

You Might Be a Redneck Engineer If...

(Case 1035)

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The Case:

About 11:00am on a beautiful Fall day, Robert, a project engineer for a mid-size geotechnical consulting firm in Metropolis, is working at his desk when the phone rings. The receptionist, Sherry, states that she has “a live one” on the other end and it has something to do with geotechnical work. This is Robert’s department, so he takes the call.

Walker, a prospective (new) client, has called from the project site on his cell phone. He wants to know if Robert can help with some soil testing for “a real nice Kentucky-style horse farm up near Hunter’s Ridge.”

Robert smiles when he thinks of it. A quiet community about 75 miles northwest of Metropolis, Hunter’s Ridge is indeed an ideal location for a “Kentucky-style” horse farm. Rolling hills, grassy meadows with scattered trees, occasional streams, and fence-lined country roads offer just the setting for this type of farm. A site visit would be the perfect afternoon get-a-way from the office – maybe he can get lucky. Still, Robert wonders how big a deal it can be to do geotechnical work for a horse farm.

After a few minutes conversation, Robert gleans that Walker knows a lot about horses, some about construction, and not much about the engineering design process. He indeed needs help. Also, it is no surprise that Walker is in a hurry and would like Robert to come out this afternoon to “look things over.” Deftly putting the phone on HOLD, Robert runs down the hall and quickly apprises his boss/ office manager, James, of the situation. Always on the lookout for new business – his favorite expression is “you gotta feed the monster” – James directs Robert to make the site visit that afternoon and to do what it takes to get the commission.

The trip to Hunter’s Ridge is as relaxing and picturesque as Robert knew it would be. As he arrives in the area, Robert notices the newly-constructed, white, four-rail horse fence that seems to go on forever, the cleared fields, and deep blue stock ponds. This place has to be several hundred acres. A farm worker in a straw hat is driving a tractor out in the pasture, clearing some stumps. Also, Robert sees a new maroon pickup parked up on a hill – Walker’s vehicle – so he enters the site and proceeds to the pickup.

Walker, a tall, lanky, country gentleman with deeply tanned face and friendly wrinkles about his eyes, greets Robert and then spreads out a rudimentary site plan on the hood of the pickup and explains the project. It will be quite a show-place -- mare and colt barns, an opulent stud barn, feed storage and tack buildings, a veterinary clinic, numerous stables, a maintenance shop, headquarters for the ranch foreman, and on the other side of the creek – back in the trees – a 5,000 square-foot residence for the Owner, a multi-millionaire who will relocate to the farm once it is constructed. The horse facilities, especially the mare and stud barns, are for thoroughbred racehorses and are large heavy structures, intended to impress with stately woodwork, ornate cupolas, and all the amenities.

It turns out that Walker is not the Owner but the Construction Manager. Walker explains that the designer for the new facility, Chuck, has suggested that Walker get some soil testing to make sure that he can use “footers” like he would do back in Kentucky. Also, he states that because of the extensive network of stables, gates, and holding pens, there is very little tolerance for movement – no one wants a door to drag or a gate to fail to shut perfectly when they are stabling a thoroughbred. Chuck is not on site – he lives in Kentucky and “all he does is horse farms like this.”

Having outlined the overall scope of the proposed development, Walker immediately asks how much it would cost for Robert to do the soil testing, and when he could start. While it is not clear to Robert whether Walker really understands the engineered design-construction process, it is clear that Walker means business and this is no time to bandy weasel words. Pointing to the plan sheet spread out on the hood of the pickup, Robert briefly explains that he'll have to do two borings for this structure, four for that, etc., as well as soil testing and engineering analysis. He also explains that he will produce a report with recommendations, not the foundation plan itself, and that Walker will need to have a structural engineer do the actual foundation design. Walker acknowledges this and comments that “the footers are Chuck’s department.” Doing a quick calculation, Robert names a low five-figure fee for the work.

