



Bay Area Retrofit
www.bayarearetrofit.com

510-548-1111

Workers' Comp. 2246
Contractors Lic. #558462
Bond #6334450

D

Howard Cook
737 Page St.
Berkeley, CA 94710

Dear ,

This proposal has three parts. We recommend reading the Contract and Plans, along with Part Three: Understanding Your Retrofit, together to gain the greatest understanding of our proposal. In practice this means put the contract on one side the table, the drawing in the middle, and the estimate on the right. The contract describes what is being installed, the drawing shows where they go, and Understanding Your Retrofit illustrates what they do.

I would be very happy to come back, answer any questions, and explain my approach. I have always found this helpful for clients to understand the protection they will be afforded by their retrofit.

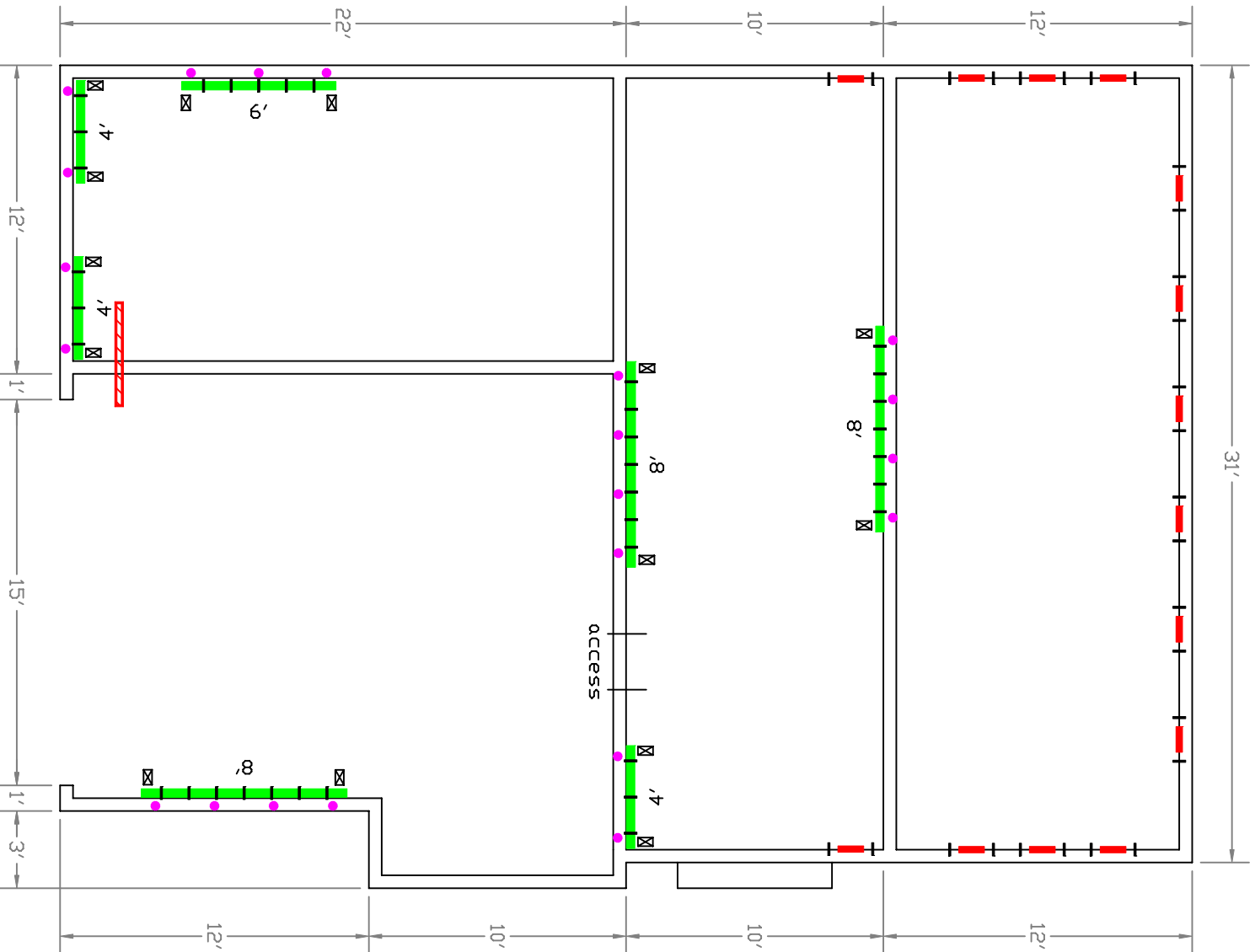
If you have not already done so, I suggest you look at the PBS/NewsHour 8 minute video Dangers of the Hayward Fault, which can be seen on our website home page at bayarearetrofit.com under the credit card icons. This video discusses the geology of the Hayward Fault and has an informative section on retrofitting homes.

If you wish to proceed, please fill out the Terms and Signature page, write in the dollar amount of the contract, sign and date it. You can then mail it to the above address or fax it.

If you have any questions, please do not hesitate to call.

Sincerely,

Howard Cook
Office: 510-548-1111
Fax: 510-704-4408



Design and actual placement of bolts, plywood panels and other hardware may vary depending on existing site conditions.

