Vulnerability-Based Seismic Assessment and Retrofit of One- and Two-Family Dwellings

Volume 2A - Plan Set for Crawlspace Dwellings

FEMA P-1100-2A / October 2019
Notice

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Cover photograph – Photograph showing crawlspace dwelling.
Purpose and Scope

This Plan Set is for retrofit of crawlspace dwellings and is provided as a supplement to FEMA P-1100, Vulnerability-Based Seismic Assessment and Retrofit of One-and Two-Family Dwellings, Volume I – Prestandard. The Plan Set presents prescriptive, pre-engineered plans for a suggested minimum level of retrofit design for use by a general contractor or homeowner without necessarily having to involve a registered design professional. Use of this Plan Set is limited to dwellings that are compliant with eligibility statements presented in Table 1 on Sheet S0. The extent of the scope of this Plan Set is described on Sheet S0.

The Plan Set is intended to contain all of the necessary supplemental technical information and guidance for preparation of a complete set of plans for submittal to the local building department and for use during construction; however, supplemental information may be required by some building departments. Note that building permits are always required when performing the work described in this Plan Set.

The Plan Set does not attempt to address all potential deficiencies in a home and does not eliminate the risk of potential damage in future earthquakes.

Instructions for use are provided on Sheet 01.

Limitation of Liability

Earthquake strengthening constructed in accordance with this Plan Set is intended to reduce the risk of earthquake-related damage to existing residential dwellings with wood-frame cripple walls. The content of this Plan Set is based on the experience and judgment of practicing engineers and limited research. All circumstances, forms, or types of construction have not necessarily been contemplated in the preparation of this Plan Set, and it is not possible to control the quality of construction or predict or test all conditions that may occur during an earthquake. No party associated with the preparation of this Plan Set makes any representation, warranty, or covenant, expressed or implied, with respect to the design, condition, quality, durability, operation, fitness for use, or suitability of earthquake strengthening based on this Plan Set.
A. Before you begin:

- This Plan Set is intended for use by a general contractor or homeowner without necessarily having to involve a Registered Design Professional.
- Contact your local Building Official, often known as the Building Department, to understand the building permit application process.
- Inquire about:
  a. Fees,
  b. how many copies of the plans must be submitted, and
  c. which field inspections are required; see Table 2 below.
- The Building Official may also be able to assist with assessing the applicability of this plan set to a home. See Eligibility For Use, Sheet S0.
- Comply the Eligibility For Use questionnaire on Sheet S0 (Table 1), to determine if this plan set is applicable. A "non-compliant" answer to any question disqualifies the home from using this plan set unless a Registered Design Professional is involved.

B. Determine your Seismic Design Category (SDC) and Weight Classification:
- See Sheet S1 and determine the Seismic Design Category (SDC) and Weight Classification for the dwelling. This information will be used to determine which S3.1 sheet is applicable. Note that there are two unique S3.1 sheets for one-story dwellings with differing SDS values and three similar sheets for two-story dwellings. Only one Sheet S3.1 will be applicable to any given dwelling and included within the set of drawings used for submission to the Building Official.

C. Prepare your plans:
- Draw a scaled plan of the perimeter of the home in the graph layout area provided on Sheet S4, Foundation and Retrofit Layout Plan. Your plan should include the following:
  a. The location of any obstructions along the perimeter of the foundation that make the retrofitting work difficult or impossible such as fireplaces, water heaters, or utilities.
  b. An arrow pointing to North.
  c. Indicate the height of the tallest cripple wall for each wall line. The minimum required length of retrofitting along each wall line will be based, among other variables, on this height. See the sections in Details 1 and 2 on Sheet D4 for measurement of "cripple wall height."
  d. Dimensions for each length of perimeter wall segment and overall dimensions of wall lines.
  e. An arrow pointing to North.
  f. Label the sheet side (front) of the home.
  g. See Sheet X1 for an example of a plan sheet submittal.
  h. See Sheets X2 and X3 for additional examples and instructions of how certain items are calculated, such as the length of bracing at offset walls of non-rectangular "T" or "L" shaped dwellings, as noted in Section J, General Notes, Sheet S1.
  i. See Sheets X4 and X5 for illustrations and definitions of terms for retrofit conditions.

D. Gather information to complete the plans:
- Review Sheets S1 and S2 for guidance on materials and installation for the required work.
- Review the Detail Sheets included in this plan set (Sheets D1-D7). Locate the details that most substantially match the home’s framing conditions. Not all details or sheets will apply. As a minimum, you should have one detail each for:
  a. The foundation sill to concrete foundation connection (Sheet D1);
  b. The floor framing to foundation sill connection (Sheet D2);
  c. Floor framing to cripple wall connection (Sheet D3 and/or Sheet D3.1).
- Differences in existing conditions from those illustrated in the details that result in changes to these drawings will need to be reviewed by a Registered Design Professional. See "Purpose" on Sheet S0 for additional information.
- Once you have chosen the correct (applicable) S3.1 sheet, follow the instructions provided to determine the amount and type of earthquake retrofitting required along each perimeter wall line. Once Steps 1 through 7 of the instructions are complete, document the results within the Retrofit Table as explained in Step 8.
- Refer to Supplemental Technical Notes on Sheet S2 where tie-downs are required.

E. Complete your plans:
- Using the information from the Earthquake Retrofit Schedule on Sheet S3.1, and the following to complete your Foundation and Retrofit Layout Plan on Sheet S4:
  a. Indicate and dimension the total length of braced wall segments required at each wall line.
  b. Identify the details used for the connections as noted in D3 above. Indicate the connection type and the minimum number of connectors for each wall line.
  c. Conform to Sections L and M of Sheet S1.
  d. The details used for the wood structural panel (Sheets D4 or D5).
  e. If tie-downs are used, identify the details used (Sheet D6).
  f. Identify the detail used for the top plate splice (Sheet D6).
  g. Identify the detail used for retrofitting and/or cutoffs (Sheet D6).

F. Submit your plans:
- Submit a permit application and the required number of completed sheets (Sheets S0 through D7) to the Building Official for review. Photographs of the foundation sill, cripple wall, and floor framing conditions may assist the review process.
- Before starting work, the permit holder may be required to schedule a preconstruction inspection with the Building Official to verify that field conditions are consistent with the information provided on the approved plan.
- Inspection(s) by the Building Official may be required for:
  a. Foundation Anchor bolts / Anchor Plate installation,
  b. Blocking installation,
  c. Wood structural panel on cripple wall, sheathing and nailing,
  d. Metal hardware "connectors" installation,
  e. Tie-downs, and
  f. Final inspection.

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** SHEET LIST **

01 Instructions for Use
S0 Cover Sheet
S1 General Notes
S2 Supplemental Technical Notes
S3 Seismic Design Category, Weight Classification, and Connectors
S3.1 Earthquake Retrofit Schedule - SDS 1.5, Two-Story
S3.1 Earthquake Retrofit Schedule - SDS 1.5, One-Story
S3.1 Earthquake Retrofit Schedule - SDS 1.0, Two-Story
S3.1 Earthquake Retrofit Schedule - SDS 1.0, One-Story
S3.1 Earthquake Retrofit Schedule - SDS 1.2, Two-Story
S3.1 Earthquake Retrofit Schedule - SDS 1.2, One-Story
S4 Foundation and Retrofit Layout Plan
S5 Foundation Schedule SDS 1.5, Two-Story
S5 Foundation Schedule SDS 1.5, One-Story
S5 Foundation Schedule SDS 1.0, Two-Story
S5 Foundation Schedule SDS 1.0, One-Story
D1 Foundation Sill to Concrete Foundation Connection Details
D2 Floor Framing to Foundation Sill Connection Details
D3 Floor Framing to Cripple Wall Connection Details
D3.1 Floor Framing to Cripple Wall Connection Details
D4 Wood Structural Panel Installation without Tie-Downs
D5 Wood Structural Panel Installation with Tie-Downs
D6 Vent Openings and Top Plate Details
D7 Foundation Replacement Details
X1 Example of Foundation and Retrofit Layout Plan
X2 Example - Foundation Plan (Dwelling without Tie-Downs)
X3 Example - Foundation Plan (Dwelling with Tie-Downs)
X4 Illustration - Cripple Wall Retrofit
X5 Illustration - Retrofit - No Cripple Wall

* Sheet for reference only. Do not submit to the Building Official.
** Only one "S3.1" sheet will be submitted to the Building Official.
Plan Sets intended to prevent earthquake damage. For additional information, see FEMA P-1100 Prestandard. The provisions of this Plan Set address a single vulnerability; see the FEMA P-1100 Prestandard for assessment and retrofit methodologies. Use of this Plan Set is intended improve earthquake performance but is not intended to prevent earthquake damage. For additional information, see www.fema.gov/.Ready/earthquake/178158.

SCOPE
This Plan Set contains prescriptive provisions for retrofit of wood light-frame crawlspace dwelling anchorage to the foundation and cripple walls. Dwellings shall be considered cripple wall dwellings for purposes of this plan set when:

- The dwelling has unoccupied space below the lowest framed floor.
- The dwelling has cripple walls not exceeding 7'-0" wall (Figure 1).
- The downspill does not exceed 20% (Figures 2 & 3).

Where dwellings include both crawlspaces and portions of the dwelling with concrete slab on grade, this Plan Set applies to the perimeter of the crawlspace portion of the dwelling. This Plan Set does not require work in the slab-on-grade portion of the dwelling. However, the user is encouraged to add additional anchor bolts, wherever possible, around the perimeter of the slab-on-grade portion per Sheet D1 to increase the foundation sill to existing concrete connection.

ELIGIBILITY
Cripple wall dwellings are permitted to use the prescriptive retrofit provisions of this Plan Set with specific questions in Table 1 can be answered with "compliant". For dwellings not eligible to use this Plan Set, see the FEMA P-1100 Prestandard, Section 4.5 for the Simplified Engineering Procedure.

OFFERING CONDITIONS
Where a dwelling's actual conditions require modification of the vulnerability-based prescriptive retrofit solutions identified within this plan set, additional or modified details may be generated by a Registered Design Professional and used to supplement the prescriptive provisions of this section. These supplemental details shall be stamped and signed by a Registered Design Professional and approved by the Building Official in accordance with the FEMA P-1100 Prestandard, Section 4.5.

DESIGN BASIS
This Plan Set is deemed to comply with Chapter 4 of FEMA P-1100 Prestandard. Specific design assumptions are as follows: R = 4.0, \( S_H = 1.5 \), \( S_B = \text{Varies} \) (between 1 and 1.5), Site Class C.

GENERAL
Cripple Wall Retrofit in accordance with this plan set shall include each of the following for the full extent of the crawlspace perimeter (Figure 4):

1. Wood structural panels in accordance with the Earthquake Retrofit Schedule, Sheet S3.1 and details on Sheets D9 & D14 at all non-zero height cripple walls, and

2. Foundation sill plate anchorage to the foundation in accordance with the Earthquake Retrofit Schedule, Sheet S3.1 and details on Sheets D1 & D2, and

3. Floor framing to cripple wall top plates or floor framing to foundation sill plate connections in accordance with the Earthquake Retrofit Schedule, Sheet S3.1 and details on Sheets D9 & D14.

Any retrofit not incorporating each applicable item at the full crawlspace perimeter shall not be considered as conforming to this Plan Set. All work shall be in accordance with Sheet S1 General Notes.

This Plan Set for strengthening is intended to be approved by the Building Official without requiring additional plans or calculations, except as required for offering conditions.

ASSESSMENT
The retrofit provisions of this Plan Set are intended to apply to dwellings that have been assessed using the FEMA P-1100 Prestandard methodology and found to have a crawlspace dwelling vulnerability.

