

Today

Submitted to:

John Doe

Dear Mr. Doe,

We are honored you have considered us to protect your family and your greatest investment. We take this very seriously and will do the best job we possibly can. You are in good hands.

We were able to design your retrofit to resist 20,880 lbs of earthquake force while the anticipated earthquake force is 9,473 lbs. In other words, we have been able to provide you with twice as much earthquake resistance than you should need. We do this because we want you to be 100% safe and frankly don't want to get a call from you after the earthquake saying you wish we had done more.

If you wonder whether or not you should get a building permit this article from the [New York Times](#) may help you make an informed decision.

It is intended that you print this proposal and follow the links to our website or you can just read it as is. It just depends on how much detail you want.

If you happen to print it and want to follow the thread to the relevant webpages follow this example: www.Bayarearetrofit.com → Proposals → [Cripple Wall Retrofits](#)



Jason McDonauld
Field Supervisor
Office-510-548-1111



Founder/Owner Bay Area Retrofit
Office-510-548-1111
Cell-510-418-1676

Retrofitting Homes for 25 Years and Still Counting



BACKGROUND INFORMATION FOR YOUR EARTHQUAKE (SEISMIC) RETROFIT

Your retrofit consists of two types: a cripple wall retrofit and a no cripple wall retrofit. This proposal is therefore broken into two sections.

The type of hardware and retrofit methods required differ from house to house. What you see here may not be exactly what we do for your home. I personally train our technicians in seismic engineering principles so they know what to do no matter what they find.

SECTION 1: THE CRIPPLE WALL PORTION OF YOUR RETROFIT:

General Principles

www.Bayarearetrofit.com → Proposals → Cripple Wall Retrofits → Cripple Wall Retrofits - Video

This webpage describes almost everything you need to know about a cripple wall retrofit.

The type of hardware and retrofit techniques we use vary considerably from house to house and what you see here may not be exactly what we do. We train our technician's carefully in seismic engineering and they know what to do no matter what they find.

Foundation Bolts

www.Bayarearetrofit.com → [Proposals](#) → [Cripple Wall Retrofits](#) → [Foundation Bolts](#) → [What they do and how they do it.](#)

We must bolt the mudsill (piece of wood sitting directly on top of the foundation) to the foundation. We bolt the mudsill to the foundation at shear wall locations with laboratory tested foundation bolts. We only install bolts [at shear wall locations.](#)

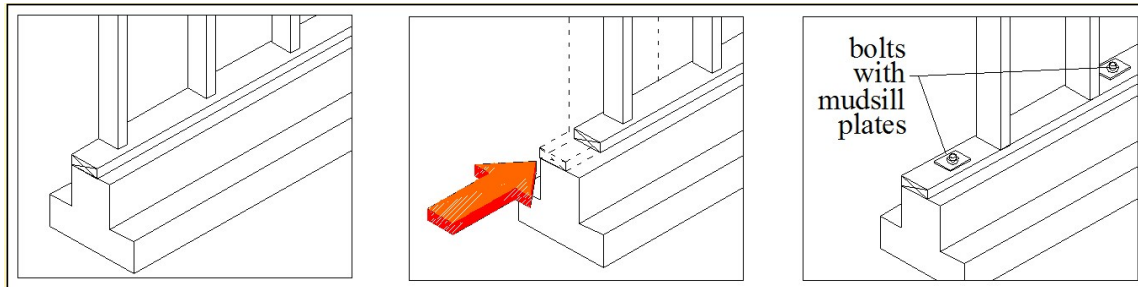


Diagram: Bolts prevent the bottom of the cripple wall from sliding off the mudsill.

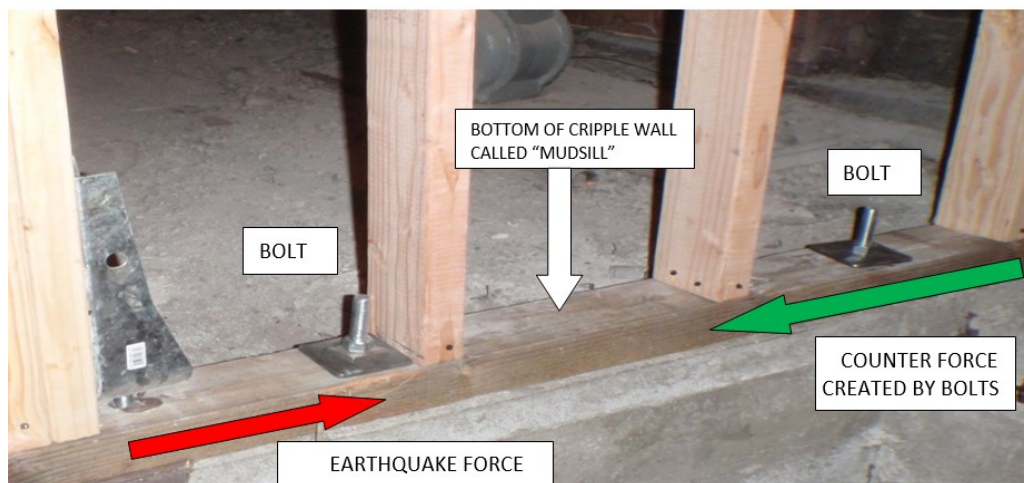


Photo: Cripple wall resists movement because of bolt counterforce.

Mudsill Plates

www.Bayarearetrofit.com → [Proposals](#) → [Cripple Wall Retrofits](#) → [Foundation Bolts](#) → [Mudsill Plates](#)

To my knowledge, you are the only company in the San Francisco Bay area who uses this highly specialized type of hardware. Tests have shown Mudsill Plates can increase the strength of a bolt by 59%. Your retrofit includes installation mudsill plates on all new bolts.



Photo: Teeth on mudsill plate prevent mudsill from splitting.

Plate Washers

www.Bayarearetrofit.com → [Proposals](#) → [Cripple Wall Retrofits](#) → [Foundation Bolts](#) → [Plate Washers](#)

Plate washers prevent damage called “cross-grain bending.” We install plate washers on all new bolts.

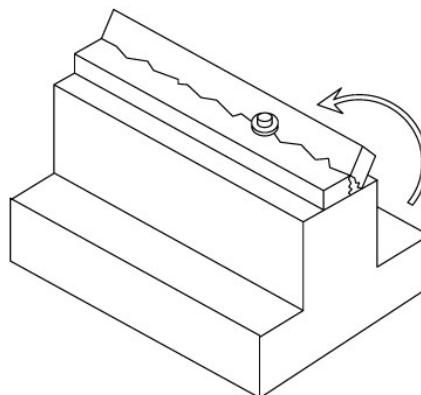


Figure: Cross-grain bending (splitting). Wood has practically no ability to resist cross grain bending.



Photo: Cross-grain bending damage to mudsill in a testing laboratory.



Photo: A square washer absorbs movement (converting it into an upward pull on the plate) and acts to prevent splitting of the mudsill.

Sheetrock removal

www.Bayarearetrofit.com → Proposals → Cripple Wall Retrofits → [Sheetrock Removal](#)

In order to access the wall framing and foundation we will need to remove plaster/sheetrock at certain locations. This may require removal of lead-based paint. The Environmental Protection Agency has certified us to safely remove lead-based paint.

We will remove plaster or sheetrock as required and replace with plywood shear wall(s). When we are done, you will see bare plywood at the new shear wall location(s). In my own house I taped, textured, and painted the plywood just like sheet rock. The only difference being that I could hang up a picture anywhere on the wall!



Photos: Before

During

After

The building department will require the new shear walls be covered with fire-resistant sheetrock and fire taped, but not painted, in the *GARAGE ONLY*. If applicable, this is included in our proposal.

Install Plywood Shear Walls to Prevent Cripple Wall Collapse

As part of a retrofit, we must address the potential of cripple wall collapse when an earthquake strikes. The diagrams below show what happens when a cripple wall collapses:

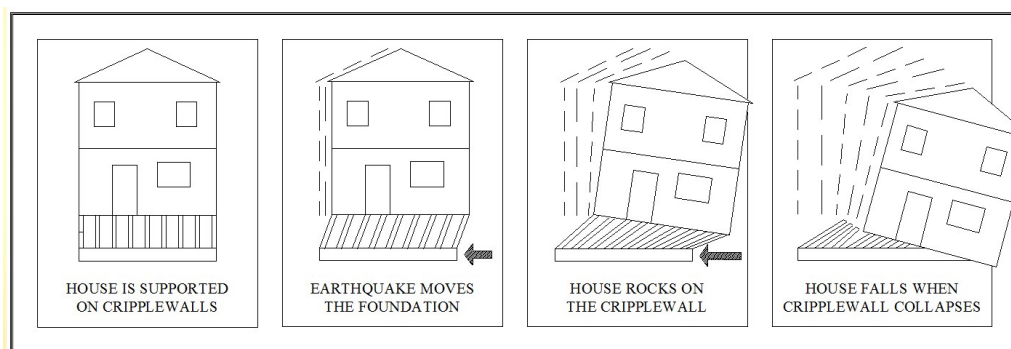
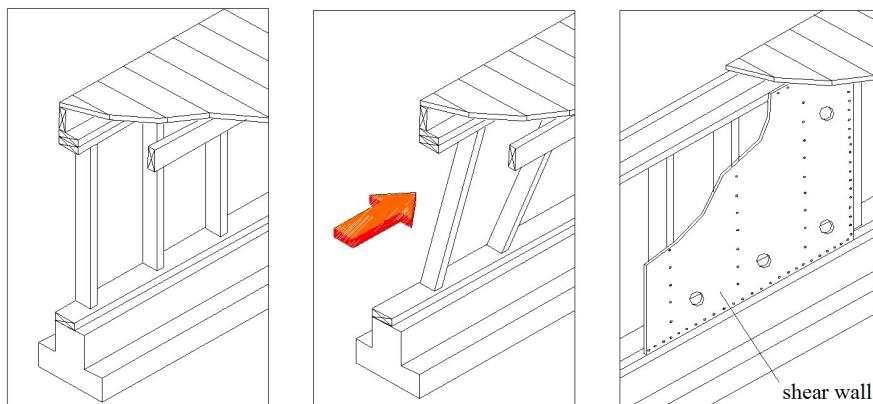


Diagram: Cripple wall collapse.

