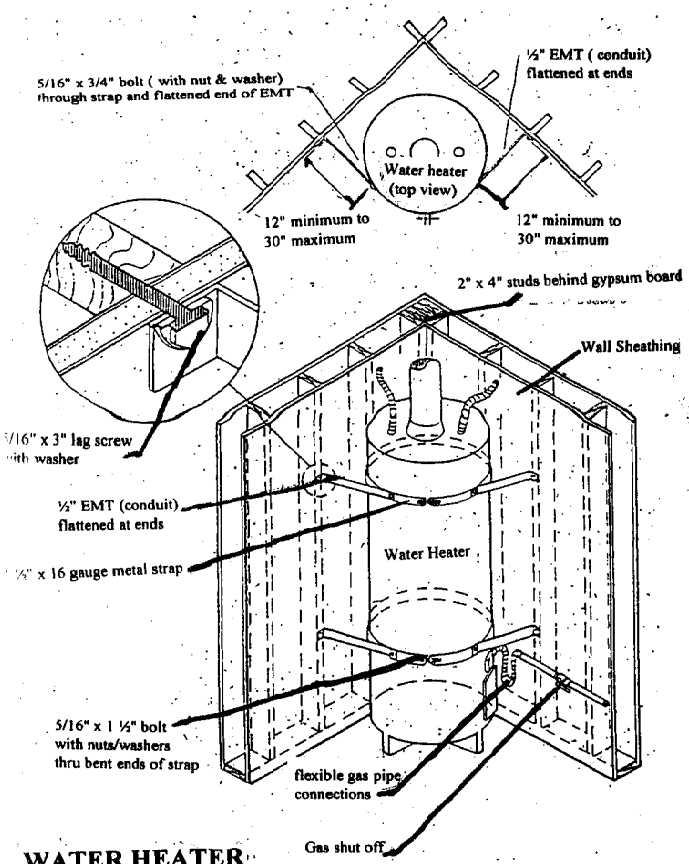
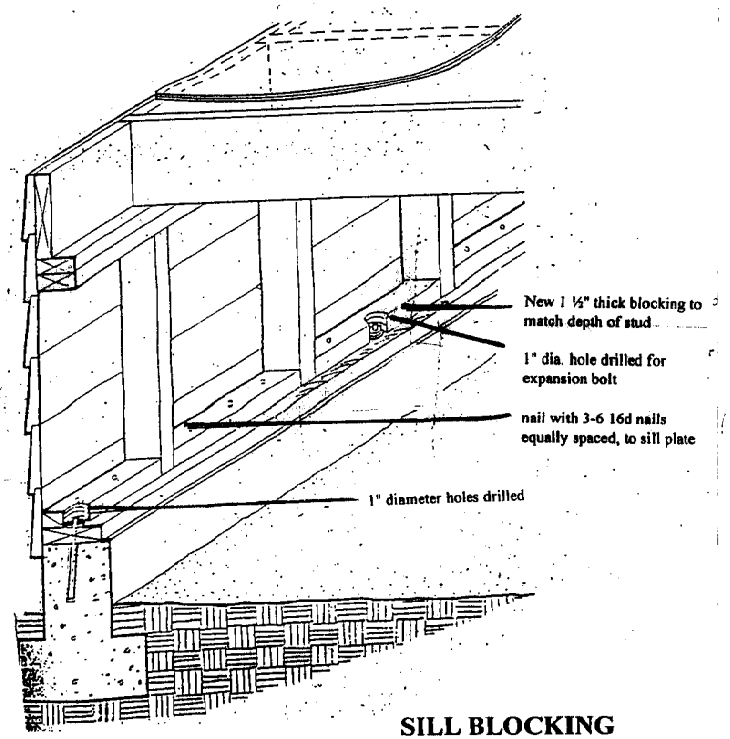
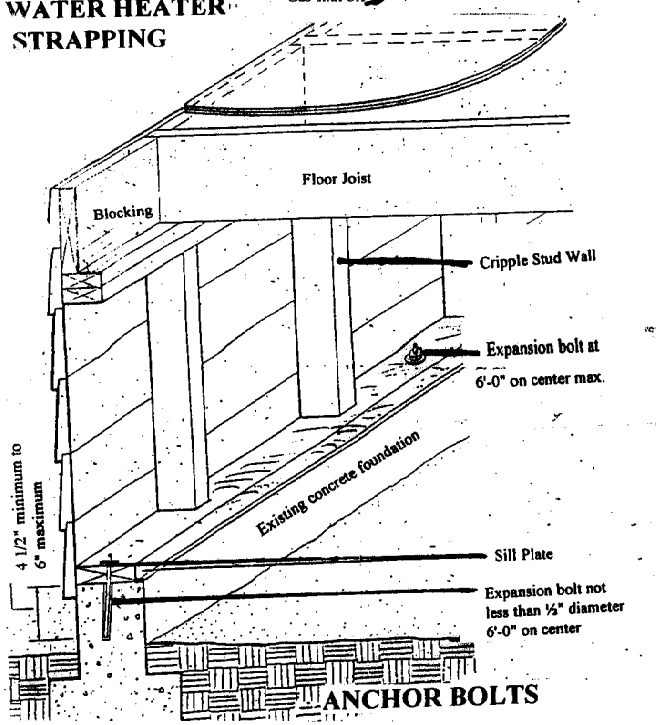


