Foundation Capping

"Capping" of an existing un-reinforced masonry foundation refers to the addition of concrete (or shotcrete or gunite) on the top of, on one side of, or on the top and both sides of an existing foundation. The concrete should have some reinforcing connecting the cap to the existing foundation but there is really no way to know. This is one of three foundation retrofit methods addressed in the "Seismic Retrofit Training For Building Contractors and Inspectors" Participant Handbook, prepared by Woodward Clyde Federal Services and the Hazard Mitigation Technical Assistance Partnership, Inc., and available on the ABAG website (http://www.abag.gov/bayarea/eqmaps/fixit/training/html).

Foundation capping, primarily on the top of an existing un-reinforced masonry foundation, appears to be recommended with some regularity by San Francisco Bay Area pest inspectors for wood framed buildings in order to increase the clearance between soil and wood wall framing. This may be driven by a desire to make existing buildings comply with CBC Section 2306.8, which for new construction requires a minimum clearance of six inches from earth to wood that is neither treated nor of natural resistance to decay. Recently a major lender has also requested foundation capping, apparently due to concerns regarding building support on an un-reinforced masonry foundation.

There are limitations and inherent risks that should be considered before undertaking foundation capping. In addition, when foundation capping is being undertaken as part of voluntary earthquake retrofit, the priority of foundation capping relative to other retrofit needs should be considered.

Uses, Limitations and Risks of Foundation Capping

Capping the top of an un-reinforced masonry foundation is a complex operation that provides a number of opportunities for damage to the supported building, both during and after the capping procedure. A contractor shores up the building just inside the foundation line in the crawlspace with "cribbing" to hold the house in place. The bottoms of the studs are then cut off and the same mudsill is nailed back to the bottom of the studs. After that the concrete is poured so that the mudsill is now embedded into the concrete. This also usually requires that the inside of the foundation be capped so that the concrete can be poured into the form. If it a cap of a brick foundation you often see a saddle. This means the brick is covered on the top, inside, and outside edges. To find out if it is a saddled brick foundation dig below the concrete and see if you find brick. Without adequate anchorage of the concrete to the existing foundation, the interface between the two can provide an additional slip-plane under earthquake loading, providing another opportunity for damage.

Capping the top of a foundation is a risky approach to increasing clearance from soil to wood. There are very few circumstances where this risk would be reasonable or cost effective. One reason might be if decay, pest damage, or remodel requires substantial reconstruction of the wall framing anyway. The soil to wood problem can be addressed using pressure treated wood and plastic spacers as the drawing included herein. A second reason might be to provide a local

repair to a locally fractured or deteriorated foundation (When this is the case the source of fracture or deterioration should also be addressed). Tests done by the Structural Engineer's Association of Southern California demonstrated that even marginal un-reinforced foundations can still perform well in earthquakes. Please see the SEAOSC report from November of 1992.

Wood to soil clearance is likely to be only one of many aspects of an existing building that may not conform to the current code for new construction. There is seldom any code-based requirement for an existing building to meet current requirements for new construction (change of use of the building might be one reason for such requirements). The decision to modify the existing building should be based on the ease with which modifications can be made and the likely hazard if modifications are not made. As one example, if a building has existed for 80 years without decay or pest damage, it is hard to justify expensive measures to avoid possible future decay or pest damage; periodic monitoring might make more sense in this case. Where possible, lowering of the soil is the quickest, easiest, and cheapest solution to increasing soil to wood clearance. Where lowering the soil is not possible, it may be reasonable to do nothing or possibly to add decay-resistant framing.

Capping both sides and the top of a foundation (sometimes called a saddle) provides a good approach to re-supporting studs and posts at a local area of foundation fracture or deterioration.

