beam Size	Location	C_D	Demand (lbs)	Type	Fasteners	Capacity (lbs)
4x	Porch	1.15	495.00	BC4	(6) 16d	980
6x	Floor	1	6779.61	PC6Z	(10) 10d	-

Post to Footing

Post Size	Location	C_D	Demand (lbs)	Type	Fasteners	Capacity (lbs)
4x	Porch	1.15	2385.00	EPB66	(12) 16d	3465.00
4x	Deck	1.15	2809.38	EPB66	(12) 16d	3465.00
6x	Floor	1.0	13559.22	CBS66	(2) 5/8" AB	14420.00

*Reference Simpson Strong-Tie Wood Construction Connector

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Page F-1
Sheet Continous Foundation

Design Loading

Description	Weight (psf)	Trib. Width (ft)	Distributed Load
Roof Dead	15	13	195 plf
Roof Snow	51	13	663 plf
Exterior Wall	13	10	130 plf
Floor Dead	17.5	6	105 plf
Floor Live	40	6	240 plf
Total			1093.00 plf

Allowable Soil Bearing

1500 psf per ASCE

Width of Continous Foundation

B = plf/ (allowable soil bearing) 0.73 ft

Pad Footing Min. Reinforcement

$A_{s\min}$	*0.0018bh*	ACI 318			
$A_{s\min}$	0.324	sq. in	b	15	in
Try 4-#3 REBAR			h	12	in
$A_{s\text{prov.}}$	0.44	sq. in			

USE 1'-3" WIDE x 1'-0" DEEP CONTINOUS FOUNDATION W/ 2-#3 T&B

Stem Wall Min. Reinforcement

$A_{s\min}$	*0.0018bh*	ACI 318			
$A_{s\min}$	0.2592	sq. in	b	6	in
Try 3-#3 REBAR			h	24	in
$A_{s\text{prov.}}$	0.33	sq. in			

USE 6" WIDE STEM WALL W/ 3-#3 EA

Page F-2
Sheet Pad Footings

Pad Footing for Post #3

Loading

P	13559.22	lbs	REF. P-3

Allowable Soil Bearing

1500	psf	per ASCE

Pad Footing Dimensions

Area = P/(allowable soil bearing)	9.04	sq. ft.
B= sqrt(A)	3.01	ft

Pad Footing Min. Reinforcement

$A_{s\,min}$	*0.0018bh*	ACI 318			
$A_{s\,min}$	0.9072	sq. in	b	42	in
Try 6-#4 REBAR			h	12	in
$A_{s\,prov.}$	1.20	sq. in			

USE 3'-6" Square Pad Footing w/ 3-#4 Rebar EACH Way

Pad Footing for Post #4

Loading

P	2809.38	lbs	REF. P-3

Allowable Soil Bearing

1500	psf	per ASCE

Pad Footing Dimensions

Area = P/(allowable soil bearing)	1.87	sq. ft.
B= sqrt(A)	1.37	ft

Pad Footing Min. Reinforcement

$A_{s\,min}$	*0.0018bh*	ACI 318			
$A_{s\,min}$	0.3888	sq. in	b	18	in
Try 4-#3 REBAR			h	12	in
$A_{s\,prov.}$	0.44	sq. in			

USE 1'-6" Square Pad Footing W/ 2-#3 EACH Way

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Page	W-1
Sheet	Wind Design

Wind Design Per ASCE 7-10

Building Information		
Roof Pitch	5:12	
Mean Roof Height (h)	16	ft
Directionality Factor, Kd	0.85	(ASCE 7 Table 26.6-1)
Topographic Factor, Kzt	1.0	(ASCE 7 Fig. 26.8-1)
External Pressure Coeff.	0.85	
Internal Pressure, GCpi	0.18	

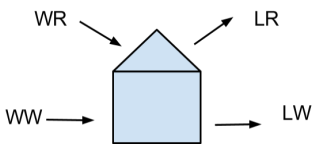
Site Information		
Basic Wind Speed (V)	110	mph
Exposure Category	C	
Velocity Pressure Exp. Coeff.,K_{z15}	0.85	
Velocity Pressure Exp. Coeff., K_{z20}	0.9	