Legend

- bolt
- foundation anchor
- new plywood shear panel
- - - - - continuity tie
- X hold down
- | shear transfer tie

Mr. and Mrs Doe
 134 Crystal Way
 Berkeley, CA 94708
 510-123-3456

Bay Area Retrofit

Howard Cook, Contractor
 (510) 548-1111

February 1, 2011

Submitted to:

Mr. and Mrs. Doe
1134 Crystal Way
Berkeley, CA 94708
510.123-4567

My examination of your home showed a need for the following modifications:

Bolt House to Foundation Please see the section on bolting found in “Understanding Your Retrofit”

FINDING: **The walls that support the floor are not bolted to the foundation.** The mudsill (the part of the house that rests directly on top of the concrete foundation) needs to be bolted to the foundation. The bolts we use have been tested and approved by the International Building Code for retrofit applications.

RECOMMENDATION: Where shown on the enclosed drawing, bolt the mudsill to the foundation

Install foundation anchors Foundation anchors are discussed in “Understanding Your Retrofit”

RECOMMENDATION: Install foundation anchors where shown on the enclosed drawing. Low clearance between the foundation and the floor prevents the installation of standard bolts because concrete drilling equipment will not fit. Instead foundation anchors, shown on your drawing, will need to be installed in place of bolts.

Some persons recommend “angle irons” which engineering research has shown to be ineffective. Please see a renowned engineer’s analysis of angle irons at [Bayarearetrofit.com/Avoid These/Example 3](http://Bayarearetrofit.com/Avoid%20These/Example%203). I can also send you a more in depth analysis of angle irons if you like.

Install Plywood Installing plywood is discussed in “Understanding Your Retrofit”

FINDING: **The cripple walls have inadequate lateral bracing to prevent collapse.** This hazard can be corrected by bracing these walls with plywood. Our plywood installations follow the guidelines published in the book Shear Walls, An Illustrated Guide”.

RECOMMENDATION: Where shown on the enclosed drawing, install structural grade plywood to prevent collapse of these walls using the guidelines mentioned above, in addition to information found in the American Plywood Association Research Report 154, available on the internet.

Use the Flush Cut Method: The flush cut method is discussed in “Understanding Your Retrofit”.

Attach the plywood to the bolted mudsill with the “Flush Cut” rather than the “Blocking Method” whenever possible. This method is identical to the method used in thousands of tests performed in American Plywood Association laboratories.

Install Shear Transfer Ties to Connect Floor to Mudsill These are discussed in “Understanding Your Retrofit”

FINDING: **The floor of the home can slide off the mudsill.** This can be corrected by attaching the floor to mudsill with steel shear transfer ties. **Note:** *Shear transfer ties are required by all published retrofit guidelines and are an important part of any retrofit.*

RECOMMENDATION: Where shown on the enclosed drawing, install laboratory shear transfer ties. In this way the floor will not slide off the bolted mudsill.

Install Shear Transfer Ties to Connect Floor to Cripple Walls These are discussed in “Understanding Your Retrofit”

FINDING: **The floor of the home can slide off the plywood braced and bolted cripple walls.** This can be corrected by attaching the floor to the walls with steel shear transfer ties. **Note:** *Shear transfer ties are required by all published retrofit guidelines and are an important part of any retrofit.*

RECOMMENDATION: Where shown on the enclosed drawing, install laboratory tested shear transfer ties. In this way the braced walls will be attached to the floor they are supposed to restrain from movement.

Connect Breaks in Upper Top Plate This is discussed in “Understanding Your Retrofit”

FINDING: **The horizontal 2 by 4’s at the top of the floor cripple walls, (known as the top plate) are not joined together.** Instead they are made of several unconnected pieces that are butted together.

RECOMMENDATION: The top plates should be nailed together. This connects the tops of the cripple walls so they work together in transferring earthquake forces from the floor to the shear walls. This is an important part of any retrofit.

Install Hold Downs These are discussed in “Understanding Your Retrofit”

FINDING: **The shear walls need hold-downs to resist overturning (or tipping over) forces at specific shear wall locations.** The lateral forces of an earthquake pushing against the top of a shear wall cause the it to tip over, much as a tall chest of drawers will tilt up and overturn if you try and slide it across the floor by pushing it from the top.

RECOMMENDATION: Where shown on the drawing install hold-downs on shear wall to help keep the wall from tipping over.

The Building Department

We charge \$275.00 for the time it takes to draw plans for the retrofit, submit the plans for review, and meet with the building inspector after the work is completed.

Total Contract Price: \$7,471.00
Plus price of permit paid to city usually between \$300 and \$800

Note: For engineered plans, add \$1,200 to the estimate total and disregard the \$275 charge mentioned above. A separate agreement between you and the engineer will be required.

Our Professional Affiliations

Author: “*Seismic Retrofit for Cripple Walls*”, The Journal of Light Construction.
15 April, 2006

Featured Contractor: “*The Coming Bay Area Earthquake*”_The NewsHour with
Jim Lehrer, April, 2006

Featured Contractor: “*The Hayward Fault. Predictable Peril.*” KQED, Channel 9.
October 2008

Co-Author: Bay Area’s Retrofit Guidelines: Standard Plan A, Residential Seismic
Strengthening Plan, San Francisco Bay Area: The International Code Council,
2005.

Lecturers on Retrofit Principles and Practice for the American Society of Home
Inspectors

Course Instructors: “*Principles and Practice of Earthquake Retrofitting*” for the
Association of Bay Area Governments

Contributors: Wood-Framed Shear Wall Construction: An Illustrated Guide.
Matteson, Thor, Structural Engineer. Illinois: The International Code Council,
2010.

