STANDARD EARTHQUAKE HOME RETROFIT (SEHR) OVERVIEW

1. Submittal Requirements:
   - 2 copies of the Standard Earthquake Home Retrofit (SEHR) Plan Set, Sheets S1–S20
   - 2 copies of any other plans you have drawn
   - Completed building permit application

2. Review Process:
   - Review by a building plans examiner
   - Expedited approval process
   - If home doesn't qualify to use SEHR Plan, plans examiner will advise
   - Your home can still be retrofitted but additional engineering will be needed
   - You will be called when the approved plans are ready to be issued

3. Inspection Process:
   - Do not begin work until the permit has been issued
   - Call inspector to verify anchor bolt installation
   - Call inspector for a pony wall strengthening inspection
   - You will need to be present at the inspection so the inspector can have access to the project.

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# PROJECT IMPACT
**Earthquake Home Retrofit Program**

## THE HOME ASSESSMENT CHECKLIST

Complete this checklist before application to determine the existing conditions in your home.

Detailed instructions for completing this checklist are included in the Home Retrofit Handbook.

Space is provided at the end of the checklist for you to enter comments related to questions answered "No" or "Uncertain".

The plans examiner will determine if your proposed meets the requirements to use the SEHR Plan based on your answers.

## Qualification Requirements (Existing Conditions)

All "Yes" or "No" (not applicable) answers mean your home is qualified to use the Standard Earthquake Home Retrofit (SEHR) Plan. You may need to hire an engineer or architect to develop the appropriate retrofit method if "No" or "Uncertain" is checked.

### Home Characteristics

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is the home of light, wood-frame residential construction?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Does the home have four or fewer dwelling units?</td>
<td></td>
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</tr>
<tr>
<td>3. Is a sill plate present?</td>
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<tr>
<td>4. Is the home built on a flat or moderate slope of less than 30 percent (approximately 18 degrees from horizontal)?</td>
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<tr>
<td>5. Is the foundation wall around the perimeter of the home continuous except for allowable exceptions?</td>
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<tr>
<td>6. Is the foundation of concrete or reinforced masonry that is in good condition?</td>
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<tr>
<td>7. Are the porches 4 feet or less in height?</td>
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<tr>
<td>8. Is the home story or less, counting porches over 18 1/2 inches on one story?</td>
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</tbody>
</table>

### Additional Home Information

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. What is the overall height of the porch wall? (Specify dimension.)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10. How many stories are above the porch wall? (Specify # of stories)</td>
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<tr>
<td>11. Is the roof made of standard lightweight roofing materials, such as wood or composition shingles?</td>
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</tr>
</tbody>
</table>

### Identify Retrofit Needs for Home

All "Yes" answers indicate a retrofit work is needed. "No" or "Uncertain" answers indicate retrofit and/or repair work is needed to improve the resistance of the home to earthquake shaking.

### Anchoring the Sill Plate

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Are all plates in good condition?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>13. Are all plates anchored (bolted) to the foundation?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Are all plate anchor bolts spaced 4 to 6 feet apart, placed near the center of the concrete foundation wall (about 3 1/2 inches from the side of a 6 inch foundation wall), and in good condition?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>15. Are all plate anchor bolts at least 1/2 inch in diameter for one to two story buildings and 5/8 inch for a three-story building?</td>
<td></td>
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</tr>
<tr>
<td>16. Are all plate anchor bolts located not more than 12 inches from the ends of each piece of all plates that is more than 30 inches in length?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Connecting the Floor Framing

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Do floor joists have either continuous sink joints or joint blocking present at bearing points?</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Is the floor framing system connected to the underlying sill plate with metal framing clips or are flat nails placed 6 inches on center?</td>
<td></td>
<td></td>
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<tr>
<td>19. Is the floor framing system connected to the underlying pony wall top plate with metal framing clips or are flat nails placed 6 inches on center?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Are pony wall details top plate present and in good condition?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Do structural panels (ply wood sheathing) cover the stud walls on either the inside or the outside of the pony wall?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>22. Does existing pony wall sheathing in a crawl space have sufficient stud cavity ventilation to prevent the growth of fungus within the wall?</td>
<td></td>
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<tr>
<td>23. Are the nails around the perimeter of the structural paneling spaced 3 to 6 inches apart?</td>
<td></td>
<td></td>
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<tr>
<td>24. Are the nails along the studs in panel field (see panel edge conditions) spaced 6 to 14 inches apart?</td>
<td></td>
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<tr>
<td>25. Are there unscreened crawl space ventilation openings through structural panels? (Yes or NA)</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### Comments about "No" or "Uncertain" answers:

- "No" answers require retrofit work to achieve compliance with the Standard Earthquake Home Retrofit Plan.
- "Uncertain" answers require professional evaluation by a qualified engineer or architect.

