APPENDIX
# ELECTRICAL LOAD ESTIMATING WORKSHEET

This worksheet can be used to determine the required size of the main electrical panel. This worksheet is designed for existing dwelling with 120/240 or 120/208 volt, three wire, single phase services.

1. ____ Square footage of existing living area\(^1\) x 3 watts/sq. ft. = ________ watts

2. ____ 20 amp small appliance circuits @ 1500 watts each = ________ watts

3. ____ Laundry circuits @ 1500 watts each = ________ watts

4. Electrical appliances at nameplate value\(^2\)
   
   a. Range = ________ watts
   b. Oven = ________ watts
   c. Garbage Disposal = ________ watts
   d. Clothes Dryer\(^3\) = ________ watts
   e. Dishwasher = ________ watts
   f. Other:________________________ = ________ watts
   g. Other:________________________ = ________ watts
   h. Other:________________________ = ________ watts

   Sub-Total (Lines 1-4) = ____________ watts

5. First 8,000 watts @ 100% = ________ watts

6. Balance (sub-total - 8,000) @ 40% = ________ watts

7.\(^4\)  
   Air conditioning @ 100% = ________ watts  
   Central space heating @ 100% = ________ watts  
   <4 Space heaters @ 100% = ________ watts  
   >4 Space heaters @ 100% = ________ watts

   Total (Lines 5-7) = ________ watts

Convert to amps by dividing by 240 volts (A = watts/volts) = ________ amps

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\(^1\) Use outside dimensions  
\(^2\) If values are given in amps, multiply by volts to obtain watts (watts = amps x volts)  
\(^3\) Minimum 5000 watts  
\(^4\) Use larger connected load of A/C and space heating, not both. Heat pumps are calculated at 100% or 65% if the heat pump is supplementary.
**TYPICAL SINGLE STORY FOUNDATION DETAILS**

**FOUNDATIONS WITH UNDER FLOOR EXCAVATION**

*Screened under-floor ventilation shall be not less than 1 sq. ft. for each 150 sq.ft. of under floor area.*

**Foundation anchor bolts shall be a minimum 5/8” x 10” steel bolts at six feet on center maximum, 4” minimum and 12” maximum from corners with 3” x 3” x 1/4” washers. Two anchor bolts per sill minimum.
TYPICAL PIER AND INTERIOR FOOTING DETAILS

UNDER FLOOR PIER WITHOUT FLOOR JOIST

![Diagram of Under Floor Pier Without Floor Joist]

** Foundation anchor bolts shall be a minimum 1/2” x 10” steel bolts at 6 feet on center maximum, seven bolt diameters minimum and 12” maximum from corners with 3” x 3” x 1/4” washers. Two anchor bolts per sill minimum. Bolts shall be embedded at least 7 inches into concrete.

UNDER FLOOR PIER WITH FLOOR JOIST

![Diagram of Under Floor Pier With Floor Joist]

UNDER SLAB PIER

![Diagram of Under Slab Pier]

** Foundation anchor bolts shall be a minimum 1/2” x 10” steel bolts at 6 feet on center maximum, seven bolt diameters minimum and 12” maximum from corners with 3” x 3” x 1/4” washers. Two anchor bolts per sill minimum. Bolts shall be embedded at least 7 inches into concrete.
TYPICAL GIRDER DETAIL

POST-GIRDER CONNECTION
GENERAL FRAMING DETAILS

At a shallow sill notch up to about six inches long, it may be possible to relocate lost edge nailing to either side of the notch.

Where existing notch extends deeper than 1/4 the sill width, the sill to each side of the notch should be considered a separate sill section, with each section having not less than two bolts.

FIG. 1 - FOUNDATION SILL PENETRATIONS

FIG. 2 - UNDER FLOOR CLEARANCES

FIG. 3 - WEEP SCREED CLEARANCES
GENERAL FRAMING DETAILs (CONTinued)

GENERAL FRAMING NAILING REQUIREMENTS

1. Ceiling joist to parallel rafters: Varies based on roof span and roof slope.
2. Ceiling joist to plate toenail: 3-0d common or box nails.
3. Sole (bottom) plate to joint or blocking: 16d common at 16" O.C.
4. Blocking to joint: 3-0d common or box nails, toenail or 2-16d common or box nails, face nailing.
5. Joint to mud sill or upper top plate: 3-0d common, box nails or toenails.
6. Top plates typical attaching: 16d common or box nails at 24" O.C.
7. Top plates lap at intersection, face nail: 2-16d common or box nails. 4 is recommended.
8. Lower top plate to stud: 2-16d common or box nails.
9. Stud to sole bottom plate: 2-16d common or box nails.