Walker thinks this over and says, “I better talk to Bruce.” He then waves to the farm worker on the tractor, a stocky man with a sweat-stained straw hat. Bruce waves back and drives the tractor over to the pickup, and shuts the engine off. Walker briefly summarizes what Robert has told him about the engineering work, including the five-figure fee. Bruce looks Robert over and then asks Walker if he “feels good about it,” to which Walker replies, “I feel good about it.” As Robert watches this interchange he notices, curiously, that the substance of the conversation is whether what they are talking about “feels good.” Not whether the scope of work is adequate, or if it is what they expected, or if the money seems reasonable, or anything cognitive, but only “do you feel good about it.” Based on Walker’s response, Bruce says, “Go ahead,” and he leaves to get back on the tractor.

At this point, Walker turns to Robert with one of those why-aren't-your-people-out-here-right-now looks and says, "OK, get started." It turns out that Bruce, the tractor-driving stump-pulling farm laborer, is also the multi-millionaire Owner, and the project has been approved. Just like that, with feeling. A little stunned, Robert hurriedly explains that he'll write up a proposal, fax it over for signature "just to confirm everything," and that he'll plan to have a drill crew out the day after tomorrow, which he does.

Everything seems to go fine. Robert obtains the soil test borings, and analyzes the data. In process, he discovers the site has a couple of areas of problem soils and some shallow ground water, and this will require some extensive earthwork – cutting and filling. However, if done properly, the earthwork should allow Chuck to use footers (lightly-reinforced spread and strip footings) as he is accustomed. Robert phones Walker to explain. Walker doesn't quibble but immediately retains Robert's firm to provide a full-time soil technician on site to monitor the earthwork.

Here Robert first realizes that Walker has no civil engineer consultant on the project, and no construction drawings other than Chuck's site plan showing where the buildings are to be located. In fact, Walker appears to be acting directly off of what Robert says (over the phone!), which in this case amounts to brief guidelines about the excavation of several feet of soil beneath the mare barn and replacement with select, engineered fill. This is a somewhat complicated process, and Robert fears that Walker may be moving a little too fast for his own good. Robert is not quite sure what he should do, but Walker is not waiting around – earthwork operations begin immediately.

Given the time constraints, Robert goes over the project in detail with his technician and directs him to watch everything closely and to report anything "unusual." Robert then proceeds to complete his geotechnical report. Three days later, the technician calls to say that the excavation was completed without incident, but that it encountered ground water and the hole is starting to fill up with water. Later that same day, who should show up at Robert's office but Larry, a friend of Walker's and a "designer" who has been hired by Walker to do the horse barn foundations for Chuck.

Crude and unpretentious, Larry is no engineer but he has been in contact with Chuck and he does have some elevation and floor plan drawings of the largest and most ornate horse barns Robert has ever seen. Noting how wonderful it must be to live the life of a stud horse on a farm like this – all they do is eat and inseminate mares – Larry states that he has heard about some "soil problems" from Walker and will respond accordingly. Larry also explains how he plans to deal with the water in the excavation, and his approach sounds reasonable. After discussion of the soil conditions, geotechnical design issues, and construction issues, Robert believes that Larry understands what is required for the project. Larry leaves for the site with a copy of Robert's report in hand.

The foundation construction will commence the following week, and Robert makes plans to be on site at that time, just to have a look at things. Arriving just prior to the concrete pour, Robert is greeted by both Walker and Chuck, the barn designer. Bruce is traveling in Spain looking at thoroughbred mares, Larry is supposed to arrive on site later, and Walker is busy and has no time to visit – he has a concrete pump and a concrete finishing crew on site and transit mix trucks are starting to arrive.

Immaculately dressed in Kentucky-style western garb, Chuck is polite, businesslike, and particular about his barns. After informing Robert that the first syllable of cupola is pronounced “kyōō” and not “kūp,” Chuck privately expresses amazement at the amount of steel and concrete being used for the foundation. Larry has done the foundation drawings but Walker’s construction foreman has them. So Chuck takes Robert over to look at the foundation excavation with the rebar cages in place, and Robert quickly realizes that, (1) Larry has grossly misinterpreted his geotechnical recommendations, and (2) the foundation is way over-done.