---

**For Office Use Only**

- Home qualifies to use the Standard Earthquake Home Retrofit Plan
- Home does not qualify to use the Standard Earthquake Home Retrofit Plan
- Home earthquake retrofit not needed
- Damaged or missing structural elements must be repaired or installed before completing the retrofit
SECTION II

Earthquake Retrofit Plan Drawing Instructions:

1. Help:
   Refer to the Home Retrofit Handbook for detailed instructions on how to prepare your plan.

2. Measure and Mark Existing Conditions:
   Draw an outline of the building's foundation in the space provided (Section 1b).
   Mark the scale used. Show chimneys, crawl space access, and any other gaps in the foundation wall below the height of all pony walls. Mark the direction of run (orientation) of floor joints on your foundation outline. For completeness, show an outline of porches, garages, or additions that lack a foundation using a dashed line. Refer to the "SAMPLE PLAN" (Section 1b) for guidance.

3. Select and Mark Plan Detail Numbers:
   For each wall segment on your Earthquake Retrofit Plan Drawing, mark on the foundation outline the number of the plan detail(s) that you will use to complete your retrofit project. Sheets S6 through S18 include details for common building conditions that meet the minimum prescriptive requirements.

4. Determine and Mark Wall Bracing Layout:
   Use the Summary of Minimum Prescriptive Requirements (Table 1 on Sheet S7) to determine the amount and placement of pony wall bracing. Show on the foundation outline the layout of the structural panels you will use to brace the pony walls.

5. You have now completed your Earthquake Retrofit Plan Drawing.
A. PURPOSE

The intent of the Standard Earthquake Home Retrofit (SEHR) Plan is to promote public safety and welfare by reducing the risk of collapse and damage during earthquake events. The requirements in this plan ensure a minimum recommended standard for the retrofit of existing buildings. Damage to homes in past earthquakes show that incorrect or incomplete retrofits are as bad as having no retrofit at all. Use of this standard plan is intended to improve building performance during earthquake shaking, but will not necessarily eliminate earthquake damage. The primary purpose is to reduce the likelihood that these buildings will fall off their foundations.

B. SCOPE

The standard plan applies to one, two and three-story light wood-frame residential buildings with raised wood floors meeting the following criteria as determined by the completion of the Home Assessment Checklist:

1. The maximum number of dwelling units and/or guest rooms is four.
2. No portion of the building is constructed over a slope steeper than 3 horizontal to 1 vertical.
3. The building is supported at its perimeter by a continuous concrete or reinforced masonry footing and stem wall in good condition.
4. The pony wall heights do not exceed 48 inches in one or two story buildings and do not exceed 18-1/2 inches in three story buildings.
5. The pony walls are not sheathed with sufficient wood structural panels or diagonal sheathing.

C. GENERAL REQUIREMENTS

Permit requirements: All work shown on these plans requires a building permit.

Inspection requirements: All work is subject to inspection by the local building inspector. In general, this will involve two inspections, anchor bolt and panel installation. A final sign off by inspectors is required when the work is complete. If new concrete foundations are included, additional inspections will be required after all forming and placement of reinforcing, but before concrete pouring. In addition, if the contractor wishes to discuss construction specifics with the inspector, a separate inspection may be necessary.

D. DEFINITIONS

Anchor side plate: A metal plate or plates used to connect the sill plate or floor framing to the side of a concrete stem wall when problems exist between chemical anchor or expansion bolt installation vertically through the sill plate.

Approved is current product acceptance under an ICC (International Code Council) evaluation report or equivalent.

Chemical anchor: a fastener placed in hardened concrete that derives its holding strength from a chemical adhesive compound placed between the wall of the hole and the embedded portion of the anchor. Chemical anchor compounds are composed of resin and hardener, that form adhesives when blended together. Examples of chemical adhesive compounds include epoxies, polyurethanes, polyesters, methyl methacrylate and vinyl esters.

Embedment depth is the depth of the anchor into the concrete.