### Table 1: ELIGIBILITY FOR USE

<table>
<thead>
<tr>
<th>Question</th>
<th>Compliant</th>
<th>Non-compliant</th>
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<tbody>
<tr>
<td>1. The dwelling is a one- or two-family detached structure or townhouse.</td>
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<td>2. The dwelling is a wood light-frame dwelling that is two stories or less.</td>
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<td>3. The dwelling is a crawlspace dwelling as defined in Chapter 2 of FEMA P-1100 Prestandard and the perimeter (not including porches or other appurtenances) is supported on:</td>
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<tr>
<td>- Cripple walls, or</td>
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<td>- Foundation stem walls, or</td>
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<td>- Post and pier systems to be retrofitted with cripple walls, or</td>
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<td>- Cripple walls or foundation stem walls in combination with a slab on grade foundation.</td>
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<td>4. The dwelling has a continuous perimeter foundation (not including porches or other appurtenances)</td>
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<tr>
<td>- Cripple wall or masonry stem wall, or</td>
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<tr>
<td>- Concrete foundation stem wall, or</td>
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<td>- Slab on grade stem wall, or</td>
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<td>5. Cripple walls, where they occur, do not exceed 7'-0&quot; in clear height.</td>
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<td>6. The maximum slope as measured from the top of foundations along one edge of the home to the other end does not exceed 5' to 1 (horizontal to vertical) or 20%.</td>
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<td>7. Weight of roofing material shall not exceed 12 psf., except for one-story crawlspace dwellings with clay tile roofing as described in footnote 1 below.</td>
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<td>8. Weight of exterior wall finish shall not exceed 10 psf., except that masonry wainscots supported on concrete or masonry foundations are permitted to extend up to four feet above the top of foundation.</td>
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<tr>
<td>9. Weight of interior wall finish shall not exceed 8 psf., except that veneer fireplace surrounds of not more than 4' thick and of up to 100 square feet of vertical surface area are permitted to exceed this weight.</td>
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<td>10. Weight of floor finish shall not exceed 5 psf., except that heavier floor finishes of up to 10 psf are acceptable where limited to 25% of the total floor area of each level.</td>
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<td>11. Floors in each story are at the same level and not split level, excluding slab on grade portions.</td>
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<td>12. The maximum square footage of the dwelling, excluding areas supported on slabs on grade, do not exceed 3,000 square feet for one story dwellings and 4,000 square feet for two-story dwellings.</td>
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<td>13. No part of the foundations is constructed of unfortified masonry or stone.</td>
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<td>14. Clear floor to ceiling height at any occupied level do not exceed 9'-0&quot;.</td>
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<td>15. There is no indication that an engineered seismic force-resisting system is present in the dwelling (engineered plans, visible tie-down brackets).</td>
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</table>

If you answer "Compliant" to each of these questions, proceed to Sheet S3. If you answered "Non-compliant" to any of these questions the home is not eligible to apply this plan set, unless a Registered Design Professional addresses the non-compliant issues in accordance with P-1100 FEMA Prestandard, Section 4.5, Offering Conditions.
A. CODE
1. All work not otherwise specified shall conform to the locally adopted version of the building code or residential code. Contractor shall comply with all locally adopted building codes and ordinances.

B. GENERAL
1. The contractor is responsible for maintaining a safe job site and complying with relevant state and federal OSHA standards. Contractor is responsible for the means and methods for accomplishing the work shown in this plan set, including any shoring and bracing of existing construction as required to safely install new work. Exercise caution working around existing utilities, locate underground utilities before excavating, and arrange for temporary disconnection of utilities if necessary.

2. All existing above ground water and sewer shall be maintained.

C. EXISTING CONDITIONS
1. Contractor shall confirm that existing conditions match plans and details prior to start of work.

2. Contractor shall verify that existing concrete, anchor bolts, wood framing, and other materials that will become part of the wall or retrofit construction is in reasonableness sound condition and free of defects that would substantially reduce the capacity of the material. Where possible, damaged or deteriorated elements shall be repaired in place or supplemented with new elements. Otherwise damaged or deteriorated members shall be replaced. Repair or replacement shall be in accordance with the adopted building code or residential code.

3. The Owner or Contractor shall verify that the existing concrete within all areas to receive new anchor bolts are in reasonableness good condition. Examples of poor concrete quality would include excessive spalling, large rod poke-outs, cracks extending completely through the footing greater than 1/4” wide (closer than 6'-0” on center on average), or low strength concrete or mortar easily sculpable with a metal knife or trowel. Strengthening should be avoided in选址 areas of poor quality. Where these areas cannot be avoided, or where locations of poor quality are widespread, the new anchor bolts shall be torque tested in accordance with Table C-1. Where torque tests continue to fail, the existing foundation system shall be replaced locally for a minimum of 30 inches on each side of the proposed anchor location.

D. NOTCHING, BORING AND CUTTING
1. Do not cut, bore, or notch structural members except as shown in these drawings or as specifically permitted by the building inspector.

2. Excessive Notching and boring of framing shall be permitted as per Part X of the International Residential Code (IRC).

E. CONCRETE
1. Concrete shall have a strength of not less than 3,000 psi at 28 days (design based on 2,900 psi). Concrete mixed on site shall be mixed and placed in accordance with the manufacturer’s instructions using potable water.

F. REINFORCING STEEL (REBAR)
1. Reinforcing steel shall conform to ASTM A615 Grade 40 or 60, ASTM A706, or ASTM A616 Type B.

2. Reinforcing steel bend radii and other rebar detailing shall be in accordance with Concrete Reinforcing Steel Institute.

3. Minimum concrete cover over reinforcing steel:
   - A. Concrete cast against and permanently exposed to soil: 3 inches
   - B. Formed concrete exposed to weather: 2 inches
   - C. Concrete not exposed to weather or in contact with soil: 1-1/2 inch
   - D. Reinforcing steel lap splice lengths:
     - Horizontal bars with more than 12 inches concrete below: 32 inches
     - Other bars: 24 inches

G. STRUCTURAL STEEL
1. Structural steel FRP sections, plate, and miscellaneous steel shall be ASTM A53, A992, or A572. Welding shall comply with AWS D1.1 requirements using prequalified welding procedures. All welding shall be conducted by welders certified for the materials and welding procedures used.


H. FASTENERS
1. General
   - A. All bolts, nails, and other fasteners in contact with preservative-treated wood or exposed to weather shall be hot-dip galvanized or stainless steel.
   - B. Unless otherwise noted, all nails specified are common nails.

2. Special care is required when installing nails in existing framing. Where required to avoid splitting of framing, predrill to 75% of nail shank diameter.

3. Fasteners for wood structural panel sheathing shall be full length 8d common nails (0.131 x 2.5”). Drive sheathing nail head flush with face of sheathing.

4. Do not overtighten, overdrive, or otherwise damage the outermost ply when installing nails. Nail oval is overdriven when it breaks the surface ply. When nails are overtightened to the point that the veneer is fractured, add one new nail for every (2) overdriven nails. Space new nails between existing.

5. Anchor Bolts
   - A. Predrill bolt holes to not more than 1/16” inch larger than bolt anchor to be placed.
   - B. At each perimeter wall line, provide a minimum quantity of Foundation Bill Anchors as required by the Earthquake Retrofit Schedule. Place new anchors between 8 and 12 inches from the end of each foundation wall plate and distribute the remaining anchors as evenly as practical along the wall line.

   - C. Provide steel plate washers 0.229 x 3 x 3 inch minimum at all anchor bolts. Centerline of washer should be 1-1/2” to 2” from face of sheathing.

   - D. Anchor bolts shall be a maximum spacing of 64” on center for one-story buildings and 48” on center for two-story dwellings along the entire portion of all exterior walls, except as permitted in Section J.

   - E. For braced wall sections without tie-downs, provide one of the required anchor bolts within 8” of each end and one additional anchor bolt at each end as noted on Sheet D4.

   - F. For braced wall sections with tie-downs, provide one additional anchor bolt within 1/2” minimum and 12” maximum from foundation plate as noted on Sheet D5.

I. WOOD STRUCTURAL PANEL SHEATHING
1. Wood structural panels shall be 15/32” plywood sheathing, all veneer, conforming to US voluntary Product Standard PS-1, Exposure I or Exterior Exposure, manufactured with exterior glue, and minimum 4-ply.

2. Oriented Strand Board (OSB) shall be 15/32” thick and conform to US Voluntary Product Standard PS-2 with an exposure rating of Exposure 1 or Exterior Exposure, manufactured with exterior glue, and minimum 4-ply.

3. Provide 1/8” minimum gap at all sheathing panel ends and edges.

4. Maintain a minimum edge distance of 3/8” from center of nailing to edges of sheathing, studs, or top and side plates. See Sheet D4 for double stud at sheathing panel joints.

5. Braced wall sections closest to the ends of wall lines shall be located as near to the ends as practicable. Braced wall sections may be located away from the ends of a wall line when existing obstructions or limited clearance necessitates such relocations.

6. Braced wall sections along the length of a wall line should be nearly equal in spacing where possible. Using increments of existing stud spacing is expected.

7. The length of each braced wall section shall not be less than 48 inches. The length of braced wall sections without tie downs should be equal to or exceed twice the height of the cripple wall. Exceptions are permitted when obstructions do not allow braced wall sections of the required length.

J. ADDITIONAL REQUIREMENTS FOR NON-RECTANGULAR DWELLINGS WITH "T" OR "L" PLAN CONFIGURATIONS
1. Plan configurations other than rectangular such as "T" or "L" shapes that have offsets in the exterior wall lines, within the crawl space plan area, greater than 33% of the largest plan dimension shall meet the following special provisions in that direction:

   - A. Foundation shall to foundation connections along offset walls shall have a maximum spacing of 32” on center.

   - B. Prior to foundation and floor joist framing to the top of cripple wall connections along offset walls shall have a maximum spacing of 16” on center.

   - C. cripple walls, where they occur, shall be sheathed with new wood structural panels. The sheathing shall have a minimum length of 60% of the offset wall length.

K. FRAMEWORK
1. Framing shall be Douglas Fir-Larch, or an approved species having a greater or equal specific gravity.

2. Framing in contact with foundations or exposed to weather shall be preservative treated in accordance with APA U1 (Commodity Specification A, Use Category GB). Field treated wood, screws, and nails per APA M-4.

L. CONNECTOR DEVICES
1. Connectors shall be pre-engineered pre-manufactured devices, approved by the Building Official and installed in accordance with the manufacturer’s instructions.

2. Connectors protected from weather shall be provided with a minimum of Q90 zinc coating in accordance with ASTM A663. Connectors exposed to weather or in contact with preservative treated wood shall be provided with a minimum hot-dip galvanized coating or Q185 coating in accordance with ASTM A663, and fasteners conforming to ASTM A515.

3. Connector devices shall be of the type and size specified in these drawings.

4. Connectors required by the Earthquake Retrofit Schedule (Sheet S3.1) shall be distributed equally along the length of each wall line or within the length of the braced wall panels.

5. Connector spacing may not be less than 8” on center.

6. Increase nail or screw length 1/2-inch minimum when installing connectors over wood structural panels.

L. POST-INSTALLED ANCHORS
1. Post-installed anchors shall be installed in accordance with the manufacturer’s installation instructions.

2. Adhesive anchors shall be Simpson Strong-Tie SET-HP, HILTI RX 500 BD, CIA-GEL 7000C, or approved equivalent.

3. Concrete screws shall be Simpson Strong-Tie Titan HD, KCI Metal Wall-HUS-EZ, or Powers Fasteners Wedge-Bolt, or approved equivalent.

4. See H.3, for additional anchor bolt requirements.

M. PERMITS
1. All work required by this Plan Set shall be permitted through the building department.

O. INSPECTIONS
1. Contractor shall coordinate with the building inspector to ensure that work is accessible for building department inspections, and shall correct non-compliant work as identified by the inspector.

P. SPECIAL INSPECTIONS
1. Special inspection by a third party inspector is not required for the following:

   - A. Concrete or reinforcing steel for foundations.

   - B. Design is based on an ultimate concrete strength of 2,500 psi or less.

   - C. Installation of fasten-in-place or post-installed anchors.

   - D. Installation of adhesive anchors for tie-down devices, provided that each anchor is torque-tested in accordance with Table R-2, Sheet S2.