Mayoral Appointee to the Berkeley Disaster Commission 2005 and 2006 as an
advisor on Berkeley’s Earthquake Retrofit programs.

Five time graduate of the course “Earthquake Retrofit for Wood-Frame Homes”
presented by the Association of Bay Area Governments, starting with the first
course in 1995.

Part Two

Understanding Your Retrofit

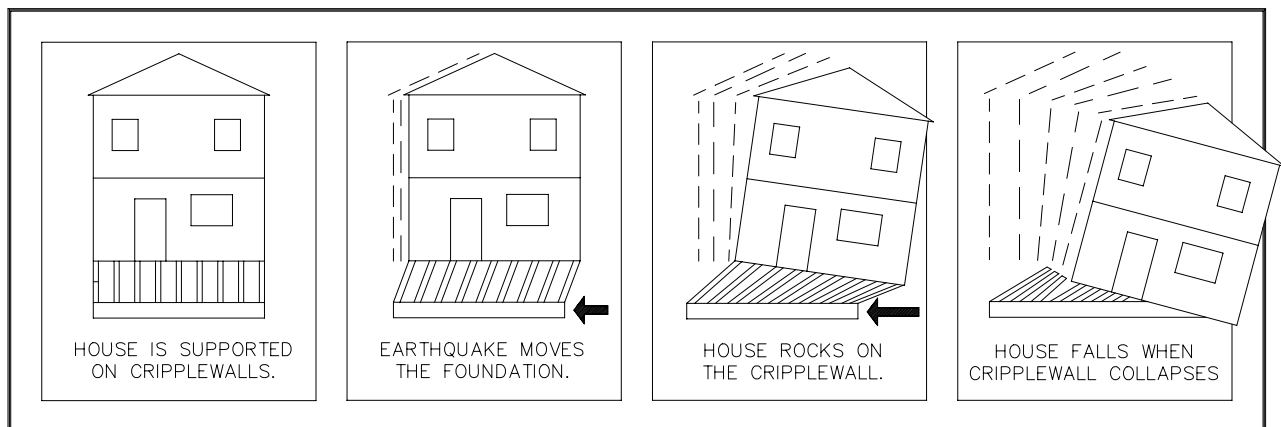
These few pages are intended to help you understand what we plan to do when we retrofit your home. Please refer to these pages while reviewing your drawing and proposal. Each bold underlined title in your contract corresponds to the same bold title below here. We have also put together two pages of background information in the next two pages we would like for you to read.



Your home has a structural weakness called a cripple wall. This is a wall between the foundation and your floor.



A typical cripple wall seen from the outside
Photo courtesy Summerfield Inspections, Berkeley



A cripple wall will collapse during a large earthquake if it is not retrofitted with a shear wall.



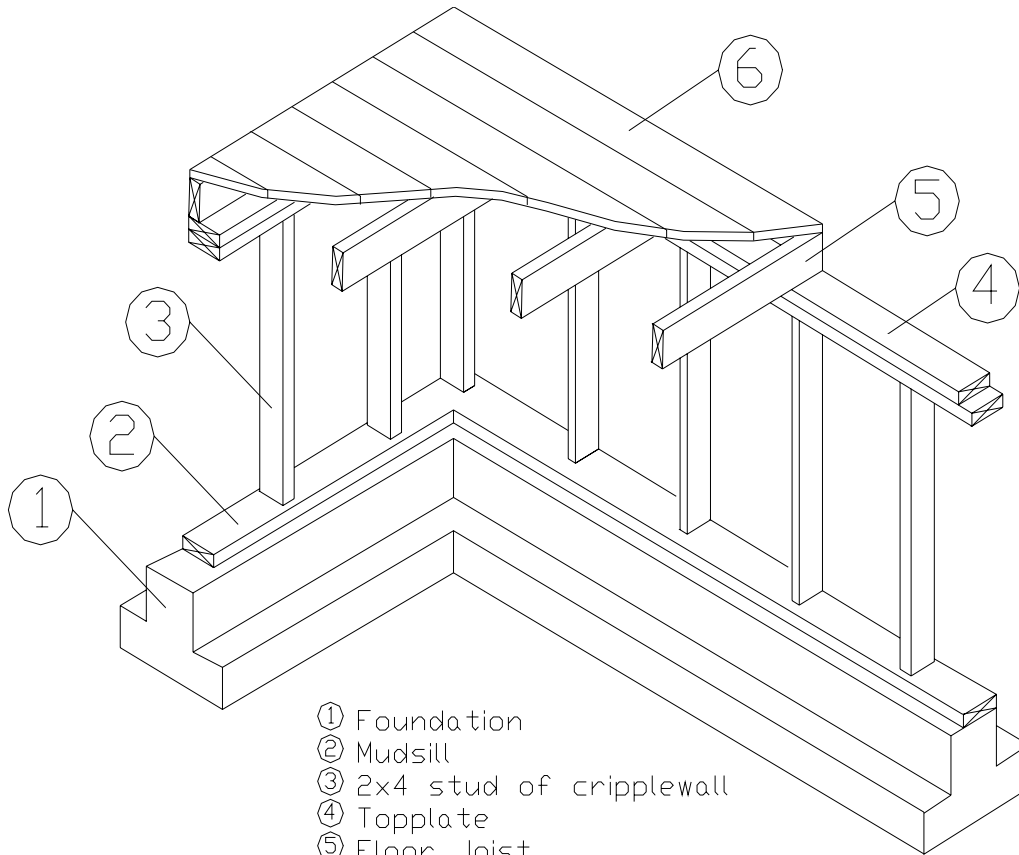
Example 1: Cripple wall failure; notice the location of the steps relative to the floor.