Expansion bolt is a mechanical fastener placed in hardened concrete designed to expand in a pre-drilled hole of a specified size and engage the sides of the hole in one or more locations to develop shear and/or tension resistance to applied loads without grip, adhesive or dowel.

Holdown: hardware used to resist overturning and tension forces. Installed in pairs at the opposite ends of structural panel framing, holdowns connect the framing to the concrete foundation. Holdowns require chemical anchoring and are not a replacement for typical foundation anchor bolts. The capacity to resist tension/gap load per holdown must exceed 3000 lbs. Refer to manufacturer for additional requirements and estimation recommendations.

Installation torque is the minimum moment applied to a torque-set anchor that creates the desired anchorage required for full load values.

Mechanical Anchor: A fastener placed in hardened concrete that derives its holding strength by a mechanical interface between the anchor and the walls of the concrete hole without grip, adhesive or dowel. Examples of chemical anchors include expansion bolts and screw anchors.

Minimum concrete edge distance is the measure between the free edge of the concrete and the centerline of the bolts of which the concrete will not break away when the anchor is set or headed in service. For minimum edge distances for anchors refer to manufacturer.

Deflected strand bar (DSB) is a man-locked wood structural panel composed of this rectangular wood strands or fibers arranged in oriented layers and bonded with waterproof adhesive.

Floor wood is a wood-framed wall extending from the top of the foundation to the underside of the lowest floor framing. Also called a single wall or a drop wall.

Scene Anchor: A mechanical fastener with hardened self-drilling, threaded teeth, designed to screw into a pre-drilled hole of a specific size is hardened concrete, achieving shear and/or tension resistance by a threaded interlock between its teeth and the concrete hole without grip, adhesive or dowel.

Space tight in the condition when the full surface of the plate washer is in contact with the wood member and begins to slightly indent the wood surface.

Structural panel in the standard plan refers to a product composed primarily of wood and meeting the requirements of the applicable standard FSI & PS2 per ICC Section 2306.1, including all-veneer plywood and OSB.

Tongue and groove anchor is an expansion bolt whose sleeve or sleeve engages the concrete base material in the drilled hole by the application of torque and where the amount of torque applied controls the degree of anchorage.

E. MATERIALS

Adhesive: The packaging for each adhesive shall be marked with the manufacturer’s name and address, lot number, date of packaging, shelf life or expiration date, name of the quality control agency and instructions for installation. No adhesive shall be used after its expiration date.

Anchor bolts: All anchor bolts shall be galvanized when exposed to weather. The minimum zinc adjusted load capacity for shear in the direction of the anchor bolt must exceed or equal a capacity of 1250 lbs when subjected to 5/8 inch bolts and 840 lbs when subjected to 7/8 inch bolts. Other products with lower capacities may be used if their required spacing is reduced proportionately by the ratio of their strength to the strength requirement above. For example, (400 lbs/640 lbs) x 7/8 in. dia. x 34 in. dia. x 640 lbs. The concrete must be a minimum strength of 3000 psi concrete of the intended edge distance and depth of embedment. All proprietary anchors shall have current ICC or equivalent approval.

Anchor side plates: All anchor side plates shall be galvanized when exposed to weather. The minimum zinc adjusted load capacity for shear in the direction of the anchor bolt must exceed or equal a capacity of 1250 lbs when subjected to 5/8 inch bolts and 840 lbs when subjected to 7/8 inch bolts. Other products with lower capacities may be used if their required spacing is reduced proportionately by the ratio of their strength to the strength requirement above. For example, (400 lbs/640 lbs) x 7/8 in. dia. x 34 in. dia. x 640 lbs. The concrete must be a minimum strength of 3000 psi concrete of the intended edge distance and depth of embedment. All proprietary anchors shall have current ICC or equivalent approval.

Concrete: All new concrete for replacement foundations shall be of 2500 psi minimum compressive strength. No special inspection is required.

Framing clips: All framing clips shall be of minimum 15 gauge galvanized steel and approved under ICC or equivalent for use with concrete framing. The seismic load capacity in the long direction must exceed 450 lbs in dry lumber. The fasteners must be (12) 6d galvanized 1-1/2 inch nails unless otherwise approved. No x 1-1/2 inch lag hi wood screws may be used at existing rim joint, blocking or top plate connections.