Code Equations Per ASCE 7-10 CH. 26,28

Velocity Pressure	*qz = 0.00256KzKztKdV2*	(ASCE 7-10 Eq. 28.3-1)
Wind Pressure	*p = qh[GCp -+ (GCpi)]*	(ASCE 7-10 Eq. 28.4-1)
Base Shear, V	SUM(p * A)	

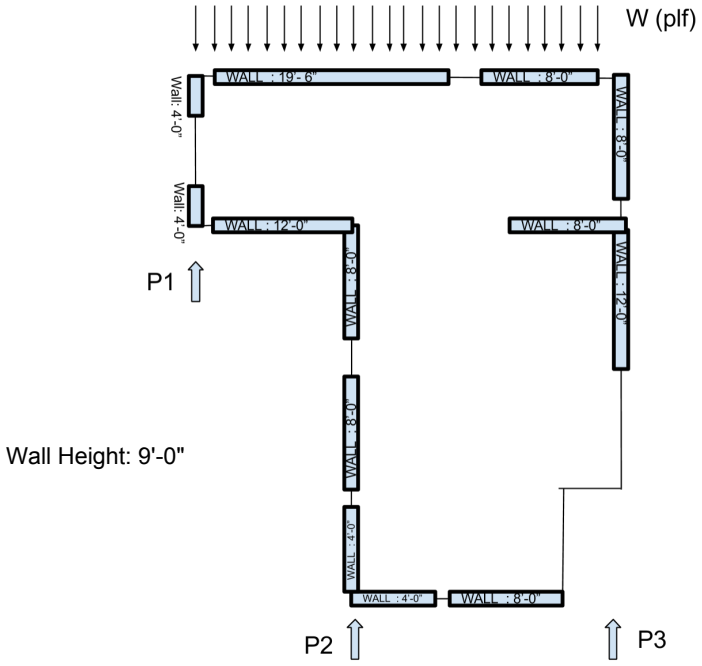
Wind Forces - MWFRS

Velocity Pressure, q_{z15}	22.380	psf
Velocity Pressure, q_{z20}	23.697	psf
Velocity Pressure, q_{z16}	22.64	psf
	Wind Pressure	
Windward Wall	19.47	psf
Leeward Wall	5.55	psf
Windward Roof	11.77	psf
Leeward Roof	5.55	psf



Base Shear, V 42.34 A

Page W-2
Sheet Wind Design: North-South



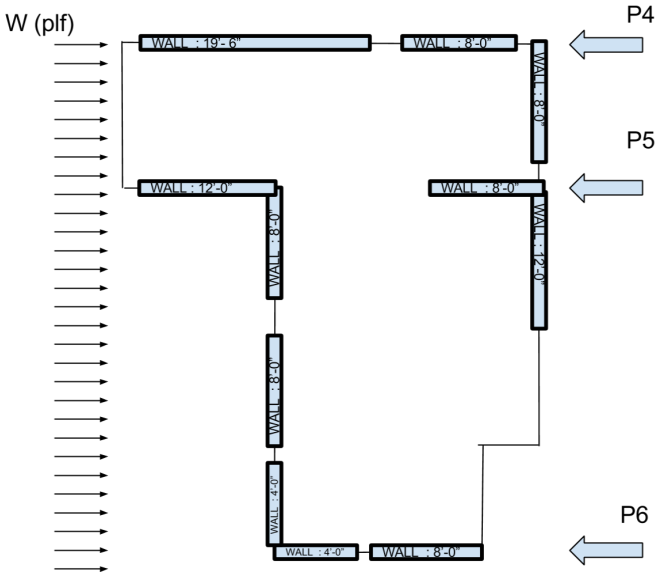
Description	Wind Pressure (psf)	Area (sq. ft)	
Windward Wall	19.47	247.5	
Leeward Wall	5.55	108	
Windward Roof	11.77	164	
Leeward Roof	5.55	164	
Base Shear, V		8258.39	lbs
Distributed Load, W		202.25	plf

Load at P-lines

P1		
Simple	16	ft
Reaction, P1	1617.98	lbs
P2		
Simple	16	ft
Simple	25	ft
Reaction, P2	4146.08	lbs
P3		
Simple	25	ft
Reaction, P3	2528.10	lbs

Page W-3
Sheet Wind Design: East-West

Wall Heights: 9'-0"



