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.
### 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.

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

**Additional Home Information**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. What is the overall height of the house?</td>
<td>Yes or NA</td>
<td>No</td>
<td>Uncertain</td>
</tr>
<tr>
<td>9. How many stories are above the foundation?</td>
<td>Yes or NA</td>
<td>No</td>
<td>Uncertain</td>
</tr>
<tr>
<td>10. Is the roof made of standard lightweight roofing materials, such as wood or composition shingles?</td>
<td>Yes or NA</td>
<td>No</td>
<td>Uncertain</td>
</tr>
</tbody>
</table>

**Identify Retrofit Needs for Home**

All "yes" answers indicate no retrofit work is needed. "no" or "uncertain" answers indicate retrofit and/or repair work is needed to improve the resilience of the home to earthquake shaking.

**Anchoring the sill plate**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Are all plates in good condition?</td>
<td>Yes or NA</td>
<td>No</td>
<td>Uncertain</td>
</tr>
<tr>
<td>13. Are all plates anchored (bolted) to the foundation?</td>
<td>Yes or NA</td>
<td>No</td>
<td>Uncertain</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, and at least 3/4&quot; in diameter for use in two story buildings and 1/2&quot; for a three-story building?</td>
<td>Yes or NA</td>
<td>No</td>
<td>Uncertain</td>
</tr>
<tr>
<td>15. Are all anchor bolts located at least 1/2&quot; in diameter for use in two story buildings and 1/2&quot; for a three-story building?</td>
<td>Yes or NA</td>
<td>No</td>
<td>Uncertain</td>
</tr>
<tr>
<td>16. Are all plate anchor bolts connected by metal plates to the plate and at least 12 inches from the ends of each piece of sill plate?</td>
<td>Yes or NA</td>
<td>No</td>
<td>Uncertain</td>
</tr>
</tbody>
</table>

**Connecting the floor framing**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Uncertain</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Do floor joists have continuous rim joists or joist blocking present at bearing location?</td>
<td>Yes or NA</td>
<td>No</td>
<td>Uncertain</td>
</tr>
</tbody>
</table>

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

- Strengthening the pony wall (Answer "NA" if no pony wall)
- Are pony walls double top plates present and in good condition?
- Do structural panels (plywood sheathing) cover the stud walls on either the inside or the outside of the pony wall?
- Does existing pony wall sheathing or a crawl space have sufficient stud cavity ventilation to prevent the growth of fungus within the wall?
- Are the walls around the perimeter of the structural paneling spaced 3 to 6 inches apart?
- Are the walls along the studs in panel field (one panel edge condition) spaced 6 to 14 inches apart?
- Do the panel framing and other framing (not shear walls) extend through the wall opening?

**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

Name and daytime phone number of person who completed the Home Assessment Checklist (PLEASE PRINT)

[Signature]

[Phone Number]
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, note 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 S5 through S19 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 earthquake-induced damage in existing wood frame residential buildings. The requirements in this plan define a minimum recommended standard for the retrofit of these 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 roof 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 3:1 horizontal to 1 vertical.
3. The building is supported at its periphery 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 involved, an additional inspection will be required after all framing 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 conditions prevent chemical anchor or expansion bolt installation vertically through the sill plate.
Approved 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 compound is composed of resin and hardener, that mix when acidic admixture is blended together. Examples of chemical adhesive compounds include epoxy, polyurethane, polyesters, methyl methacrylate and vinyl esters.
Embedment depth: the depth of the anchor into the concrete.
Expansion bolt: 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 glue, adhesive or diaper.
Hold downs: Hardware used to resist overturning and tension forces. Installed in pairs at the opposite ends of structural panel framing, hold downs connect the framing to the concrete foundation. Hold downs require chemical anchoring and are not a replacement for typical foundation anchor bolts. The capacity to resist tension/drift forces per hold down must meet or exceed 3,000 lbs. Refer to manufacturer for additional requirements and installation recommendations.
Installation torque: the minimum moment applied to a torque-set anchor that creates the desired degree of 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 glue, adhesive, or diaper. Examples of mechanical anchors include expansion bolts and screw anchors.

