



SAUNDERS
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What is Seismic Retrofitting?

SEISMIC RETROFITTING

Seismic retrofit consists of adding roof to wall anchors and continuity ties in its simplest form. This strengthens the connections that have found to be inadequate in older buildings. Buildings built prior to 1985 need to be looked at for possible strengthening and buildings prior to 1975 will most likely need a retrofit. The main purpose is to keep the roof from pulling apart especially at the perimeter. The concrete tilt-up walls are very heavy and when they move in an earthquake, they exert a great deal of force. The reason for strengthening a structure might be due to insurance cost, lender requirements, life safety issues and essential facility status.

WHY SHOULD I RETROFIT

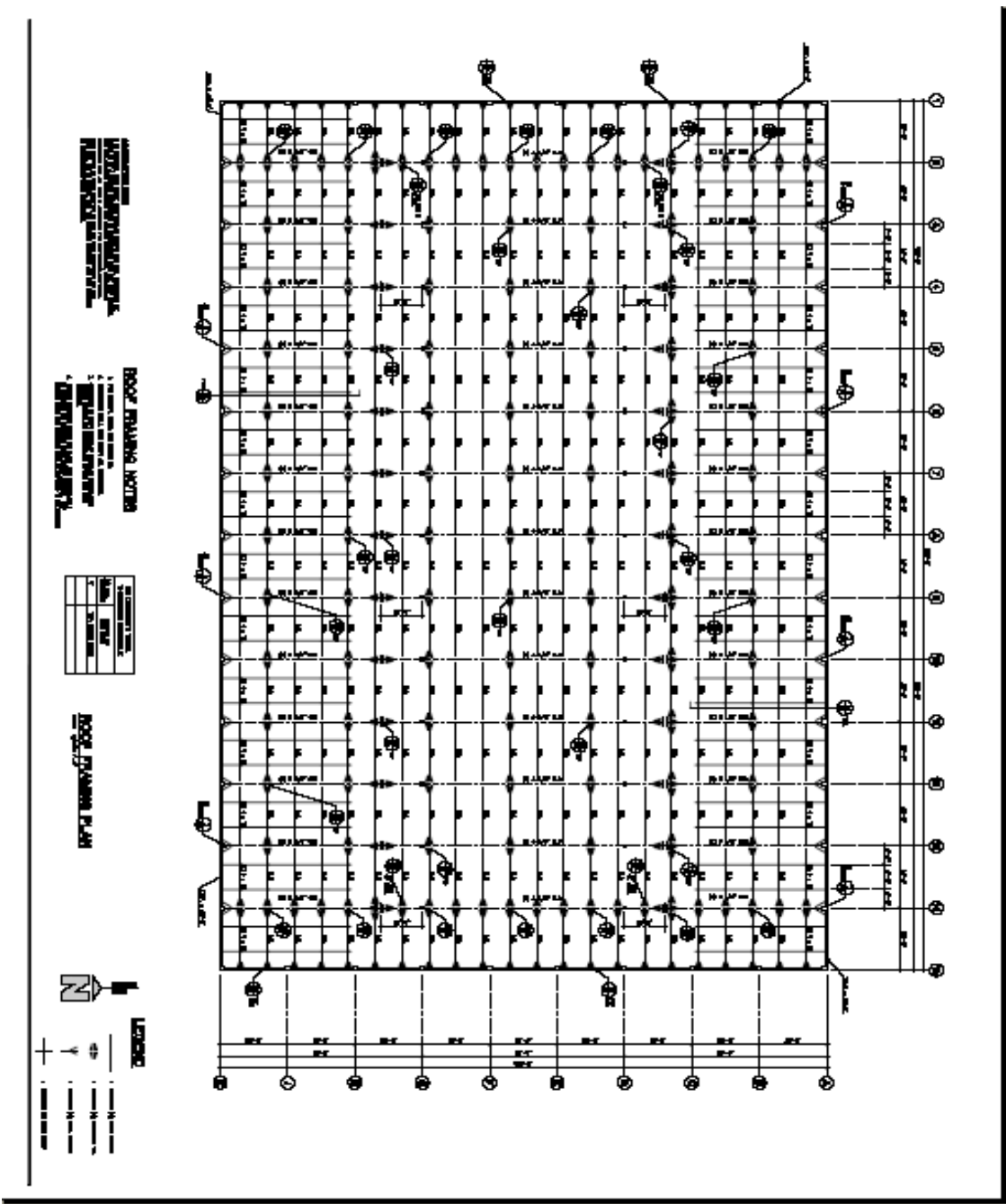
1. When you retrofit your building, it is an asset to the building. When you go to sell the building the lenders that will loan on the building increases due to the PML being 20 or less. Since there are more lenders you have more buyers!
2. The risk of injury and legal litigation. If found negligent then they could come after the owner. Negligence could be that you knew that the building needed some structural work but did not have a plan to correct the problem. Is there enough coverage for negligence?
3. Reduce earthquake coverage by lowering the Cap (At this time some insurance companies do not recognize the PML of a building).
4. Lenders request that the PML of the building is less than 20%.
5. Insurance companies in the future may not write coverage for earthquakes due to past losses and other events. Rates have increased 3 to 6 times the rate charged since 2005!
6. Tenant considers the operation of the building critical to the survivability of the business. In other words, it is considered an essential facility.