Plywood designed to prevent this from happening will be you used in your retrofit. [This webpage](#) explains what scientists have discovered about making the strongest plywood shear panels possible.



Movement prevented by plywood shear panels.

Diagram: The plywood braces the cripple wall and prevents collapse. .

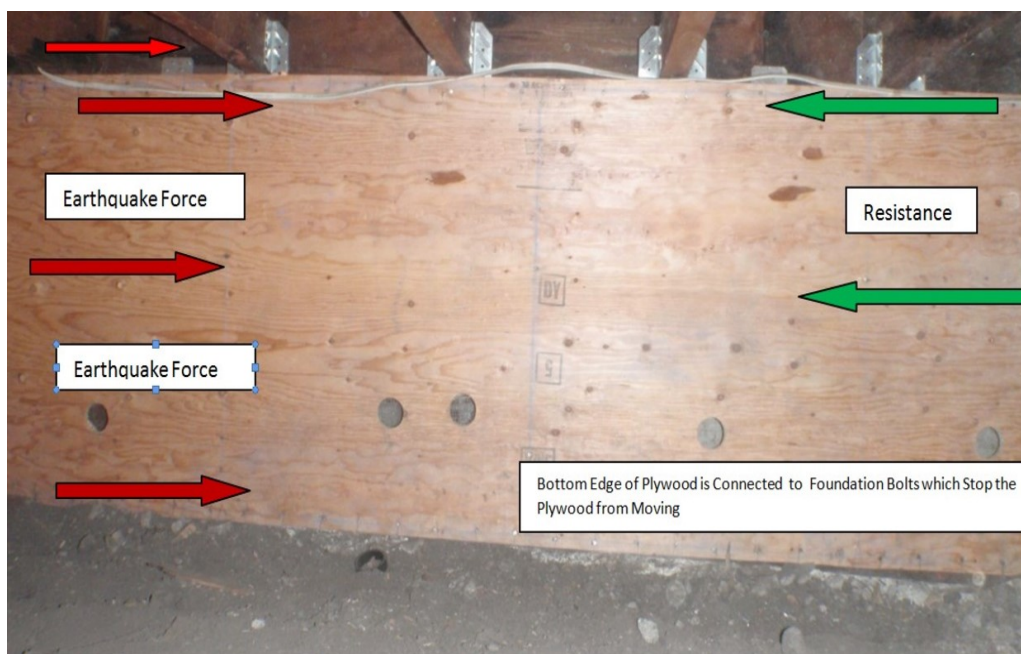


Photo: Bolts at base of plywood resist earthquake force.

The Most Vital Cripple Wall Connection

www.Bayarearetrofit.com → Proposals → Cripple Wall Retrofits → [The most Vital Cripple Wall Connection](#)

To my knowledge, we are the only company in the San Francisco Bay Area that uses the Flush Cut method.



***Photo:** Comparison between old-growth redwood and modern tree farm*

We nail the plywood into this very strong old growth redwood with closely spaced growth rings. Closely spaced growth rings are better able to hold the nails in place, which improves plywood performance. The nail-blocking method, which we avoid whenever possible, uses low quality tree-farm wood with widely spaced growth rings

Making the Strongest Plywood Connection Possible

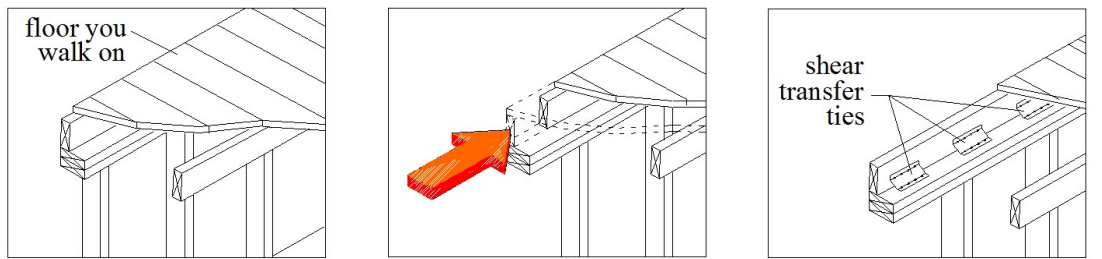
www.Bayarearetrofit.com → Proposals → Cripple Wall Retrofits → [Making the Strongest Plywood Connection Possible](#)

The combination of plywood grade, thickness, nail size and nail spacing determine how strong the plywood shear wall will be. We make sure the plywood on your house uses the optimal combination of these factors.

Shear Transfer Ties

www.Bayarearetrofit.com → [Proposals](#) → [Cripple Wall Retrofits](#) → [Cripple Wall Retrofits - VIDEO](#) (Forward to minute 3:45 of the video)

In order to complete the cripple-wall-to-shear-wall conversion process, we will connect the bolted and plywooded cripple walls to the floor with steel known as shear transfer ties. We install laboratory tested shear transfer ties.



Movement prevented by shear transfer ties.

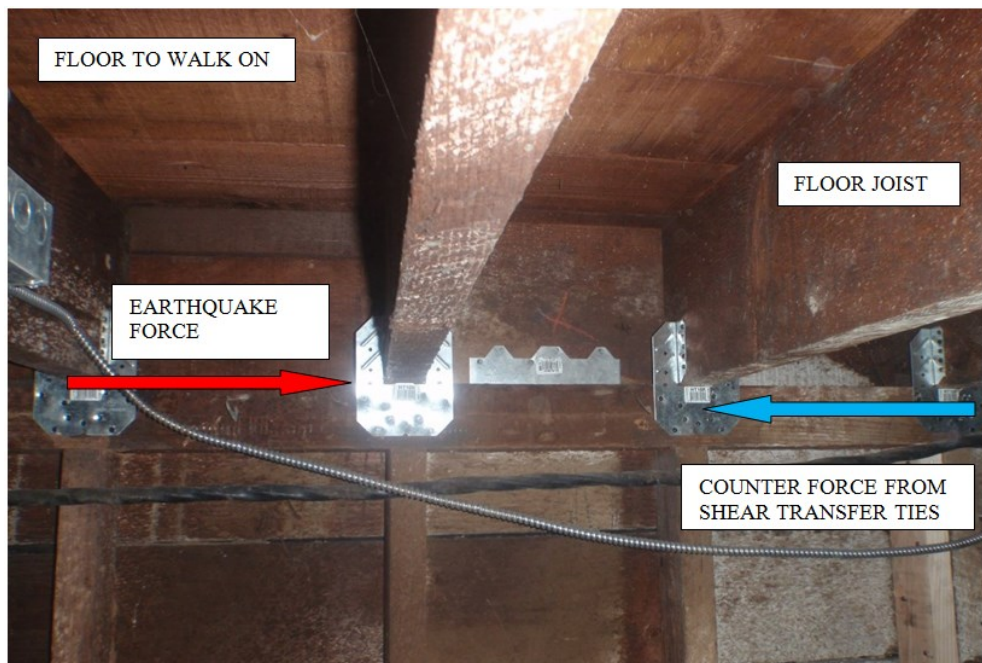


Photo: Two of the many shear transfer ties we use.

Short Cripple Walls

www.Bayarearetrofit.com → [Proposals](#) → [Cripple Wall Retrofits](#) → [Short Cripple Walls](#)

If the vertical distance between the foundation and the floor prevents installation of standard bolts on cripple walls, we will install foundation anchors as bolt substitutes.

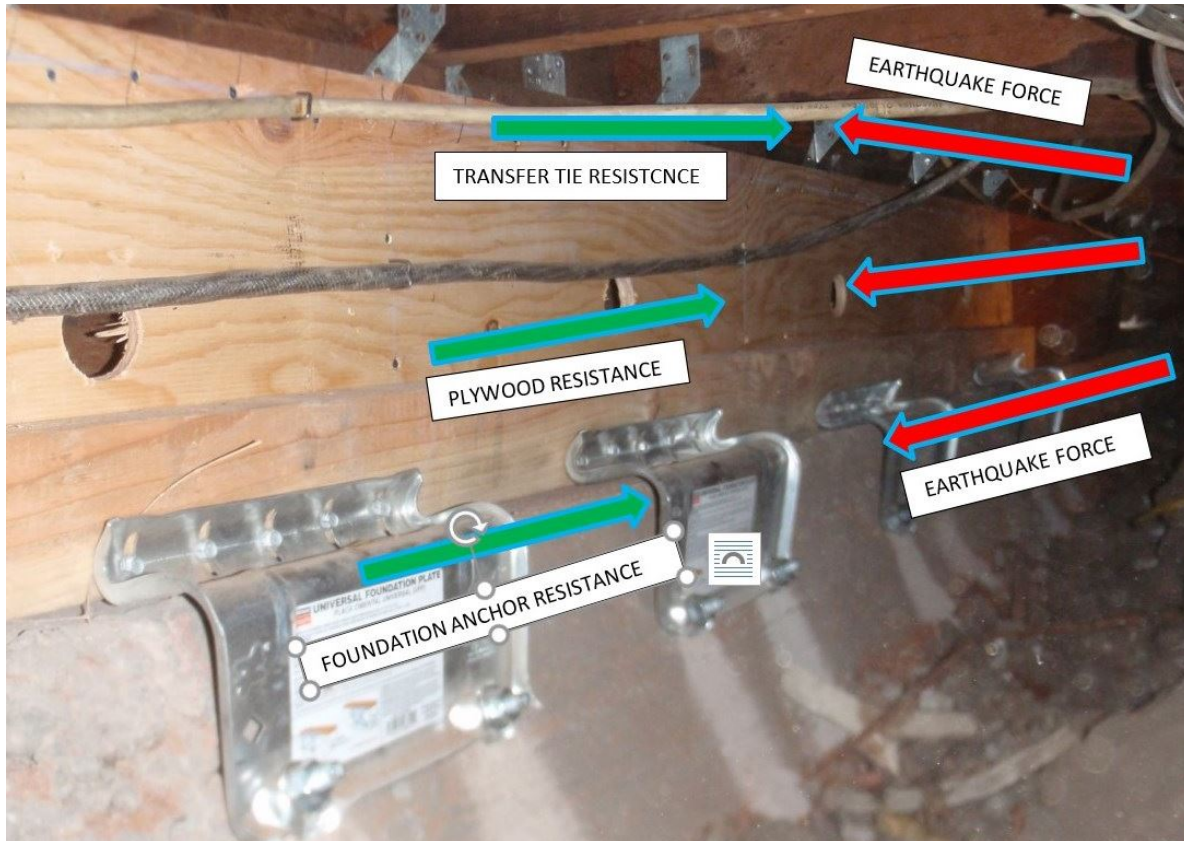


Photo: Shear wall bolted to the foundation with foundation anchors when there is not enough room to drill down vertically for a standard bolt.

