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SINGLE-FAMILY EARTHQUAKE (SEISMIC) RETROFITS

Most experts agree that it is not if, but when a significant earthquake will occur in the Pacific Northwest. Many homeowners have questions about what they can do to their home to help protect it from earthquake damage. The following information is provided to answer some of those questions.

GENERAL QUESTIONS

Q **Does the City have information on what other homeowners have done to make their homes safer?**

A Most in earthquake retrofits have involved improving the connection of the house to the foundation. This has been accomplished through use of metal straps, anchors, bolts, lags screws and/or nails to connect the wood sole plate to the foundation. This is probably the first area that should be retrofitted when considering and earthquake upgrade. In an earthquake, a house that is not connected to the foundation has a tendency to move or 'walk-off' the foundation, causing severe and sometimes irreparable damage. Even if the building itself is strong enough to withstand the motion, without a good connection to the foundation the rest is pointless. Note: Typical building codes use in the State since 1960 have had a requirement that the foundation sole plate be anchored to the foundation by ½ - inch diameter bolts spaced six-feet apart along the foundation wall. Depending on the type of floor construction, you may not be able to see if these bolts exist (especially in a 'post and beam' type floor system where the sub-floor boards or plywood are nailed directly to the sole plate, covering the top of the bolt and nut). See the Web information on 'Structural Mitigation' for information on anchorage foundations and other earthquake retrofit information at: http://www.BeavertonOregon.gov/index.aspx?NID=1202

Q **After what year of build date are most homes considered safe because of code requirements for seismic activity?**

A Homes built prior to 1960 are probably in the most need of verification that they are anchored to the by bolts to the foundation walls. Starting the mid 1970's, the State of Oregon improved the building code and inspection process by mandating a single State-wide Building Code for builders to follow, and certification (through experience and training) of building inspectors. It was not until the late 1980's that earthquake resistant construction became commonplace, so homes built since that time have anchorage of the building to the foundation and wall bracing as an integral part of the design, construction and inspection requirements. Note: even though a home is built to the most current earthquake standards, there is no guarantee that in a severe earthquake the building won't sustain damage (no building can be guaranteed earthquake-proof). The purpose of earthquake building codes is to have the building resist the earthquake movement long enough for the occupants to be able to escape to the outside. The intensity and duration of an earthquake (in any combination) have a lot to do with how much damage is experienced.

Q **I live in a three story town home. What seismic improvements might it need?**

A These types of buildings are relatively new to the Beaverton area. Most were built beginning in the late 1980's. Most have been constructed to modern Building Codes and are earthquake resistant with positive connection of the building to the foundation and walls designed to brace against movement, so there probably is not a lot of earthquake retrofit that can be done. If the building is older, then verifying the building is anchored to the foundation is the first place to start. If the building was built before the late 1980's, then wall bracing (especially on the bottom level at the garage doors or similar large openings) would be another area to consider.

Q **If my home has high beamed ceilings, what supports if any is recommended?**

A In an earthquake it is not support that is the issue, it is connection. Making sure that beams are connected to the posts and the posts are connected to the foundation is an area where a retrofit would to better resist earthquakes. This could be done with various metal straps, hangers, anchors, ties, bolts, lag screws and nails. Home improvement stores usually carry an assortment of metal straps, anchors, ties, hangers, ties, bolts and lag screws for various connection conditions, there are even some that are decorative in nature, so if they are exposed they have a less utilitarian look.

Q **Should furnaces be attached to the walls like water heaters?**

A Furnaces are required to be anchored in an approved manner. That typically is per the approved manufacturer's installation instructions. That typically involves screws or similar anchors connecting the furnace to the plenum boxes at the top and bottom of the furnace. In some cases it may also be connected by straps or similar material to the wall framing. If one chooses to add additional strapping, care must be taken to make sure the furnace is not damaged (as in piercing the combustion chamber, electronics, vents, fans, etc.). If possible check with the manufacturer about methods to better anchor the furnace (you don't want to void any warranty).