Example 2: Cripple wall failure where the floor shifted to the right..

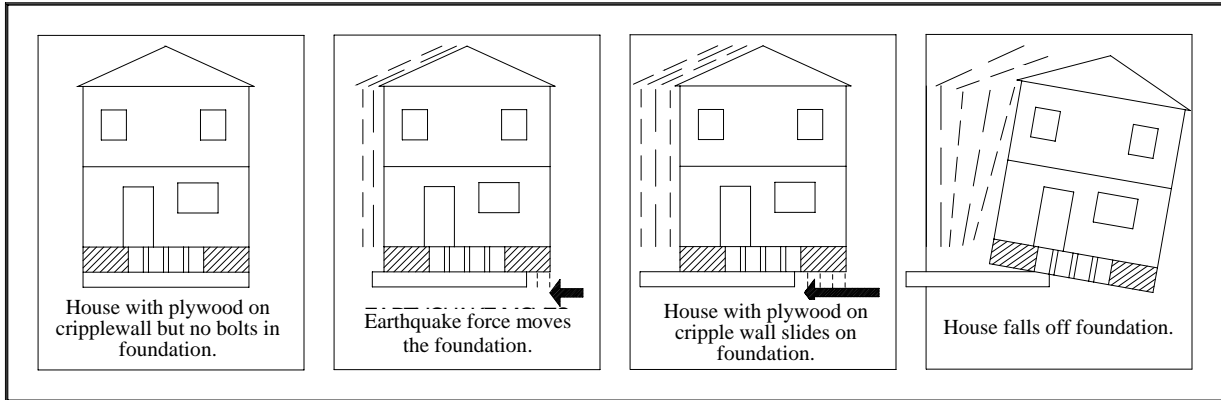
The house on the left has fallen from its foundation but is otherwise intact. This small house in Ferndale California cost over \$150,000 to repair and was unlivable for six months. This damage would have been avoided if it had been retrofitted.

Glossary of useful terms

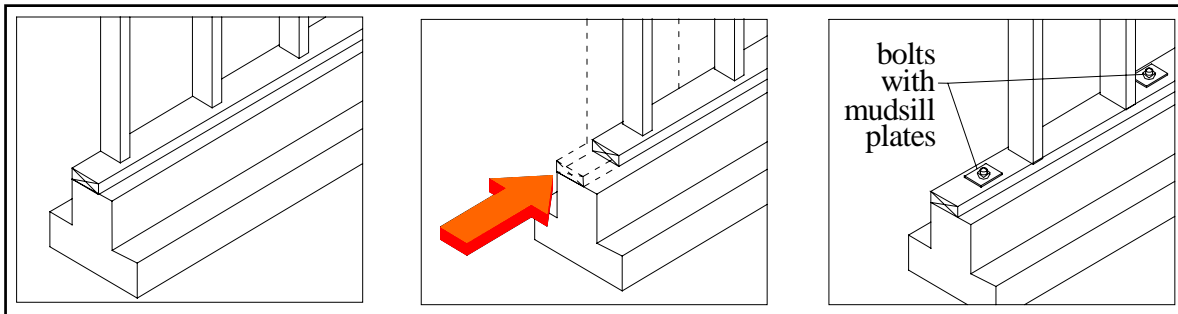


- ① Foundation
- ② Mudsill
- ③ 2x4 stud of cripplewall
- ④ Topplate
- ⑤ Floor Joist
- ⑥ Floor you walk on

Bolt House to Foundation



This is what happens when a house is not bolted to the foundation.



The arrow represents the earthquake force moving the bottom of the cripple wall. The third frame shows the bolts that prevent this movement.

Structural engineers in Southern California discovered that bolts bent in earthquakes and that this split the mudsill. These same engineers discovered that plate washers as shown below prevent this from happening.



Bolt with plate washer



Bolt with plate washer passing through mudsill and into foundation.

Install Mudsill Plates



These engineers also discovered that mudsills often split because when the earthquake force pushed on the mudsill against the bolt, the wood was much softer than the bolt or the concrete. They developed a special type of washer called a mudsill plate that not only helps with spitting, but also increases bolt strength by 59% to 200%. Bay Area Retrofit is the only company that uses these special washers.



Mudsill Plate

Install Foundation Anchors

Sometimes there is no room to install a bolt because the distance from the mudsill to the floor you walk on is too short for a concrete drill. In these cases a foundation anchor is bolted to the side of the concrete and the side of the mudsill.

Foundation anchors, as shown in the photo below, are used to attach the mudsill to the concrete foundation. They are stronger than a standard bolt.