The amount of concrete and steel, together with the closely-spaced network of large foundation beams could take anything but a direct hit. Actually, the foundation probably could take a direct hit, and will cost a small fortune to build, certainly much more than the simple footings Robert had envisioned in conjunction with the earthwork. On the other hand, Robert notices several construction issues: the excavations are not as neat as they could be, the rebar cages “burn” the sides and bottom of the excavations in places, and portions of the excavation have loose soil and water in them. Because of this he is silently thankful for the extra concrete and steel, even though it is overkill.

Thus the concrete for the mare barn is placed, a massive foundation that Robert feels is more suitable for a reactor core than a horse barn. As he drives back to Metropolis, Robert can’t help but feel that, although he has done his best for his client in providing quality engineering services, the client has ultimately gotten a raw deal. Apart from his verbal earthwork recommendations, his geotechnical report has largely gone unused. The cost of the geotechnical work alone could have been saved by reducing the concrete and steel in this one barn if only the client had a qualified design team in place to implement the recommendations, and a contractor sophisticated enough to build them. But neither is the case, and the good ole’ boy design/construction team seems very tight.

As to the project, the geotechnical work is done and the earthwork is now complete. Walker is moving ahead with construction and, contrary to Robert’s recommendations, Larry has not specified any further quality control monitoring or testing for the foundations. Robert’s work on this project is over.

Yet several other barns, plus the residence, remain to be constructed. Robert is a little concerned about potential liability that might come back on his firm if the

buildings do not perform, and here Larry's massive over-design has a calming effect. But Robert is even more troubled by what he sees as the waste of labor, concrete, steel, and money on a project that could be done so much more efficiently.

What, if anything, should Robert do?

Alternate Approaches and Survey Results for "You Might Be A Redneck Engineer If..." (Case 1035)

1. Don't Worry, Be Happy. Despite the construction flaws, Larry's massive, over-designed foundation will ensure no life-safety issues. Arguably the project is wasteful, but the facts are, it is Bruce's design team and Bruce's money. If Bruce can afford this thoroughbred horse farm, then it should be his prerogative to choose or not choose "best practice" engineering. Robert has the opportunity to enjoy being part of a project like they used to be in the days before the bean-counters and lawyers took over. There is no problem here, just some good ole' boys having a good ole' time. Robert has earned his money and should celebrate the moment.

Percentage of votes agreeing: 2%

2. Don't Worry. Like the old saying, "You can lead a horse to water, but you cannot make him drink," Robert cannot control what other people do. Robert acted in good faith and even went beyond his normal duties to assist Walker and Larry by explaining his findings and recommending they seek a competent engineer for additional project design. Other than keeping clear notes of his observations in the project file, Robert should do nothing. His task is complete, and everything Robert has done is morally and professionally defensible.

Percentage of votes agreeing: 6%

3. Worry. Maybe nothing will go wrong. But despite the fact that Walker & company seem OK with everything for now, Robert knows that the design-construction work being done on Hunter's Ridge does not rise to professional standards. Robert and his firm are the only "professionals" associated with this project. As such, they stand to face financial blame in the event of structural failure, and worse, some might claim they are morally at fault for taking advantage of an uninformed client. At a minimum there is an image issue, and maybe a loss-prevention issue not far behind that. Robert should keep clear and detailed notes of his observations in the project file.

Percentage of votes agreeing: 4%

4. Share the Responsibility, with James. This situation is out of Robert's control. While reasons exist to suggest that the client not be bothered (yet), Robert should immediately discuss his concerns with James; they should notify legal counsel, and the responsible principal in their firm. As a group,

they should draft a plan of action to manage their potential liability exposure and do damage control on any image issues. Further, they should prepare full documentation of this project for the file, in the event of a problem.