Hold Downs

www.Bayarearetrofit.com → [Proposals](#) → [Cripple Wall Retrofits](#) → [Hold Downs](#)

Tall and narrow shear walls need hold downs to resist overturning (tipping over). Lateral forces pushing against the top of a shear wall can cause it to tip over, in the same way a tall chest of drawers will tip over if you try to slide it across the floor by pushing it from the top. If the shear wall tips over, the plywood tears and the shear wall is no longer effective. We will install hold-downs on shear walls to resist overturning, as shown on the drawing below.

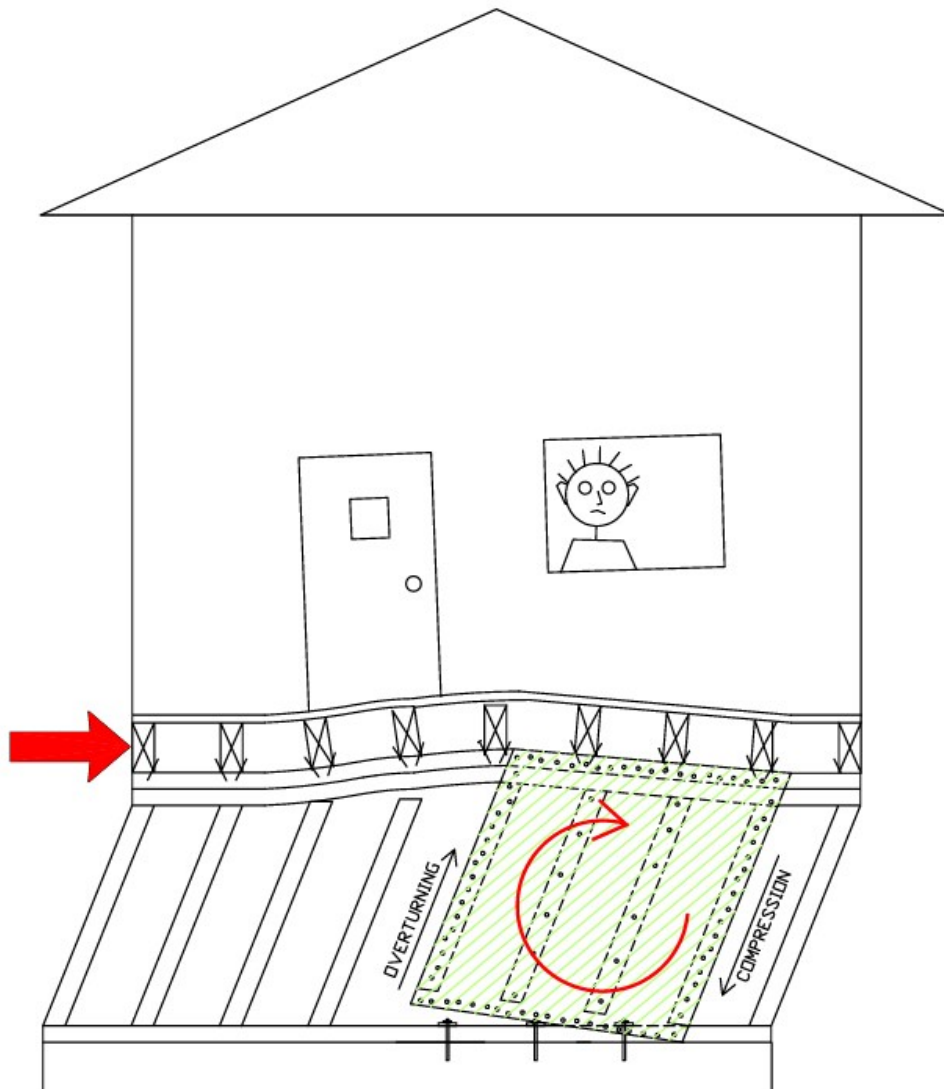


Diagram: Earthquake force is overturning the shear wall tearing the plywood at base.

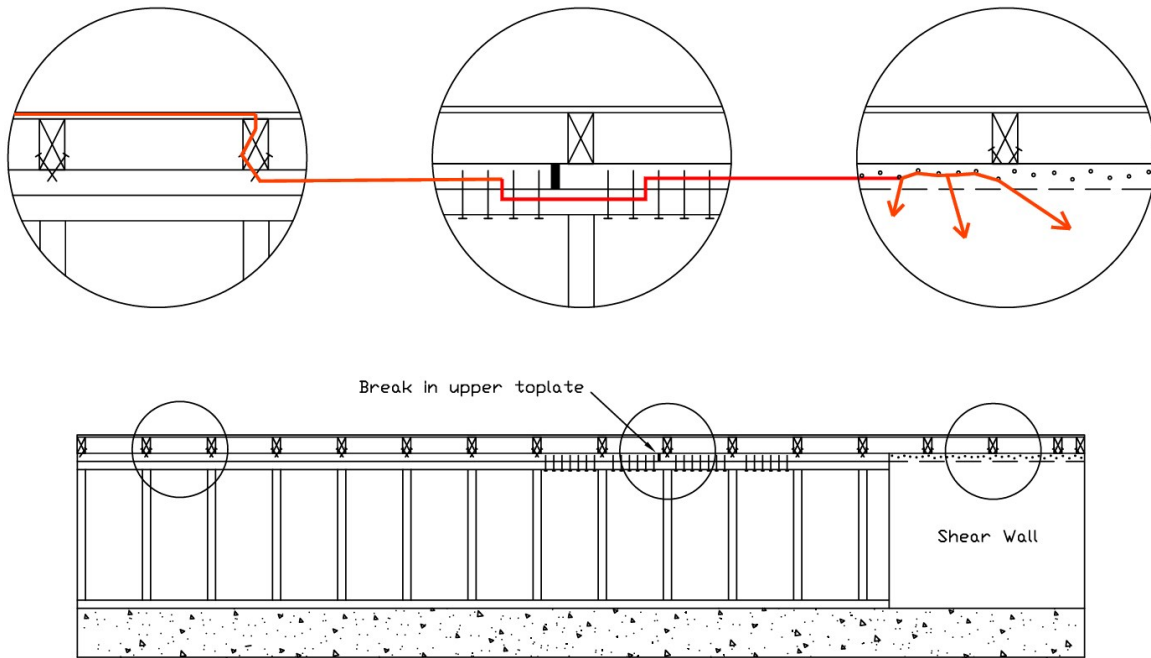


Photo: Overturning force pulling on hold down bolt deeply embedded into the foundation, as shown by red arrow.

Top Plates and Cripple Wall Retrofits

www.Bayarearetrofit.com → Proposals → Cripple Wall Retrofits → [Top Plates and Cripple Wall Retrofits](#)

The horizontal two by fours at the top of the cripple walls (known as top plates) are not connected. They tend to separate where not connected together. We will connect the top plates with either nails or steel.



Lag Bolts and Cripple Wall Retrofits

www.Bayarearetrofit.com → Proposals → Cripple Wall Retrofits → [Lag Bolts and Cripple Wall Retrofits](#)

Attach the shear walls at plaster/sheet rock locations to the floor with non-invasive lag bolts. Lag bolts allow us to connect the top of the shear wall to the floor with vertical bolts so we do not need to remove the sheet rock.

Otherwise, we will need to remove strips of ceiling plaster for access and install shear transfer ties at much greater cost.



Possible Removal and Replacement of Sheet Rock on Ceiling

When the lag bolts mentioned above will not work, we will need to remove a strip of sheet rock 18 inches wide so we can use conventional shear transfer ties. We charge an extra \$35 per linear foot for this. The charge includes sheet rock replacement but no finishing.



Photo: The contractor removed part of the ceiling to access the floor framing and install shear transfer ties.

SECTION 2: THE NO CRIPPLE WALL PORTION OF YOUR RETROFIT

Basic Principles

www.Bayarearetrofit.com → Proposals → No Cripple Wall Retrofit → [No Cripple Wall Retrofit Methods - VIDEO](#)

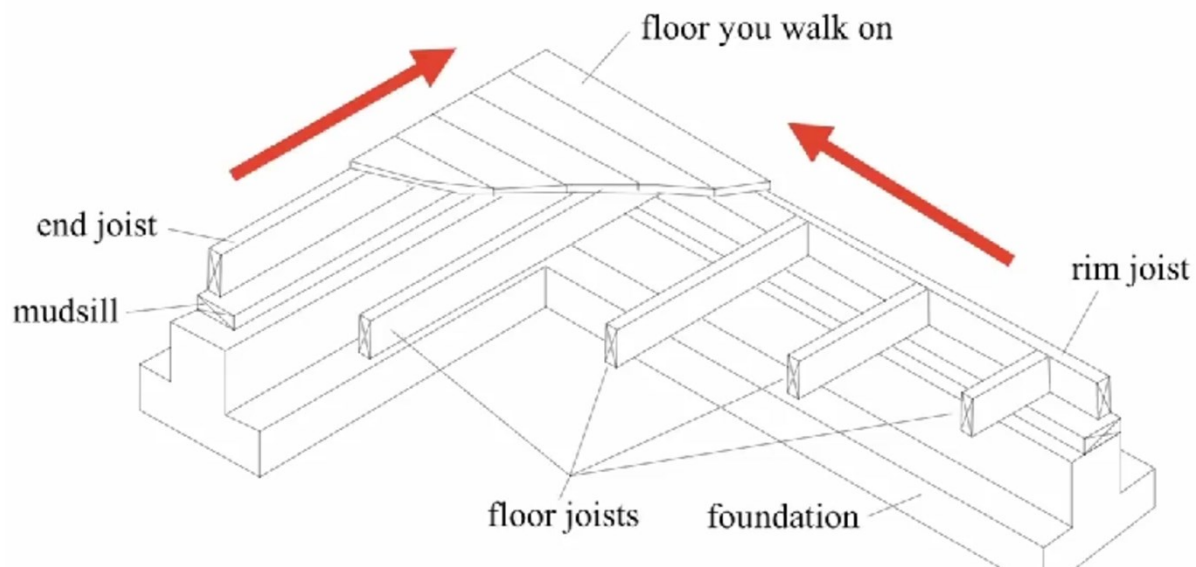


Diagram: Earthquake forces will try to push your floor (consisting of the mudsill and joists) off the foundation.