What is needed in a seismic retrofit?

A Seismic retrofit of a standard concrete tilt-up building with a panelized roof system would consist of some or all of the following:

Set of engineering plans for the building. You want to use a structural engineer with experience in seismic retrofits.

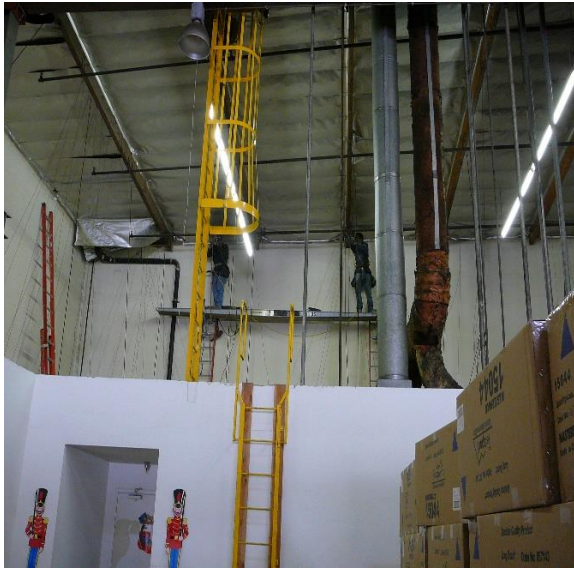
See Diagram:



Setting up and preparing the hardware.