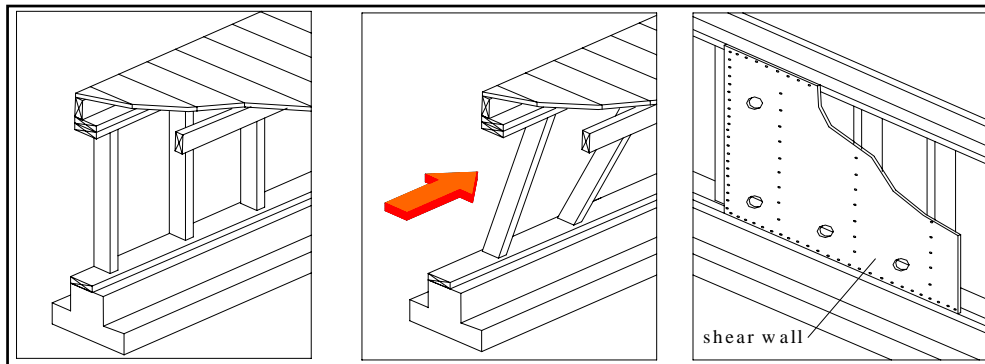


Mudsill

Concrete

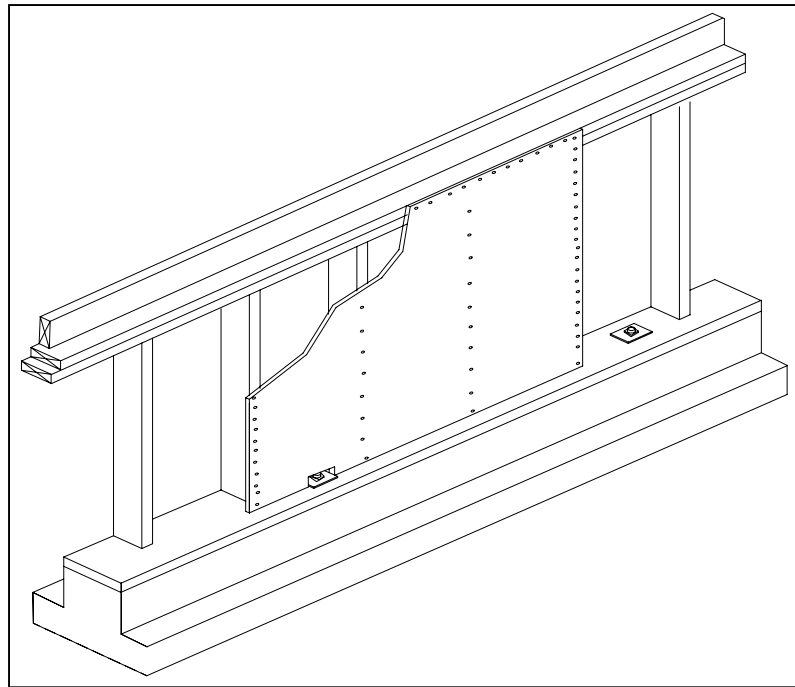
Foundation Anchor

Install Plywood

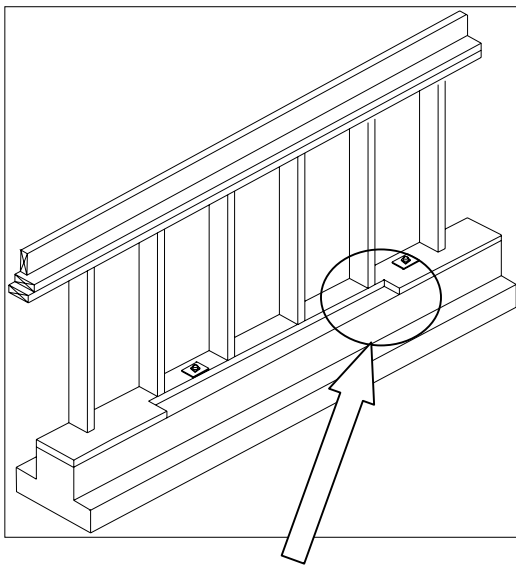


The red arrow in the center drawing shows how earthquake forces push on the cripple wall, causing it to collapse. The last drawing shows how we install plywood to prevent it from collapsing. Even though this drawing makes plywood installation look very simple, entire manuals and even books have been written on this subject

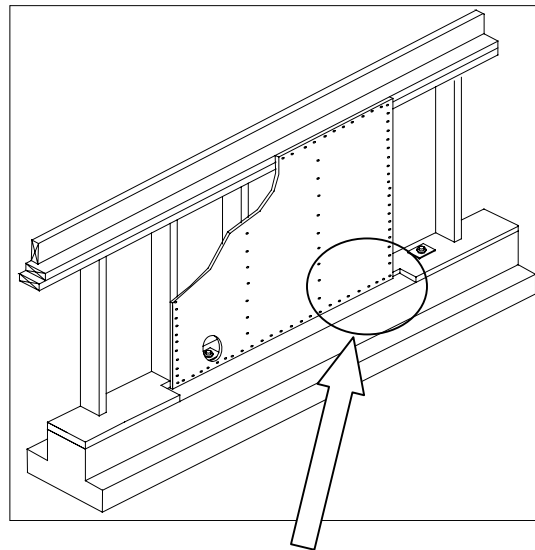
Use the flush cut method



Your home is built with mudsills that are 6 inches wide supporting 4 inch wide two by fours. As shown above, unless a modification is made, the plywood will sit on top of the mudsill where it will not be connected to the bolts. One method is the flush cut method. This is the method Bay Area Retrofit uses and is the only company in the Bay Area that does so