See the fastener schedule for additional nailing requirements.
GENERAL FRAMING DETAILS (CONTINUED)

GENERAL FRAMING NAILING REQUIREMENTS (CONTINUED)

See the fastener schedule for additional nailing requirements.
Nails shall be considered overdriven when the top of the head of the nail is more than 1/32" below the face of sheathing.

Face of sheathing

\[ \frac{1}{32}'' \text{ max} \]

FIG. 5 - OVER DRIVEN NAIL
GENERAL FRAMING DETAILS (CONTINUED)

GABLE END WALL SECTION

INTERIOR SHEAR WALL DETAIL FOR ROOF TRUSS FRAMING
SHEAR AND FRAMING DETAILS

FIG. 6 - SHEAR & FRAMING
SHEAR AND FRAMING DETAILS (CONTINUED)

Notes:
1. Roof diaphragm sheathing edge or boundary fastening to blocking
2. Blocking fastening to top plates
3. Shear-wall sheathing fastening to top plates

DETAIL A ~ ROOF CONNECTION TO EXTERIOR WALL AT EAVE

DETAIL B ~ ATTIC SHEAR-WALL EXTENSION IN CONVENTIONAL ROOF FRAMING
SHEAR AND FRAMING DETAILS (CONTINUED)

TYPICAL PARALLEL RAFTER CONDITION WITH CEILING JOIST

** 2X BRACE (2"X6 W/ 2"X4 STRONG BACK AT BRACES OVER 8'-0" LONG) AT 8'-0" O.C., TYP. AT ALL PARALLEL RAFTER CONDS. THROUGHOUT ENTIRE BUILDING, NOT JUST SHEAR WALLS

** 2X NALER WITH 16d AT 16" O.C. TO PL. (TYP. ALONG ENTIRE BLDG)
SHEAR AND FRAMING DETAILS (CONTINUED)

DETAIL C - ATTIC SHEAR-WALL BETWEEN TRUSSES

DETAIL C - SECT. A-A ~ ATTIC SHEAR-WALL BETWEEN TRUSSES
SHEAR AND FRAMING DETAILS (CONTINUED)

DETAIL D ~ INTERIOR SHEAR-WALL CONNECTION TO ROOF

DETAIL E ~ SHEAR-WALL CONNECTION AT FLAT ROOF
SHEAR AND FRAMING DETAILS (CONTINUED)

1. End nail from shear-wall to sole plate.
2. Sole plate nailing to top chord of I-Joist.
4. End nail from shear-wall to top chord.
5. End nail from lower shear-wall to bottom chord.
6. End nail from lower shear-wall to top plates.

DETAIL F ~ SHEAR TRANSFER AT I-JOIST FLOOR OR RIM JOIST
**SHEAR AND FRAMING DETAILS (CONTINUED)**

**FIG. G ~ EXTERIOR WALL THROUGH-FLOOR SHEAR TRANSFER WITH SHEATHING SPICED ON BLOCK OR RIM JOIST.**

**Notes:**
1. Shear-wall sheathing edge fastening to sole (bottom) plate.
2. Sole plate fastening through floor sheathing to blocking.
3. Floor diaphragm sheathing edge / boundary fastening to blocking.
4. Upper shear-wall sheathing edge fastening to rim joist or blocking.
5. Lower shear-wall sheathing edge fastening to rim joist or blocking.
6. Shear-wall sheathing edge fastening to top plates.