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

Dowel bar detail (DBD) is a mortar-wood structural panel composite of this rectangular wood strands or fibers arranged in oriented layers and bonded with waterproof adhesive.
Pony wall is a wood-framed wall extending from the top of the foundation to the underside of the lowest floor framing. Also called a cripple wall or a knee wall.
Screw Anchor: A mechanical fastener with hardened self-threading, threaded teeth, designed to screw into a pre-drilled hole of a specific size in hardened concrete, achieving shear and/or tension resistance by a threaded interlock between its teeth and the concrete hole without glue, adhesive, or diaper.
Steel stud in the condition where the full surface of the plate washer is in contact with the wood member and begins to slightly indent the wood surface.
Structural panel is the standard plan to refer a product composed primarily of wood and meeting the requirements of the applicable standard PSI & PSZ per ICC Section 350-61, including all-vener plywood and OSB.
Torque-set anchor is an expansion bolt whose wedge 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 specification: The packaging for each adhesive shall be marked with the manufacturer's name and address, lot number of batch or packaging, shelf life and expiration date, name of the quality control agency, and instructions for installation. No adhesive shall be used after its expiration date.
Anchor, including chemical and mechanical: All adhesive or mechanical anchors shall have a minimum nominal load capacity of 576 lbs for 1/2 inch bolts and 900 lbs for 5/8 inch bolts in 2000 psi concrete of the inspected edge distance and depth of embedment. All proprietary anchors shall have current ICC or equivalent approval.
Anchor side plate: All anchor side plates shall be galvanized when exposed to weather. The minimum nominal adjusted load capacity for shear in the direction of the sill plate must meet or exceed a capacity of 250 lbs when substituted for 5/8 inch bolts and 480 lbs when substituted for 1/2 inch bolts. Other bolts with lower adjusted capacities may be used if the required spacing is reduced proportionately by the ratio of the steel to the strength requirement above. For example, (400 lbs/480 lbs) x 72 lbs. As a = 54 lbs. As a = 72 lbs. As a = one-story using an anchor side plate with allowable loads of 400 lbs instead of 480 lbs or greater. Anchor side plates shall be attached to the concrete stem wall with a minimum of two 1/2 inch approved anchors. The number of mechanical or adhesive anchors used must have a total shear capacity in concrete equal to or greater than the value for the foundation anchor requirement above.
Chemical anchor rod materials: All chemical anchors shall use all-thread rod manufactured from ASTM A36 or A578 grade 100 material to meet the mechanical requirements of ASTM A307. All thread rods shall be free of oil, rust and dirt. The use of smooth or partially threaded rods or bolts is prohibited.
Concrete: All new concrete for replacement footings shall be of 2500 psi minimum compressive strength. No special inspection is required.
Frames: All framing clips shall be of minimum 18 gauge galvanized steel and approved under ICC or equivalent for wood frame construction. The incident load capacity in the long direction must meet or exceed 450 kips in dry timber. The fasteners must be (1/2) 8d common x 1 1/2 inch nails unless otherwise approved, (6) 1 1/4 x 1 1/2 inch flat head wood screws may be used at existing rim jamb, blocking or top plate connections.
Lumber: All new lumber installed for joint blocking shall be a minimum of nominal two inch heart #2 or better as graded under Western Wood Products Association rules. All lumber in contact with concrete shall be pressure treated heart for new store walls and for sill plate replacements over 10% of the wall length. Replacement of sill plates less than 10% of the wall length may use the same lumber species as the existing materials. All existing lumber shall be free of defects including 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: 3/16 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 proper anchor shall not be used. Boxed 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 A1015 Grade 40 or 60

Structural panels (Sheathing): All plywood shall be graded under United States Warrany Product Standard & shall meet IBC 2308.1. All structural panel sheathing used for wall bracing shall be nominal 1/2 inch (eg. 15/32 inch plywood, 1/4 inch OSB) APA Rated Sheathing, or CQX. Sheathing of 5-ply or better is required. 7/16 inch Oriented Strand Board (OSB) is acceptable provided studies are spaced a maximum of 16 inch o.c. or panels are installed with the long dimension across the stud.

Structural panel fasteners: Nails shall be 8d common (1.13 inch x 2-1/2 inch) with full heads (281 inch).

F. REPLACEMENT OF EXISTING FOOTINGS & STEMI WALLS

1. Deteriorated, cracked or unrepaird masonry pavers may be replaced as shown on this plan provided proper bonding is provided. The method of bonding and sequence of its construction shall be the responsibility of the person performing the work and shall not weaken the structure 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 tamped a minimum of 24 inches and shall be dowelled into the existing concrete with adhesive or dowps a minimum of 5 inches.