   - E. Nailing of wood structural panel sheathing, provided a building department inspection is performed.
Q. PURPOSE OF SUPPLEMENTAL TECHNICAL NOTES
1. These Supplemental Technical Notes provide guidance for the installation of wood structural panels that use tie-downs and existing foundation systems. Tie-downs shall be used where there is insufficient wall length to install the length of wood structural panels specified in the Earthquake Retrofit Schedule, Sheet S3.1.
2. Where “With Tie-down” (as specified on the Earthquake Retrofit Schedule, Sheet S3.1) is used to determine the amount of strengthening required along each wall length, additional visual verification and testing of the existing foundation system is required to be completed by the owner or general contractor and approved by the Building Official, and documented in Table R-1 prior to commencing any work. Visual verification and testing shall be as noted in Section R.
3. Where these requirements are not met, a new foundation system will be required in accordance with Sheet D7.

R. EXISTING FOUNDATION REQUIREMENTS AND TESTING
1. The size of existing foundation systems at the location of new tie-down anchors shall be verified to be at least 15” deep (“D”) and 8” wide (“W”). The dimension “D” shall be measured from the bottom of footing to the underside of the existing mudsill. The dimension “W” shall be measured from the top outside face of footing to the inside top face of footing. See Table R-1, item A.1.
2. Verification of the overall quality of concrete along any wall line requiring tie-downs shall be made and documented within Table R-1, item B.1. This verification shall be made by use of a minimum of two sacrificial torque tests along each wall line where tie-downs are used. These tests shall consist of installing 1/2” or 5/8” diameter screw-type bolts into the existing concrete and verifying that a value per Table R-2 can be achieved. Torque tests can be performed either by the owner, a general contractor, or a special inspection company or testing agency hired by the owner and as approved by the Building Official.
3. Where “Tie-downs” are used to determine the sheathed panel length required along a wall line, each adhesive anchor shall be torque tested in accordance with Table R-2.

S. TIE-DOWN REQUIREMENTS
1. Tie-downs shall be Simpson HDU2-SDS2.5, KC Metals ADST2, USP Structural Connectors PHD2A, or an equivalent with an allowable tensile load of 3075 lbs or more, installed per manufacturer’s instructions.
2. End stud(s) to which tie-downs are installed, shall be 3x minimum or double 2x. For nailing at double studs, see Sheet D5.
3. All tie-downs shall use 5/8”ø (A36) threaded rod adhesive-type anchors with minimum embedment per Detail 1, Sheet D5.

T. MINIMUM INSTALLATION REQUIREMENTS FOR TIE-DOWN ANCHORS TO FOUNDATIONS
1. All holes shall be drilled to the specified diameter and depth.
2. All holes shall be blown clean of dust with oil-free compressed air for a minimum of 4 seconds.
3. All holes shall be cleaned with a nylon brush for a minimum of 4 cycles.
4. Blow holes clean of dust with oil-free compressed air for a minimum of 4 seconds.
5. Check adhesive cartridge expiration date, open, and install per the manufacturer’s instructions.
6. Fill the holes 1/2 to 2/3 full, starting at the bottom of the hole to prevent air pockets and withdraw the nozzle as the hole fills up.
7. Insert a clean and oil-free anchor turning slowly until the anchor contacts the bottom of the hole.
8. Do not disturb the anchor until fully cured. See manufacturer’s instructions.

Table R-1: Verification of Existing Foundation System

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Yes or N/A</th>
<th>Signature of Owner or Contractor (Owner performing work)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1 The size of the existing foundation is greater than or equal to that specified in Section R, item 1</td>
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<td>Signature</td>
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<tr>
<td>B.1 The existing foundation has been verified to be in generally good condition at planned tie-down locations as specified in Section R, item 2</td>
<td></td>
<td>Signature</td>
</tr>
<tr>
<td>C.1 The capacity of each new tie-down anchor has been verified by passing the torque tests specified in Table R-2.</td>
<td></td>
<td>Signature</td>
</tr>
<tr>
<td>D.1 All adhesive anchors were installed per the manufacturer’s instructions per the minimum steps as noted in Section T.</td>
<td></td>
<td>Signature</td>
</tr>
</tbody>
</table>

Table R-2: Foundation Verification Requirements

<table>
<thead>
<tr>
<th>Diameter ø</th>
<th>Torque (ft-lbs)</th>
<th>Torque (ft-lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2” ø</td>
<td>35</td>
<td>15</td>
</tr>
<tr>
<td>5/8” ø</td>
<td>50</td>
<td>20</td>
</tr>
</tbody>
</table>
Seismic Design Category (SDC)

1. The first factor taken into consideration when determining the appropriate amount of earthquake strengthening is the anticipated level of seismic shaking or $S_{1}$ value, which is directly related to the Seismic Design Category (SDC).

2. To find the appropriate $S_{1}$ value, which is either 0.0, 1.0, 2.0, or 1.5, you must first determine your Seismic Design Category (SDC) by clicking the link below.

   a. In your internet browser go to http://www.atlanticu.org/fema-p-1100

   b. Click on one of the five (5) geographic areas listed to find your location on the appropriate map.

   c. Locate your SDC (S.A-C.S.E) E by the color contour shown on the map which corresponds to the %g values shown.

   d. For SDC A,C,D use $S_{1} = 1.0$

   e. For SDC E use $S_{1} = 1.5$

   note: where your location is on, or close to, the border of two SDCs, it is prudent to choose the higher value.

3. Make a note of the appropriate $S_{1}$ value. It will be used together with the number of stories the dwelling has to determine the appropriate Earthquake Retrofit Schedule. 

4. This Plan Set was developed using the lowest listed manufacturer’s capacity within a particular group.

5. Any of the connectors listed within a particular group may be used for strengthening the particular condition.

6. Connector images are general in nature only. Individual manufacturer’s connectors may vary.

7. Manufacturer’s model numbers and installation instructions are subject to change. Verify and follow manufacturer’s written instructions.

8. Specific notes for exterior, interior and roof coverings:

   a. Note the weight classification result for use in the Earthquake Retrofit Schedule, Sheet S3.1.

   b. Start with the exterior finish and move progressively to roofing material then to the interior finish.

   c. For the purposes of this Plan Set, three weight classifications (Heavy, Medium, and Light) have been established as described below. Using the flowchart presented:

      1. Start with the exterior finish and move progressively to roofing material then to the interior finish.

      2. Note the weight classification result for use in the Earthquake Retrofit Schedule, Sheet S3.1.

Weight Classification

The next factor used to establish the appropriate amount of earthquake strengthening is the weight of the exterior and interior finish. For the purposes of this Plan Set, three weight classifications (Heavy, Medium, and Light) have been established as described below. Using the flowchart presented:

1. The “wood siding or shingles” exterior finish category also includes finishes of similar weight, including but not limited to fiber-cement and aluminum siding.

2. The “comp or shingles” roofing material category also includes roofing materials of similar weight, including but not limited to roll roofing, built-up felt roofing, single-ply membrane roofing, and metal roofing.

3. The “stucco or plaster” interior finish category also includes wall finish materials of similar weight, including but not limited to wood board or panel siding.

4. The exterior finish, roofing material, and interior finish categories are intended to be identified based on the predominant materials used in construction. Where interior or exterior finishes vary, a heavier finish type shall be assumed where 25% or more of the heavier finish type exists within the dwelling.

Connectors

1. Manufacturer model numbers and installation instructions are subject to change. Verify and follow manufacturer’s written instructions.

2. Connector images are general in nature only. Individual manufacturer’s connectors may vary.

3. Any of the connectors listed within a particular group may be used for strengthening the particular condition.

4. This Plan Set was developed using the lowest listed manufacturer’s capacity within a particular group.

5. Where connectors listed within the applicable Earthquake Retrofit Schedule will not fit within a particular wall line due to limitations in length, alternate connections may be substituted but shall be designed or selected by a registered design professional and approved by the Building Official.

**Figure 1. SDC versus %g**

<table>
<thead>
<tr>
<th>SDC Category</th>
<th>%g</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>15</td>
</tr>
<tr>
<td>C</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>25</td>
</tr>
<tr>
<td>E</td>
<td>30</td>
</tr>
</tbody>
</table>

**One-Story and Two-Story Dwellings**

<table>
<thead>
<tr>
<th>Exterior Finish</th>
<th>Roofing Material</th>
<th>Interior Finish</th>
<th>Roofing Material</th>
<th>Exterior Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Stucco or Plaster</td>
<td>□ Concrete Tiles</td>
<td>□ Plaster</td>
<td>□ Concrete Tiles</td>
<td>□ Wood Siding or Shingles</td>
</tr>
<tr>
<td>□ Wood Siding or Shingles</td>
<td>□ Comp or Shingles</td>
<td>□ Gypsum Board</td>
<td>□ Comp or Shingles</td>
<td>□ Gypsum Board</td>
</tr>
</tbody>
</table>

**Seismic Design Category (SDC), Weight Classification, Connectors, and Bolts**

**Connectors**

<table>
<thead>
<tr>
<th>IMAGE</th>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE A</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>UREP 153#</td>
</tr>
<tr>
<td>TYPE B</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>FRPP 106#</td>
</tr>
<tr>
<td>TYPE C</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>FRFP 106#</td>
</tr>
<tr>
<td>TYPE D</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>FRFP 106#</td>
</tr>
<tr>
<td>TYPE E</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>L70 740#</td>
</tr>
<tr>
<td>TYPE F</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE G</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE H</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>L70 740#</td>
</tr>
<tr>
<td>TYPE I</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE J</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE K</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE L</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE M</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE N</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE O</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE P</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE Q</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE R</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
<tr>
<td>TYPE S</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>H70A 850#</td>
</tr>
</tbody>
</table>

**Bolts**

<table>
<thead>
<tr>
<th>IMAGE</th>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>EMBEDMENT DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type B</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type C</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type D</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type E</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type F</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type G</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type H</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type I</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type J</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type K</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type L</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type M</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type N</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type O</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type P</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type Q</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type R</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>Type S</td>
<td>Simpson Strong-Tie</td>
<td>USP Structural Connectors</td>
<td>1 1/4&quot;</td>
</tr>
</tbody>
</table>

**Notes**

- Do not submit the unused S3.1 sheets to the Building Official.
- Use S3.1 sheets to find the appropriate SDC value. It will be used together with the number of stories the dwelling has to determine the appropriate Earthquake Retrofit Schedule (Sheet S3.1) to use in preparing and submitting the plans. You will only use one of the following six Earthquake Retrofit Schedule Sheets.
- For SDC A, C, D use $S_{1} = 1.0$
- For SDC E use $S_{1} = 1.5$
- Note: where your location is on, or close to, the border of two SDC's, it is prudent to choose the higher value.
- Make a note of the appropriate $S_{1}$ value. It will be used together with the number of stories the dwelling has to determine the appropriate Earthquake Retrofit Schedule. 
- Specific notes for exterior, interior and roof coverings:
  - Note the weight classification result for use in the Earthquake Retrofit Schedule, Sheet S3.1.
  - Start with the exterior finish and move progressively to roofing material then to the interior finish.
  - For the purposes of this Plan Set, three weight classifications (Heavy, Medium, and Light) have been established as described below. Using the flowchart presented:
    - Start with the exterior finish and move progressively to roofing material then to the interior finish.
    - Note the weight classification result for use in the Earthquake Retrofit Schedule, Sheet S3.1.
EARTHQUAKE RETROFIT SCHEDULE (S=1.0 Seismic) ONE-STORY

Notes:
1. Anchor bolts and Connectors shown in the Earthquake Retrofit Schedule are the minimum required per wall line, placed within the length of strengthening where possible and spaced as equally along each wall line as possible. Note that where using 12" or 5/8" bolts, one additional anchor is required at the end of each braced wall panel per Sheet DS.

2. Tie-downs: If your foundation meets the criteria, you may choose the tie-down option to decrease the required length of strengthening. This may be required where the length of the wall without tie-downs specified in this schedule is longer than can be strengthened by existing conditions. However, there is a level of uncertainty when dealing with existing foundations, therefore, possible, longer lengths of strengthening, without tie-downs, are preferred. (See Supplementary Technical Notes, Sheet S2 to verify the existing foundation is suitable and meets criteria.)