Lumber: All new lumber installed for joint blocking shall be of nominal two inch clear fir or better as approved under Western Wood Products Association & Standard lumber for all other framing. All lumber in contact with concrete shall be pressure treated and lubricated and for new wall trim for outdoor applications. All existing lumber shall be free of defects including dry rot, mildew, excessive warping, and insect infestation or damage. Damaged lumber must be replaced and the source of water or insect infestation removed.
SECTION III — GENERAL NOTES (continued)

Plate washers: 3/8 x 2 x 2 square plate washers are required (see IEBC 2006 Table A3-A). Standard circular cut washers shall not be used to secure all plate to concrete stem walls. Washers furnished with the proprietary anchors shall not be used. Beveled washers shall be used on anchors drilled at an angle exceeding 6 degrees from vertical and shall be placed over the plate washers.

Reinforcing bar: ASTM A615 Grade 40 or 60

Structural panels (Steel hedge): All plywood shall be graded under United States Walnut Pro Standard & shall meet IBC 2306. All structural panel sheathing used for wall bracing shall be nominal 1/2 inch (eg. 15/32 inch plywood, 1/32 inch OSB) APA Rated Sheathing, or OSB. Sheathing of 9 ply or better is required. 7/6 inch Oriented Strand Board (OSB) is acceptable provided studies are executed a maximum of 16 inch o.c. or panels are installed within the long dimension across stud.

Structural panel fasteners: Nail shall be 8d common (1.13 inch x 2-1/2 inch) with full heads (288 inch).

F. REPLACEMENT OF EXISTING FOOTINGS & STEM WALLS

1. Deteriorated, cracked or unretained masonry forms may be replaced or be shown on this plan provided proper drainage is provided. The method of drainage and sequence of its construction shall be the responsibility of the person performing the work and shall not weaken the structure as so as to be a threat to the safety of its occupants or passersby nearby.

2. When existing footings and stem walls are replaced in sections, the person performing the work shall take care to ensure that all reinforcing steel shall be lapped a minimum of 24 inches and shall be dowelled into the existing concrete with adhesive or epoxy of a minimum of 8 inches.

3. The repair of damaged footings or stem walls or the continued use of existing building materials such as unretained masonry, requires that plans and calculations be prepared by a licensed architect or engineer.

4. All load-bearing concrete foundations shall have a minimum of 1- 8 horizontal rebars within the top 6" of the wall, maintain a minimum of 1" separation between rebars, and maintain a minimum 3/4" of continuous cement cover.

G. ANCHOR BOLT INSTALLATION

1. General Requirements
   (a) Condition of existing concrete: All concrete shall be fully cured and hardened, not structurally weakened by cracking and in sound condition. Concrete with excessive cracking, deterioration or damage shall be replaced.
   (b) Condition of existing anchor bolts: Existing all plate anchor bolts cast in concrete and in sound condition shall be permitted to provide all or a portion of the sill plate connection required if the anchor bolt diameter and spacing meet or exceed the requirements in the Summary of Minimum Prescriptive Requirements and the sill plate is connected to a snug tight condition under the torque test requirement.
   (c) Drilling of the hole in concrete: The drilled hole diameter and minimums for spacing, depth of hole and edge distance must comply with an ICC Evaluation Report or equivalent approved and manufacturers’ recommendations. All holes shall be drilled with outside-lipped drill bits conforming to ANSI Specification 11-93, 12-77 tolerance (1/2 = 0.500-0.503, 5/8 = 0.650-0.653 inches). Drilling with drill bits with reduced diameters below the ANSI tolerance limits shall not be used. All holes shall be driven perpendicular to the concrete surface.
   (d) Choosing between mechanical or chemical anchors: Mechanical or chemical anchors may be used interchangeably in concrete of average or better quality. Concrete of weaker quality may be indicated by spalling during drilling or setting of expansion bolts or failure of anchors to reach the minimum torque required. Chemical anchors must be used in weaker quality concrete. This requirement does not waive the need to reinforce existing concrete foundations when damaged, deteriorated, or of untestable quality.