3. The repair of damaged footings or stem walls or the continued use of unheated building materials such as unrepaird 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 1½−4 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 bolt anchor bolts must be 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 quantity meet or exceed the requirements in the Summary of Minimum Prescriptive Requirements and the sill plate is connected to a wall system as per the seismic 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 IBC Evaluation Report or equivalent approved and manufacturer’s recommendations. Holes shall be drilled with outside−tipped drill bits conforming to ANSI Specification BH−12−77 tolerance (1/2 = .500−.520, 5/8 = .650−.665 inches). Wear drill bits with reduced diameters below the ANSI tolerance limits shall not be used. All holes shall be driven as perpendicular as possible 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 lower quality may be indicated by spalling during driving 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 replace existing concrete foundations when damaged, deteriorated, or of unsuitable quality.

2. Requirements for Installing Chemical Anchors

(a) Cleaning of the hole: The hole must 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 resin, filler and hardener shall be thoroughly mixed before placement in the hole while the hole is wet. The mixture shall be of uniform color. Ensure uniform color by excluding 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 curing 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. Care must be taken to ensure that the anchor bore is not disturbed until the adhesive has sufficiently cured.

(e) Torque requirements: A minimum torque setting of 30 ft lbs for 7/16 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 occurs when there is no party wall 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 less. 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. Leg 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 end of the plate thickness and shall penetrate the sill plate a minimum of 2−1/2 inches.

(b) Lead plate 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 platen to the full depth of penetration of the lag screw. Use a 1/4 inch diameter drill bit for 3/8 inch lag screws and 3/8 inch drill bit for 1/4 inch lag screws.

(c) Clearance holes shall also be drilled for the solid portion of the shank as follows: lag screw. The clearance hole shall be equal in length and diameter to the solid portion of the shank.

(d) The threaded portion of the leg or wood screw shall be inserted in its lead hole by turning with a wrench and by not driving with a hammer or other blunt object.

(e) Screw or bolt lubricant 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 length of the structural panels along the foundation shall be at least 49 inches or twice the height of the wall, whichever is greater. Bracing is required on all exterior walls. Structural panels installed on individual party wall sections shall be nearly equally length and nearly equally spaced. The nails shall be 8d common with a minimum shank diameter of 0.131 inches.

2. Framing members or blocking shall be provided at the edge of all wood structural panels.
### Table 1: Summary of Minimum Prescriptive Requirements For Anchoring Frame to Foundation System

<table>
<thead>
<tr>
<th>Stories Above Foundation Wall (a)</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 Tie Rods or Stucco Walls (k)</th>
<th>Framing Clips (l)</th>
<th>Bending (E, D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE</td>
<td>1/2 inch at 6 ft. on center maximum</td>
<td>3 anchors</td>
<td>2 anchors</td>
<td>None</td>
<td>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.</td>
<td>32 in. on center maximum</td>
</tr>
<tr>
<td>TWO</td>
<td>1/2 inch at 4 ft. on center maximum</td>
<td>4 anchors for 1/2 in. bolts, 3 anchors for 5/8 in. bolts, 2 anchors near center</td>
<td>1 anchor near center</td>
<td>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.</td>
<td>24 in. on center maximum</td>
<td>At every joint space above braced pony wall, at alternate joint spaces at other locations</td>
</tr>
<tr>
<td>THREE</td>
<td>5/8 inch at 4 ft. on center maximum</td>
<td>4 anchors</td>
<td>2 anchors</td>
<td>None</td>
<td>Install bracing over 90% of the wall length. Install part of bracing at each end of wall section and remainder equally spaced in between ends.</td>
<td>16 in. on center maximum</td>
</tr>
</tbody>
</table>

(a) Letter refers to Section of General Notes, typical.
(b) If blocking is used between joints in place of continuous tie plate, one framing connection must be installed at each block.
(c) Based on 2008 IBC Tables A3-4, A3-5, and Figure A3-10.
(d) Exterior walls with porous cement plaster and roofing using clay and concrete tile weighing more than 600 lbs. per sq. ft.
(e) See Approved Alternate Details for pony wall bracing not meeting the 2:1 aspect ratio.

