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**Kevin L. Williams PE 19124/LS 1606**  
**Oklahoma City, OK 12/1/06**

## A Dilemma in Residential Foundations

by Robert C. Zahl, P.E.



**A** serious problem exists with many of the residential foundations that are being built today in central Oklahoma, in that they do not meet the minimum requirements of any of the local residential building codes. When I was hired to investigate movement problems with one of these foundations for a builder in the Del City area last year, I explained the problem with what I had seen to him, and his comment was, **“But I’ve got 118 houses that I’ve built just like this one.”** All that I could tell him was that he probably had 118 problems. This is a situation that is happening again and again, and it is creating a whole lot of unhappy homeowners.

The problem to which I am referring has to do with what the builders and foundation sub-contractors commonly refer to as a “pier and grade” foundation system. To me, this means that it is “almost” a **pier and grade beam** foundation system...but not quite. Described below is what is typically being done.

- The foundation sub-contractor “prepares the site” by scraping off the grass and other vegetation, which is considered “leveling the pad.” This does not always happen. Also, fill dirt is sometimes added to elevate the building pad.
- Following the creation of the pad, forms for the “grade beams” are put in place around the perimeter of the proposed location of the house. These forms are set to allow forming of the “grade beams,” which are usually 10” wide and 14” to 18” deep, poured right on top of the ground surface.
- Ten inch round by approximately three foot deep piers are drilled through the form openings before the grade beam reinforcing is placed into the forms, and these piers are typically spaced between 6 feet and 8 feet apart, with one vertical reinforcing bar in each of them. The concrete for the piers is generally placed at the same time the grade beams are poured.
- Once the “grade beams” have cured sufficiently to have the forms stripped off, the electrical conduit, mechanical ductwork, and plumbing pipes are laid out in the area inside of the grade beam perimeter.
- Either before or after all of the items that are going to be buried under the slab have been placed, the inside area is filled with sand or some other kind of earthen fill material. In many cases, the only compaction that this fill material receives is whatever it gets as the bobcat is running over it during the placement of the fill dirt.
- A nominal 4” slab-on-grade (typically unreinforced) is poured over the fill material, very often with a mix that is intentionally so wet that the whole slab can be poured from one or two locations.
- After the foundation is in place and the slab is poured, the superstructure is erected and the brick veneer is laid on top of the “grade beams.”

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Oklahoma State Board of Licensure for Professional Engineers and Land Surveyors

## Disciplinary Activity of the Board (cont.)

**In the Matter of M & M Lumber Co. and Darryl Ogden; Case No. 2006-101; Summary of Findings of Fact and Conclusions of Law:** For offering and performing engineering services for a project without a certificate of authorization to do so, M & M Lumber Co. is found Guilty and assessed an administrative penalty of \$5,000. For offering and practicing engineering without a license to do so, Mr. Ogden is found Guilty and assessed an administrative penalty in the amount of \$1,000. Darryl Ogden and M & M Lumber Co. are ordered to Cease and Desist from practicing or offering to practice engineering in the State of Oklahoma until such time as they have been duly licensed to do so.

**In the Matter of 4-D Air and Eugene De Ryche; Case No. 2006-103; Through Consent:** For offering and performing engineering services for a project without a certificate of authorization to do so, 4-D Air is found Guilty and assessed an administrative penalty of \$1,000. For offering and practicing engineering services without a license to do so, Mr. De Ryche is found Guilty and assessed an administrative penalty of \$1,000. Mr. De Ryche and 4-D Air are ordered to Cease and Desist from practicing or offering to practice engineering in the State of Oklahoma until such time as they have been duly licensed to do so.



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## A Dilemma in Residential Foundations (cont.)

- The final step in this process is to place dirt backfill around the outside of the house, to cover up the bottom of the exposed concrete grade beams. This usually ends up with the bottom of the grade beams being 3" to 10" below the finish grade, which does NOT meet code, because it is not below the frost line. In this area of the state, the frost line is 16" to 18" below ground level. It is impossible to be able to get the bottom of these 14" deep members below the frost line without having the finish grade extending up onto the brick veneer. This does not work, because the tops of the grade beams are usually even with the floor line. Exposed concrete at the base of the brick veneer exterior walls is usually the first clue that this type of system has been used.

It seems that whoever decided that this system was a good way for builders to save money in the construction of a house overlooked the fact that the continuous portion of the foundation system, and not just the piers, needs to be below the frost line. There are a few things that can be done to eliminate this problem, such as using perimeter insulation, but the foundations that I am seeing installed do not have this.

The further problem with many of these systems is that the piers being installed are typically not even capable of supporting the kinds of loads that they are supposed to be carrying. One specific design that I checked would not even support the weight of the brick veneer, not to mention the rest of the wall, ceiling, and roof loads that it was supposed to be carrying. When I questioned this, and the builder passed it on to the engineers hired that had provided the design, their answer was that the load was not going to the piers...it was being supported by the ground under the grade beam. By definition, this system should not even be considered a pier and grade beam system. If the builders are going to build systems that are continuously supported by the ground, then these systems should be built to meet the minimum code requirements for continuous footings.

The Board plans to schedule a public meeting to discuss this matter and if you wish to participate please e-mail Kathy Hart at kathy@pels.state.ok.us and she will contact you to notify you when the meeting is scheduled. It will also be posted on our website. You may also submit comments in writing to the Board office concerning this issue.