2. Requirements for Installing Chemical Anchors
   (a) Cleanliness of the hole: The hole shall be cleaned with a vacuum attachment, hole brush, and/or compressed air. No debris or dust shall remain in the hole.
   (b) Placement of the adhesive: The reuse, filler and hardener shall be thoroughly mixed before placement in the hole under pressure and then placed in the hole. Adhesives dispersed through a static mixing nozzle must be of uniform color. Ensure uniform color by extruding a small amount of adhesive until color uniformity is achieved. Adhesive added to the hole shall be applied at a slow enough rate to prevent the formation of air voids. Adhesives must be installed within the manufacturer’s recommended temperature range for the oil and concrete.
   (c) Placement of the threaded rod: The all thread rod, completely free of rust, scale or oil, shall be installed to the full depth of the hole. The rod shall be turned counter-clockwise for the adhesive to engage the threads. The length of the rod shall extend a minimum of one rod diameter above the nut after tightening.
   (d) Adhesive setting time: No tampering of the anchors shall occur until the adhesive has cured for the recommended time based on the temperature as shown in the manufacturer’s instructions. Cures must be maintained to ensure that the anchor bond is not disturbed until the adhesive has sufficiently cured.
   (e) Torque requirements: A minimum torque setting of 30 ft-lbs for 1/2 inch anchors and 40 ft-lbs for 5/8 inch anchors is required for all chemical anchors for the snug tight condition unless this value exceeds the maximum torque allowed by the manufacturer specifications. In those cases, the torque shall be set to its maximum allowable value.

H. ANCHOR SIDE PLATE INSTALLATION

1. Anchor side plates may be substituted for vertically placed chemical or mechanical anchors only when conditions prevent anchor or bolt installation vertically through the sill plate. This condition commonly occurs when there is no dry well or one of greatly reduced height.

2. A minimum of two anchor side plates must be installed on each piece of sill plate 32 inches or longer. The nearest edge of the plate shall be installed a minimum of 8 inches but not more than 12 inches from the end of the sill plate.

3. Installation of the anchor bolts in the existing concrete shall follow the information in Section C except as noted herein. Care shall be taken to ensure the drilled hole depth does not exceed 2/3s of the stem wall thickness. Cleaning of the hole is required.

4. Lag screws and wood screws used to attach anchor side plates shall be installed as follows:
   (a) The lag or wood screw shall be located at the center of the plate thickness and shall penetrate the sill plate a minimum of 2-1/2 inches.
   (b) Lead holes shall be pre-drilled for the threaded portion of the screw as follows:
      - Lag screw: The pre-drill diameter for the lead hole shall not exceed 70% of the shank diameter and shall be drilled to the full depth of penetration of the lag screw. Use a 3/8 inch diameter drills bit for 3/8 inch lag screws and 5/16 inch drill bit for 1/4 inch lag screws.
      - Clearance holes shall be bored for the solid portion of the shank as follows:
         - Lag screw: The clearance hole shall be equal in diameter and located to the solid portion of the shank.
      - The threaded portion of the lag or wood screw shall be inserted in its lead hole by turning with a wrench and not by driving with a hammer or other blunt object.
   (c) Screws or other fasteners shall be used on the lag or wood screws or in the lead holes for ease of installation and to prevent damage to the lag screw.

5. Wood shims may be required to fill the space between the inside edge of the sill plate and the edge of the concrete stem wall. See manufacturer’s instructions.

I. PONY WALL BRACING, VENTILATION & FRAMING CLIP INSTALLATION

1. The thickness of the structural panels along the foundation shall be at least 49 inches or 2 times the height of the wall, whichever is greater. Bracing is required of all exterior walls. Structural panels installed on individual pony wall sections shall be equally spaced along the wall. Nails shall be 8d common with a minimum shank diameter of .153 inches.

2. Framing members or blocking shall be provided at the edge of all wood structural panels.
### SECTION III – GENERAL NOTES (continued)

3. Panel joints shall occur on the joint of double studs where these studs are nailed with 15d sinker nails at 4 in. o.c.
4. Panel joints shall maintain a 1/8 inch separation between panels for expansion.
5. Panels may be oriented horizontally or vertically.
6. Nails shall be driven flush but shall not fracture the surface of the structural panel sheathing, both edge and field nailing. Where a nail fractures the sheathing it shall be left in place and not counted as part of the required nailing. A new nail shall be driven flush to the surface within 2 inches of the discarded nail.
7. Existing crawl space ventilations must be maintained and not covered by the structural panels used to brace the pony wall.
8. Where obstructions such as crawl space ventilation openings or mechanical utilities cannot be avoided in the panel length, the required panel length shall be increased by the length of the obstruction or a minimum of one stud spacing, whichever is greater.
9. Framing clips shall connect the top plate to a rim joist or to joist blocking, or, in the case without a pony wall, shall connect the sill plate to a rim joist or to joist blocking. They shall be installed with their long dimension horizontal and with all of the nail holes filled with approved nails or wood screws.