**FIG. H ~ THROUGH-FLOOR SHEAR-WALL CONNECTION WITH I-JOIST FRAMING AT INTERIOR WALL LOCATION.**

**Notes:**
1. Shear-wall sheathing edge fastening to sole plate.
2. Sole plate fastening through floor sheathing to I-joist blocking.
3. Floor diaphragm sheathing edge or boundary fastening to I-joist blocking.
4. I-joist blocking bottom chord fastening to double top plates.
5. Shear-wall sheathing edge fastening to top plates.
SHEAR AND FRAMING DETAILS (CONTINUED)

Notes:
1. Shear-wall sheathing edge fastening to sole plate.
2. Sole plate fastening through floor sheathing to blocking.
3. Floor diaphragm sheathing edge or boundary fastening to blocking.
4. Blocking fastening to double top plates.
5. Shear-wall sheathing edge fastening to top plates.

DETAIL K – THROUGH-FLOOR SHEAR-WALL CONNECTION WITH SOLID - SAWN FRAMING

Notes:
1. Shear-wall sheathing edge fastening to sole (bottom) plate.
2. Sole plate fastening through floor sheathing to blocking.
3. Floor diaphragm sheathing edge or boundary fastening to blocking.
4. Blocking angle clip fastening to top plates.
5. Shear-wall sheathing edge fastening to top plates.
6. Blocking end fastening using end nails or toenails.

DETAIL K – SECT. B-B – ELEVATION OF THROUGH-FLOOR SHEAR TRANSFER: SOLID-SAWN FRAMING
Appendix

SHEAR AND FRAMING DETAILS (CONTINUED)

DETAIL M ~ INTERIOR WALL WITH HIGH STEM CONDITION

Steel clip at 12” on center

14” min. height

Plywood as wall above

Foundation Reinforcement
as required by local
ordinance or design

DETAIL N ~ INTERIOR WALL WITH CRIPPLE WALL

Steel clip at 12” O.C. or per plan

16d per plan

Foundation Reinforcement
as required by local
ordinance or design
SHEAR AND FRAMING DETAILS (CONTINUED)

DETAIL P – SHEAR-WALL CONNECTION AT EXTERIOR WALL

- Bottom plate nailing
- Boundary nailing
- Wall sheathing continuous to sill plate
- Edge nailing
- Rim joist
- Edge nailing
- Blocking @ 4” O.C.
- Foundation reinforcement as required by local ordinance or design
At blocked diaphragms:
Edge nailing at continuous panel joints provides full depth or flat blocking at unsupported panel edges as required.

At blocked diaphragm boundary nailing as required by plans.

Staggering of panel as required by plans.

$\frac{3}{8}$ min. distance from panel edge to $\frac{1}{2}$ of fastener.

$\frac{1}{8}$ gap, typical at panel ends and edges.

24" min. panel dimension in seismic zones 3 & 4.

Where diaphragm sheathing extends beyond exterior walls, boundary nailing above exterior wall.

Reaction

Edge nail at supported panel edges

Splice in top plates designed for chord and collector forces.

Double top plates parallel to the applied load function as collectors.

Boundary rail at all diaphragm perimeters.

Beam Collector splice to double top plates as required by plans.

Double top plates perpendicular to applied load function as chords.

Chord members must extend the full width of the diaphragm.

Splices in top plates designed for chord and collector forces.

Diaphragm shear must be transferred from the sheathing into the chord member.

Diaphragm shear must be transferred from the blocking into the shear-wall top plate.

Venting of framing bays, where required, must be detailed so as to not interfere with shear transfer.

FIG. 7 - TYPICAL FLOOR OR ROOF DIAPHRAGM
TYPICAL TWO STORY WALL FRAMING

SECOND STORY
- ceiling joist
- double top plate
- not more than 1/6 joist depth
- 7' minimum ceiling height

FIRST FLOOR
- 2"x4" studs @ 16" o.c.
- not more than 1/4 joist depth
- 1"x4" ribbon cut into stud
- 7' minimum ceiling height
- bottom or sole plate
- blocking
- joist
- subfloor
- rim joist
- sole plate
- blocking
- joist
- 2"x4" sill

PLATFORM FRAME
- shear splice
- edge nailing

BALLOON FRAME
TYPICAL WALL FRAMING

- Stagger top plate joints 4 feet
- Double top plates
- If plates are cut for pipe or heating stack, tie each plate with a metal strap 1-1/2" 16 gage with not less than 8-16d nails each end
- 2x Studs
- 2x Trimmers
- Header
- Pipe or heating stack
- Solid blocking
- Vent: 1 sq. ft. for each 150 sq. ft. of under-floor area
- 2x Foundation sill
- 1/2" diameter bolt
- Foundation