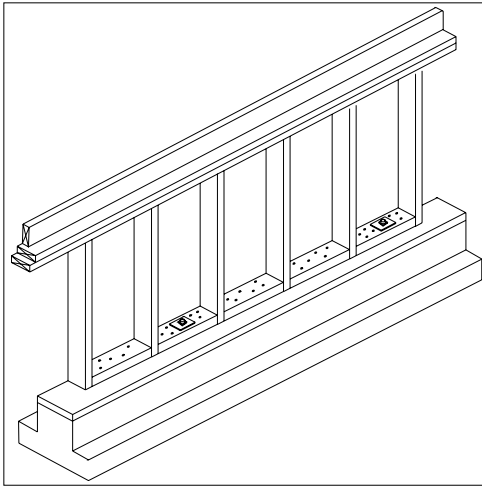


Mudsill is cut flush with the 2 by 4s

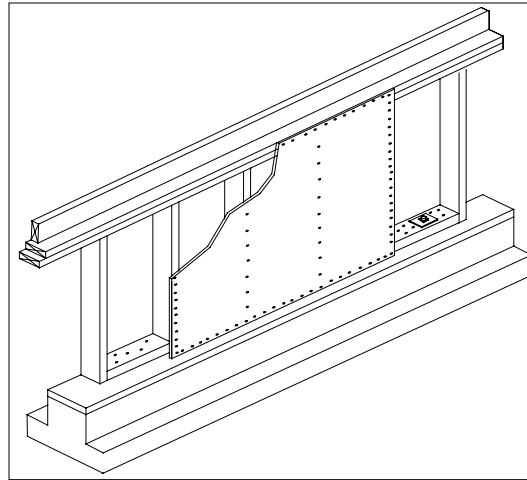


Plywood is nailed to the bolted mudsill.

Another method is to install wooden blocks between the 2 by 4s and then nail the plywood to the blocks.



Blocks nailed between 2 by 4s



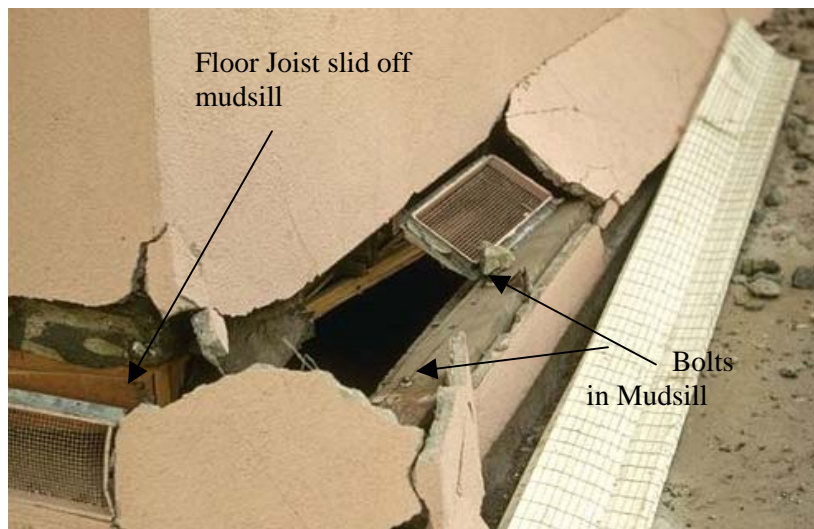
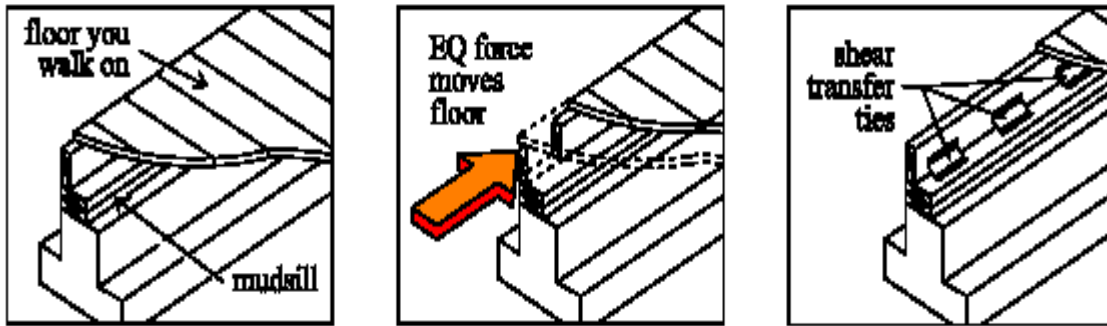
Plywood nailed to the blocks

This method often splits the blocks.



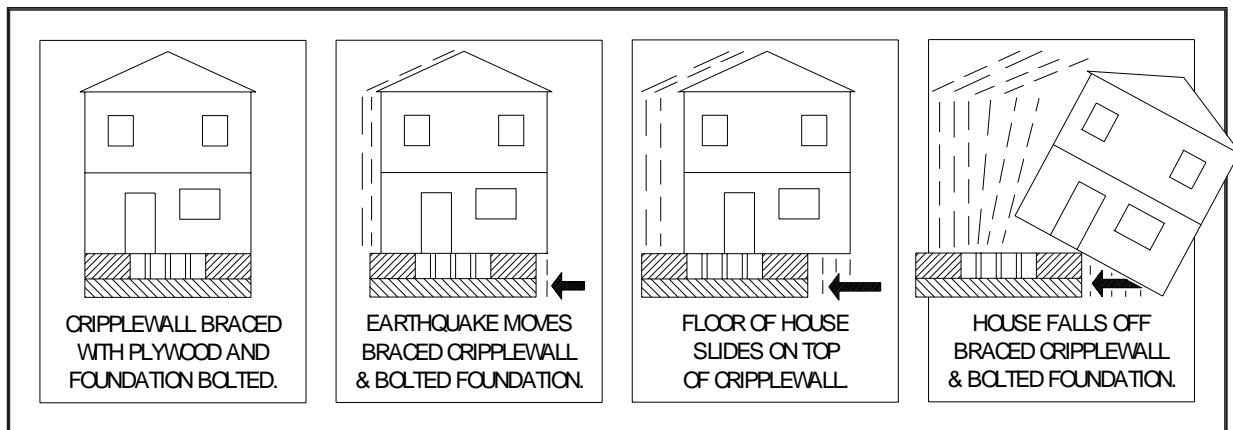
We never use nailed wood blocks. This method has only been tested once and was found to produce shear walls that are half as strong as shear walls built using the flush cut method.