3. Connector Type "F" should be used as an alternative only if joists have blocking on both sides and where accessibility makes the use of Types "D" or "E" impractical.

4. Any of the connectors listed within a particular group and as shown on Sheet S3 may be used for strengthening the particular condition.

5. This Plan Set was developed using the lowest listed manufacturer's capacity within a particular group. Required number of connectors on the Earthquake Retrofit Schedule may be found to have an acceptable spacing where an alternate connector is used. Any such substitution can only be designed or specified by a Registered Design Professional.

6. Foundation sill anchor types A, B, and C should not be used with cripple walls over 2 feet.

INSTRUCTIONS
1. Locate the section that matches your home’s construction. Use the found chart on Sheet S3 to determine “Weight Category.”

2. Find the home’s Total Floor Area in the schedule, this number should be at least as large as the number listed below. Do not use a smaller number, even if it is closer.

a. Approximate 1st floor area over crawl space:
   (Do not include areas built over slab-on-grade.)

3. Check the box that matches your home’s construction type, number of stories, and total floor area. You will use this information in the next row of the schedule to determine length of wood structural panels, nailing requirements, quantities of hardware, etc.

4. Measure the maximum height of the cripple wall along each wall line of the house.

5. Determine the length of wood structural panel bracing required. The columns contain the length of required bracing, depending on the height of the cripple wall. The length of bracing is given for cripple walls heights of zero to 1’, 1’ to 2’, 2’ to 4’, 4’ to 6’, and 6’ to 7’. Furthermore, choices are given for bracing without tie-downs and with tie-downs. If the cripple wall height exceeds along the length of the wall, use the tallest height to determine the required bracing length. Follow the row across from the total floor area that you checked for your home (in Step 2) to find the bracing length for the cripple wall height on each side of the house. Review General Notes, Sheet S1, Section J for instructions on non-rectangular "T" or "L" shaped dwellings. Check boxes where Special Provisions apply.

6. Determine the number of Foundation Sill Anchors required. The columns show the number of anchors required, depending on whether you use Types A through C, or 12" or 5/8" anchor bolts (a = diameter of the bolts). See Sheet S3.

7. Determine the number of Floor to Cripple Wall or Foundation Sill connectors. The columns indicate how many framing connectors are required, depending on whether you use Types D, E, F, G, or O. See Sheet S3.

8. Complete the Retrofit Summary for your project. Fill in the lengths found in the Earthquake Retrofit Schedule. Check the box for the anchor and connector types you plan to use. The length of new cripple wall sheathing should be distributed along a wall line either in full length or in a maximum of two panels of approximately equal length (offset walls can work). If you intend to use tie-downs, check the box for tie-downs for each wall line where use is intended. Check the box on line 4, and see the Supplementary Technical Notes for additional information. Where the length of required panel does not fit within the available length, the dwelling must have an engineered solution. Alternately, if 100% of the length along any particular wall can be sheathed, then that wall line shall be considered acceptable and an engineered solution is not required.

RETOFIT SUMMARY
1. Minimum required length of wood Structural Panels per wall line (check boxes where conditions apply):
   - North Wall: ______ ft
   - East Wall: ______ ft
   - South Wall: ______ ft
   - West Wall: ______ ft

2. Panel Edge Nailing: ______ on center.

3. New Foundation Sill Anchorage:
   - North Wall Type: ______ Min required
   - East Wall Type: ______ Min required
   - South Wall Type: ______ Min required
   - West Wall Type: ______ Min required

4. Floor Framing Connectors (to Cripple Wall or Foundation Sill):
   - North Wall Type: ______ Min required
   - East Wall Type: ______ Min required
   - South Wall Type: ______ Min required
   - West Wall Type: ______ Min required

5. Check this box if tie-downs and SUPPLEMENTAL TECHNICAL NOTES on Sheet S2 will be used.

<table>
<thead>
<tr>
<th>Weight Category</th>
<th>Total Area in Square Feet</th>
<th>Number of Foundation Connectors or Anchors</th>
<th>Panel Edge Nailing</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Construction</td>
<td>0 - 1500</td>
<td>______ ft x 2</td>
<td>______ ft x 2</td>
<td>Notes</td>
</tr>
<tr>
<td>Medium Construction</td>
<td>1501 to 2000</td>
<td>______ ft x 2</td>
<td>______ ft x 2</td>
<td>Notes</td>
</tr>
<tr>
<td>Heavy Construction</td>
<td>2001 to 2500</td>
<td>______ ft x 2</td>
<td>______ ft x 2</td>
<td>Notes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length Each of Two Braced Wall Sections Required Along Each Perimeter Wall Line</th>
<th>Number of Foundation Connectors or Anchors at Each Perimeter Wall Line</th>
<th>Assumed Distributed Along Length</th>
<th>Wood Structural Panels</th>
<th>Foundation Sill Anchors</th>
<th>Floor to Cripple Wall or Floor to Foundation Sill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Tie-downs</td>
<td>Without Tie-downs</td>
<td>Without Tie-downs</td>
<td>Without Tie-downs</td>
<td>Without Tie-downs</td>
<td>Without Tie-downs</td>
</tr>
<tr>
<td>1&quot; to 2'</td>
<td>2&quot; to 4'</td>
<td>4&quot; to 6'</td>
<td>6&quot; to 7'</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Type</th>
<th>Type</th>
<th>Type</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>&quot;A&quot;</td>
<td>&quot;B&quot;</td>
<td>&quot;C&quot;</td>
<td>&quot;D&quot;</td>
<td>&quot;E&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wood Structural Panels</th>
<th>Foundation Sill Anchors</th>
<th>Floor to Cripple Wall or Floor to Foundation Sill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Type</td>
<td>Type</td>
</tr>
<tr>
<td>&quot;F&quot;</td>
<td>&quot;G&quot;</td>
<td>&quot;H&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Anchor bolts and Connectors shown in the Earthquake Retrofit Schedule are the minimum required per wall line, placed within the length of strengthening where possible and spaced as equally along each wall line as possible. Note that where using 12&quot; or 5/8&quot; bolts, one additional anchor is required at the end of each braced wall panel per Sheet DS.</td>
</tr>
<tr>
<td>2. Tie-downs: If your foundation meets the criteria, you may choose the tie-down option to decrease the required length of strengthening. This may be required where the length of the wall without tie-downs specified in this schedule is longer than can be strengthened by existing conditions. However, there is a level of uncertainty when dealing with existing foundations, therefore, possible, longer lengths of strengthening, without tie-downs, are preferred. (See Supplementary Technical Notes, Sheet S2 to verify the existing foundation is suitable and meets criteria.)</td>
</tr>
<tr>
<td>3. Connector Type &quot;F&quot; should be used as an alternative only if joists have blocking on both sides and where accessibility makes the use of Types &quot;D&quot; or &quot;E&quot; impractical.</td>
</tr>
<tr>
<td>4. Any of the connectors listed within a particular group and as shown on Sheet S3 may be used for strengthening the particular condition.</td>
</tr>
<tr>
<td>5. This Plan Set was developed using the lowest listed manufacturer's capacity within a particular group. Required number of connectors on the Earthquake Retrofit Schedule may be found to have an acceptable spacing where an alternate connector is used. Any such substitution can only be designed or specified by a Registered Design Professional.</td>
</tr>
<tr>
<td>6. Foundation sill anchor types A, B, and C should not be used with cripple walls over 2 feet.</td>
</tr>
</tbody>
</table>

Retirement of Crawspace (Plan Set)
- Vulnerability Based Seismic Assessment, Retrofit, and Reinforcement Manual
- FEMA P-110, Volume 2
- Issued: SEPT 2019

Property Address:
<table>
<thead>
<tr>
<th>APPLICANT:</th>
</tr>
</thead>
</table>

Earthquake Retrofit Schedule
- S=1.0 Seismic
- RETROFIT SUMMARY
**EARTHQUAKE RETROFIT SCHEDULE (SCS 1.2 High Seismic) ONE-STORY**

### Wood Structural Panels

<table>
<thead>
<tr>
<th>Weight Category</th>
<th>Total Area in Square Feet</th>
<th>1st Story</th>
<th>2nd Story</th>
<th>3rd Story</th>
<th>4th Story</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Construction</td>
<td>up to 800</td>
<td>6.7&quot;</td>
<td>8.0&quot;</td>
<td>6.7&quot;</td>
<td>10.7&quot;</td>
</tr>
<tr>
<td>Medium Construction</td>
<td>801 to 1200</td>
<td>6.7&quot;</td>
<td>8.0&quot;</td>
<td>9.3&quot;</td>
<td>12.0&quot;</td>
</tr>
<tr>
<td>Heavy Construction</td>
<td>1201 to 1500</td>
<td>8.0&quot;</td>
<td>8.0&quot;</td>
<td>10.7&quot;</td>
<td>13.3&quot;</td>
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</tbody>
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### Foundation Sill Anchors

<table>
<thead>
<tr>
<th>Panel Edge Nailing</th>
<th>Type “A”</th>
<th>Type “B”</th>
<th>Type “C”</th>
<th>1&quot; x 2&quot;</th>
<th>5/8&quot; x 1&quot;</th>
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<tbody>
<tr>
<td>6&quot; x 12&quot;</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

### Floor to Cripple Wall or Floor to Foundation Sill

<table>
<thead>
<tr>
<th>Panel Edge Nailing</th>
<th>Type “D”</th>
<th>Type “E”</th>
<th>Type “F”</th>
<th>Type “G”</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; x 12&quot;</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>12</td>
</tr>
</tbody>
</table>

### Notes:

1. Anchor bolts and connectors shown in the Earthquake Retrofit Schedule are the minimum required per wall, placed within the length of strengthening where possible and spaced as equally along each wall line as possible. Note that where using 12" or 9/8" bolts, one additional anchor is required at the end of each braced wall panel per Sheet C4.

2. Tie-downs. If your foundation meets the criteria, you may choose the tie-down option to decrease the required length of strengthening. This may be required where the length of the wall without tie-downs specified in this schedule is longer than that which can be accommodated by existing conditions. However, there is a level of uncertainty when dealing with existing foundations, therefore, where possible, longer lengths of strengthening, without tie-downs, are preferred. (See Supplemental Technical Notes, Sheet S2 to verify the existing foundation is suitable and meets criteria.)

3. Connector Type “P" should be used as an alternative only if joists have blocking on both sides and where accessibility makes the use of Types “D" or “E" impractical.

4. Any of the connectors listed within a particular group and as shown on Sheet S3 may be used for strengthening the particular condition.

5. This Plan Set was developed using the lowest listed manufacturer’s capacity within a particular group. Required number of connectors on the Earthquake Retrofit Schedule may be found to have an acceptable spacing where an alternate connector is used. Any such substitution can only be designed or specified by a Registered Design Professional.

6. Foundation sill anchor types A, B, C and D should not be used with cripple walls over 2 feet.

---

### INSTRUCTIONS

1. Locate the section that matches your home's construction. Use the flowchart on Sheet S3 to determine "Weight Category.”

2. Find the home's Total Floor Area in the schedule, this number should be at least as large as the number listed below. Do not use a smaller number, even if it is closer.

   a. Approximate 1st floor area over crawlspace: (Do not include areas built over slab-on-grade.)

3. Check the box that matches your home's construction type, number of stories, and total floor area. You will use information in this row of the schedule to determine length of wood structural panels, nailing requirements, quantities of hardware, etc.

4. Measure the maximum height of the cripple wall along each wall line of the house.

5. Determine the length of wood structural panel bracing required. The columns contain the length of required bracing, depending on the height of the cripple wall. The length of bracing is given for cripple wall heights of zero to 1", 1" to 2", 2" to 4", 4" to 6", and 6" to 7'.

   a. Choose the length of required panel does not fit within the available length, the dwelling must have an engineered solution. Alternately, if 100% of the length along any particular wall can be strengthened, then that wall shall be considered acceptable and an engineered solution is not required.