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1. Pony wall bracing, ventilation & framing clip installation (continued)
2. Panel joints shall occur on the joint of double studs when these studs are nailed with 15d sinker nails at 4 in. o.c.
3. Panel joints shall maintain a 1/8 inch separation between panels for expansion.
4. Panel joints may be oriented horizontally or vertically.
5. Nails shall be driven flush but shall not fracture the surface of the structural panel sheathing; both edge and field nailing. When 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 discarnated nail.
6. Existing crawl space ventilation must be maintained and not covered by the structural panels used to brace the pony wall.
7. 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.
8. 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 top 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.
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 supersedes 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)

TYPICAL WALL RETROFIT

SIDE VIEW
1. **SILL PLATE ANCHOR DETAILS**

   - **Vertical Anchor Detail (sill plate width = pony wall width):**
     - Sill plate
     - Concrete foundation stem wall
     - Pre-drill sill plate. Bolt embedment in concrete is 4 inches or per manufacturer.

   - **Vertical Anchor Detail (sill plate wider than pony wall):**
     - Sill plate
     - Concrete foundation stem wall

   - See Section III - General Notes (Sheets S5-S7) 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.
24. SILL PLATE SAME WIDTH AS PONY WALL

2b. SILL PLATE WIDER THAN PONY WALL OR EMBEDDED IN CONCRETE

SECTION

- 1/2" structural panels
- Fasten structural panels with 8d common nails at 4" on center at all edges and at 12" on center 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 wall stud nailed to existing with 16d common nails @ 8" o.c. (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-nail block using two 10d nails at each end. Nail to sill plate with four 10d nails staggered. (Typ.) (Also see Detail 2d).

Framing members or embedded in concrete.

SECTION

- 1/2" structural panels
- Fasten structural panels with 8d common nails at 4" on center at all edges and at 12" on center at intermediate supports (two nails per stud minimum).
- Sill plate (wider than pony wall)

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 requirements 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-nail block using two 16d nails at each end. Nail to sill plate with four 10d nails staggered. (Typ.) (Also see Detail 2d).

SILL PLATE WIDER THAN PONY WALL OR EMBEDDED IN CONCRETE

2b. SILL PLATE WIDER THAN PONY WALL OR EMBEDDED IN CONCRETE

- 1/2" structural panels
- Install separate pieces of blocking adjacent to sill plate bolt.

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 21 and General Notes (Section II, Sheet S5 - S7).

2. Nails: All 8d nails shall be "common" nails with 8d Shank diameter equal to 0.331 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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**Front View**

- **Structural Panel Installed On Exterior Face of Pony Studs**
  - New pony wall stud nailed to existing with 16d common nails @ 8"oc (3 nails max.) to allow proper edge-nailing for abutting panels (typical for details 2a, 2b, 2c)
  - SWH plate
  - Existing foundation stem wall. Anchor bolt not shown.
  - 1/2" structural panels
  - Joint at abutting shear panels (1/8" minimum gap)

- **Panel Cutouts and Notching**
  - 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

---

- **SECTION**
  - Existing stud wall
  - Flooring over subfloor
  - Flooring joint
  - 1/2" floor joint depth
  - New 1/2 inch structural panel
  - 8d galvanized common nails at 4"oc
  - Provide a weather-resistant barrier (15g tare min.) to protect the sheathing.
  - Exterior bays for cement plaster requires two layers of (10 minute min.) grade D paper over the sheathing.
**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.

**PONY WALL BRACING FOR PONY WALLS WITHOUT TOP PLATES**
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'-4" 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 ratios to resist overturning forces. Supplemental Detail 2f explains a prescriptive method for bracing pony wall sections as small as 1:1 and 2:0 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 1), per wall, can be reduced in 2 and 3 story conditions as shown:

<table>
<thead>
<tr>
<th>Story</th>
<th>Percentage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-story</td>
<td>55%</td>
<td>(heavy roof or stucco walls)</td>
</tr>
<tr>
<td>3-story</td>
<td>80%</td>
<td>(heavy roof or stucco walls)</td>
</tr>
</tbody>
</table>

3) PONY WALL BRACING DETAILS — HOLDOWN HARDWARE
### 3. Pony Wall Bracing Details - Holdown Hardware