Install Shear Transfer Ties to Connect Floor to Mudsill



A house without a cripple wall and no shear transfer ties.

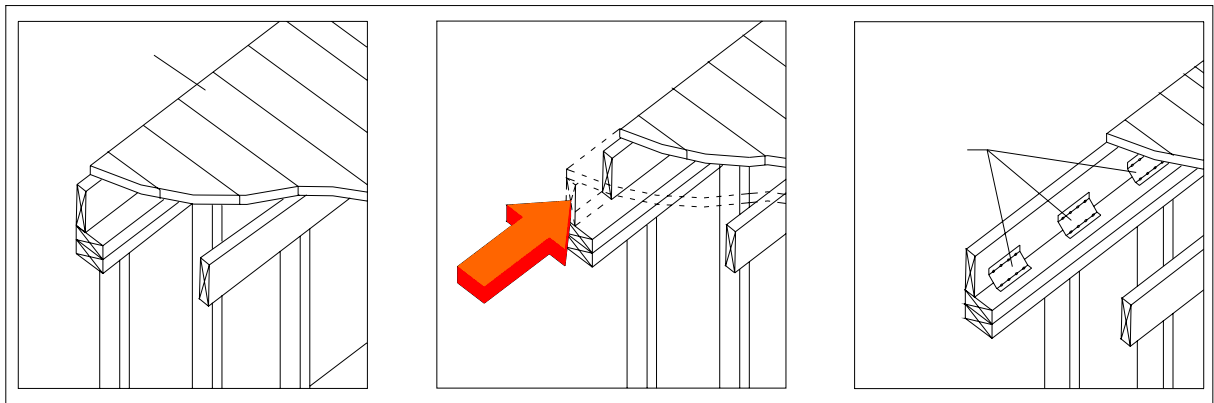
Install Shear Transfer Ties to Connect Floor Joists to Cripple Wall.