---

### RETROFIT SUMMARY

- **BRACING, ANCHORS, CONNECTORS, AND TIE-DOWNS**

  1. Minimum required length of wood Structural Panels per wall line (check boxes where condition applies)

     - North Wall
     - East Wall
     - South Wall
     - West Wall

  2. Panel Edge Nailing: on center.

  3. New Foundation Sill Anchorage:

     - North Wall
     - East Wall
     - South Wall
     - West Wall

  4. Floor Framing Connectors (to Cripple Wall or Foundation Sill):

     - North Wall
     - East Wall
     - South Wall
     - West Wall

  5. If your  foundation meets the criteria, you may choose the tie-down option to decrease the required length of strengthening. This may be required where the length of the wall without tie-downs specified in this schedule is longer than that which can be accommodated by existing conditions. However, there is a level of uncertainty when dealing with existing foundations, therefore, where possible, longer lengths of strengthening, without tie-downs, are preferred. (See Supplemental Technical Notes, Sheet S2 to verify the existing foundation is suitable and meets criteria.)

---

**Earthquake Retrofit Schedule (for Crawlspace or Non-rectangular "T" or "L" shaped dwellings)**

**Retrofit of Crawlspace Wall/ Foundation Connector on Sheet S2 will be used.**

**Earthquake retrofit Schedule (for Rectangular ”T” or "L" shaped dwellings)**

**Retrofit of non-rectangular "T" or "L" shaped dwellings will be used.**

---

**Disclaimer:**

- This document contains general information about earthquake retrofitting. Always consult a professional for specific recommendations based on your home's unique structure and location.
Notes:
1. Anchor bolts and Connectors shown in the Earthquake Retrofit Schedule are the minimum required per wall line, placed within the wall line as possible.
2. Tie-downs: If your foundation meets the criteria, you may choose the tie-down option to decrease the required length of strengthening. This may be required where the length of the wall without tie-downs is longer than can be accommodated by existing conditions. However, there is a level of uncertainty whenever dealing with existing foundations, therefore, where possible, lengths of strengthening, without tie-downs, are preferred. (See Supplemental Technical Notes, Sheet S2 to verify the existing foundation is suitable and meets criteria.)
3. Connector Type "H" should be used as an alternative only if joists have blocking on both sides and where accessibility makes the use of Types "D" or "E" impractical.
4. Any of the connectors listed within a particular group and as shown on Sheet S3 may be used for strengthening the particular condition.
5. This Plan Set was developed using the lowest listed manufacturer’s capacity within a particular group. Required number of connectors on the Earthquake Retrofit Schedule may be found to have an acceptable spacing where an alternate connector is used. Any such substitution can only be designed or specified by a Registered Design Professional.
6. Foundation sill anchor types A, B, and C should not be used with cripple walls over 2 feet.

EARTHQUAKE RETROFIT SCHEDULE (SoS= 1.5 Very High Seismic) ONE-STORY

INSTRUCTIONS
1. Locate the section that matches your home's construction. Use the flowchart on Sheet S3 to determine “Weight Category”.
2. Find the home's Total Floor Area in the schedule, this number should be at least as large as the number listed below. Do not use a smaller number, even if it is closer.
   a. Approximate 1st floor area over crawlspaces: (Do not include areas built over slab-on-grade.)

3. Check the box that matches your home's construction type, number of stories, and total floor area. You will use information in this row of the schedule to determine length of wood structural panels, nailing requirements, quantities of hardware, etc.

4. Measure the maximum height of the cripple wall along each wall line of the house.

5. Determine the weight of wood structural panel bracing required. The columns contain the length of required bracing, depending on the height of the cripple wall. The length of bracing is given for cripple wall heights of zero to 1', 1' to 2', 2' to 4', 4' to 6', and 6' to 7'. Furthermore, choices are given for bracing without tie-downs and with tie-downs. If the cripple wall height changes along the length of the wall, use the tallest height to determine the required bracing length.

6. Complete the Retrofit Summary for your project. Fill in the lengths found in Sheet S3.
   a. Check the boxes for the anchor and connector types you plan to use. The length of new cripple wall sheathing should be distributed along a wall line either in one full length or in a maximum of two panel lengths of approximately equal length (offset walls can have three). If you intend to use tie-downs, check the box for tie-downs for each wall line where use is intended. Check the box on line 4, and read the Supplemental Technical Notes for additional information. Where the length of required panel does not fit within the available length, the dwelling must have an engineered solution. Alternately, if 100% of the length along any particular wall can be sheathed, then that wall line shall be considered acceptable and an engineered solution is not required.

   b. Determine the number of Foundation Sill Anchors required. The columns show the number of anchors required, depending on whether you use Types A through C, or D or E or F anchor bolts. (a = diameter of the bolt.) See Sheet S3.

   c. Determine the number of Floor to Cripple Wall or Foundation Sill connectors. The columns indicate how many framing connectors are required, depending on whether you use Types D or E, F, or G. See Sheet S2.

   d. Check this box if tie-downs and SUPPLEMENTAL TECHNICAL NOTES on Sheet S2 will be used.

   e. Check this box if tie-downs and with tie-downs for each wall line where use is intended. Check the box on line 4, and read the Supplemental Technical Notes for additional information. Where the length of required panel does not fit within the available length, the dwelling must have an engineered solution. Alternately, if 100% of the length along any particular wall can be sheathed, then that wall line shall be considered acceptable and an engineered solution is not required.

   f. Check this box if tie-downs and SUPPLEMENTAL TECHNICAL NOTES on Sheet S2 will be used.

   g. Check this box if tie-downs and SUPPLEMENTAL TECHNICAL NOTES on Sheet S2 will be used.
### Earthquake Retrofit Schedule (S2= 1.0 Seismic) Two-story

#### Wood Structural Panels

<table>
<thead>
<tr>
<th>Total Area in Square Feet</th>
<th>Min. required</th>
<th>0.5&quot; to 1&quot; Type</th>
<th>1&quot; to 1.5&quot; Type</th>
<th>1.5&quot; to 2&quot; Type</th>
<th>2&quot; to 3&quot; Type</th>
<th>3&quot; to 4&quot; Type</th>
<th>4&quot; to 6&quot; Type</th>
<th>6&quot; to 8&quot; Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 1600</td>
<td>8.0'</td>
<td>8.0'</td>
<td>10.7'</td>
<td>10.7'</td>
<td>12.0'</td>
<td>12.0'</td>
<td>13.3'</td>
<td>13.3'</td>
</tr>
<tr>
<td>1601 to 2000</td>
<td>9.3'</td>
<td>9.3'</td>
<td>12.0'</td>
<td>13.3'</td>
<td>14.7'</td>
<td>14.7'</td>
<td>17.3'</td>
<td>17.3'</td>
</tr>
<tr>
<td>2001 to 2400</td>
<td>10.7'</td>
<td>10.7'</td>
<td>13.3'</td>
<td>17.3'</td>
<td>17.3'</td>
<td>17.3'</td>
<td>17.3'</td>
<td>17.3'</td>
</tr>
<tr>
<td>2401 to 3000</td>
<td>12.0'</td>
<td>12.0'</td>
<td>14.7'</td>
<td>17.3'</td>
<td>17.3'</td>
<td>17.3'</td>
<td>17.3'</td>
<td>17.3'</td>
</tr>
<tr>
<td>3001 to 4000</td>
<td>14.7'</td>
<td>14.7'</td>
<td>17.3'</td>
<td>17.3'</td>
<td>20.0'</td>
<td>20.0'</td>
<td>23.4'</td>
<td>23.4'</td>
</tr>
<tr>
<td>4001 to 5000</td>
<td>16.0'</td>
<td>16.0'</td>
<td>19.7'</td>
<td>19.7'</td>
<td>20.0'</td>
<td>20.0'</td>
<td>23.4'</td>
<td>23.4'</td>
</tr>
<tr>
<td>5001 to 6000</td>
<td>18.7'</td>
<td>18.7'</td>
<td>21.3'</td>
<td>21.3'</td>
<td>22.7'</td>
<td>22.7'</td>
<td>26.1'</td>
<td>26.1'</td>
</tr>
<tr>
<td>6001 to 8000</td>
<td>21.3'</td>
<td>21.3'</td>
<td>23.4'</td>
<td>23.4'</td>
<td>26.1'</td>
<td>26.1'</td>
<td>26.1'</td>
<td>26.1'</td>
</tr>
</tbody>
</table>

**Notes:**

1. Anchor bolts and Connectors shown in the Earthquake Retrofit Schedule are the minimum required per wall line, placed within the length of strengthening where possible and spaced as equally along each wall line as possible. Note that where using 1/2" or 5/8" bolts, one additional anchor is required at the end of each braced panel per Sheet D4.

2. Tie-downs: If your foundation meets the criteria, you may choose the tie-down option to decrease the required length of strengthening. This may be required where the length of the wall without tie-downs specified in this schedule is longer than can be accommodated by existing conditions. However, there is a level of uncertainty when dealing with existing foundations, therefore, where possible, longer lengths of strengthening, without tie-downs, are preferred. (See Supplemental Technical Notes, Sheet S2 to verify the existing foundation is suitable and meets criteria.)

3. Connector Type "P" should be used as an alternative only if there are blocks on both sides and where accessibility makes the use of Types "D" or "E" impractical.

4. Any of the connectors listed within a particular group and as shown on Sheet S3 may be used for strengthening the particular condition.

5. This Plan Set was developed using the lowest listed manufacturer’s capacity within a particular group. Required number of connectors on the Earthquake Retrofit Schedule may be found to have an acceptable spacing when an alternate connector is used. Any such substitution can only be designed or specified by a Registered Design Professional.

6. Foundation sill anchor types A, B, and C should not be used with cripple walls over 2 feet.

---

### RETROFIT SUMMARY

#### Bracing, Anchors, Connectors, and Tie-downs

1. Minimum required length of Wood Structural Panels per wall line (check boxes where condition applies)

   - North Wall
   - East Wall
   - South Wall
   - West Wall

2. Panel Edge Nailing

3. New Foundation Sill Anchorage

4. Floor Framing Connectors (to cripple wall or Foundation Sill)

5. Additional type/quantity (if used)

---

**INSTRUCTIONS**

1. Locate the section that matches your home’s construction. Use the chart on Sheet S3 to determine “Weight Category.”

2. Find the home’s Total Floor Area in the schedule, this number should be at least as large as the number calculated in S2. Do not use a smaller number, even if it is closer.

   a. Approximate 1st floor area over crawl space: (Do not include areas built out on stairs or grade.)
   b. Approximate 2nd floor area over crawl space: (Do not include areas where the 1st floors are built on grade.)
   c. Total approximate square footage: (line a + line b)

3. Check the box that matches your home’s construction type, number of stories, and total floor area. You will use this information in the row of the schedule to determine length of wood structural panels, nailing requirements, quantities of hardware, etc.

4. Measure the maximum height of the cripple wall along each wall line of the house.

5. Determine the length of wood structural panel bracing required. The columns contain the length of required bracing, depending on the height of the cripple wall. The length of bracing is given for cripple wall lengths of zero to 5 ft, 10 ft, 20 ft, 40 ft to 60 ft, and 60 ft and up. Therefore, choices are given for bracing without tie-downs and tie-downs. If the cripple wall height changes along the length of the wall, use the tallest height to determine the required bracing length. Follow the row across from the total floor area that you checked for your home (in Step 3) to find the bracing length for the cripple wall height on each side of the house. Review General Notes, Sheet S1, Section 2 for instructions at non-rectangular "T" or "L" shaped dwellings. Check boxes where Special Provisions apply.

6. The columns number the anchor provisions required, depending on whether you use Types A through C, or 1/2" or 5/8" anchor bolts. (ø = diameter of the bolts.) See Sheet S3.

7. The columns indicate the minimum number of bracing connectors required, depending on whether you use Types D, E, F, or G. See Sheet S3.