**TABLE 2 FOR DETAIL H**

<table>
<thead>
<tr>
<th>STORES</th>
<th>ANCHOR</th>
<th>MINIMUM PRACTICAL BS LIGHT</th>
<th>MINIMUM PANEL LENGTH</th>
<th>POINT WALL BRACING (b)</th>
<th>TOTAL UPGRADE PER WALL</th>
<th>HEAVY TIE / ROOF OR STUCCO WALLS</th>
<th>AVERAGE CONDITION</th>
<th>EACH PANEL LENGTH LESS THAN 2.1</th>
<th>SIMDANEL LENGTH LESS THAN 4.0</th>
<th>PANEL EDGE NAILING</th>
<th>FRAMING CLIPS</th>
<th>JOINT BLOCKING</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWO</td>
<td>1/2&quot; at 12&quot; O.C. maximum</td>
<td>2 anchors</td>
<td>2 anchors</td>
<td>3 anchors</td>
<td>Tote tracing not less than 50% of wall length</td>
<td>Install part of tracing at each end and one side to be equally spaced between ends</td>
<td>2 hold downs</td>
<td>one at each end</td>
<td>1/2&quot; maximum</td>
<td>All joint spaces</td>
<td>12&quot; O.C. maximum</td>
<td>8d common nail</td>
</tr>
<tr>
<td>THREE</td>
<td>1/2&quot; at 12&quot; O.C. maximum</td>
<td>2 anchors</td>
<td>2 anchors</td>
<td>3 anchors</td>
<td>Tote tracing not less than 50% of wall length</td>
<td>Install part of tracing at each end and one side to be equally spaced between ends</td>
<td>2 hold downs</td>
<td>one at each end</td>
<td>1/2&quot; maximum</td>
<td>8d common nail</td>
<td>12&quot; O.C. maximum</td>
<td>3/4&quot; O.C.</td>
</tr>
</tbody>
</table>

**NOTES**

- Letters in bold heading refer to Section III. General Notes, Typical
- 1/2" Diameter chemical anchor or mechanical anchor with square plate anchors 3/4" x 2" x 2" minimum.
- Provide 1/2" x 3/16" x 1/2" washer bolts with 8d common nails @ 3" o.c. and 1/2" in the field.
- Provide 1/2" x 3/8" x 1/2" mechanical anchors with minimum 2" wall thickness.
- 10d common nails @ 3" o.c. staggered.
- Minimum height of wall at a point is 2'.
- Minimum panel length of a wall is 12'.
- Minimum joint spacing and minimum 4" all joint spaces.
- Holdown capacity is 1/2" minimum spalled for steel to meet or exceed 0.5 kPa.
- Provide 3/8" diameter mechanical anchors with 1/2" in existing concrete foundation and maintain 3/4" edge distance minimum (edge of concrete to edge of bolt). Use holdown load where only required for panels less than 2' in height.
- Provide 8d common nail @ 3" o.c. for holdown load.
- Install holdown load where only required for panels less than 2' in height.

**Diagram**

- Rim Joint
- 1/2" structural panel
- Tote tracing not less than 50% of wall length
- Install part of tracing at each end and one side to be equally spaced between ends
- 2 hold downs
- 1/2" maximum
- All joint spaces
- 12" O.C. maximum
- 8d common nail
- 3/4" O.C.

**Existing Concrete Foundation**

- Existing concrete foundation
- Holdown load
- 2.5" x 2.5" minimum

**Holdown Hardware**

- Holdown load
- 1/2" structural panel
- 1/2" maximum
- All joint spaces
- 12" O.C. maximum
- 8d common nail
- 3/4" O.C.

**Existing Wall**

- Existing wall
- Holdown load
- 1/2" structural panel
- 1/2" maximum
- All joint spaces
- 12" O.C. maximum
- 8d common nail
- 3/4" O.C.
3a. FLOOR JOIST PERPENDICULAR TO SILL PLATE OR PONY WALL

3b. FLOOR JOIST PARALLEL TO SILL PLATE OR PONY WALL

3. FLOOR FRAMING CONNECTION DETAILS
**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 S-16.)
SIDE VIEW

METHOD 1
Solid blocking between joints with 2-1/2" west hole, toenailing @ both ends of block, & framing clip @ mud sill

METHOD 2
Continuous 2"x6" member nailed to floor joints 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")

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")

3c. CANTILEVER ABOVE SILL PLATE

3d. CANTILEVER ABOVE PONY WALL

FLOOR FRAMING CONNECTION DETAILS AT CANTILEVERED FLOORS
Problems:
Inadequate space between rim joint & floor joist results in no room to install framing clips and/or anchors.

Solution:
Framing modifications are necessary to allow access to the rim joint 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.

Inadequate Clearance
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, dt. 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