Percentage of votes agreeing: 17%

5. Talk to Walker, the Construction Manager. Robert should have a heart-to-heart talk with Walker, his primary contact for the project. The point of the conversation should be to explain in friendly, clear, and simple terms that while what is currently being done with the foundations may work, the outcome will be better and a lot of money can be saved if Robert's recommendations (both design and construction) are followed more closely. Robert can make known his willingness to help out, up to and including providing a list of competent structural engineers. If Walker is unreceptive, document the conversation with notes and place them in the project file.

Percentage of votes agreeing: 9%

6. Talk to Larry, the Structures Guy. Robert should have a colleague-to-"colleague" talk with Larry. After all, it appears that Larry is the team member who is best positioned to implement sound design and construction practice. The point of the conversation should be to explain in friendly, clear, and simple terms that while what is currently being done with the foundations may work, the outcome will be better and a lot of money can be saved if Robert's recommendations (both design and construction) are followed more closely. If Larry is unreceptive, document the conversation with notes and place them in the project file.

Percentage of votes agreeing: 4%

7. Talk to Chuck, the Horse Farm Designer. Robert should have an "off the record" talk with Chuck, since in his role as lead designer, Chuck has the most influence over the project. Plus, Chuck has already picked up on the conservatism in the foundation design and he would be a better person to redirect the design-construction process than going to either Larry or Walker. The point of the conversation should be to explain in friendly, clear, and simple terms that while what is currently being done with the foundations may work, the outcome will be better and a lot of money can be saved if Robert's recommendations (both design and construction) are followed more closely. If Chuck is unreceptive, document the conversation with notes and place them in the project file.

Percentage of votes agreeing: 3%

8. Talk to Bruce, the Owner. Robert should have a high-level talk with Bruce. Being a businessman, Bruce will be sure to understand the benefit of saving money for money's sake. The point of the conversation should be to explain in friendly, clear, and simple terms that while what is currently being done with the foundations may work, the outcome will be better and a lot of money can be saved if Robert's recommendations (both design and

construction) are followed more closely. If Bruce is unreceptive, document the conversation with notes and place them in the project file.

Percentage of votes agreeing: 6%

9. Notify Walker & Bruce, Formally. Robert should write a letter to Walker and Bruce (presumably one of them signed his proposal), formally stating his concerns about the gross inefficiency of the design on the horse barn foundation. The letter should explain in friendly, clear, and simple terms that while what is currently being done with the foundations may work, the outcome will be better and a lot of money can be saved if Robert's recommendations (both design and construction) are followed more closely. Further, the letter should expressly disclaim any responsibility for foundation performance because a non-professional is designing the foundation system.

Percentage of votes agreeing: 43%

10. Report Larry & Chuck, Legally. This good ole' boy design effort is going to waste a small fortune, it is placing undue liability on Robert's firm, and it may even get someone hurt. Robert should not aid or abet the unlawful practice of engineering but should report to the State Board of Licensure that Chuck and Larry (if he can determine their full names and business addresses) are practicing civil engineering design work without a license.

Percentage of votes agreeing: 7%

Forum Comments from Respondents

1. In one sense, Robert has done what he was asked to do, and he has done it well. However, the burning concern about project waste should, at least, cause him to contact Walker. If Walker is open to ideas, fine. If not, Robert should move on to the next project, with notes of everything in his file.
2. It is unethical to ignore the situation completely because it may cause harm in the future; however, it is also not appropriate to talk to the client's client (Bruce). I suggest either formally or informally reporting the problem to Walker, documenting the problem, and leaving it alone at that point.
3. Robert should report Larry and Chuck, legally (Response 10). The reason is that both the ASCE and NSPE Codes of Ethics specifically state that engineers should report persons who are not engineers but are providing others with engineering services.
4. Robert should first talk with Larry, the structures guy (Response 6). If Larry is non-responsive, Robert should talk with Walker (Response 5). If that doesn't work, Robert should notify Walker and Bruce, formally (Response 9) and then report Larry and Chuck to the authorities (Response 10).
5. In many areas, short buildings can be designed by "designers" who are not engineers. There was no mention of the owner's building permit, the review

of which would usually ensure the design meets the code minimums and ensure public safety.