8. Complete the Retrofit Summary for your project. Fill in the lengths of Wood Structural Panels found in the retrofit schedule in the retrofit section. Note the quantity and type of connectors used on each wall line. The length of new cripple wall strengthening should be distributed along a wall line either in one full length or in a minimum of two panel lengths of approximately equal length (offset walls can have three). If you intend to use tie-downs, check the box for tie-downs for each wall line where use is intended. Check the box on line 5, and note the Supplemental Technical Notes for additional information.

9. Where the length of required panel does not fall within the available length, the dwelling must have an engineered solution. Alternately, if 100% of the length along any particular wall can be strengthened, then that wall line shall be considered acceptable and an engineered solution is not required.

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**Notes:**

The Earthquake Retrofit Schedule (S2= 1.0 Seismic) Two-story plan set is issued in September 2019.
### Earthquake Retrofit Schedule (Spec 1.2 High Seismic) Two-Story

#### Wood Structural Panels

<table>
<thead>
<tr>
<th>Weight Category</th>
<th>Cripple Wall Height</th>
<th>Foundation Sill Anchors</th>
<th>Number of Foundation Connectors or Anchors at Each Perimeter Wall Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Construction</td>
<td>1&quot; to 4'</td>
<td>2&quot; or Foundation Sill Anchorage</td>
<td>10</td>
</tr>
<tr>
<td>Medium Construction</td>
<td>4&quot; or Foundation Sill Anchorage</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Heavy Construction</td>
<td>3&quot; or Foundation Sill Anchorage</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. Anchor bolts and Connectors shown in the Earthquake Retrofit Schedule are the minimum required per wall line, placed within the length of strengthening where possible and spaced as equally along each wall line as possible. Note that where using 12" or 15" bolts, one additional anchor is required at the end of each braced wall panel per Sheet D4.
2. Tie-downs: If your foundation meets the criteria, you may choose the tie-down option to decrease the required length of strengthening. This may be required where the length of the wall without tie-downs specified in this schedule is longer than can be accommodated by existing conditions. However, there is a level of uncertainty when dealing with existing foundations, therefore, where possible, longer lengths of strengthening, without tie-downs, are preferred. (See Supplemental Technical Notes, Sheet S2 to verify the existing foundation is suitable and meets criteria.)
3. Connector Type "F" should be used as an alternative only if joists have blocking on both sides and where accessibility makes the use of Types "D" or "E" impractical.
4. Any of the connectors listed within a particular group and as shown on Sheet S3 may be used for strengthening the particular condition.
5. This Plan Set was developed using the lowest listed manufacturer’s capacity within a particular group. Required number of connectors on the Earthquake Retrofit Schedule may be found to have an acceptable spacing where an alternate connector is used. Any such substitution can only be designed or specified by a Registered Design Professional.

### INSTRUCTIONS

1. Locate the section that matches your home’s construction. Use the chart on Sheet S3 to determine the Weight Category.
2. Find the home’s Total Floor Area in the schedule; this number should be at least as large as the number calculated in 2.c. Do not use a smaller number, even if it is closer.
   a. Approximate 1st floor area over crawl space.
   b. Approximate 2nd floor area over crawl space.
   c. Do not include areas where the 1st floor over crawl space.
3. Total approximate square footage: ______ ft²
4. Check the box that matches your home’s construction type, number of stories, and total floor area. You will see a new information in this one of the schedule to determine length of wood structural panels, nailing requirements, quantities of hardware, etc.
5. Measure the maximum height of the cripple wall along each wall line of the house.
6. Determine the length of wood structural panel bracing required. The columns contain the length of required bracing, depending on the height of the cripple wall. The length of the bracing is given for cripple wall heights of zero to 1', 1' to 2', 2' to 4', 4' to 6', and 6' and up. Furthermore, choices are given for bracing without tie-downs and with tie-downs. If the cripple wall height changes along the length of the wall, use the tallest height to determine the required bracing length. Follow the row across from the total floor area that you checked for your home in (Step 3) to find the braking length for the cripple wall height on each side of the house. Review General Notes, Sheet S1, Section J for instructions at non-rectangular “T” or “L” shaped dwellings. Check boxes where Special Provisions apply.
7. Determine the number of Foundation Sill Anchors required. The columns show the number of anchors required, depending on whether you use Type A, Type B, or Type S anchors.
8. Complete the Earthquake Retrofit Schedule for your project. Fill in the lengths of Wood Structural Panels found in Table B. Fill in the type and quantity of anchors used on each wall line. The length of new foundation wall sheathing should be distributed along a wall line either in one full length or in a maximum of two panel lengths of approximately equal length (offset walls can have three). If you intend to use tie-downs, check the box for tie-downs for each wall line where use is intended. Check the box on line 5, and read the Supplemental Technical Notes for additional information. Where the length of required panel does not fit within the available length, the bracing must have an engineered solution. Alternately, if 100% of the length along any particular wall can be sheathed, then that wall line shall be considered acceptable and an engineered solution is not required.

### RETROFIT SUMMARY

#### Bracing, Anchors, Connectors, and Tie-Downs

<table>
<thead>
<tr>
<th>Type</th>
<th>Min required</th>
<th>Additional type/quantity (if used)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Wall</td>
<td>______</td>
<td>______</td>
</tr>
<tr>
<td>East Wall</td>
<td>______</td>
<td>______</td>
</tr>
<tr>
<td>South Wall</td>
<td>______</td>
<td>______</td>
</tr>
<tr>
<td>West Wall</td>
<td>______</td>
<td>______</td>
</tr>
</tbody>
</table>

#### Wood Structural Panels

<table>
<thead>
<tr>
<th>Type</th>
<th>Min required</th>
<th>Additional type/quantity (if used)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Wall</td>
<td>______</td>
<td>______</td>
</tr>
<tr>
<td>East Wall</td>
<td>______</td>
<td>______</td>
</tr>
<tr>
<td>South Wall</td>
<td>______</td>
<td>______</td>
</tr>
<tr>
<td>West Wall</td>
<td>______</td>
<td>______</td>
</tr>
</tbody>
</table>

#### Earthquake Retrofit Schedule

1. Minimum required length of Wood Structural Panels per wall line (check boxes where condition applies)
2. Panel Edge Nailing *on center.
3. New Foundation Sill Anchorage:
   a. North Wall Type ______ Min required
   b. East Wall Type ______ Min required
   c. South Wall Type ______ Min required
   d. West Wall Type ______ Min required
4. Floor Framing Connectors (to Cripple Wall or Foundation Sill):
   a. North Wall Type ______ Min required
   b. East Wall Type ______ Min required
   c. South Wall Type ______ Min required
   d. West Wall Type ______ Min required

5. Check this box if tie-downs and SUPPLEMENTAL TECHNICAL NOTES on Sheet S2 will be used.
## Earthquake Retrofit Schedule (S3.1) Very High Seismic TWO-STORY

### Notes:
1. Anchor bolts and Connectors shown in the Earthquake Retrofit Schedule are the minimum required per wall line, placed within the length of strengthening where possible and spaced as equally along each wall line as possible. Note that where using 1/2" or 5/8" bolts, one additional anchor is required at the end of each bracket wall panel per Sheet D4.

2. Tie-downs: If your foundation meets the criteria, you may choose the tie-down option to decrease the required length of strengthening. This may be required where the length of the wall without tie-downs specified in this schedule is longer than can be accommodated by existing conditions. However, there is a level of uncertainty when dealing with existing foundations, therefore, where possible, longer lengths of strengthening, without tie-downs, are preferred. (See Supplemental Technical Notes, Sheet S2 to verify the existing foundation is suitable and meets criteria.)

3. Connector Type "F" should be used as an alternative only if joists have blocking on both sides and where accessibility makes the length of strengthening where possible and spaced as equally along each wall line.

4. Any of the connectors listed within a particular group and as shown on Sheet D5 may be used for strengthening the particular condition.

5. This Plan Set was developed using the lowest listed manufacturer’s capacity within a particular group. Required number of connectors on the Earthquake Retrofit Schedule may be found to have an acceptable minimum required per wall line, placed within the length of strengthening where possible and spaced as equally along each wall line as possible. Note that where using 1/2" or 5/8" bolts, one additional anchor is required at the end of each bracket wall panel per Sheet D4.

6. Foundation sill anchors Type A, B, and C should not be used with cripple walls over 2 feet.

---

### INSTRUCTIONS

1. Find the home’s Total Floor Area in the schedule, this number should be at least as large as the number calculated in Step 2. (Do not include a smaller number, even if it is closer.

   a. Approximate 1st floor area over crawl space (Do not include areas built over slab-on-grade.)

   b. Approximate 2nd floor area over crawl space (Do not include areas where the 1st floor over slab-on-grade.)

   c. Total approximate square footage:

   ![Image](https://example.com/image.png)

2. Determine the number of Foundation Sill Anchors required. The columns show the number of anchors required, depending on whether you use Types A through C, or 1/2" or 5/8" anchor bolts. (e = diameter of the bolts) See Sheet S3.

   ![Image](https://example.com/image.png)

3. Determine the number of Floor to Cripple Wall or Foundation Sill connectors. The columns indicate how many framing connectors are required, depending on whether you use Types D, E, F, or G. See Sheet S3.

4. Complete the Retrofit Summary for your project. Fill in the lengths of Wood Structural Panels found in the "Notes" column and the type and quantity of anchors used on each wall line. The length of new cripple wall sheathing should be distributed along a wall line either in one full length or in a maximum of two panel lengths of approximately equal length (offset walls can have three). If you intend to use tie-downs, check the box for tie-downs for each wall line where use is intended. Check the box on line 5, and read the Supplemental Technical Notes for additional information.

5. Where the length of required panel does not fit within the available length, the wall must have an engineered solution. Alternatively, if 100% of the length along any particular wall can be sheathed, then that wall line shall be considered acceptable and an engineered solution is not required.

---

### RETROFIT SUMMARY

<table>
<thead>
<tr>
<th>BRACING, ANCHORS, CONNECTORS, AND TIE-DOWNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Minimum required length of Wood Structural Panels per wall line: (check boxes where condition applies)</td>
</tr>
<tr>
<td>North Wall Type Min required:</td>
</tr>
<tr>
<td>East Wall Type Min required:</td>
</tr>
<tr>
<td>South Wall Type Min required:</td>
</tr>
<tr>
<td>West Wall Type Min required:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Panel Edge Nailing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ on center.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. New Foundation Sill Anchorage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Wall Type Min required:</td>
</tr>
<tr>
<td>East Wall Type Min required:</td>
</tr>
<tr>
<td>South Wall Type Min required:</td>
</tr>
<tr>
<td>West Wall Type Min required:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Floor Framing Connectors (to Cripple Wall or Foundation Sill):</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Wall Type Min required:</td>
</tr>
<tr>
<td>East Wall Type Min required:</td>
</tr>
<tr>
<td>South Wall Type Min required:</td>
</tr>
<tr>
<td>West Wall Type Min required:</td>
</tr>
</tbody>
</table>

| 5. □ Check this box if tie-downs and SUPPLEMENTAL TECHNICAL NOTES on Sheet S2 will be used. |
Note:
1. See Retrofit Summary on Sheet S3.1 for minimum retrofitting requirements.
**Anchor Through Foundation Sill Only**

Detail applies where (E) foundation sill is the same width as the (E) cripple studs.

- (N) Foundation sill anchoring bolt and plate washer
- See Earthquake Retrofit Schedule (Sheet S3.1)
- (E) Cripple stud
- (N) 2x blocking
- See Detail 3/01
- (E) Joint in foundation sill
- (E) Concrete foundation (shape may vary)

**Anchors Through Blocking and Foundation Sill**

Detail applies where (E) foundation sill is wider than the (E) cripple studs.

- (N) Foundation sill anchoring bolt and plate washer
- See Earthquake Retrofit Schedule (Sheet S3.1)
- (E) Cripple stud
- (N) 2x blocking
- See Detail 3/01
- (E) Joint in foundation sill
- (E) Concrete foundation (shape may vary)

**New Blocking Installation for Sheathing Attachment**

At each stud bay with sheathing.