Description	Wind Pressure (psf)	Area (sq. ft)	
Windward Wall	19.47	180	
Leeward Wall	5.55	180	
Windward Roof	11.77	144	
Leeward Roof	5.55	144	
Base Shear, V		6997.12	lbs
Distributed Load, W		126.07	plf
Use Worst Case, W		202.25	plf

Load at P-lines

P4		
Simple	19.5	ft
Reaction, P4	1971.92	lbs
P5		
Simple- Top	19.5	ft
Simple- Bottom	36	ft
Reaction, P5	5612.38	lbs
P6		
Simple	36	ft
Reaction, P6	3640.46	lbs

Page	S-1
Sheet	Seismic Design

Seismic Design Per ASCE 7-10

Building Information

R	6.5	ASCE Table 12.2-1
Risk Category	II	ASCE Table 1.5-1
Number of Stories	1.0	
Importance Factor	1.0	
Height	19.2	ft

Seismic Loads: ASCE 7-10 Section 12.8

Code Equations Per ASCE 7-10 CH. 12

Base Shear	$V = C_sW$	(ASCE 7-10 Eqn. 12.8-1)
Seismic Response Coefficient, Cs	$C_s = S_{DS}/(R/I_e)$	(ASCE 7-10 Eqn. 12.8-2)
Upper limit Cs	$C_s = S_{D1}/T(R/I_e)$	(ASCE 7-10 Eqn. 12.8-3)
Lower limit Cs	$C_s = 0.044S_{DS}I_e > 0.01$	(ASCE 7-10 Eqn. 12.8-5)
Alt. lower limit Cs	$C_s = 0.5S_1/(R/I_e)$	(ASCE 7-10 Eqn. 12.8-6)

Seismic Loads- Vertical Elements (Shearwalls)

Period, T (s)	0.1834	(ASCE 7-10 12.8.2.1)
Cs	0.0914	(ASCE 7-10 Eqn. 12.8-2)
Cs (upper limit)	0.3196	(ASCE 7-10 Eqn. 12.8-3)
Cs (lower limit)	0.0261	(ASCE 7-10 Eqn. 12.8-5)
Cs (alt lower limit)	0.0252	(ASCE 7-10 Eqn. 12.8-6)

Base Shear, V Includes 0.7 factor from ASD Basic LC **0.064** **W=** **6962.459054** **lbs**

Note: Wind Base Shear Governs.

Seismic Loads: ASCE 7-10 Section 12.10

Code Equations Per ASCE 7-10 CH. 12

Lateral Seismic Force, Fx	$F_x = C_{vx}V$	(ASCE 7-10 Eqn. 12.8-11)
Vertical Distribution Factor, Cvx	$C_{vx} = w_x h_x^k/(\sum w_i h_i^k)$	(ASCE 7-10 Eqn. 12.8-12)
Diaphragm Design Force at Level x, Fpx	$F_{px} = \sum F_i/\sum w_i w_{px}$	(ASCE 7-10 Eqn 12.10-1)
Lower Limit Fpx	$F_{px} = 0.2S_{DS}I_e w_{px}$	(ASCE 7-10 Eqn 12.10-2)
Upper Limit Fpx	$F_{px} = 0.4S_{DS}I_e w_{px}$	(ASCE 7-10 Eqn 12.10-3)

Vertical Force Distribution

Level	h (ft)	Area (sq ft)	DL (psf)	wx (lb)	wx h	Cvx	Fx
1	19.2	1909	15	28635	549792	1	6962.5

Page SW-1
Sheet ShearWall Design

P1

# of Walls 3
Total Net Length 8 ft

Wall	Length (ft)	H:W Ratio	H:W Adjust	PLF Shear
1	4.0	2.25	0.889	179.78
2	4.0	2.25	0.889	179.78

Worst Wind Shear 179.78 plf
ASD Combo 107.87 plf

Shearwall Summary

Type	Sheathing Material	Panel Thickness (in)	Fastener & Panel Edge Spacing (in)	Capacity (plf)
1	Structural 1	5/16	6d @ 6	280.00

P2

# of Walls 3
Total Net Length 20 ft

Wall	Length (ft)	H:W Ratio	H:W Adjust	PLF Shear
1	4.0	2.25	0.889	184.27
2	8.0	1.125	1	207.30
3	8.0	1.125	1	207.30