6. Robert's biggest mistake was that he failed to meet with and provide the report to the person who hired him to perform the study. Robert was already concerned that his report would not be well understood by his client and he should have scheduled a meeting time and location suitable for briefing the client on details of the project. As a result of this oversight, there seems to have been little technical discussion between Walker's design/ construction team and Robert's engineering firm about how to incorporate the suggested geotechnical requirements into the basic design. This lack of understanding has now transgressed into an act of self-interpretation by the person tasked with designing the foundation. Dissatisfaction with the outcome may turn into a case of finger-pointing between Robert and the designer. Robert should act upon his concerns but tread lightly in a quest to convince the owner, or each team member for that matter, how and why the construction methods used were inefficient. Clearly, we would not expect Robert to exceed his responsibilities, so he should discuss this matter with his employer before proceeding. Robert's employer must be allowed to decide how, or whether, to extend the business relationship with the owner. The firm must also refer questions of the qualification issues (construction manager and structural designer) to the appropriate sanctioning body. The company could salvage this business relationship by applying a little more relationship-building effort, but should consider ending it if the client insists on using unqualified persons to manage the construction and design aspects of the project.

Comments from Board of Review Members

1. While all of the colorful details make for interesting reading, they do get in the way of framing the ethical issue. Walker, the seat-of-the-pants construction manager; Chuck, the absentee "designer;" Bruce, the arm's-length owner; and Larry, the friend-foundation-designer-non-engineer make the scenarios in Robert's mind even more scary but the ethical dilemma would remain even if all of them did not appear flaky. To go right to the point, the project "team" is opaque to Robert, who has been kept in the dark but whose geotechnical work is supposedly the basis for all the others' work. Therein lies the ethical issue.
2. Robert finds himself involved in a fast-paced, free-wheeling design-build project without understanding what he was getting into. His first step could have been (once he realized what was going to happen) to try to put a few brakes on by telling Walker that he could probably help save some money if they took a little more time with the design details. Similarly, that conversation with Chuck and Larry would also have been appropriate. After the fact, he should still have that conversation -- by mail. Robert should draft a letter to Walker with copies to Chuck stating that he's been happy to

be involved, he understands he is finished even though there are more structures to build, he will be happy to help with those if they like, and by the way, based on what he saw with the barn, there may be some opportunities to save some costs on the remaining construction. Some clients care more about schedule and doing things the way they are comfortable than they do about costs. Robert should not worry excessively, but should let them know he has more to offer if they like. His letter should conclude that he understands that unless they ask him for more information, and since he won't be on site during the remaining construction, he has no responsibility for the construction or dealing with changed conditions. By the way - we don't know whether Robert ever got his proposal written and sent to Walker, and if Walker executed a contract for the work. If Robert, in his haste to get started, neglected the paperwork, then things could come back to haunt him...

3. This "Redneck" case is an interesting one. Some of the things to consider are:
 - a) If a farmer wants to build a barn and some outbuildings, does the law require that she/he have to engage professionally qualified designers and engineers to prepare plans and guide/observe their construction? There is no indication that members of the general public will be invited to or allowed on the property. It is likely, however, that Bruce may extend private invitations to selected individuals. (Farmers, especially high-end horsemen, often like to show off their 'spreads' and livestock.)
 - b) But, does Bruce have an obligation to his visitors and himself to assure that his structures and property/liability insurance will protect his guests? I think this is a personal and economic obligation, only.
 - c) It is clear that "Chuck", the designer, has and retains responsibility for the design of the facilities. Further, he recognized that he needed some input (are the soils similar to those in Kentucky and can conventional spread footings be used?) from a local geotechnical engineer. It is obvious; however, that "Chuck" has no understanding of foundation or structural engineering.
 - d) It is also very obvious that James, Robert's supervisor and the firm's office manager, has not given consideration to the potential liabilities associated with this assignment. He just wanted to put another \$19,000 on his books!
 - e) If the firm (and the state's professional registration board) considers its work on this project to be engineering, who within the firm was the responsible professional signing and sealing the report (was it Robert or an officer of the firm)?
 - f) The firm has two obligations, first, to its client to be sure that he understands the significance of the firm's recommendations (an ethics issue) and the apparent failure of the designer and construction manager