Three-stud corner
One-stud corner
Boxed corner
Three-stud intersection
TYPICAL SECTION THROUGH GARAGE

If No Ceiling, Continue Gypsum Wallboard to Roof Sheathing

1/2" Gypsum Wallboard on Garage Side

No Openings Allowed Between Garage and Bedrooms

Door Between Garage and Dwelling 1-3/8" Solid Wood Core or 20 min. Rated Door with Self-Closer

GARAGE

Exterior Wall

Note: Framing and shear transfer information not shown for clarity.
TYPICAL NOTCHING AND BORING DETAILS

CUTTING AND NOTCHING LIMITATIONS

CUTTING AND NOTCHING LIMITATIONS – FLOOR JOISTS
TYPICAL NOTCHING AND BORING DETAILS (CONTINUED)

PLATE FRAMING TO ACCOMMODATE PIPING

EXTerior OR BEARING WALL

NOTCH GREATER THAN 50 PERCENT OF THE PLATE WIDTH

16 GAGE (0.064 IN.) AND 1.5 IN. WIDE METAL TIE FASTENED ACROSS AND TO THE PLATE AT EACH SIDE OF THE NOTCH WITH 8-16G NAILS EACH SIDE

TOP PLATES

PIPE

For SI: 1 inch = 25.4 mm.

FIGURE R602.6.1
TOP PLATE FRAMING TO ACCOMMODATE PIPING

<table>
<thead>
<tr>
<th>HEADER CONSTRUCTION</th>
<th>HEADER DEPTH (inches)</th>
<th>24</th>
<th>26</th>
<th>28</th>
<th>30</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood structural panel—one side</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Wood structural panel—both sides</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
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<td>8</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. Spans are based on single story with clear-span trussed roof or two-story with floor and roof supported by interior-bearing walls.

b. See Figure R602.7.2 for construction details.
TYPICAL NOTCHING AND BORING DETAILS (CONTINUED)

NOTCHING AND BORED HOLE LIMITATION—EXTERIOR AND BEARING WALLS

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TOP PLATES

BORED HOLE MAX. DIAMETER 40 PERCENT OF STUD DEPTH

5/8 IN. MIN. TO EDGE

NOTCH MUST NOT EXCEED 25 PERCENT OF STUD DEPTH

BORED HOLES SHALL NOT BE LOCATED IN THE SAME CROSS SECTION OF CUT OR NOTCH IN STUD

IF HOLE IS BETWEEN 40 PERCENT AND 60 PERCENT OF STUD DEPTH, THEN STUD MUST BE DOUBLE AND NO MORE THAN TWO SUCCESSIVE STUDS ARE DOUBLED AND SO BORED

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1 inch = 25.4 mm.
2 Condition for exterior and bearing walls.

FIGURE R602.6(1)
NOTCHING AND BORED HOLE LIMITATIONS FOR EXTERIOR WALLS AND BEARING WALLS
TYPICAL NOTCHING AND BORING DETAILS
(CONTINUED)

NOTCHING AND BORED HOLE LIMITATION—INTERIOR NONBEARING WALLS

TOP PLATES

BORED HOLE MAX. DIAMETER 60 PERCENT OF STUD DEPTH

5/8 IN. MIN. TO EDGE

BORED HOLES SHALL NOT BE LOCATED IN THE SAME CROSS SECTION OF CUT OR NOTCH IN STUD
TYPICAL FRAMING AT OPENINGS

FRAMING AROUND OPENINGS – HEADER SPAN > FOUR FEET

LOAD BEARING WALL OR BEAM
STAIRWAY OPENING
DOUBLE HEADER
TAIL JOIST
WIDTH > 4 FT
LENGTH
SINGLE HEADER IF LOCATED DIRECTLY OVER SUPPORT
DOUBLE TRIMMER
JOISTS

FRAMING AROUND OPENINGS – HEADER SPAN FOUR FEET MAXIMUM

HEADER JOIST
4 FT MAX
NO LIMIT
DOUBLE TRIMMERS
TAIL JOISTS