Worst Wind Shear 207.30 plf
ASD Combo 124.38 plf

Shearwall Summary

Type	Sheathing Material	Panel Thickness (in)	Fastener & Panel Edge Spacing (in)	Capacity
1	Structural 1	5/16	6d @ 6	280.00

P3

# of Walls 2
Total Net Length 20 ft

Wall	Length (ft)	H:W Ratio	H:W Adjust	PLF Shear
1	8.0	1.125	1.0	126.41
2	12.0	0.75	1.0	126.41

Worst Wind Shear 126.41 plf
ASD Combo 75.84 plf

Shearwall Summary

Type	Sheathing Material	Panel Thickness (in)	Fastener & Panel Edge Spacing (in)	Capacity
1	Structural 1	5/16	6d @ 6	280.00

Page SW-2
Sheet ShearWall Design

P4

# of Walls 2
Total Net Length 27.5 ft

Wall	Length (ft)	H:W Ratio	H:W Adjust	PLF Shear
1	19.5	0.462	1.0	71.71
2	8.0	1.125	1.0	71.71

Worst Wind Shear **71.71 plf**
ASD Combo **43.02 plf**

Shearwall Summary

Type	Sheathing Material	Panel Thickness (in)	Fastener & Panel Edge Spacing (in)	Capacity
1	Structural 1	5/16	6d @ 6	280.00

P5

# of Walls 2
Total Net Length 20 ft

Wall	Length (ft)	H:W Ratio	H:W Adjust	PLF Shear
1	12.0	0.750	1.0	280.62
2	8.0	1.125	1.0	280.62

Worst Wind Shear **280.62 plf**
ASD Combo **168.37 plf**

Shearwall Summary

Type	Sheathing Material	Panel Thickness (in)	Fastener & Panel Edge Spacing (in)	Capacity
1	Structural 1	5/16	6d @ 6	280.00

P6

# of Walls 2
Total Net Length 12 ft

Wall	Length (ft)	H:W Ratio	H:W Adjust	PLF Shear
1	4.0	2.250	0.889	269.66
2	8.0	1.125	1.0	303.37

Worst Wind Shear **303.37 plf**
ASD Combo **182.02 plf**

Shearwall Summary

Type	Sheathing Material	Panel Thickness (in)	Fastener & Panel Edge Spacing (in)	Capacity
1	Structural 1	5/16	6d @ 6	280.00

Page CF-1
Sheet Chords Forces

Governing Load Combo *D + 0.7W* ASCE 7-10 12.4.2.3 LC(5)

P1 Trib. Width 8 ft

Reaction at P-line 1617.98 lbs
Total Net Length 8 ft
Dead Load 15 psf

Wall	Length (ft)	Overturning Force (lbs)	Dead Load (lbs)	Compression Force (k)
1	4.0	566.3	480.00	-1.73
2	4.0	566.3	480.00	-1.73

P2 Trib. Width 20.5 ft

Reaction at P-line 4146.08 lbs
Total Net Length 20.0 ft
Dead Load 15 psf

Wall	Length (ft)	Overturning Force (lbs)	Dead Load (lbs)	Compression Force (k)
1	4.0	580.5	1230.00	-2.20
2	8.0	1160.9	2460.00	-2.71
3	8.0	1160.9	2460.00	-2.71

P3 Trib. Width 12.5 ft

Reaction at P-line 2528.10 lbs
Total Net Length 20.0 ft
Dead Load 15 psf

Wall	Length (ft)	Overturning Force (lbs)	Dead Load (lbs)	Compression Force (k)
1	8.0	707.9	1500.00	-1.65
2	12.0	1061.8	2250.00	-2.00

P4 Trib. Width 9.75 ft

Reaction at P-line 1971.92 lbs
Total Net Length 27.5 ft
Dead Load 15 psf

Wall	Length (ft)	Overturning Force (lbs)	Dead Load (lbs)	Compression Force (k)
1	19.5	978.8	2851.88	-1.93
2	8.0	401.6	1170.00	-1.11