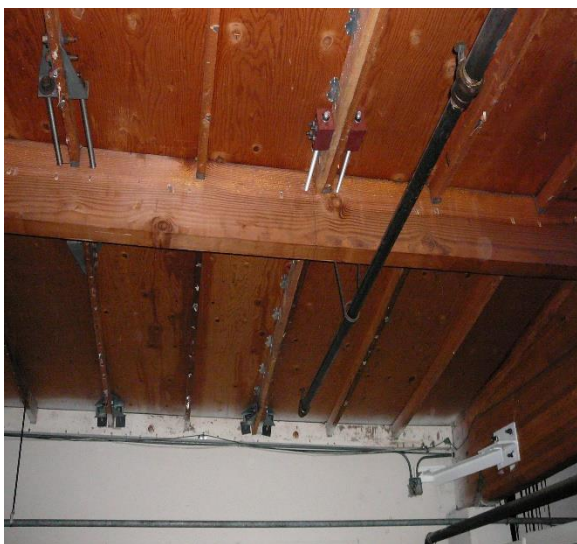
Setting up above offices



Safety meeting



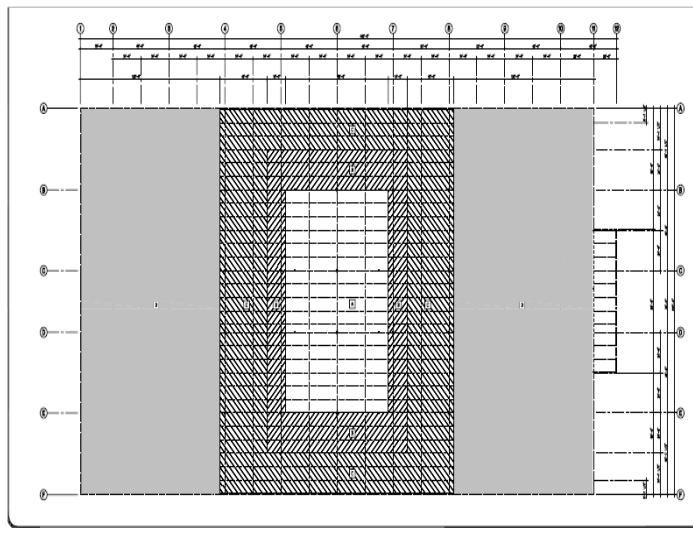
1. Roof to wall anchorage. This includes Glue laminated beams, Steel girders, purlins and sub-purlins. (Existing connections are weak and need added strength).



2. Continuity ties across the building (these are usually rows of connections that go across a building at 24 feet on center).



3. **Roof nailing** (if the roof nailing is inadequate) additional nailing of the roof may be called for at a future date.



ADDITIONAL ROOF DIAPHRAGM NAILING

ADDITIONAL NAILING SCHEDULE		
AREA	CONTINUOUS EDGES & BOUNDARIES	OTHER EDGES
(1)	6	4
(2)	2 1/2	4

SEE NOTE BELOW
 (1) PROVIDE NEW 1/2" STRUCT. I PLYWOOD OVER EXISTING PLYWOOD PER (1/4")

