

Saturday, February 5, 1994

## Building quake-proof homes

Codes are stricter, but modern homes can present new challenges

By Mark Cohen  
of the Daily Republic

California has significantly upgraded its state building code since 1976 to minimize earthquake damage to homes, but at the same time, homes have become more difficult to protect.

Most homes 30 years ago had a simple box design that was relatively easy to construct in an earthquake resistant way, said Tom Garcia, plan check engineer at Fairfield's building department.

But today's home which sports vaulted ceilings and many levels presents a greater challenge to engineers trying to figure out how to guard against damage, he said.

"When you start doing that, you have discontinuities" in design and an increased chance of cracking, Garcia said.

The problem is that home design is dictated by aesthetic concerns, not engineering considerations, said Peter Bernard, civil engineer.

To keep up with changes in house design, the state issues code updates every three years, with another one due to be issued sometime this year.

The important rules on houses built during the last 17 years are anchor bolts attaching the

Please see Quake, Page E2



Daily Republic/CHARLOTTE SCHMID-MAYBACH

Contractor Steve Sutton uses a series of HD-5s or "hold-down" bolts seen in foreground, and shear transfers or plywood supports to stabilize this Vacaville house in the event of an earthquake.

### Quake From Page E1

wood frame of the house to the foundation and bracing, usually plywood sheets nailed to frame studs to create shear walls, said Al Hurd, chief building inspector, building division, public works.

Such measures, in combination with hold-downs — sturdier metal angle brackets to hold corners and ends of shear walls — protect against the two types of stress an earthquake exerts on a house, horizontal and vertical, he said.

Hold-downs keep the house from lifting off its foundation during a quake.

Shear walls — so named

quakes.

Anchor bolts prevent shearing at the foundation to prevent the house from sliding off foundation, Garcia said.

In fact, anyone considering buying a house in a new development might want to get a tour of the construction by a building superintendent who can explain the earthquake safety techniques the builder used, he said.

Those looking to buy an older home should check the crawl space to see if the frame is bolted to the foundation and if the short cripple walls are reinforced with 3/8-inch plywood, said John Kobzeff, structural engineer.

these standards is relatively simple, unless the very foundation is too weak and crumbly to hold a bolt, Kobzeff said. In that case, the house might have to be raised and a new foundation poured.

All prospective home buyers should realize that walls hold up a house, not the windows, and that a house with too many windows could be tough to strengthen, Bernard said.

Cracks around the door frame may also be a warning sign

because a doorway is a hole in a wall and hence a structural weak point, he said.

Some builders regularly go beyond the call of duty when building homes.

Bolts that extend 25 feet from the foundation to the roof and foundations strengthened by extra steel are part of a 13,600-square-foot house Steve Sutton is building in Vacaville.

He also likes foundations for interior and perimeter walls.