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Sheet Chords Force

P5 Trib. Width 27.75 ft

Reaction at P-line 5612.38 lbs
Total Net Length 20.0 ft
Dead Load 15 psf

Wall	Length (ft)	Overturning Force (lbs)	Dead Load (lbs)	Compression Force (k)
1	12.0	2357.2	4995.00	-4.45
2	8.0	1571.5	3330.00	-3.66

P6 Trib. Width 18 ft

Reaction at P-line 3640.46 lbs
Total Net Length 12.0 ft
Dead Load 15 psf

Wall	Length (ft)	Overturning Force (lbs)	Dead Load (lbs)	Compression Force (k)
1	4.0	849.4	1080.00	-2.80
2	8.0	1698.9	2160.00	-3.19

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Sheet Chords Design

Demand			REF.	CF-1:CF-2
P1	-1.73	k		
P2	-2.71	k		
P3	-2.00	k		
P4	-1.93	k		
P5	-4.45	k		
P6	-3.19	k		

Bucking Capacity

Capacity	*F'c = Fc (Cd)(Cm)(Ct)(CF)(Ci)(Cp)*	(NDS 2015 Ed. Table 4.3.1)		
Assuming DF-L Stud Grade				
Fc	850 psi	NDS Table 4A	Emin'	580000
CD	1.60 D+E		le	120
CM	1.0		d	5.5
Ct	1.0		FcE	1001.527083
CF	1.1 6" depth of wall		Fc*	1496
Ci	1.0		FcE/ Fc*	0.67
Cp	0.541537		Cp	0.541537
Capacity, F'c	810.14 psi			

Buckling Design

fc = P/Ag
Use (2) 2x6, A 16.5 in^2

	P1	P2	P3	P4	P5	P6
Areq = P/F'c	2.136	3.339	2.475	2.379	5.494	3.938
Demand, fc (psi)	129.46	202.37	149.98	144.17	332.97	238.69

Buckling Demand < Buckling Capacity **OK**

USE (2) 2x6 DF-L Stud Grade AT ALL SW Posts

Page O-1
Sheet Overturning Forces

Governing Load Combo *0.6D + 0.6W* ASCE 7-10 12.4.2.3 LC()

P1 Trib. Width 8 ft

Reaction at P-line 1617.98 lbs
Total Net Length 8 ft
Dead Load 15 psf

Wall	Length (ft)	Overturning Force (lbs)	Resisting Force (lbs)	Tension Force (k)
1	4.0	485.4	288.00	1.08
2	4.0	485.4	288.00	1.08

Holdown	SDS Screws	Min. Wood Member Thick	Capacity (k)	D:C Ratio
HDU2-SDS2.5	(6) 1/4"x 2 1/2"	3"	3.075	0.35

P2 Trib. Width 20.5 ft

Reaction at P-line 4146.08 lbs
Total Net Length 20.0 ft
Dead Load 15 psf

Wall	Length (ft)	Overturning Force (lbs)	Resisting Force (lbs)	Tension Force (k)
1	4.0	497.5	738.00	0.86
2	8.0	995.1	1476.00	0.41
3	8.0	995.1	1476.00	0.41

Holdown	SDS Screws	Min. Wood Member Thick	Capacity (k)	D:C Ratio
HDU2-SDS2.5	(6) 1/4"x 2 1/2"	3"	3.075	0.13

P3 Trib. Width 12.5 ft

Reaction at P-line 2528.10 lbs
Total Net Length 20.0 ft
Dead Load 15 psf

Wall	Length (ft)	Overturning Force (lbs)	Resisting Force (lbs)	Tension Force (k)
1	8.0	606.7	900.00	0.25
2	12.0	910.1	1350.00	0.01

Holdown	SDS Screws	Min. Wood Member Thick	Capacity (k)	D:C Ratio
HDU2-SDS2.5	(6) 1/4"x 2 1/2"	3"	3.075	0.00

Page O-2
Sheet Overturning Forces

P4 Trib. Width 9.75 ft

Reaction at P-line	1971.92	lbs
Total Net Length	27.5	ft
Dead Load	15	psf

Wall	Length (ft)	Overturning Force (lbs)	Resisting Force (lbs)	Tension Force (k)
1	19.5	839.0	1711.13	-0.48
2	8.0	344.2	702.00	0.04

Holdown	SDS Screws	Min. Wood Member Thick	Capacity (k)	D:C Ratio
HDU2-SDS2.5	(6) 1/4"x 2 1/2"	3"	3.075	0.01