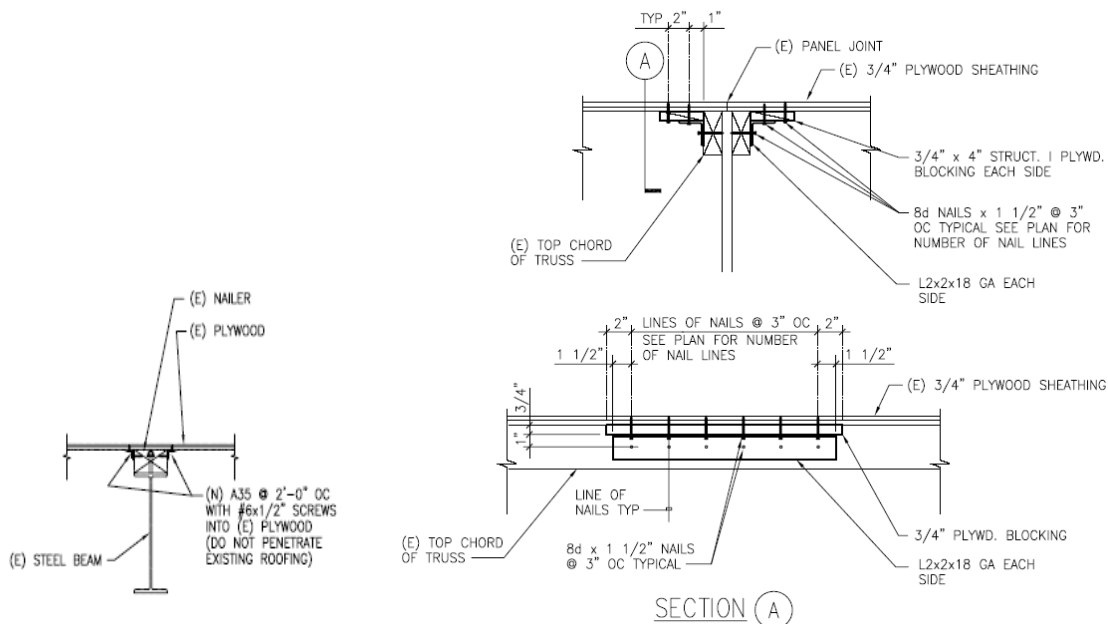
- NOTES:
- ADDITIONAL 15d NAILS AS REQUIRED TO THAT FINAL NAILING IS AS SHOWN ON "ADDITIONAL NAILING SCHEDULE"
 - (1) ROOF NAILING IS NOT KNOWN
 - (2) ROOF SHOOTING IS 1/2" STRUCT. I TO BE FIELD VERIFIED
 - CONTRACTOR SHALL VERIFY ON ADD AS NECESSARY NAILING LISTED BELOW. CONTRACTOR SHALL USE CARE TO PREVENT WOOD MEMBER SPLITTING.
 - 2 ROWS OF 15d NAILS @ 4" O/C TO ALL OLD LAM BEAMS
 - 15d NAILS AT 4" O/C TO NEW AND EXISTING SUB-PURLINS WITH WALL ANCHORS, SEE DETAIL S/PS
 - NAILING SPECIFIED IN DETAILS WHERE OCCURS
 - SEE ADD'L ROOF DIAPHRAGM NAILING
 - FLANGING MEMBERS AT PLYWOOD CONTINUOUS EDGES AND BOUNDARIES TO BE 2-2x OR 3x AND NAILING TO BE STAGGERED
 - NEW NAILING TO MATCH EXISTING AND TO BE 1" CLASS OR 1" CLASS MINIMUM