<table>
<thead>
<tr>
<th>STRIPS</th>
<th>ANCHOR SIZE AND SPACING E, G, H</th>
<th>SHORT SILL PLATES E, G, H</th>
<th>PONY WALL BRACING (i)</th>
<th>HEAVY TIEL, ROOF OR STUCCO WALLS (v)</th>
</tr>
</thead>
</table>
| **ONE** | 1/2 inch at 6 ft. on center maximum | 3 anchors | 2 anchors | 1 anchor near center | Total bracing not less than 50% of wall length. Install part of bracing at each end of wall section and remainder equally spaced in between ends.
| **TWO** | 1/2 inch at 4 ft. on center maximum or 5/8 inch at 6 ft. on center maximum | 4 anchors for 1/2 in. bolts; 3 anchors for 5/8 in. bolts | 2 anchors | 1 anchor near center | Total bracing not less than 70% of wall length. Install part of bracing at each end of wall section and remainder equally spaced in between ends.
| **THREE** | 5/8 inch at 4 ft. on center maximum or 1/2 inch at 2'-8" on center maximum | 4 anchors | 2 anchors | 1 anchor near center | Install bracing over 80% of the wall length. Install part of bracing at each end of wall section and remainder equally spaced in between ends.

### Notes:

- Letter refers to Section of General Notes, typical.
- If blocking is used between joints in place of continuous rim joist, one framing connection must be installed at each block.
- Based on 2008 IBC Tables A3-3, A3-5, and Figure A3-10.
- Exterior walls with perforated cement plaster and roofing using clay and concrete tile weighing more than 600 lbs.
- See Approved Alternate Details for pony wall bracing not meeting the 2:1 aspect ratio.
Notes:
1. This sketch shows a sample wall section that has undergone a typical seismic strengthening retrofit.
2. This is a general sketch and is not intended to supersede requirements contained in the Standard Earthquake Home Retrofit Plan or in the specific installation details.
3. Ventilation required by code in unvented crawl space situations.

FRONT VIEW (Isometric)

- **Framing Connections**
  See S16 - S19

- **Pony Wall Bracing**
  See S11 - S15

- **Sill Plate Anchor**
  See S9 & S10

- **Foundation Wall**
  See S20 for replacement of damaged section of concrete foundation wall.

S8
1 SILL PLATE ANCHOR DETAILS

- See Section III - General Notes (Sheets S9-S17) for materials, installation, and spacing requirements.
- Expansion bolts shall not be used when installation causes surface cracking of the foundation wall at the location of the bolt.
**SECTION**

Fasten structural panels with 8d common nails at 4"oc at all edges and at 12" oc at intermediate supports (two nails per stud minimum)

Existing concrete foundation stem wall. Anchor bolt not shown.

2-1/2" to 3" dia. vent holes (typ.) centered over sill plate bolt in unheated crawl space areas.

New pony stud nailed to existing with 16d common nails @ 8"oc (3 nails min.) to allow proper edge-nailing for abutting panels (typical for Details 2a, 2b, & 2c).

Note: When pony wall studs are 18" or less in height, only one vent hole is required.

Blocking installed above anchor plate for panel edge nailing. End nailing block using two 16d nails at each end. Nail to sill plate with four 10d nails staggered. (typ.) (Also see Detail 2d).

Sill plate

Typical foundation side anchor installed after panel

Existing concrete foundation stem wall

Joint at abutting shear panels (1/8" minimum gap)

1/2" structural panels

**SILL PLATE SAME WIDTH AS PONY WALL**

**SILL PLATE WIDER THAN PONY WALL OR EMBEDDED IN CONCRETE**

**SECTION**

Fasten structural panels with 8d common nails at 4 oc at all edges and at 12 oc at intermediate supports (two nails per stud minimum).

Sill plate (wider than pony wall framing members or embedded in concrete).

Existing concrete foundation stem wall. Anchor bolt not shown.

2-1/2" to 3" dia. vent holes (typ.) centered over sill plate bolt in unheated crawl space areas.

Install new 2x blocking between pony wall studs. Nail to sill plate with four 10d nails, staggered (typ.).