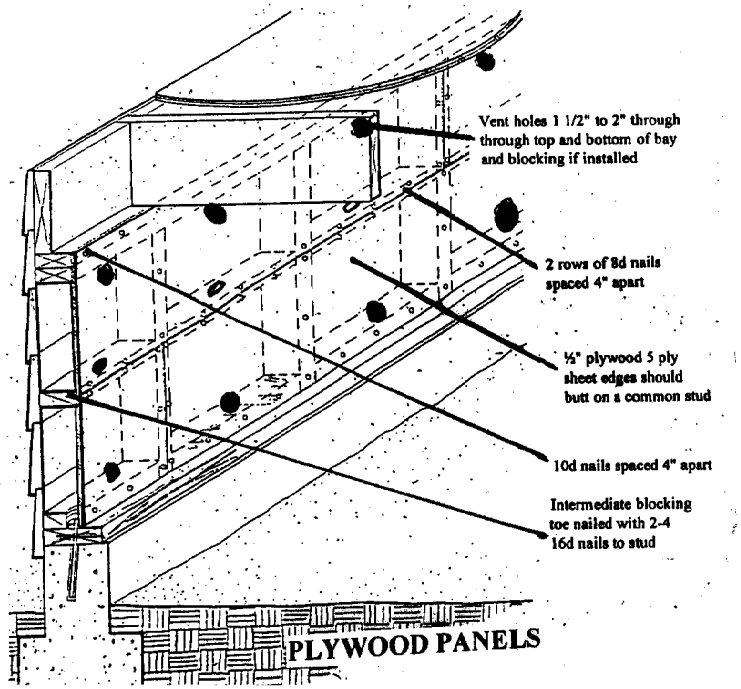
WATER HEATER STRAPPING



SILL BLOCKING



ANCHOR BOLTS



PLYWOOD PANELS

Seismic Retrofitting Guideline

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DISCLAIMER:

This publication adapted from California OES and FEMA publications illustrates basic retrofit techniques for single family wood frame structures. It is not, nor can any checklist or "how to" publication be, a substitute for evaluation of a structure by a registered structural engineer or licensed geologist or soils engineer, or retrofit by licensed construction professionals.

Because the science of earthquake engineering is not sufficiently developed to enable precise predication of an earthquake's consequences, there can be no guarantee that application of the information in this publication will safeguard people or property in an earthquake, The information in this publication has been carefully reviewed, but neither the products, the reviewers, FEMA, State of California, City of Millbrae assumes liability for any injury, death or property damage that occurs in connection with an earthquake, or in the application of recommendations contained in this publication.

This handout describes some relatively inexpensive retrofitting techniques. By following the simple steps presented here, you can reduce damage to your home. Before beginning your project read through the steps until you understand them., If you have additional questions, you may call the Building Division at 415 -259-2330 any weekday morning between 8:30 am and 12:00 Noon.

Sill Plate Bolting

1) Layout bolt locations bolts shall not be more that 6'-0" on center. Bolts at the ends shall be between 4" & 12" from the end or joints.
2) Start by putting on a dust mask before starting as this is a dusty process. Drill holes through the sill plate and into the foundation with a carbide drill bit of the size determined by the manufacturer. Drill holes a minimum of 6" into the foundation wall.
3) After drilling the holes insert a small diameter tube into the hole to blow out the concrete dust.
4) Install anchor with washer into the hole.
If wedge type anchor drive into hole until the washer rests on the sill and tighten with a wrench.
If epoxy is used install bolt with epoxy and wait until set then install nut and washer and tighten with wrench.

Sill Blocking

Blocking is only necessary if the sill has less than 2" edge showing.

1) Measure and cut blocks to fit between studs. Blocks should be the same size as the studs but not less than 2" nominal.
2) In cases where the foundation bolts occur drill a hole the same size as the bolt/washer so that the block fits snuggle on the sill plate.
3) Install blocking using between 3-6 16D nails. drill a pilot hole if block starts to split.

Installing Plywood Shear Wall

1/2" plywood 5 ply thick recommended

1) Always try to use full width sheets or sheets cut full size to the cripple wall, If you must cut in half cut the sheet length wise but not less than 18".
2) If sheets are cut in half install additional blocking at seam. Make sure to install a 1 ½" to 2" hole in the center of the block for ventilation.
3) Starting at the corner layout the plywood so that the joint end on a stud. measure and cut out vents, Block around these vent holes.
4) Mark the top plate and foundation wall the center of the studs, You will be covering the studs up and will not be able to see them without these marks.
5) Install the plywood using a nail gun or hammer install the nails 4" on center around the perimeter and in the field (middle). Minimum 10d nails.
6) Once the plywood has been installed drill a 1 ½" to 2" hole in the top and bottom of each stud bay in the center of the bay, to provide ventilation.

Water Heater Strapping

1) Mark heater 6" down from top and 18" up from bottom, locate studs in wall on both sides.
2) Drill 3/16" hole 3" deep into stud.
3) Measure around heater , add 3". cut 2 pieces 1 ½" x 16 gauge metal strips to this measurement.
4) Bend 1 ½" from end 90°.Bend straps into a curve the same as the water heater.
5) Cut four pieces of emt conduit equal to midpoint of the water heater to the wall. Add 1 ½" to these measurements. Drill 3/8" hole at this midpoint.
6) Flatten the all ends approximately 1 ½" . Be sure to flatten all ends on the same plane.
7) Drill a 3/8" hole in each end about 3/4" from the end. bend ends to approximately 45°.
8) Wrap straps around heater insert 5/16" x 1 ½" bolts with washers tighten nuts finger tight. Insert 5/16" x 3/4" bolts in midpoint holes in strap. attache one end of flattened pipes to these bolts. tighten finger tight. Insert 5/16" lag screws into holes on pipes and into wall.
9) Adjust and tighten straps to marks installed in time #1. Tighten nuts snugly not too tight.