P5 Trib. Width 27.75 ft

Reaction at P-line	5612.38	lbs
Total Net Length	20.0	ft
Dead Load	15	psf

Wall	Length (ft)	Overturning Force (lbs)	Resisting Force (lbs)	Tension Force (k)
1	12.0	2020.5	2997.00	0.02
2	8.0	1347.0	1998.00	0.55

Holdown	SDS Screws	Min. Wood Member Thick	Capacity (k)	D:C Ratio
HDU2-SDS2.5	(6) 1/4"x 2 1/2"	3"	3.075	0.18

P6 Trib. Width 18 ft

Reaction at P-line	3640.46	lbs
Total Net Length	12.0	ft
Dead Load	15	psf

Wall	Length (ft)	Overturning Force (lbs)	Resisting Force (lbs)	Tension Force (k)
1	4.0	728.1	648.00	1.50
2	8.0	1456.2	1296.00	1.06

Holdown	SDS Screws	Min. Wood Member Thick	Capacity (k)	D:C Ratio
HDU2-SDS2.5	(6) 1/4"x 2 1/2"	3"	3.075	0.34

*Reference Simpson Strong-Tie Wood Construction Connectors Holdowns Pg. 79

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Page AB-1
Sheet Anchor Bolts

Sill Plate to Stem Wall Anchor Bolt
Min. Embedment 7 in

Capacity per NDS Table 12E

$Z'=ZC_DC_MC_tC_gC_\wedge$		per NDS 2015 Table 11.3.1	
Assumptions:	Z_{II}	650	lbs
	C_D	1.15	D+S
	C_M	1.0	
	C_t	1.0	
	C_g	1.0	no group action
	$C_\wedge$	1.0	
	Z'_{II}	747.5	lbs

P-line	P1	P2	P3	P4	P5	P6
Shear	179.78	207.30	126.41	71.71	280.62	303.37
Spacing Req. (in)	49.90	43.27	70.96	125.09	31.97	29.57
Spacing Used (in)	36	36	48	48	24	24

USE 1/2" DIA. AB ALL SW Locations

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Page SD-1
Sheet Exterior Stud Design

Assuming 2x6 Stud Grade			**Spacing (in)**	**24**
Area	8.25	in^2	Emin'	580000
S	7.56	in^3	le	108
Fc	850	psi	d	5.5
Fb	700	psi	F_{cE}	1236.453189
C_D	1.15	(D + S)	Fc*	1075.25
C_D	1.6	Wind/Seismic	F_{cE}/ Fc*	1.15
C_F	1.1	(F_c)	Cp	0.736964
C_F	1.3	(F_b)		

Load Combos and Principal Equations

1 **D + L + (Lr or S)**
2 **D + (0.6W or 0.7E)**
3 **D + 0.75L + 0.75(0.6W or 0.7E) + 0.75(Lr or S)**

Bending and Axial Compression $[f_c/F_c']^2 + f_b / F_b [1 - (f_c / F_{cE}) < 1.0$ (NDS 2015 3.9-3)

Maximum Loading Height (ft) 9

Description	Weight (psf)	Trib. Width (ft)	Axial Load (lbs)	Description	Weight (psf)	Moment (lbs-ft)
Roof Dead	17.5	15.25	534	Wind	19.47	4731.21
Roof Live	40	15.25	1220			
Snow	60	15.25	1830			

Design Checks

Stresses

Load Combo	Axial	Moment	F'c	fc	F'b	fb
1	2364	1215.0	792.4	286.5	1046.5	160.7
2	534	2838.7	792.4	64.7	1046.5	375.5
3	1906	2129.0	792.4	231.1	1046.5	281.6

Combined Stresses

Load Combo			
1	0.33063	<	1
2	0.38529	<	1
3	0.41598	<	1

USE 2x6 Stud Grade @ 24" O.C. FOR EXTERIOR STUDS

Page SD-2
Sheet Interior Stud Design

Assuming 2x4 Stud Grade				**Spacing (in)**	**24**
Area		5.25	in^2	Emin'	580000
S		3.06	in^3	le	108
Fc		850	psi	d	5.5
Fb		700	psi	F_{cE}	1236.453189
C_D	1.15		(D + S)	Fc*	1075.25
C_D	1.6		Wind/Seismic	F_{cE}/ Fc*	1.15
C_F	1.1		(F_c)	Cp	0.736964
C_F	1.3		(F_b)		