FUTURE NAILING IS NOT PART OF CURRENT SCOPE OF WORK

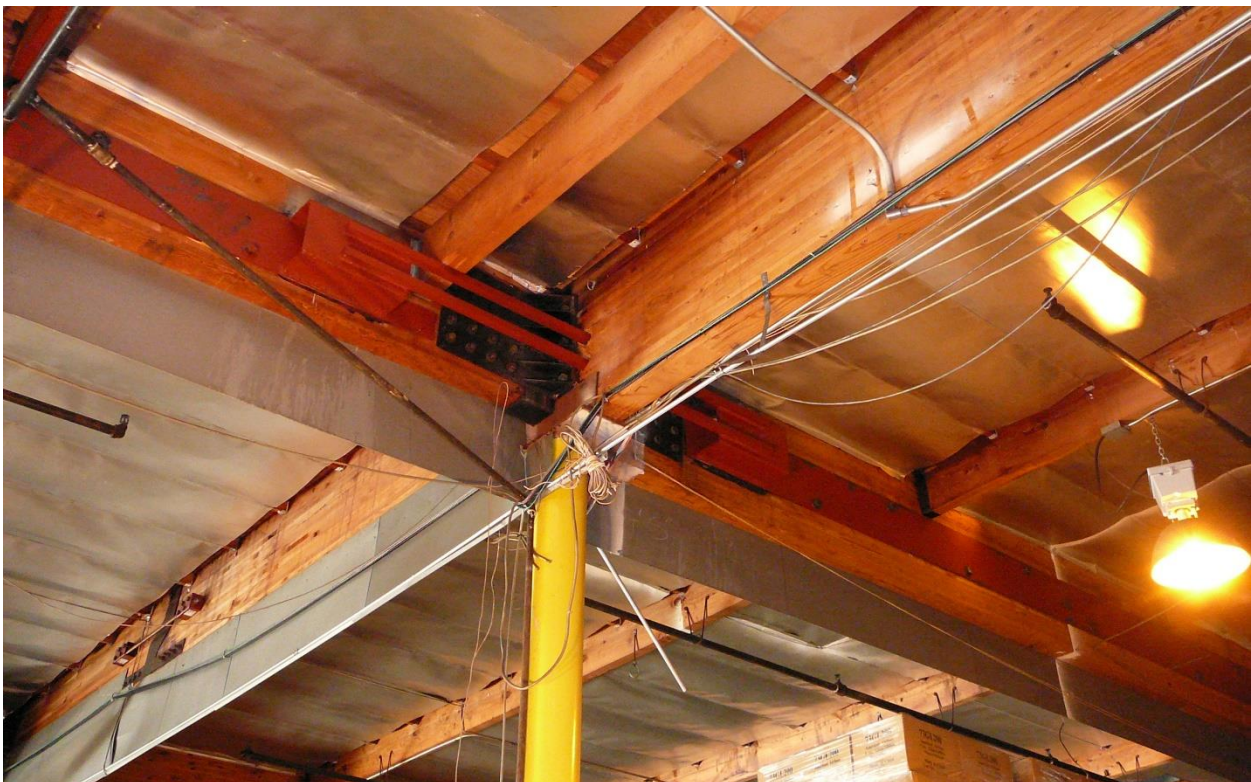
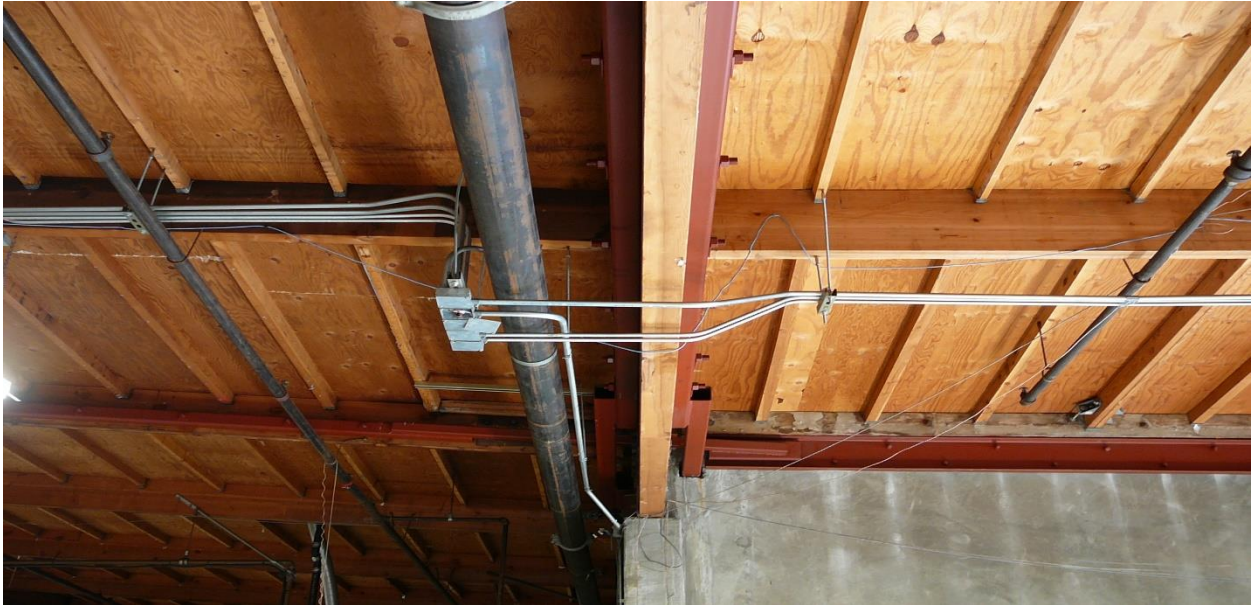
FUTURE ROOF DIAPHRAGM NAILING

SCALE: N.T.S.

If nailing from above is not practical then there are ways to accomplish that additional nailing from underneath buy using Simpson A35's and screwing to the underside of the roof sheeting.



4. **Drag lines** if there is a reentrant corner (If part of the building offsets, recesses or sticks out of the plane of the structure).





5. When needed a **brace frame or shear wall** is added (This usually needs to be done when the length of a building is three times longer than its width).



Large brace frame connected to a roof drag line to distribute the forces.



Bottom section of a brace frame in an existing office area.