Q **Our wood stove sits in the middle of the room and has at least a 10 foot section of pipe to the ceiling. What recommendations are there to better resist earthquakes?**

A Objects like a wood stove can move around in an earthquake and could cause the chimney pipe to dislodge, so anchoring the wood stove to the floor would be the best way to minimize movement.

Q **How are deck supports upgraded to earthquake standards?**

A The best way is make sure the posts are connected to the footings, the beams are connected to the posts, the joist are connected to the ledger board and the ledger board connected to the house framing and/or foundation. Also, brace the posts to resist movement. Good examples of how to accomplish this can be found in the City's "Typical Deck Plans" at: http://www.beavertonoregon.gov/DocumentView.aspx?DID=1771

See page 12 (figures 5, 6 and 7) for ledger board attachment and page13 (figure 6a) for lateral load connection of deck joists to floor joists. Attachment of the ledger board is the most important (even to ensure the ledger won't dislodge during normal use from people standing, sitting and walking on the deck). It is very important to make sure to add lag screws or bolts to the connection if it has only been attached with nails. See page 17 for cross bracing of posts. See pages 18-20 for connections of joist, beams and posts. Home improvement stores usually carry an assortment of metal straps, ties, hangers, ties, bolts and lag screws referenced in the document.

Q **Does Beaverton offer some sort of certification on the work that will be reflected in the property record for the benefit of a future sale?**

A The City will issue building permits for earthquake retrofit work and provide an inspection report for the work that was done (the City would also keep a permanent record of the permit and inspections). The report would reflect the level of work that was done. For example: If the work is for installing anchor bolts, plates and/or straps to improve the connection of the house to the foundation, but is not based on an engineered design, the permit and inspections will state: "Voluntary non-engineered seismic upgrade to improve the lateral force resistance and/or anchorage of the building. The installation only validates the anchors, plates, straps, etc. are installed as recommended by the manufacturers, and does not represent a seismic upgrade meeting the requirements of the State Building Code." If the work involved a full engineering analysis (from a design professional) to meet a minimum earthquake resistance standard, then the permits and inspections would reflect that level of retrofit.

BUILDING PERMITS

Q **Do I need a building permit to upgrade or retrofit my home to better resist earthquakes?**

A Not all earthquake retrofit work requires a building permit.

The following is a list of items that do not require a building permit.

- Installing anchor bolts, plates and/or straps to secure the existing house walls to the existing foundation.
- Installing metal anchor straps to connect posts to footings, beams to posts, floor joists and/or roof rafters to walls.
- Adding plywood or similar bracing to existing unbraced crawlspace and/or basement cripple walls. Care should be taken to ensure that existing foundation ventilation openings are not covered by the work.

The following is a list of items that do require a building permit.

- Addition of new walls and/or foundations to resist earthquakes.
- Installation of prefabricated brace wall panels or brace frames.
- Work that alters the structural framing of the building (walls, beams, posts, foundations, etc…). This does not include attachment of simple anchors, plates and/or straps as described above.

Q **Even though a permit is not required for the work, can I obtain a building permit to upgrade or retrofit my home to better resist earthquakes, especially if required by my insurance?**

A Yes, the city will issue a building permit and inspect the work for earthquake retrofits. If the work is for installing anchor bolts, plates and/or straps to improve the connection of the house to the foundation, but is not based on an engineered design, the permit and inspections will state:

"Voluntary non-engineered seismic upgrade to improve the lateral force resistance and/or anchorage of the building. The installation only validates the anchors, plates, straps, etc. are installed as recommended by the manufacturers, and does not represent a seismic upgrade meeting the requirements of the State Building Code."