to heed them, and second, to protect its shareholders from professional liability risks (an internal business issue). Robert has demonstrated his understanding the second, obligation to his employer; the first is not so clear.

A potential solution to this case is, *internally*, Robert should tell James directly of his concerns regarding the manner in which the client is managing the work and the potential liabilities which could arise from the client's perceived obligations of its "design team". Both James and Robert should discuss the situation with a responsible partner/principal in the main office and decide on a plan of action for meeting both of the above-mentioned obligations. The firm should assure that it has appropriate liability language in its contract for services and reports, to protect its shareholders. The principal should also have a heart-to-heart talk with James with regard to his obligations to protect the viability of the firm.

Follow-up actions with the client should include an on-site visit by the responsible partner/principal (or better the CEO) and Robert to explain to the client and his construction manager (and the designer) the firm's concerns regarding their apparent misuse of the firm's recommendations. The discussion should also address the matter of the client's view of his obligations to the general public with regard to engaging qualified professional services for this project. Such a discussion could be either helpful to the client (because he hadn't been aware of the issues) or it could annoy him. In the first case, the client could assemble and appropriately apply the required professional assistance. In the second case, the firm's principal would be prepared to forward a letter to the client and the firm's professional-liability insurance carrier documenting the discussions.

4. This engineering/construction project has the makings of the "Perfect Storm" with a similar outcome as the crew and ship in the movie of the same name. There is:
 - a) Robert, an over zealous engineer who wants to secure the commission without proper diligence.
 - b) Walker, an inexperienced construction manager.
 - c) Bruce, an unconcerned, laid-back owner.
 - d) Larry, a non-engineer foundation designer.

On the assumption that Robert properly scoped and completed his part of the project, it is clear that during the course of the work he became aware of issues and problems with the project. If so, Robert, a *professional engineer* pledged to protect the safety and welfare of the public and not aid and abet the unlawful practice of engineering, must bring these matters to the attention of the proper authorities.

5. Some possible outcomes to this Redneck Engineering case are:
 - a) Nothing goes wrong because of the conservative foundation design.

- b) Someone else designs the remaining foundations and there is a problem.
- c) Problems could arise from improper design or construction techniques - settlement, slab cracking, etc.

Some of the ethical/ business/ engineering considerations are:

- a) Robert is not responsible for how people choose to spend their money.
- b) Larry is not a professional.
- c) Hopefully Robert clearly stated the scope of his services in his proposal and disclaimed responsibility for how the report is interpreted.
- d) If the structures have not been designed, how are foundation loads determined?

It appears that conservatism in foundation design is appropriate at this stage to keep the project on schedule.

- 6. Robert seems to be satisfied that the finished product will adequately serve its purpose even though it may be over designed. No health or safety issues are involved. The concern is an economic concern. Everyone, except possibly the owner, is aware that the foundation is over designed, and the placement conditions are not what they should be. Robert could reasonably conclude he has fulfilled his ethical obligations. On the other hand, Robert being a prudent engineer should take further action. He should submit a written report to the owner outlining his observations and concerns. The owner has the option of asking Robert to provide additional assistance, or the owner may decide to do nothing. It's the owner's decision. Robert will have fully discharged his ethical responsibilities.