Load Combos and Principal Equations

1 **D + L + (Lr or S)**
2 **D + (0.6W or 0.7E)**
3 **D + 0.75L + 0.75(0.6W or 0.7E) + 0.75(Lr or S)**

Bending and Axial Compression $[f_c/F_c']^2 + f_b / F_b [1 - (f_c / F_{cE}) < 1.0$ (NDS 2015 3.9-3)

Maximum Loading Height (ft) 9

Description	Weight (psf)	Trib. Width (ft)	Axial Load (lbs)	Description	Weight (psf)	Moment (lbs-ft)
Roof Dead	17.5	10	350	Wind	19.47	4731.21
Roof Live	40	10	800			
Snow	60	10	1200			

Design Checks

Stresses

Load Combo	Axial	Moment	F'c	fc	F'b	fb
1	1550	1215.0	792.4	295.2	1046.5	397.1
2	350	2838.7	792.4	66.7	1046.5	927.7
3	1250	2129.0	792.4	238.1	1046.5	695.8

Combined Stresses

Load Combo			
1	0.63724	<	1
2	0.94407	<	1
3	0.91369	<	1

USE 2x4 Stud Grade @ 24" O.C. FOR INTERIOR STUDS

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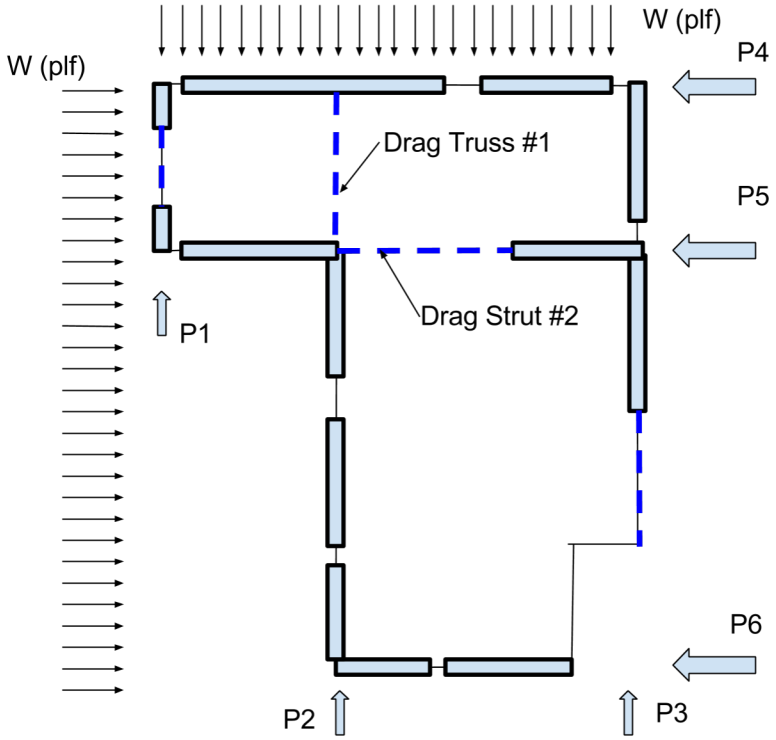
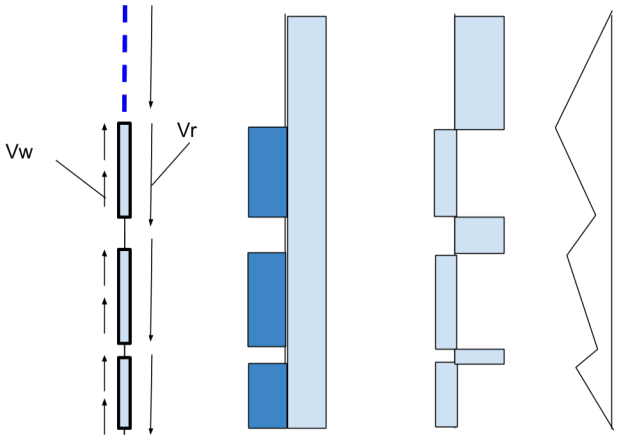
Page DF-1
Sheet Drag Forces