Bolt Mudsill to Foundation with Foundation Anchors

Because the distance between the foundation and the floor is only 6," drilling holes for bolts from the top is not possible. Instead, we will install foundation anchors to the side of the mudsill (the piece of wood on top of the foundation) and foundation to connect the two. We use three different types of foundation anchors depending on what we find under your house.

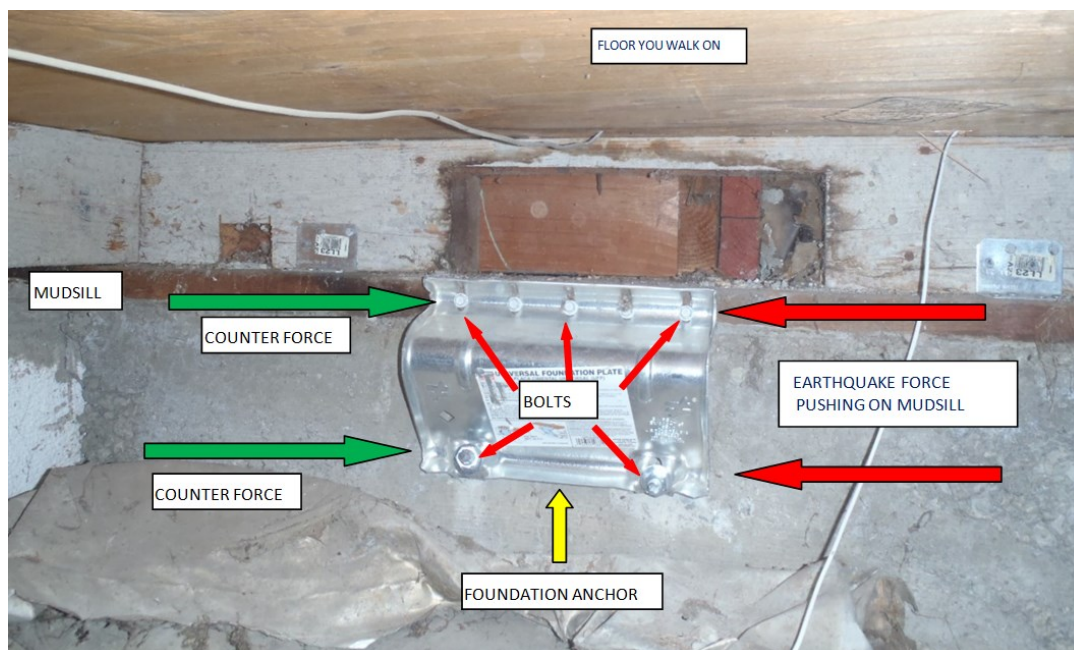


Photo: This is one type of foundation anchor.

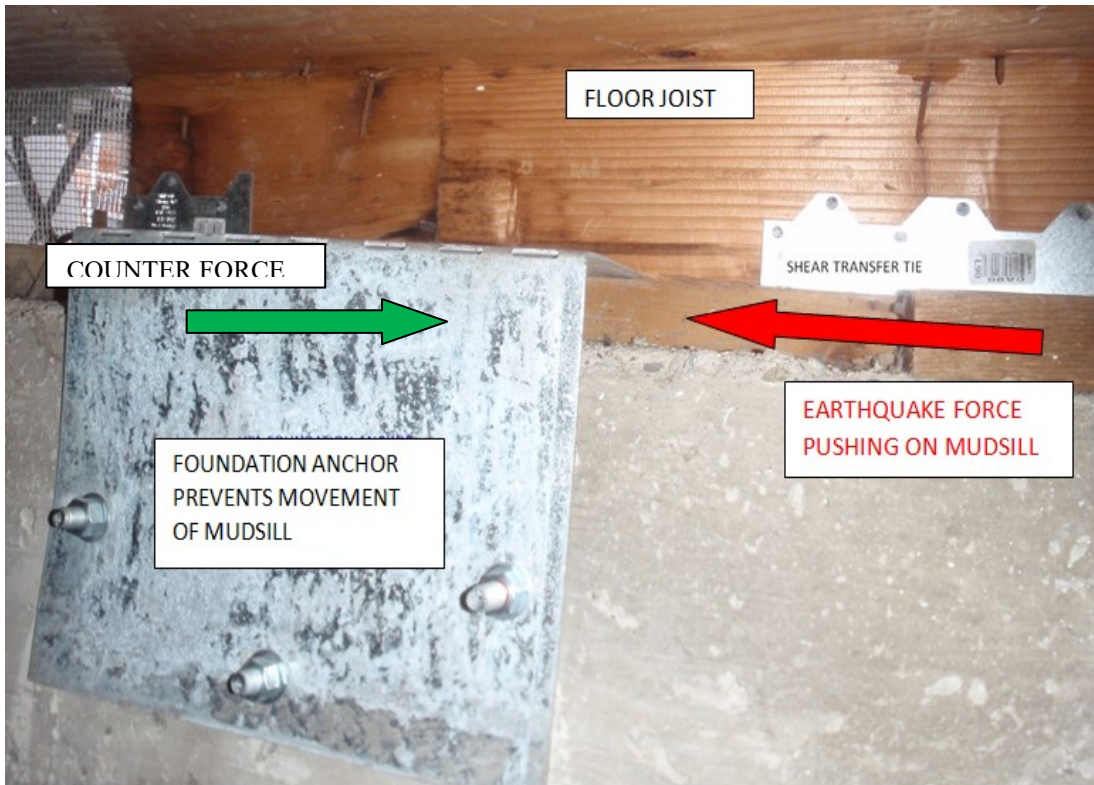


Photo: Here is another type of foundation anchor.

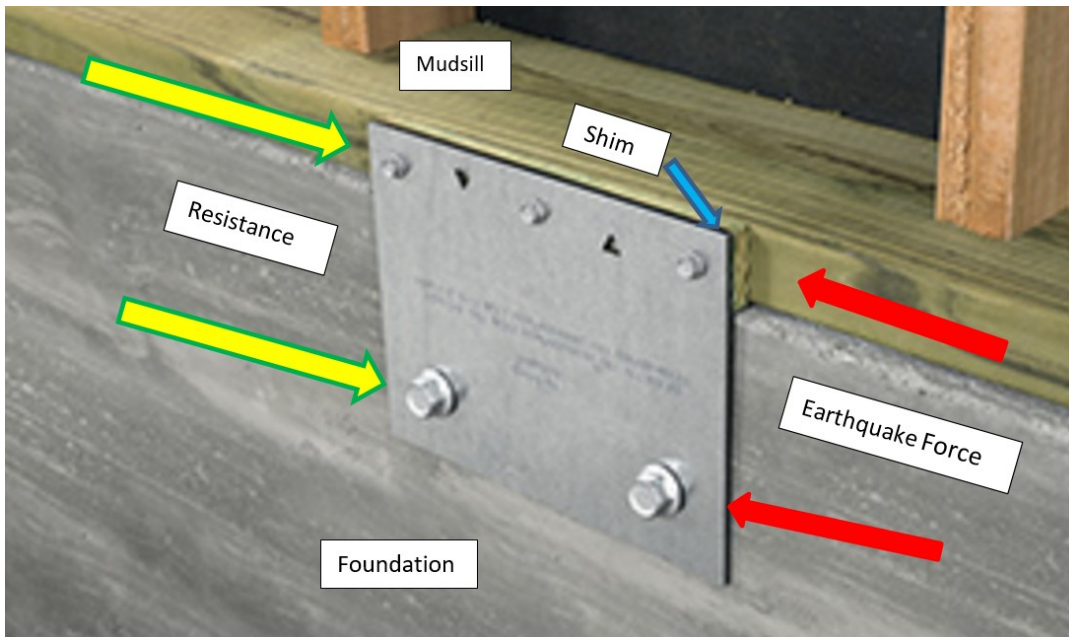
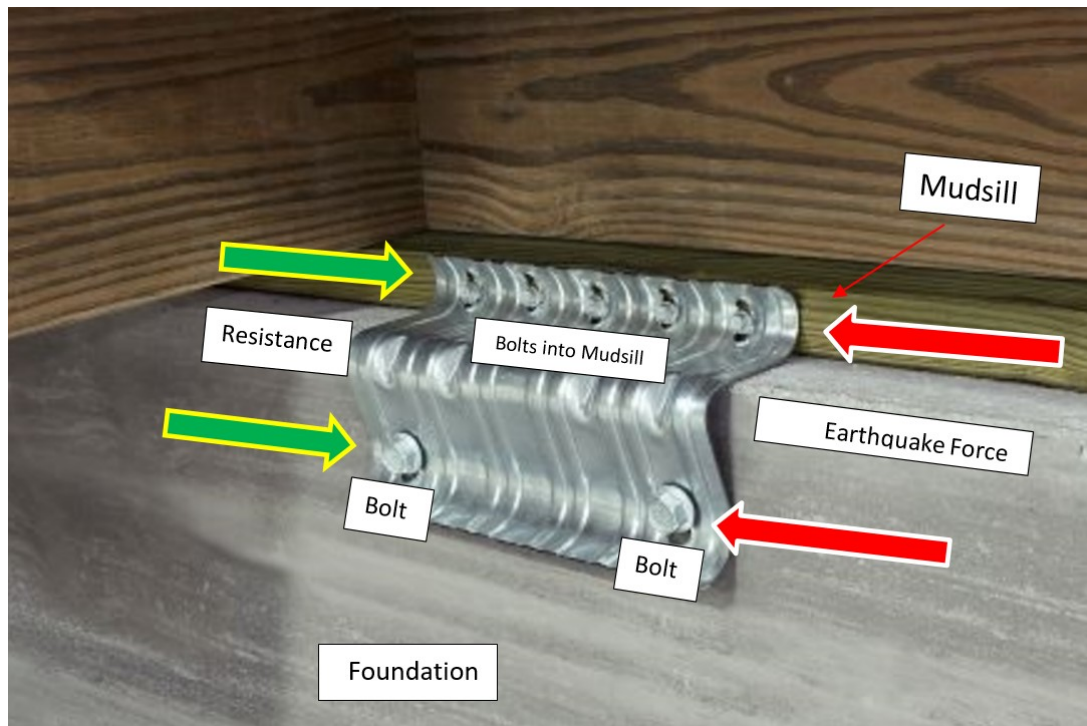