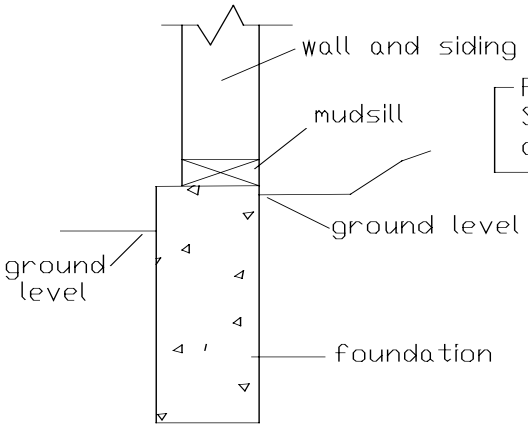
Where foundation fracture or deterioration occurs in more than a couple of local areas, where it is determined desirable to increase the strength of the foundation, or where hardware anchorage from retrofit of woodframe portion of the building is needed (other than anchor bolts), the other two methods proposed for foundation retrofit should be pursued: replacement or parallel systems. A foundation poured parallel to the old foundation would be the cheapest of the two alternatives because the old foundation would not have to be removed.

Design Guidance for Capping

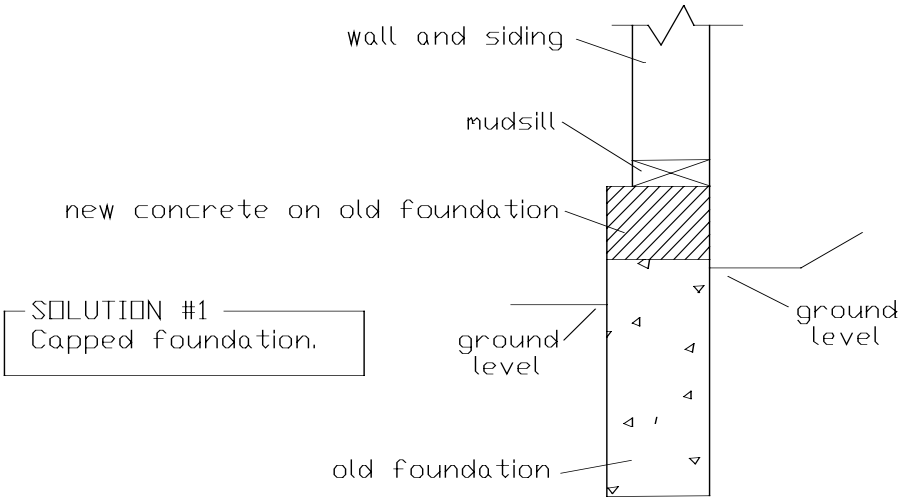
At this time there are no guidelines available to specifically address design, sizing, reinforcing or anchorage of capping retrofits. Where foundation capping serves as a local repair for a foundation, design should be provided by a registered engineer who can determine appropriate design forces and applicable building code requirements. In all cases where damage to existing foundations appears to be caused be by soil conditions such as settlement or expansion, it is desirable to consult with a geo-technical engineer prior to repair in order to avoid having the same failure repeat. Sources of water causing deterioration should also be eliminated where possible.

Retrofit Priorities

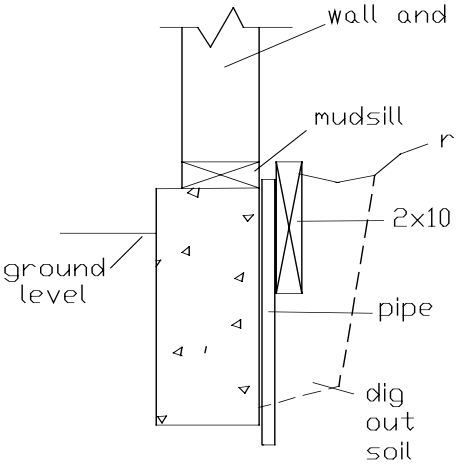
Foundation capping is an expensive retrofit, and the relative benefit of foundation capping is hard to gage Where capping is proposed, it is appropriate to ask what the benefit to cost ratio might be, and whether the expense of capping is justified. Foundation capping has been recommended in buildings that have unbraced cripple walls and soft first-stories (due to parking); retrofit of the cripple walls or soft story would generally produce a much greater benefit to cost ratio and possibly also reduce risk to life. Where limited money is available for voluntary retrofit, relative priorities of possible retrofits should be considered; foundation capping is not likely to be high on the priority list.



PROBLEM:
Soil is too close to the wall and can cause decay.



SOLUTION #1
Capped foundation.



SOLUTION #2
Dig out soil along foundation. Drive plastic pipes down next to foundation about 6 feet apart to provide an air space. Place 2"x10" pressure treated lumber next to pipes to keep soil away. Replace soil up against lumber.