Bolts may be installed through blocking per the requisits in Detail 1a.

Note: When pony wall studs are 18" or less in height, only one vent hole is required.

Blocking installed above anchor plate for panel edge nailing. End nailing block using two 16d nails at each end. Nail to sill plate with four 10d nails staggered. (typ.) (Also see Detail 2d).

Sill plate

Typical foundation side anchor

Existing concrete foundation stem wall

1/2" structural panels

Install separate pieces of blocking adjacent to sill plate bolt

**FRONT VIEW**

2a

SILL PLATE SAME WIDTH AS PONY WALL

2b

SILL PLATE WIDER THAN PONY WALL OR EMBEDDED IN CONCRETE

**2 PONY WALL BRACING DETAILS**
TYPICAL PONY WALL BRACING NOTES:

1. Structural panels shall be 15/32" or 1/2" CDX, Oriented Strand Board (OSB), or Structural II and shall be installed in accordance with the size, spacing, and hardware specifications in details 2a through 2i and General Notes (Section II, Sheet S5 - S7).

2. Nails: All 8d nails shall be "common" nails with 8d Shank diameter equal to .131 inches with full round heads.

3. Leave screws for ventilation holes at anchors unfastened until the anchors are inspected. No vent holes are required in heated areas, such as finished basements, or exterior panel installations.

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2c. **STRUCTURAL PANEL INSTALLED ON EXTERIOR FACE OF PONY STUDS**

2d. **PANEL CUTOUTS AND NOTCHING**

---

Existing rim joint or new 2x blocking with 8d toe nails at 6"oc to top plate

3/8" minimum edge distance (type)

8d galvanized common nails at 4"oc

New 1/2 inch structural panel

8d galvanized common nails 4"oc all edges and 12"oc at intermediate supports (two nails per stud minimum)

Provide a weather-resistant barrier (15g felt min.) to protect the sheathing. Exterior felt for cement plaster requires two layers of (10 minute min.) grade D paper over the sheathing.

Existing stud wall

Flooring over subfloor

Flooring joint

1/2" floor joint depth

Double top plate

Pony wall stud

Existing concrete foundation stem wall. Anchor bolt not shown.

New pony wall stud nailed to existing with 16d common nails @ 8"oc (3 nails min.) to allow proper edge-nailing for abutting panels (typical for details 2a, 2b, & 2c)

SM plate

Existing concrete foundation stem wall. Anchor bolt not shown.

1/2" structural panels

Joint at abutting shear panels (1/16" minimum gap)

---

Increase structural panel length a distance equal to length of cutout(s) but not less than one stud space.

1-1/4" to 1-1/2" radius on panel edge.

Do not square cut.

Cutout in structural panel for piping, conduit, wiring, vents, etc.

Edge nailing @ 4"oc at all edges of openings

Existing vent

9"-12" from all stud plate ends

New blocking installed between studs to permit proper panel edge nailing at cutouts. Use two 16d nails at each end.
PROBLEM:
No pony wall top plate(s)

SOLUTION:
Framing modifications are necessary to provide the required nailing surfaces for the plywood shear panels and to ensure connections which complete the load path between the pony wall and the floor system.

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PONY WALL BRACING FOR PONY WALLS WITHOUT TOP PLATES
**Problem:**
Available pony wall space for structural panel is not long enough to meet the 2:1 aspect ratio (length:height), required by the standard plan.

In this case, because a window interrupts the pony wall, only 6'-6" is available for structural panel length. Since this pony wall is 4'-0" high, the minimum panel length needed is 8'-0" (Section III, 11). Panel lengths less than 2:1 are subject to failure due to overturning forces.

**Solution:**
Holdown hardware installed at double 2x4 panel edge studs allows structural panels with less than 2:1 aspect ratio to resist overturning forces.

Supplemental Detail 2F explains a prescriptive method for bracing pony wall sections as small as 1:1 and 2:0 - 0:0 in length or greater. Detail 2F requires framing modifications, and closer spacing for anchor bolts, panel edge nailing, and framing clips. This detail affects all areas of upgrade along a given wall line, however, holdowns are only required in the panel sections less than 2:1.