Photo: This is the only tests foundation anchor for use with shims, which are necessary when the foundation and the mudsill are not flush.



***Photo:** Another type of foundation used when we find certain framing conditions.*

Attach Rim, End, and Floor Joists to Mud sill with Shear Transfer Ties

www.Bavarearetrofit.com → [Proposals](#) → [Floor Connectors](#) → [Shear Transfer Ties](#)

The floor joists can slide off the bolted mudsill during an earthquake. We will attach the joists to the mudsill with shear transfer ties. There are four different types of steel shear transfer ties.

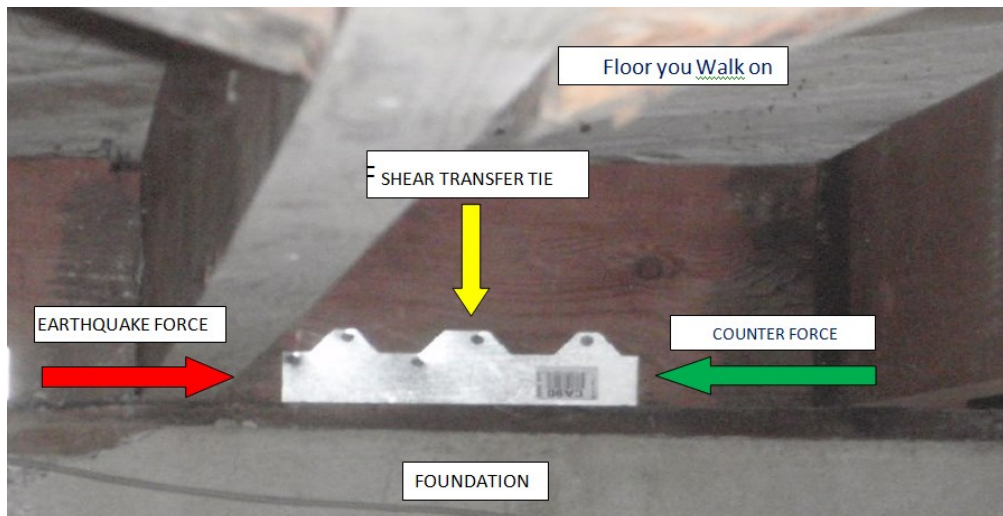


Photo: This is a shear transfer tie, which provides resistance against movement of the floor joist.

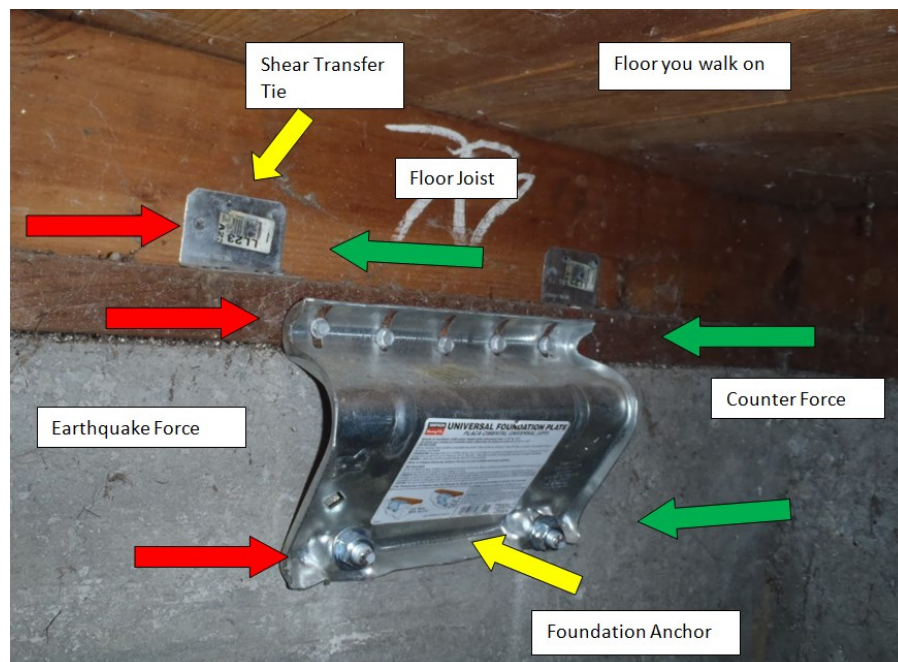


Photo: The earthquake exerts force that will cause the floor to slide on top of the mudsill. Shear transfer ties prevent this movement.

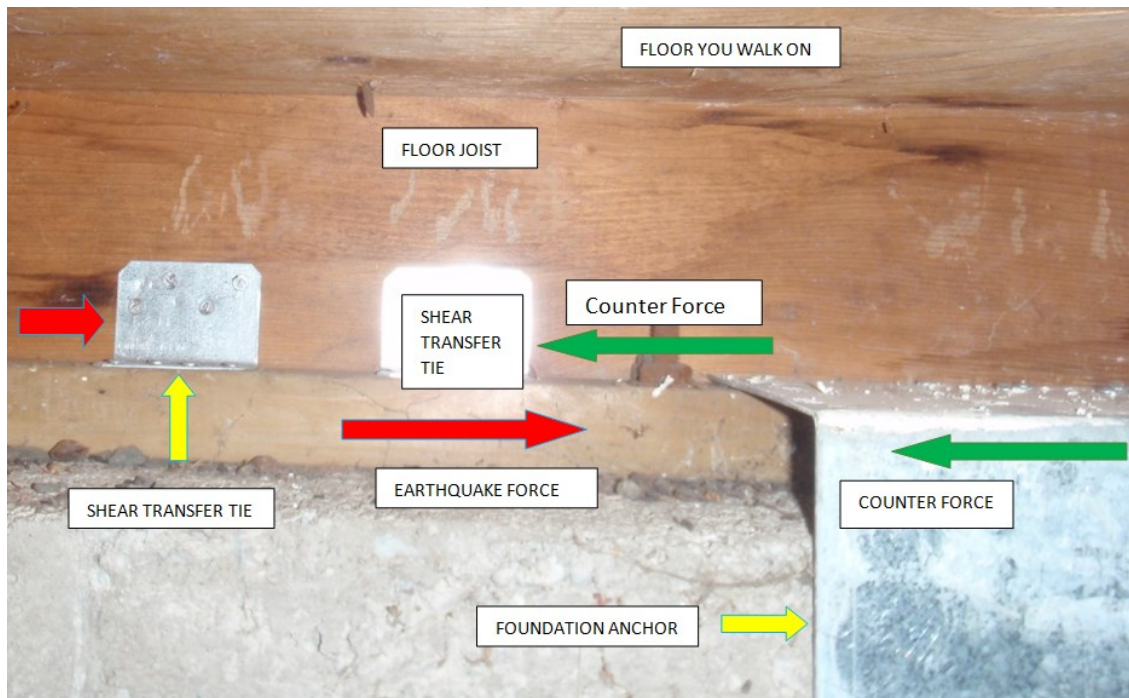


Photo: How the whole system works (described below).

- The earthquake exerts force (**red arrows**) on the shear transfer ties.
- The Shear Transfer Ties are nailed both to the floor joist and to the mudsill.
- When the shear transfer ties slide laterally on top of the mudsill, the mudsill pushes laterally on the foundation anchor.
- Because the bottom of the foundation anchor is bolted to the foundation, the sliding motion pushes the foundation and is absorbed by the ground.

www.Bavarearetrofit.com → **Proposals** → **No Cripple Wall Retrofit** → [Side Bolt Mudsill](#)

The floor needs to attach to the foundation, but sometimes-standard hardware will not work. If needed, bolt new mudsills made of special lumber that will not split to the side of the foundation and connect this to the floor with either steel or wood. See below.