- (N) Blocking where required
- (N) Connector Type "A" or "C"
- (E) Foundation sill
- Width same as, or wider than, (E) cripple studs
- (N) Connector Type "A" or "C" (shown dashed)
- (E) Concrete foundation (shape may vary)

**Foundation Sill Connectors**

Detail used where cripple wall studs are too short to allow drilling for new anchor bolts. Maximum cripple wall height 2'-0".

- (N) Wood structural panel, where required. See Sheet D4 or D5 as applicable
- 1-1/2" to 2" from center of bolt to edge of foundation sill
- Replaces center of foundation sill where (E) reinforcing conflicts with placing (N) foundation sill anchor bolt
- (E) Reinforcing bar; if present
- Do not drill through any (E) reinforcing
- (E) Concrete foundation (shape may vary)

**Material Key**

Below is a key to common call-outs in the details. Unless specified otherwise in the details, use the sizes and materials as follows:

- **Term**
  - 8d (8 penny)
  - 10d (10 penny)
  - 20d (20 penny)

- **Description**
  - 0.131" x 1-1/2" long
  - 0.162" x 3-1/2" long
  - 0.192" x 4" long
  - 0.229" x 3-1/2" long
  - 0.329" x 5-1/2" long

- **Notes**
  - Use the sizes and materials as follows:
    - 8d (8 penny): 1-1/2" long
    - 10d (10 penny): 2-1/2" long
    - 20d (20 penny): 3-3/4" long

- **Abbreviations**
  - **(E)** Existing
  - **(N)** New
  - **(min)** Minimum
  - **(max)** Maximum
  - **NTS** Not to Scale
  - **Typ.** Typical

- **Materials**
  - Simpson Strong-Tie 1/4" SDS, GRK 38°FPO "Climpak", USP Mitek 1/4" SDS, or equivalent.
  - Simpson Strong-Tie "Gold Coat", or equivalent.
  - WS "Climatek", USP Mitek 1/4" SDS, or equivalent.
  - Simpson Strong-Tie "Gold Coat", or equivalent.
  - For Connector types see Sheet S3.
MATERIAL KEY:
Below is a key to common call-outs in the details. Unless specified otherwise in the details, use the sizes and materials as follows:

Term | Description
--- | ---
(E) Balloon-framed wall stud | Depend on framing and distance between extensions.
(N) 2x blocking or (E) floor joist or blocking | Use 2x blocking at least 48" on center.
(E) Floor sheathing | Use 15/32" or 1/4" Plywood sheathing. Exposure rating of Exterior or Exposure I.
(N) Connector Type "G" | 3/8" RSS "Climatek", USP Mitek 1/4" WS "Gold Coat", or equivalent.
(N) 2x ledger with (2) 3" screws to (N) 3x blocking | Use Simpson Strong-Tie 1/4" SDS, GRK 3/8" RSS "Climatek", USP Mitek 1/4" WS "Gold Coat", or equivalent.
(E) "Let-in" ribbon | For use in cavity wall designs.
(N) Connector Type "D" | 3" long structural wood screw
(E) Wall framing | LVL (laminated veneer lumber)
(E) Floor joist | Plate washer
(N) 2x ledger with (2) 3" screws to (N) 3x blocking | 3" x 3" square x 0.229" thick.
Condition where joist is nailed to wall stud is similar | Fortiflash, Orange Peel-n-Seal, Typar, Tyvek, Vycor, HardieWrap, or equivalent.
(E) Fire-blocking | Peel & Stick
(E) Balloon-framed wall stud | Fiberglass, Orange Peel-n-Seal, PVC, Vinyl, Zip-Face, or equivalent.
(E) Fire-blocking if present | Plate washer
(N) Wood structural panel | 0.162" x 1-1/2" long.
(E) Floor sheathing | Simpson Strong-Tie 1/4" SDS, GRK 3/8" RSS "Climatek", USP Mitek 1/4" WS "Gold Coat", or equivalent.
(N) 3x6 blocking every stud bay at (N) wood structural panel | 0.131" x 3-1/2" long.
(E) "Let-in" ribbon | Simpson Strong-Tie 1/4" SDS, GRK 3/8" RSS "Climatek", USP Mitek 1/4" WS "Gold Coat", or equivalent.
(N) Connector Type "D" | 3" long structural wood screw
(E) Floor joist | 0.131" x 2-1/2" long.
(N) 2x ledger with (2) 3" screws to (N) 3x blocking | 0.131" x 1-1/2" long.
(N) Connector Type "G" | 0.148" x 2" long.
(N) 3x6 blocking every stud bay at (N) wood structural panel | 0.148" x 1-1/2" long.
(N) Connector Type "D" | 0.162" x 1-1/2" long.
(N) Wood structural panel | 0.192" x 4" long.
(N) 3x6 blocking every stud bay at (N) wood structural panel | 0.162" x 3-1/2" long.
(N) Connector Type "G" | 0.192" x 4" long.
(N) 2x ledger with (2) 3" screws to (N) 3x blocking | 0.192" x 4" long.
(N) Wood structural panel | 0.192" x 4" long.
(N) 3x6 blocking every stud bay at (N) wood structural panel | 0.192" x 4" long.
(N) Connector Type "G" | ATCO 62-0700, 1-1/2" x 62-0700, 3/4" x 62-0700, or equivalent.
(N) 2x ledger with (2) 3" screws to (N) 3x blocking | US Voluntary Product Standard PS 2. Exposure rating of Exterior or Exposure I.
(N) Wood structural panel | 0.131" x 2-1/2" long.
(E) Floor sheathing | 0.131" x 1-1/2" long.
(N) Connector Type "G" | 0.148" x 2" long.
(N) 3x6 blocking every stud bay at (N) wood structural panel | 0.148" x 1-1/2" long.
(N) Connector Type "D" | 0.162" x 1-1/2" long.
(N) Wood structural panel | 0.162" x 1-1/2" long.
(N) Connector Type "D" | 0.192" x 4" long.
(N) Wood structural panel | 0.192" x 4" long.

ABBREVIATIONS
(E) Existing
(N) New
min. Minimum
max. Maximum
NTS Not to Scale
typ. Typical

FLOOR-TO-BALLOON FRAMED WALLS

(Floor sheathing) or (E) Balloon-framed wall stud
(E) Floor joist or (N) 2x blocking
(Condition where joist is nailed to wall stud is similar)
(N) Connector Type "G"
(N) Wood structural panel
(E) Concrete foundation

CRIPPLE WALL WITHOUT TOP PLATE

(E) Wall framing
(E) End joist
(N) Connector Type "D"
(E) Floor sheathing
(N) 2x blocking
(N) 3x continuous top plate
(N) Wood structural panel, where required. See Sheet D4 or D5 for installation.
(E) Concrete foundation

CRIPPLE WALL WITH SINGLE TOP PLATE

(E) Wall framing
(E) End joist or (E) blocking
(E) Floor sheathing
(N) 4" long screw at 8" on center or Connector Type "D" or "E" per Earthquake Retrofit Schedule (Sheet S3.1)
(N) Wood structural panel, where required. See Sheet D4 or D5 for installation.
(N) Connector Type "D"
WOOD STRUCTURAL PANEL INSTALLATION WITHOUT TIE-DOWNS

1. Provide additional 2x4 or 2x6 cripple stud where (E) stud is less than 1-3/4" thick. Fasten to (E) stud with 16d nails at 4" on center, staggered to avoid splitting.

2. Wood structural panel. Fasten with 8d nails at all panel edges at spacing specified on the Earthquake Retrofit Schedule (Sheet S3.1) and 12" on center at intermediate supports.

3. Additional foundation sill anchor at the end of each braced wall line.

4. Foundation sill anchor bolt See Detail 1/D1 or 2/D1 where applicable

5. Wood structural panel. Fasten with 8d nails at all panel edges at spacing specified on the Earthquake Retrofit Schedule (Sheet S3.1) and 12" on center at intermediate supports.

6. Joint at abutting wood structural panels (1/16" gap between panels).

7. Note: When cripple wall is less than 18" in height, only one vent hole is required at bottom.

8. Place each hole over (N) foundation sill anchor bolt for inspection.

9.提供的所有要求的钉子应处在上部的墙板上。

10. (N) 2"x4 or 2"x6钉子的墙壁厚度小于1-3/4"时。将钉子固定在(E)钉子上，间隔4"，呈锯齿状分布以避免开裂。

11. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

12. 联合固定在每个横向支撑线上。

13. 铁质螺旋垫圈3" x 3"方形 x 0.229"厚。

14. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

15. 联合固定在每个横向支撑线上。

16. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

17. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

18. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

19. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

20. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

21. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

22. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

23. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

24. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

25. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

26. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

27. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

28. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

29. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

30. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

31. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

32. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

33. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

34. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

35. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。

36. 木结构面板。用8d钉子固定在所有板的边缘上，间距按地震改进建设指导手册（Sheet S3.1）和12"设置在中间支撑处。
Wall framing

Reinforcing bars may or may not be

Plan Sets

Floor sheathing

"D" indicates the depth of an existing foundation, or new foundation constructed in accordance with Detail 1/D7.

Concrete

Reinforcing

Foundation sill

Top plate(s)

Foundation sill anchor bolt

Prior to installing wood structural panels, see Detail 4/D6 where pipes or conduits pass through cripple studs or top plates.

For existing foundations, see Supplemental Technical Notes, Sheet S2, Section R for additional requirements.

Top plate(s)

Wood structural panel. Fasten

foundation sill is wider

Floor joist or

"W" indicates the width of an existing foundation, or new foundation constructed in accordance with Detail 1/D7.

At crawlspace vents or similar cripple wall blockouts, see Detail 3/D6.

Prior to installing wood structural panels, see Detail 4/D6 where pipes or conduits pass through cripple studs or top plates.

"N" indicates the width of an existing foundation, or new foundation constructed in accordance with Detail 1/D7.

"D" indicates the depth of an existing foundation, or new foundation constructed in accordance with Detail 1/D7.

For strapping at top plate splices, see Details 1/D6 or 2/D6.

Top plate(s)

Wood structural panels may be installed vertically (face grain parallel to stud) or horizontally.

2x4 or 2x6 cripple stud. Fasten

Cripple stud

foundation sill

Nailers

1/2" to 3" diameter

Provide all required nailing 10d (10 penny) 0.148" x 3" long

at upper top plate at connectors (E) blocking

Provide additional 8d at 12" on center at bottom plate (where occurs)

Notes:

1. For strapping at top plate splices, see Details 1/D6 or 2/D6.

2. At crawlspace vents or similar cripple-wall blockouts, see Detail 3/D6.

3. Prior to installing wood structural panels, see Detail 4/D6 where pipes or conduits pass through cripple studs or top plates.

4. "N" indicates the width of an existing foundation, or new foundation constructed in accordance with Detail 1/D7.

5. "D" indicates the depth of an existing foundation, or new foundation constructed in accordance with Detail 1/D7.

6. For existing foundations, see Supplemental Technical Notes, Sheet S2, Section R for additional requirements.

7. Wood structural panels may be installed vertically (face grain parallel to stud) or horizontally.

8. Provide 2x4 flat blocking at all horizontal panel edges.

TYPICAL INSTALLATION

ELEVATION

SECTION

SECTION

(Foundation sill BLOCKING REQUIRED)

(Foundation sill BLOCKING REQUIRED)

Notes:

1. For strapping at top plate splices, see Details 1/D6 or 2/D6.

2. At crawlspace vents or similar cripple-wall blockouts, see Detail 3/D6.

3. Prior to installing wood structural panels, see Detail 4/D6 where pipes or conduits pass through cripple studs or top plates.

4. "N" indicates the width of an existing foundation, or new foundation constructed in accordance with Detail 1/D7.

5. "D" indicates the depth of an existing foundation, or new foundation constructed in accordance with Detail 1/D7.