Q **If I am going to retrofit all or part of my house to better resist earthquakes, do I have to bring the entire home up to the current codes for earthquake resistance in effect today?**

A No. A voluntary earthquake upgrade does not require the entire building to be brought up to the current code requirements. The limitation would be that any new earthquake resistance retrofitting cannot create a hazard for the existing building such as cutting existing wall sheathing or other structural members for access to install anchor bolts.

Q **What do I need to obtain a permit?**

A A completed building permit application and three set of plans and/or information that describes what work will be done is required. Example: If the work involves installing anchor bolts, plates and/or straps to secure the existing house walls to the existing foundation, provide information from the manufacturers on the anchor bolts, plates and/or straps, identify the size, length and spacing of the anchors, describe the location of where they will be installed, such as "in the crawl space, connecting the sill plate to the foundation wall".
Link to permit applications:

http://www.BeavertonOregon.gov/index.aspx?nid=440

Q **How much does a permit cost?**

A Building permit fees are determined by using the fair market value of the project (what a contractor would charge for materials and services). Example: The permit cost for a fair market value of $500 would be around $90.00.

Q **What is the purpose of the permits and codes?**

A The purpose behind building codes is to give reasonable assurance that a home is safe from structural failure, fire hazards from electrical and heating systems, electrical shock, and health risks. The permits provide a permanent record of the work performed and inspections conducted on the project.

LICENSES, CONTRACTORS AND DESIGN PROFESSIONALS

Q **Do I have to have a license to do work on my own home?**

A No. A homeowner (who owns and occupies the house) may do any or all of the work. If you are not sure of your abilities to do any or all of the work, it is recommended that you hire a licensed contractor.

Q **If I use a contractor, why should I use a licensed contractor?**

A For one thing, any contracted person doing work who is not currently registered with the State Construction Contractors Board is doing so illegally. Would you want this type of person working on your home? Another reason is the registration provides some protection to the homeowner from being charged for work and materials not provided or paying twice for them (material suppliers and

subcontractors can place a lien on your home if they do not receive payment from your contractor). You can verify if a contractor is registered with the State Construction Contractors Board on the following Web site:

Link to State Construction Contractors Board:

http://www.oregon.gov/CCB/Pages/index.aspx

Q **If I am having my project done by a licensed contractor, should I rely on my contractor to get the permits?**

A Often there is a misunderstanding between the contractor and owner as to who is responsible for obtaining the permits. Be sure it is clear who is responsible. If the contractor were to be responsible for obtaining the permits, it would be wise to have the contractor provide proof they did so. The owner will ultimately be responsible for the work on their property.

Q **How long does it take to get a permit?**

A The length of time varies depending on the complexity of the project. The Building Division has a staff member available Monday through Friday, from 7:30 a.m. – 9:30 a.m. and 1:30 p.m. - 2:30 p.m. or by appointment to review small, simple projects "over the counter." This means you can come in and leave with a permit (taking approximately one-half hour). It may take other more complex projects up to two weeks before they are reviewed.

Q **Do I have to have my plans drawn by a Professional Designer, Architect, or Engineer?**

A No. The owner or anyone they choose may draw the plans as long as they are clear and detailed enough to indicate what and how the project will be built. If the earthquake upgrade is intended to upgrade the house to the current code requirements or an established seismic retrofit standard, a design professional will be required to prepare the plans and design.

INSPECTIONS

Q **Why do I need inspections? Do I have to pay for these inspections?**

A Inspections are required at various stages of the project to see that the work is following the approved plans and codes. There is no additional charge for the inspections. They have been paid for with the permit fees.

Q **How do I get an inspection?**

A To request an inspection, call the City Inspection Request Lines (526-2400). Please leave the following information: Address of the job site, the permit number, the type of inspection needed, contractor or contact person, and a contact telephone number. Inspection requests received before 7:00 am will normally be done that same day. Requests received after 7:00 am will be done the following workday. The Building Division will try to accommodate requests by homeowners to schedule a time for the inspector to meet them when necessary.