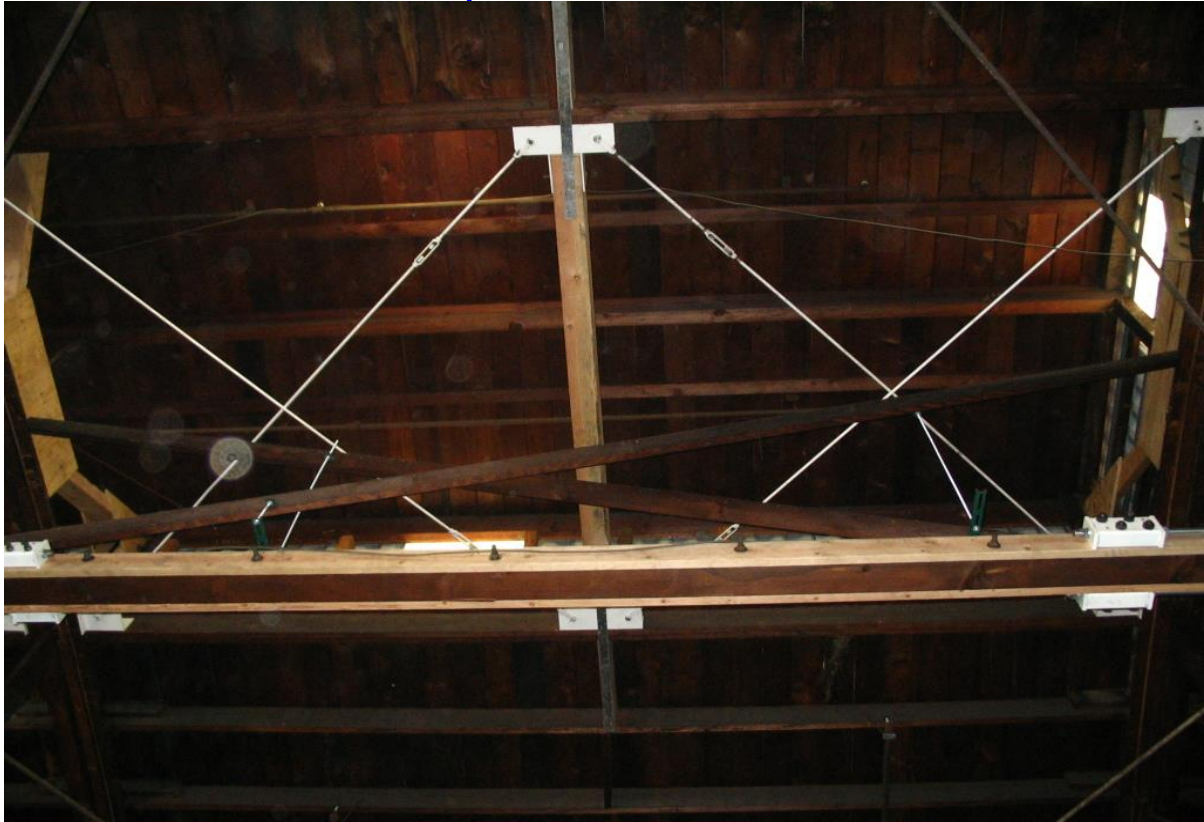
6. **Cord plate** (this is used if the walls are weak and need to be stronger in plane)



7.) When the walls are weak and need strengthening, we add exterior steel to strengthen the walls.



8. Seismic retrofit and truss repair on a barrel truss roof.



9. Venting the foil can greatly reduce the chance of **Condensation** problems continuing or starting. Cutting back the foil approximately 3 inches from the ends lets the cavity breathe.
(To reduce cost, it is best to perform the venting while we are performing our Seismic retrofit)



(Notice the white corrosion formed on the sub purlin hanger)



(Notice the rusting of the Purlin hanger from condensation)

10. Equipment anchoring.

Four-way sway brace cables for
Fire Sprinkler piping.



Tube steel frame bolted to the concrete floor for tank containment.



Four-way sway bracing for piping
systems.



Protecting the operations of a business along with the building by equipment
anchoring.

11. **Apartment (soft story) retrofit.** Install new shear walls, footings, replace existing support columns, continuity straps, stucco and paint.
All with our own crews!