Drag Force #1

Vr	74.70	plf
Vw	207.30	plf
Point 1	0	lbs
Point 2	530.4	lbs
Point 3	194.2	lbs
Point 4	1255.0	lbs
Point 5	433.3	lbs
Point 6	1494.1	lbs
Point 7	0.0	lbs



Max Collector Force 1494.08 lbs

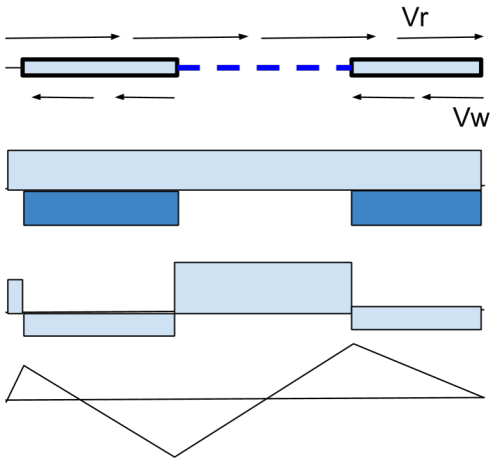
Strap	Fasteners	Capacity (k)	D:C Ratio
CS16	(20) 10d	1.705	0.88

Design Drag Truss #1 for 1500# Drag

Page DF-2
Sheet Drag Forces

Drag Force #2

Vr	136.89	plf
Vw	280.62	plf
Point 1	0.0	lbs
Point 2	616.0	lbs
Point 3	-1108.8	lbs
Point 4	1149.9	lbs
Point 5	0.0	lbs



Top Plate Lateral Capacity

Typical plate splice: (24) 16d nails (12 nails on each side of splice)

Nail Capacity	118	#/nail
C_d	1.6	D+ W or E
Nailing Splice Capacity	4531.2	lbs

Demand (1149.9#) < Capacity (4531.2 #) OK

Top Plate Spice OK for Drag Force

Strap b/w Prefab Shear Wall Segment

Max Force	1149.9	lbs
(1) CTS218 One Sided	(24) 10d x 1 1/2"	
Capacity	2,270	lbs

Demand (1149.9#) < Capacity (2,270#) OK

(1) CTS218 Strap at Connection b/w Prefab Shearwall Segments

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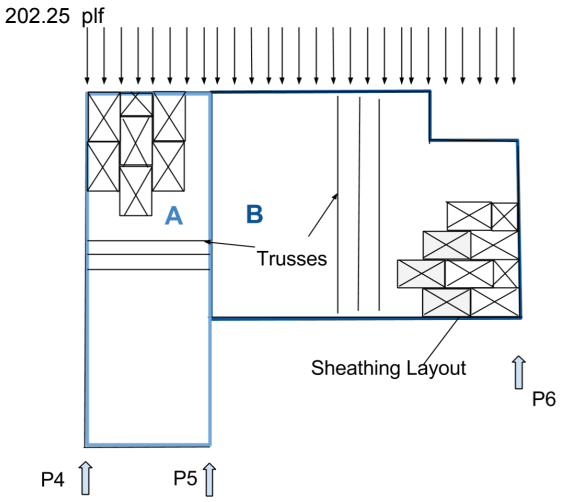
Page D-1
Sheet Diaphragm Design

Summary of Inputs

Governing Force Wind

Max Lateral Force



	Reaction (lbs)	Shear (plf)	ASD Shear (*0.6)	
P4	1971.92	48.10	28.86	plf
P5	5612.38	229.08	137.45	plf
P6	3640.46	227.53	136.52	plf

A- Case 3

Sheathing Grade	Panel Thickness (in)	Common Nail Size	Boundary Nailing	All Other Edges	Capacity (ASD)
Sheathing	15/32	8d	6	12	377.50

B-Case 1

Sheathing Grade	Panel Thickness (in)	Common Nail Size	Boundary Nailing	All Other Edges	Capacity (ASD)
Sheathing	15/32	8d	6	12	377.50

Credits

Rendering & Site Plan	Tori Hertz
	Michael Pollakowsky
Floor Plan & Elevations	Tori Hertz
	Michael Pollakowsky
Architectural Sections	Michael Pollakowsky