6. For existing foundations, see Supplemental Technical Notes, Sheet S2, Section R for additional requirements.

7. Wood structural panels may be installed vertically (face grain parallel to stud) or horizontally.

8. Provide 2x4 flat blocking at all horizontal panel edges.
VENT OPENINGS AND TOP PLATE DETAILS

1. TOP PLATE SPLICE AT EXISTING DOUBLE TOP PLATES

2. TOP PLATE SPLICE AT EXISTING SINGLE TOP PLATE

3. CUTOUT REQUIREMENTS IN BRACED PANELS

4. ALLOWABLE NOTCHING AND REINFORCING FOR TOP PLATES AND STUDS

MATERIAL KEY:

- **N** Connector Type "S1" centered at (E) top plate splice location. Install with (14) 8d nails each side of the joint. (8 total)
- **E** Joint in (E) upper top plate
- **N** Joint in (E) upper top plate splice location
- **E** Double cripple wall
- **N** Cripple wall

Notes:
1. Floor framing not shown.
2. In area of sheathing, install strap over sheathing.

<table>
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<tr>
<th>Term</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>N8 (8 penny)</td>
<td>0.131&quot; x 2-1/2&quot; long</td>
</tr>
<tr>
<td>N8 (8 penny)</td>
<td>0.131&quot; x 1-1/2&quot; long</td>
</tr>
<tr>
<td>N10 (10 penny)</td>
<td>0.148&quot; x 2&quot; long</td>
</tr>
<tr>
<td>N10 (10 penny)</td>
<td>0.148&quot; x 1-1/2&quot; long</td>
</tr>
<tr>
<td>N16 (16 penny)</td>
<td>0.162&quot; x 3&quot; long</td>
</tr>
<tr>
<td>N20 (20 penny)</td>
<td>0.192&quot; x 4&quot; long</td>
</tr>
</tbody>
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Structural wood screws
- Simpson Strong-Tie 1/4" SDS, GRK 3/8" SDS "Climatek", USP Mitek 1/4" WS "Gold Coat", or equivalent.
- 3" screw 3" long structural wood screw
- 4" screw 4" long structural wood screw
- 6" screw 6" long structural wood screw

Wood structural panel
- 15/32" plywood sheathing, Exposure rating of Exterior or Exposure I.
- 4-Ply, or Oriented Strand Board (OSB) Conforming to US Voluntary Product Standard PS 2. Exposure rating of Exterior or Exposure I. Manufactured with exterior glue. Minimum 4-ply.
- LVL (laminated veneer lumber) Boise-Cascade "VersaLam", Georgia-Pacific "GP-Lam", LP "Solid Start", or equivalent.
- Plate washer 3" x 3" square x 0.229" thick.
- "Peel & Stick" Fortiflash, Orange Peel-n-Seal, flashing tape Typar, Tyvek, Vycor, HardieWrap, or bituthene equivalent.

For Connector types see Sheet S3.

ABBREVIATIONS

(E) Existing
(N) New
(min) Minimum
(max) Maximum
(NTS) Not To Scale
(typ) Typical

DATE: SEPTEMBER 2019

D6 SHEET
1. Contact Building Official to verify applicability.
2. Where frost conditions occur, the minimum depth shall extend below the frost line.
3. Footing to be deepened as required to bear on firm soils.
4. Where expansive soil is known to exist, the foundation depth and reinforcement shall be as approved by the Building Official.
5. Where frost conditions occur, the minimum depth shall extend below the frost line.

Notes:

- Footing Width: 12" min.
- Footing Depth: 12" min.
- Footing Thickness: 10" min.
- Stemwall Thickness: 6" min.

SECTION

CONCRETE FOUNDATION FOR SECTION REPLACEMENT - OPTION 1

CONCRETE FOUNDATION FOR SECTION REPLACEMENT - OPTION 2

ABBREVIATIONS

- (E) Existing
- (N) New
- max. Maximum
- min. Minimum
- NTS Not to Scale
- typ. Typical

MATERIAL KEY:

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note</td>
<td></td>
</tr>
<tr>
<td>8d (8 penny)</td>
<td>at connectors, attached over plywood</td>
</tr>
<tr>
<td>10d (10 penny)</td>
<td>at connectors, attached directly in framing</td>
</tr>
<tr>
<td>(1-1/2&quot;) x 2-1/2&quot;</td>
<td>screw #6 long structural wood screw</td>
</tr>
<tr>
<td>(1-1/2&quot;) x 3&quot;</td>
<td>screw #8 long structural wood screw</td>
</tr>
<tr>
<td>(1-1/2&quot;) x 4&quot;</td>
<td>screw #10 long structural wood screw</td>
</tr>
</tbody>
</table>

Footin

Footing Width: 12" min.
Footing Depth: 12" min.
Footing Thickness: 10" min.
Stemwall Thickness: 6" min.

SECTION

Notes:

1. Contact Building Official to verify applicability.
2. Where frost conditions occur, the minimum depth shall extend below the frost line.
3. Footing to be deepened as required to bear on firm soils.
4. Where expansive soil is known to exist, the foundation depth and reinforcement shall be as approved by the Building Official.
5. Where frost conditions occur, the minimum depth shall extend below the frost line.
6. A geotechnical report or modified foundation may be required at locations with expansive or liquefiable soils or sites with potential for sliding.

Notes:

- Footing Width: 12" min.
- Footing Depth: 12" min.
- Footing Thickness: 10" min.
- Stemwall Thickness: 6" min.

SECTION

Notes:

1. Contact Building Official to verify applicability.
2. Where frost conditions occur, the minimum depth shall extend below the frost line.
3. Footing to be deepened as required to bear on firm soils.
4. Where expansive soil is known to exist, the foundation depth and reinforcement shall be as approved by the Building Official.
5. Where frost conditions occur, the minimum depth shall extend below the frost line.
6. A geotechnical report or modified foundation may be required at locations with expansive or liquefiable soils or sites with potential for sliding.

Notes:

- Footing Width: 12" min.
- Footing Depth: 12" min.
- Footing Thickness: 10" min.
- Stemwall Thickness: 6" min.

SECTION

Notes:

1. Contact Building Official to verify applicability.
2. Where frost conditions occur, the minimum depth shall extend below the frost line.
3. Footing to be deepened as required to bear on firm soils.
4. Where expansive soil is known to exist, the foundation depth and reinforcement shall be as approved by the Building Official.
5. Where frost conditions occur, the minimum depth shall extend below the frost line.
6. A geotechnical report or modified foundation may be required at locations with expansive or liquefiable soils or sites with potential for sliding.

Notes:

- Footing Width: 12" min.
- Footing Depth: 12" min.
- Footing Thickness: 10" min.
- Stemwall Thickness: 6" min.

SECTION

Notes:

1. Contact Building Official to verify applicability.
2. Where frost conditions occur, the minimum depth shall extend below the frost line.
3. Footing to be deepened as required to bear on firm soils.
4. Where expansive soil is known to exist, the foundation depth and reinforcement shall be as approved by the Building Official.
5. Where frost conditions occur, the minimum depth shall extend below the frost line.
6. A geotechnical report or modified foundation may be required at locations with expansive or liquefiable soils or sites with potential for sliding.

Notes:

- Footing Width: 12" min.
- Footing Depth: 12" min.
- Footing Thickness: 10" min.
- Stemwall Thickness: 6" min.

SECTION

Notes:

1. Contact Building Official to verify applicability.
2. Where frost conditions occur, the minimum depth shall extend below the frost line.
3. Footing to be deepened as required to bear on firm soils.
4. Where expansive soil is known to exist, the foundation depth and reinforcement shall be as approved by the Building Official.
5. Where frost conditions occur, the minimum depth shall extend below the frost line.
6. A geotechnical report or modified foundation may be required at locations with expansive or liquefiable soils or sites with potential for sliding.

Notes:

- Footing Width: 12" min.
- Footing Depth: 12" min.
- Footing Thickness: 10" min.
- Stemwall Thickness: 6" min.

SECTION

Notes:

1. Contact Building Official to verify applicability.
2. Where frost conditions occur, the minimum depth shall extend below the frost line.
3. Footing to be deepened as required to bear on firm soils.
4. Where expansive soil is known to exist, the foundation depth and reinforcement shall be as approved by the Building Official.
5. Where frost conditions occur, the minimum depth shall extend below the frost line.
6. A geotechnical report or modified foundation may be required at locations with expansive or liquefiable soils or sites with potential for sliding.

Notes:

- Footing Width: 12" min.
- Footing Depth: 12" min.
- Footing Thickness: 10" min.
- Stemwall Thickness: 6" min.

SECTION
EXAMPLE OF CALCULATING TOTAL STRENGTHENING REQUIREMENTS

This example is a 2,598 square foot two-story home (excluding garage and porch), with a "Light" weight classification in a low seismic area.

Two of the anchor bolts required by the Earthquake Strengthening Schedule within 8' of each end of the braced wall section with tie-downs. See Detail 1 or Sheet D5

The length of the wood structural panel for walls without tie-downs must be at least the greater of: 2 times the maximum cripple wall height or 4'-0" for walls with tie-downs; this rule does not apply. See Sheet S1, Section I, Note 1.

Typical cripple wall height = 6'-3"

The cripple walls are 6'-3" tall at walls without tie-downs, they require a minimum panel length of 12'-6" (6'-3"x2 = 12'-6", 16'-0"x0.5 = 8'-0")

Additional anchors for 48" on center minimum spacing as required by General Notes, Sheet S1, Note H.3.e.

Connectors as required by the Earthquake Retrofit Schedule

Chimney

Label the front side of home (street side)

EXAMPLE OF NOTATION FOR SUBMITTAL TO Building Official

Key:
- Minimum required length of strengthening using wood structural panels, anchors, and connectors
- Foundation sill anchor or connector
- Additional foundation sill anchor or connector
- Tie-down
- Floor framing connector
- Detail Number
- Sheet Number
- homeowner or Contractor to choose most appropriate detail

Definitions:
- (E) Existing
- (N) New
- Strengthening: Foundation and/or cripple wall work intended to improve performance during an earthquake
- Wall lines: All wall segments forming the overall building dimension on one side.

Notes:
1. Plan shows typical notation. Instructional notes are in italics and should not be included on submittal drawing. Refer to Sheet D1 for additional instructions. 
2. Required length values are rounded up to be at 18" typical stud space increments.
Required (N) Braced wall section with tie-downs. See Earthquake Retrofit Schedule, Sheet S3.1

(N) Connector Type "D" or "E" See Earthquake Retrofit Schedule, Sheet S3.1

(N) 2x at wood structural panel splice (where required) See Detail 1/D4, 2/D4, or 1/D5

See Earthquake Retrofit Schedule, Sheet S3.1

Connector Type "D" or "E"

Required (N) Braced wall section without tie-downs. See Earthquake Retrofit Schedule, Sheet S3.1

2x at wood structural panel splice (where required) See Detail 1/D4, 2/D4, or 1/D5

See Detail 1/D4, 2/D4, or 1/D5

Vent holes

End joist

Floor joist (Floor framing)

Wood structural panel

Nail holes

Top plate joint

Top plate strap

Nailing pattern

Nailing at (N) cripple stud

Diagonal blocking, where occurs. Provide vent holes above and below (E) blocking

Diagonal blocking may be removed at (N) wood structural panel

Foundation sill anchor bolt

64" on center minimum at one-story dwellings, 48" on center minimum at two-story dwellings See Detail 1/D1

Concrete foundation

Tie-down method:

(E) Foundation sill anchor bolt

44" on center minimum at one-story dwellings, 48" on center minimum at two-story dwellings See Detail 1/D1

Foundation sill

Foundation sill blocking if required to provide flush surface for wood structural panel See Detail 2/D1

Definitions

(E) Existing

(N) New

Strengthening: Foundation and/or cripple wall work intended to improve performance during an earthquake.

Wall line: All wall segments forming the overall building dimension on one side.

Notes:

1. This detail is to show an example of cripple wall that has gone through an earthquake retrofit and to identify terms and details used in this plan set.

2. This detail is not intended to supersede requirements contained in the specific installation details on Sheets D1 through D7.

3. This view is looking from the interior of the crawl space.
Notes:
1. This detail is to show an example of an earthquake retrofit where there is no cripple wall, and to identify terms and details used in this plan set.
2. This detail is not intended to supersede requirements contained in the specific installation details on Sheets D1 through D6.
3. This view is looking from the interior of the crawl space.