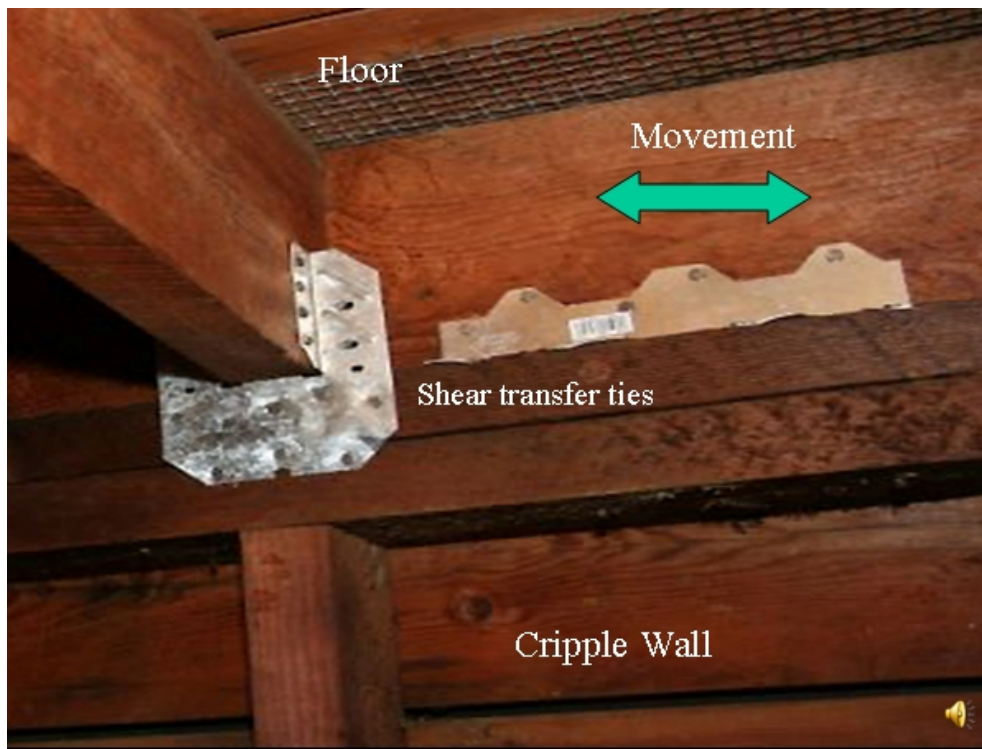
Floor you
walk on

Earthquake Force

Shear Transfer Ties

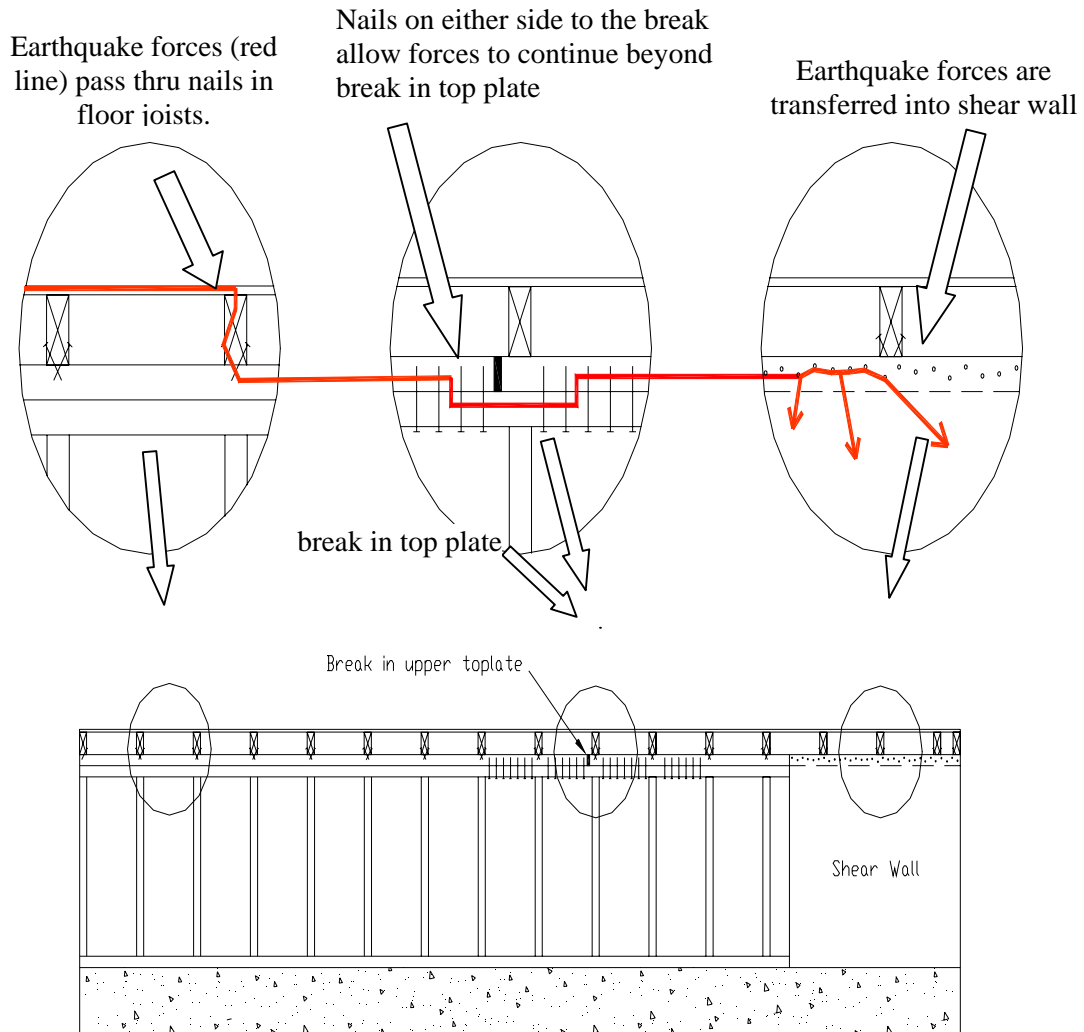


Shear Transfer Ties are a special type of hardware designed to prevent the floor framing from moving on top of the cripple walls.



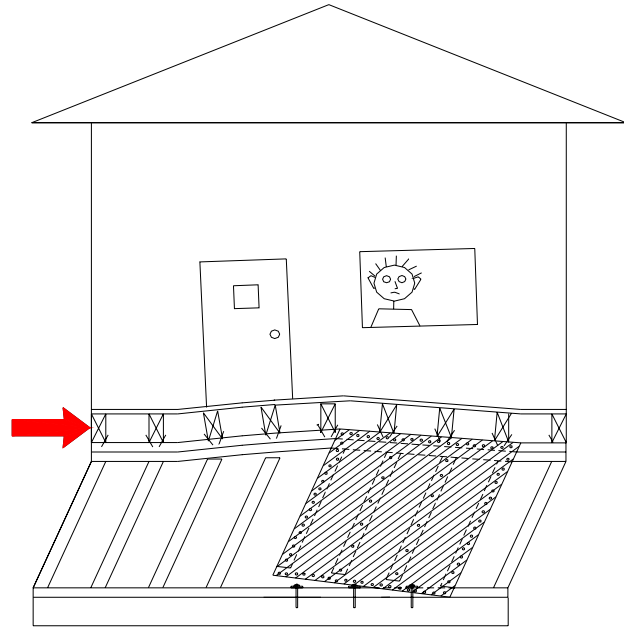
Connecting Breaks in Upper Top Plate

It is important to make sure any breaks in the top plate are spliced together. In this way earthquake forces traveling through the top plate are transferred to the shear walls. In the following illustrations, the red line represents earthquake forces moving along the top of the wall, into the top plate and down into the shear wall.



Install Hold Downs

A shear wall can tip over when an earthquake force shown by the red arrow pushes on the floor. This is especially true for tall shear walls. Hold downs prevent this from happening.



The narrow tall shear walls on this house tipped over.

Does Retrofitting Really Work?



An architect owned two identical Santa Cruz homes. In 1989 he retrofitted one of them. Before retrofitting the other one, the 7.1 Loma Prieta earthquake struck. The retrofitted one cost \$5,000 to repair. The other one cost \$260,000 to repair because the cripple walls collapsed.