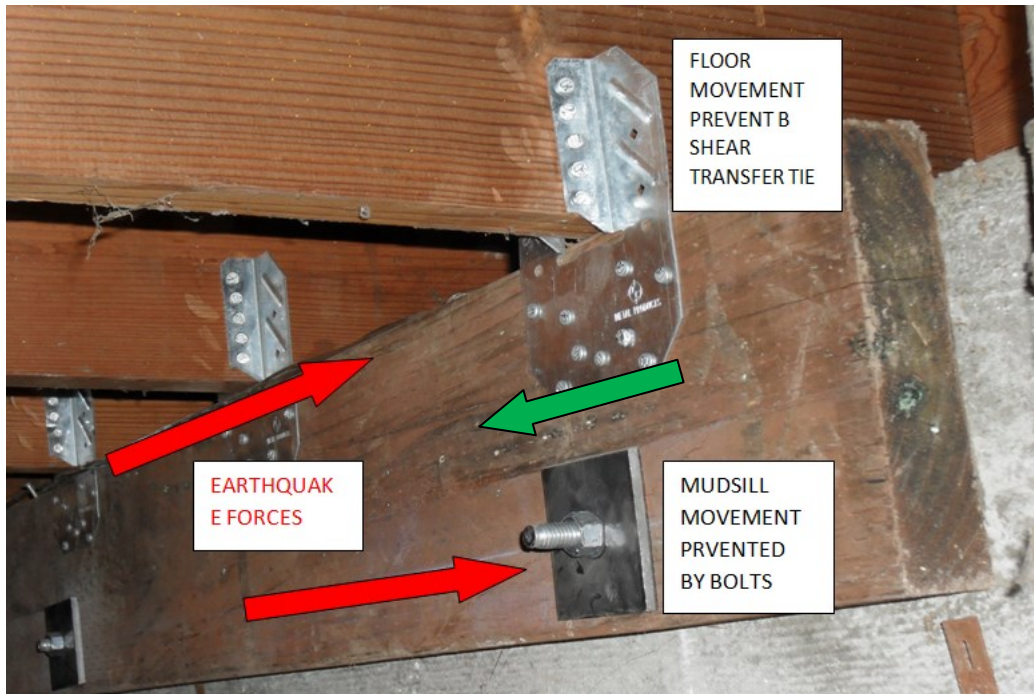


Photo: Earthquake force pushes on mudsill, into the bolt, and into the side of the foundation

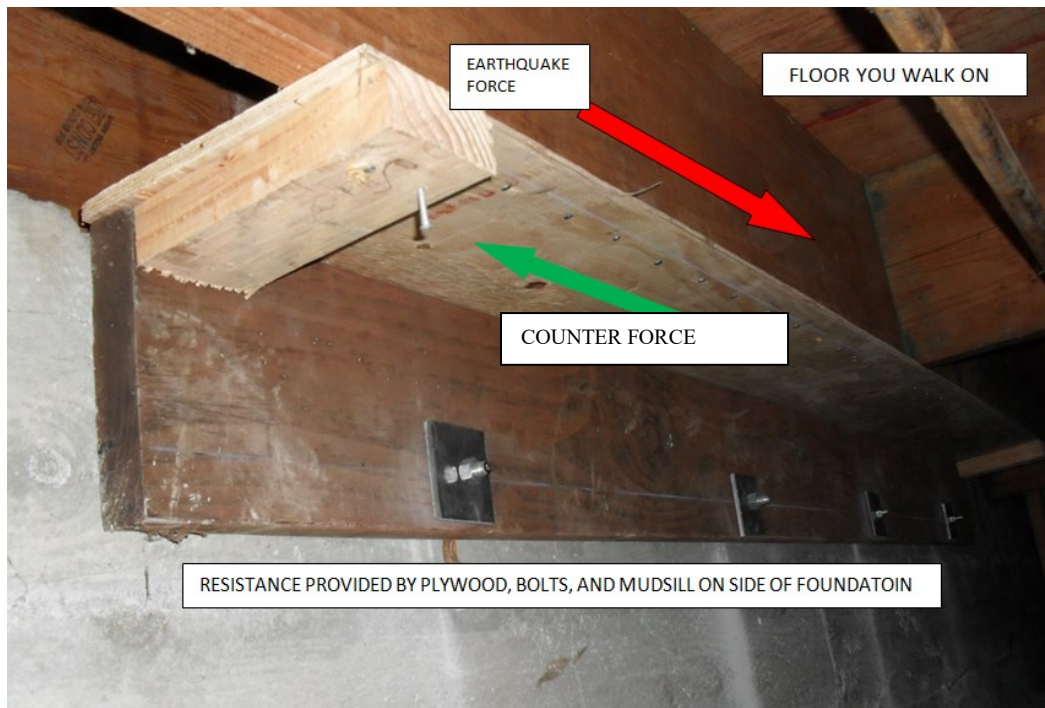


Photo: Earthquake force is transferred into the plywood and then into the bolts in the side-bolted mudsill.

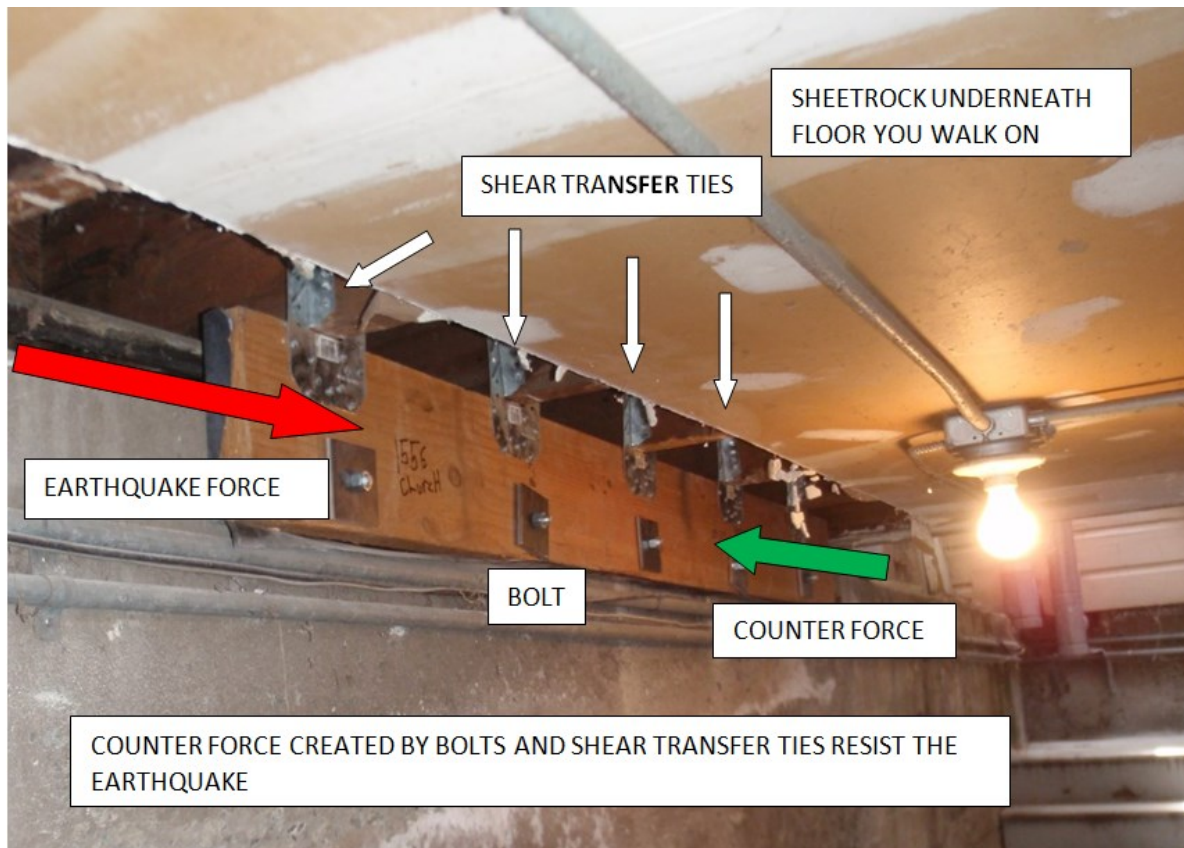


Photo: Another example of a new mudsill bolted to the side of the foundation and attached to the floor with shear transfer ties.

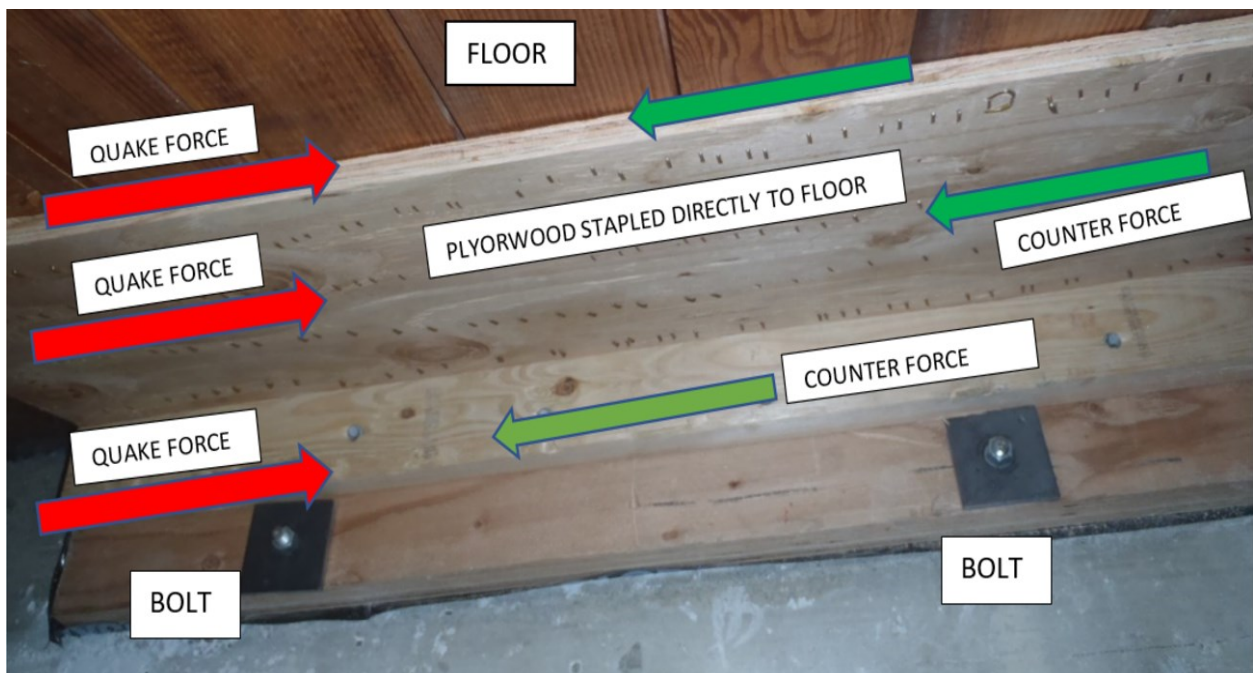


Photo: Sometimes it is necessary to attach the mudsill bolted to side of foundation directly to the floor with plywood.