Following detail 2F, the percentage of pony wall to be braced (Section II, Table C), per wall, can be reduced in 2 and 3-story conditions as shown:

- 2-story: 55% (heavy roof or stucco walls) 40% (average weight)
- 3-story: 80% (heavy roof or stucco walls) 65% (average weight)
### Table 3: Pony Wall Bracing Details - Holdown Hardware

<table>
<thead>
<tr>
<th>Storeys</th>
<th>Anchor</th>
<th>Size</th>
<th>Minimum Panel Length</th>
<th>Total Upgrade Per Wall</th>
<th>Panel Edge Nailing</th>
<th>Framing Clips</th>
<th>Joint Blocking</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWO</td>
<td>2 anchors</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1/2&quot; O.C. maximum</td>
<td>Tote bracing not less than 55% of wall length</td>
<td>Install part of bracing at each end of wall and remainders to be equally spaced between ends</td>
</tr>
<tr>
<td></td>
<td>2 anchors</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1/2&quot; O.C. maximum</td>
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<td>THREE</td>
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<td>3</td>
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<td>Tote bracing not less than 55% of wall length</td>
<td>Install part of bracing at each end of wall and remainders to be equally spaced between ends</td>
</tr>
</tbody>
</table>

**Notes:**
- Use 1/2" O.C. maximum length for all panel edges.
- Tote bracing must be installed at each end of wall and remainders to be equally spaced between ends.
- Minimum panel length must be 1/2" O.C. maximum.
- Framing clips must be installed at each end of wall and remainders to be equally spaced between ends.

### Diagram:
- **Framing Clips:** Installed at 12" o.c.
- **Double Top Plates:** Installed at each end of wall and remainders to be equally spaced between ends.
- **Base Plate:** Minimum 1/4" thickness.
- **Existing Concrete Foundation:** Minimum 3" thickness.
- **Holdown Hardware:** Use 1/2" O.C. maximum for all panel edges.

**Standard Earthquake Home Retrofit Plan Set**

**Sheet: S15**

**Revision:** January 2008
3a FLOOR JOIST PERPENDICULAR TO SILL PLATE OR PONY WALL

3b FLOOR JOIST PARALLEL TO SILL PLATE OR PONY WALL
**PROBLEM:**
Lack of blocking above pony wall at cantilevered floor results in no framing elements on which to install framing clips.

**SOLUTION:**
Framing modifications are necessary to provide the required nailing surfaces for the framing clips and to ensure connections that complete the load path between the pony wall and the floor system. (See details on sheet 5-16.)
**METHOD 1**
Solid blocking between joints with 2-1/2" vent hole, toenailing @ both ends of block, & framing clip @ top plate of pony wall.

**METHOD 2**
Continuous 2"x6" member nailed to floor joists with three 16d nails into each joint. Install framing clips @ 16" o.c. - over plywood panels.

**SIDE VIEW**

**CANTILEVER ABOVE SILL PLATE**

Repair detail for cantilevered floor with no blocking above sill plate.
(Install solid blocking between joints - "METHOD 1")

**SIDE VIEW**

**CANTILEVER ABOVE PONY WALL**

Repair detail for cantilevered floor with no blocking above pony wall.
(Install solid blocking between joints - "METHOD 1"
OR install continuous 2x member - "METHOD 2")
Problems:
Inadequate space between rim joist & floor joist results in no room to install framing clips and/or anchors.

Solution:
Framing modifications are necessary to allow access to the rim joist and the mud sill (or the top of the pony wall) to permit the installation of the required framing clips and/or mud sill anchors. Alternate solutions may be approved on a case by case basis.
NOTE:
This detail only applies to the replacement of a SECTION of foundation wall. Partial perimeter foundations or unreinforced masonry foundations shall be evaluated by an engineer or architect.

Existing pony wall construction to remain
New foundation anchor bolts and plate washers per Detail 1a. Locate bolt in middle third of plate width.
Sill plate (1/16 inch maximum oversized hole drilled for bolts)
(1) #4 rebar continuous
See general note F.2 & F.4, typical.
Existing ground level

#4 @ 18"oc vertical, dl. hooks
Stem wall thickness:
6" min. for 1-story
8" min. for 2-story
10" min. for 3-story
(2) #4 rebar continuous
Cold joint (when footing and stem wall poured separately)
(1) #4 continuous required only when stem wall is poured in sections around the perimeter of the structure

REFERENCE: IBC 2006, FIGURE A3-1

SIDE VIEW

CONCRETE FOUNDATION — SECTION REPLACEMENT