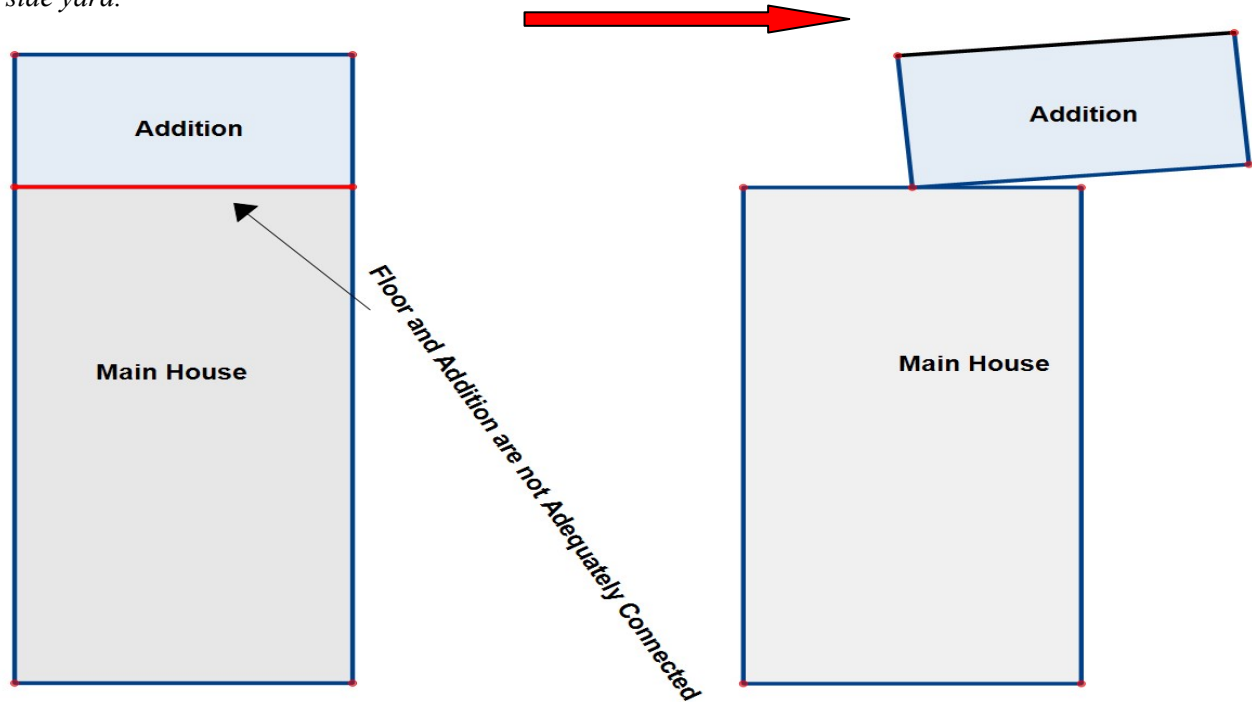
The Addition is Not Properly Attached to the Main House

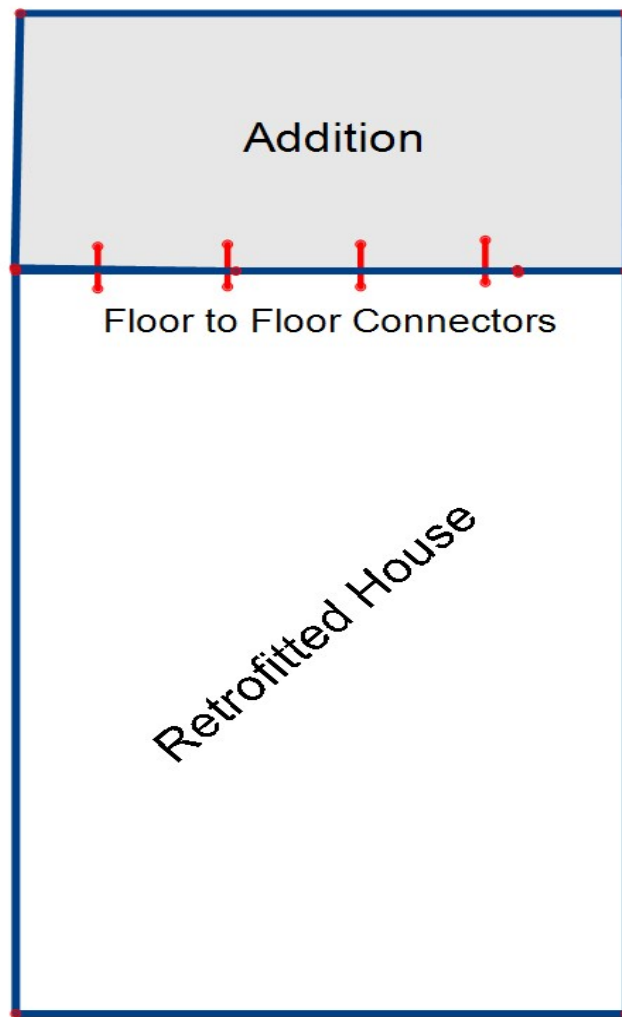
www.Bayarearetrofit.com → [Proposals](#) → [Cripple Wall Retrofits](#) → [Additions](#) → [Floor to Floor Connectors](#)

The building code does not regulate how an addition is attached to the main house. Earthquake forces may push an addition into the side yard.

Install floor-to-floor connectors to hold them together.

Diagram: Floor-to-floor connectors resist earthquake forces that try to push the addition into the side yard.





Tension Tie Floor Connectors

www.Bayarearetrofit.com → [Proposals](#) → [Cripple Wall Retrofits - VIDEO](#) → [Additions](#) → [Tension Tie Floor Connectors](#)

The building code does not regulate how an addition is attached to the main house. Earthquake forces may push an addition into back yard.

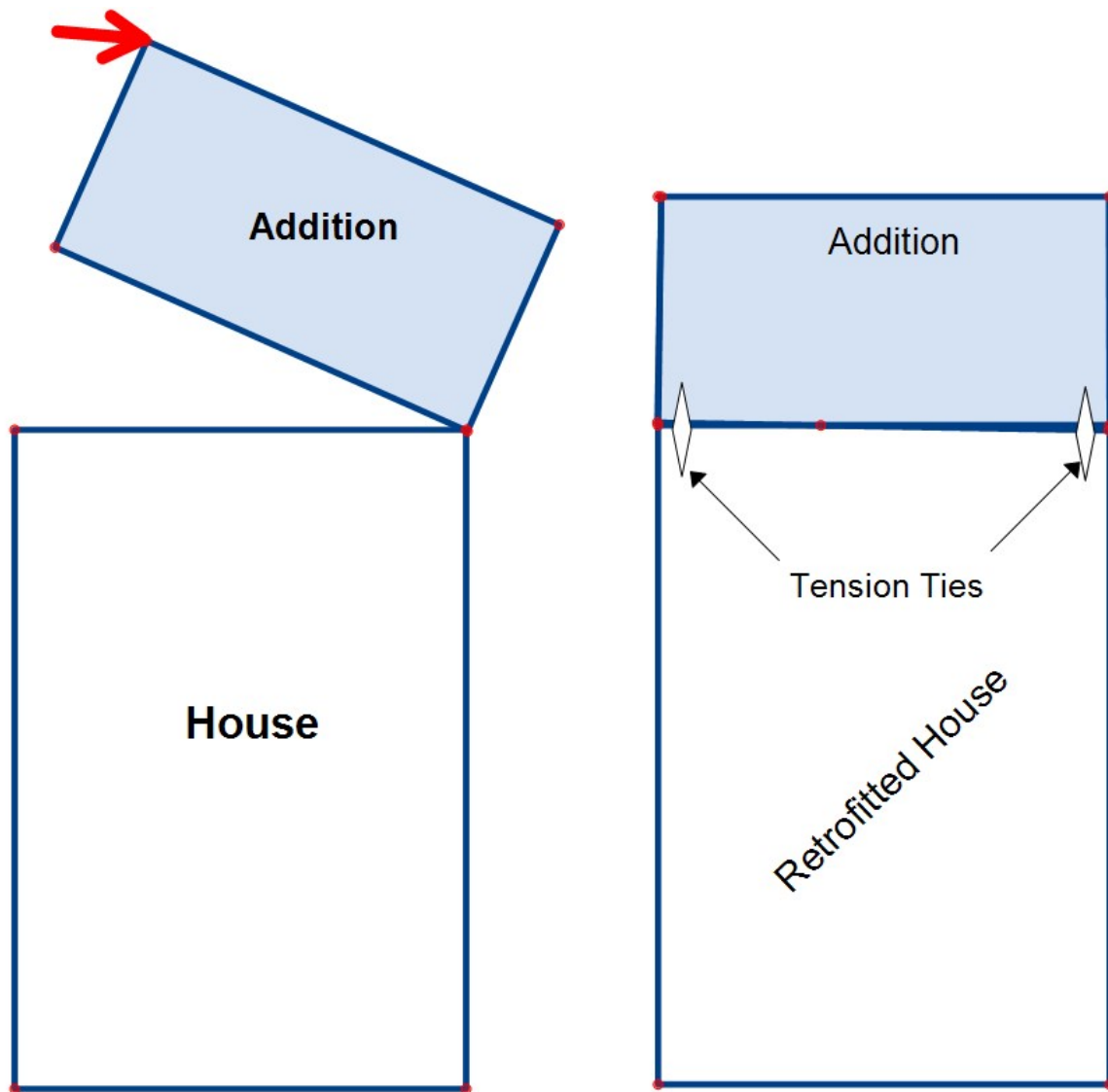


Diagram: Tension ties keep the addition from falling into the backyard.

Engineering no Cripple Wall Retrofits.

[www.Bayarearetrofit.com](#) → [Proposals](#) → [No Cripple Wall Retrofit](#) → [Engineering in No Cripple Wall Retrofits](#)

Permitting and Documentation

[www.Bayarearetrofit.com](#) → [Before Hiring](#) → [Do I need a Permit?](#)

Please review the pros and cons

IMPORTANT:

In some circumstances building departments require something called a “special inspection.” The Special Inspection requirement is quite arbitrary and depends on whom you talk to at the front counter. Building departments use special inspectors because city inspectors often have 15 inspections to do a day, in addition to necessary paperwork, and simply do not have time, nor are they properly dressed to crawl under a house. Special inspections are paid to an outside agency and cost \$650 each and we charge \$350 to meet the inspector and arrange the inspection. You will be required to pay these fees as well as our fee to meet the inspector. Most cities do not require special inspections, but we are discovering more and more building departments are requiring them and need to make sure that cost will be passed on to you. I HIGHLY recommend you come and look at the work yourself while our crew is there so they can explain what they did and why they did it. No one cares about your house more than you do

BUILDING SKETCH

Looking at foundation from above

Engineering based on Calculations used in Standard Plan A

Anticipated Ground Acceleration = 0.186 Gs

The Standard Plan A calculations tell us this house weighs 41# per square foot

41# X 2118sf = 86,838# of House Weight

86,838# x 0.186 Gs = 16,161# Anticipated Pounds of Earthquake Force Striking From each Direction

16,548/2 = 8076# Resistance Needed on Each Side

This design provides 20,880# of Earthquake Resistnce

Earthquake Resistance in lbs.

1/2 Bolt 1340#

10,440# Resistance Provided (minimum)

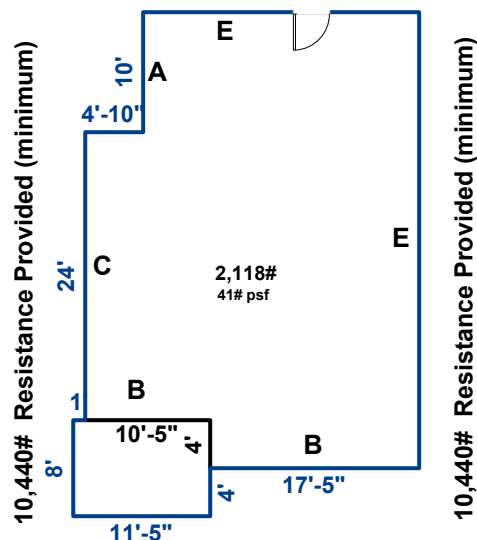
1 Foot Plywood = 870#

4' Plywood = 3480#

6' Plywood = 5220#

8' Plywood = 6960#

12' Plywood = 10440#



10,440# Resistance Provided (minimum)

Nailing: 10d nails 2" apart

Shear Transfer Ties

Earthquake Resistance in lbs.

L90 = 925#,

4LTP = 670#

23A = 565#

H10AR = 590#

8" Floor Lag Bolt = 550#

HD = Hold Down

- Along Foundation A: 4' Plywood + Three Bolts + Four L90 or Six HT10AR or Six LTP4 or Seven 23A + Two HD
Along Foundation B: 6' Plywood + Four Bolts + Six L90 or Nine HT10AR or Eight LTP4 or Seven 23A + Two HD
Along Foundation C: 8' Plywood + Six Bolts + Seven L90 or Twelve HT10AR or Eleven LTP4 or Thirteen 23A + Two HD
Along Foundation D: 12' Plywood + Eight Bolts + Twelve L90 or Eighteen HT10AR or Sixteen LTP4 or Nineteen 23A + Two HD

Plywood, Bolts and Shear Transfer Ties will Resist Minimum 10,440# Earthquake Force

Stud Stitch Connections with Nails or Lags (Overturning Resistance)

H = Height in Feet

3H needs 13Nails or 6Lags-, 4H needs 18Nails or 8Lags, 5H needs 22Nails or 10Lags, 6H needs 26Nails or 12 Lags

7H needs 31Nails or 14Lags, 8' needs 35Nails or 16Lags

14.5' Sill blocking = 5 Nails or 3Lags

Nail = 200#, Lag with 2" penetration = 450#

Extend plywood when possible to reduce overturning

Nail = 200#, Lag with 1 1/2" penetration = 300#

Retrofit methods, materials and placement may vary depending on site consitions.

Ani Tajirian

Email

Ani.Tajirian@gmail.com

Phone

(203) 430-7553

Property Address

4288 Howe St.

Oakland, CA 94611

Terms and Signature Page

If you would like to proceed, please fill out this Terms and Signature Page, input the dollar amount of the contract, and return it to Jasonm@bayarearetrofit.com.

I will need to meet the inspector for the final inspection so he/she can look at the required smoke detectors. I understand I will need to be home and wait for the Inspector for up to 4 hours, either from 8-12 or 12-4

Initial

I would like Bay Area Retrofit to install _____ Smoke Detectors and _____ Carbon Monoxide Detectors for \$75 each. Combination Smoke/Carbon Monoxide detectors will cost \$85 each.

If I get a permit, I will need these before I meet City building department requirements.

Initial

NA

If we find problems such as dry rot, termite damage, etc. that can compromise the retrofit; I understand such repair work will need to be done before we can complete our job. Our rate is \$135 an hour.

Initial

If removal of plaster or sheet rock exposes problematic framing that will significantly increase the time to install the retrofit, this extra time will be billed to me at a rate of \$135 an hour.

Initial

Contractor not responsible for incidental damage caused by existing conditions such as previous poor workmanship and/or building materials that can cause things like cracking of plaster, popping out of drywall, old pipes breaking, etc. It is extremely uncommon for this sort of thing to happen but we want it clear that we cannot be responsible for the structural integrity of the rest of the house. When alarm wires are strewn on the ground, or even attached to floor joists/beams, contractor and his employees shall be careful when working around them but shall not be held responsible if wires are pulled from their triggers or otherwise damaged in the normal course of this work. Contractor to do such repairs himself if possible at a rate of \$135 an hour or will find a sub-contractor to do this work it is beyond his skill lever.

Initial

I will remove personal property from work areas.

Initial

I understand the type of hardware, quantities, linear footage of plywood etc may vary slightly depending on existing site conditions

Initial

I understand contractor disclaims any express or implied warranties that the seismically strengthened building will be able to withstand an earthquake without damage to its structure or contents

Initial

If on site work is delayed at no fault to the contractor because personal property must be removed, a baby is napping; etc., owner will be charged \$135 an hour for each person who is laid idle.

Payment:

Full payment is due upon completion of work. Payable by: cash, check, or credit card plus 3% service charge.

Acceptance:

WITH PERMIT: I desire a permit. I have read and understand the information above, initialed where listed, and hereby accept this proposal. I understand the cost for construction and plan submittal will be (construction cost + \$1000 plans and processing fee) will be:

\$ 9,700

Circle this number if this is the option you want

PLUS cost of City permit fees (should be between \$500 and \$1000) and special inspections (\$1000 if applicable) are to-be-determined when these fees are paid. These costs will be reflected in my final invoice

Initial

WITHOUT PERMIT: I do not want a permit and instead desire a photographic record, which, along with the narrative proposal and plan in my possession, will be my documentation. I accept this proposal without a permit for

\$ 8,700

Circle this number if this is the option you want

Signature _____ Date _____

Print Name _____ E-mail _____

Address _____

Phone _____

Professional Highlights

Co-author of primary material used in the [Retrofit workshop](#). Sponsored by City of San Leandro. To present.

Course instructor, “[Seismic Retrofitting for Homeowners](#).” Sponsored by the Association of Bay Area Governments (ABAG). (2004, 2006, and 2012) (You will receive a virus warning, there are no viruses.)

Featured contractor, “[The Hayward Fault: Predictable Peril](#).” Documentary produced by KQED Public Television (Channel 9) 2008.

Featured contractor, “[California Works to Prepare for the Big One](#).” Segment on the News Hour, produced by KQED Public Television (Channel 9) 2006

Lecturer, “Retrofit Principles and Practice for the Home Inspection Industry.” Sponsored by the Golden Gate Chapter of the American Society of Home Inspectors. 2004 and 2008

Keynote speaker, “The Preservation of Historical Wood-Framed Buildings.” Sponsored by [The City of Victoria Heritage Foundation, British Columbia](#). 2013

Mayoral appointee to the [Berkeley Disaster Commission](#). 2003-2011

Guest lecturer, “Retrofit Principles and Practice for the Canadian Home Inspection Industry.” Sponsored by the [Canadian Association of Home and Property Inspectors 2013](#).

Primary source for this [San Jose Mercury News article](#) on soft story retrofitting.

Residential damage inspector, FEMA. 1989–1994.

Professional Affiliations

[Earthquake Research Institute](#)

[Structural Engineering Association of Northern CA](#)

City of Oakland Apartment Building Retrofit Committee

Publications

- Author, “[Seismic Retrofit for Cripple Walls](#).” *The Journal of Light Construction*. April, 2006 (you will receive a virus warning; there are no viruses).
- Contributor, [Wood-Framed Shear Wall Construction: An Illustrated Guide](#). Authored by Thor Matteson, structural engineer. The International Code Council, 2010.
- Co-Author, “[Retrofit Mudsill Anchorage Systems](#).” Co-author with Allen Wendy, Engineer for Simpson Strong Tie, 2007.
- Co-Author, “[Standard Plan A, Residential Seismic Strengthening Plan](#).” Part of a team that created the Bay Area’s retrofit guidelines. The International Code Council, 2005.

References

Previous customers will tell you we were pleasant, cleaned up, and were easy to deal with. But the references we are especially proud of are from industry professionals who know our work and expertise. Feel free to contact them.

Thor Matteson
Structural engineer specializing in seismic retrofitting
Email: Thor@shearwalls.com
[Website](#)
510-225-1112

Larry Guillot, Owner & Consultant
QuakePrepare
Quakeprepare.com
Email: larry@quakeprepare.com
[Website](#)
707-965-3299

John Fryer
President, Bay Area Chapter
American Society of Home Inspectors
Email: johnfryer@gmail.com
[Website](#)
510-682-4908

Katy Briggs
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