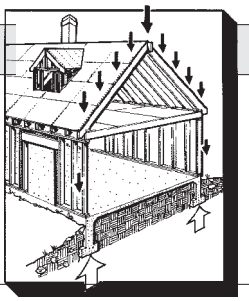
Should I Call An Engineer?

by Harris Hyman



Greetings to all my friends out there in Hammer & Nail City. A few weeks ago the editors of *JLC* gave me a call and asked whether I'd do a regular column. My immediate reaction was, "That would be crazy. If I wrote what I really thought, half the readers would be all over me, not to mention code officials." (I have enough trouble with my local inspectors.) But after thinking it over, I decided to give it a go.

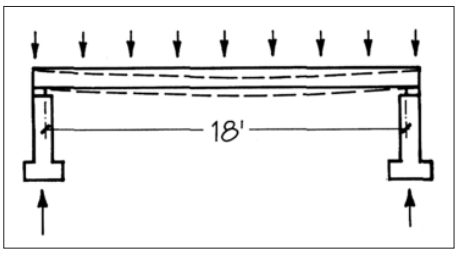
The purpose of this column is to give you a basic idea of how engineering works, and sufficient information to help you answer the kinds of engineering questions that come up on the job site every day: How far can I cantilever that balcony? How do I attach the porch ledger to the band joist through 2 inches of foam board? Can these old floor joists handle the weight of that new whirlpool when it's filled to the brim?

Good builders answer questions like these all the time, relying on span tables, experience, and a good intuitive sense of the mechanics of a building. I'll be looking at these same problems from the engineer's perspective, trying to give you some new insight along the way. Some of the problems will originate from my own experience, but most, I hope, will come from you readers.

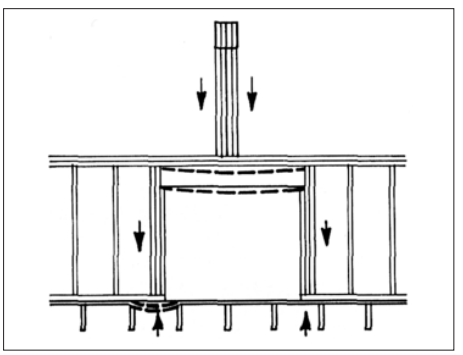
When the G.C. Needs a P.E.

After 10 or 20 years in the field, a good builder can solve most of the problems that come up on the job site. But it's important to recognize when you are really over your head and need to call in a specialist. This is especially true in structural matters, where mistakes can be costly, embarrassing, or even dangerous. In this first column, I'd like to give you a few rules of thumb to help you identify where a professional number cruncher might come in handy. For example:

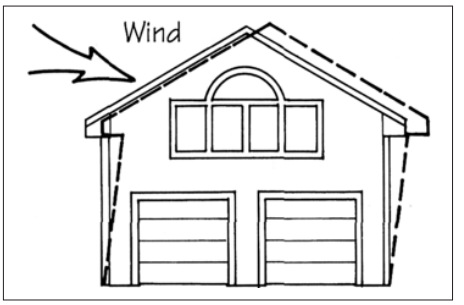
- ***When a floor span exceeds 18 feet.*** If you hunt around you can still buy 2x12s twenty-four feet long, but will they do the job? These sticks will hold things up, but they'll also bounce like crazy. Eighteen feet is both the useful working limit for 2x12s and the edge of most residential experience. Beyond 18 feet, think carefully about what is happening.
- ***When a roof span exceeds 24 feet.*** Here is the same situation, but the loads on a roof are lighter, and nobody generally walks around up there. So, we can go a little farther on the roof span than the floor.
- ***When a header exceeds 8 feet.*** Most builders overdo headers, so there's rarely a problem here. But beam problems are related to the *square* of the span, not just the length. An 8-foot header needs *four* times the strength of a 4-footer, not just twice as much. A header problem can have some messy consequences, like jamming a door or window. When the opening grows, call for help.
- ***When something rests on a header.*** When a wall or post rests on a header, questions arise — like where does the load come from, and how is it transferred to the studs that hold up the header? And then where does it go on its way to the ground? Resting a post on a header can often solve an architectural problem, but be careful. There might be a lot more to the situation than is immediately apparent.
- ***When an exterior wall is more than 60% openings.*** The openings in most walls for doors and windows make up less than 30% of the surface area. But look at the front wall of a garage with an apartment above it. The big garage doors and the apartment windows above it take up about three-fourths of the wall area, which doesn't leave much strength in the wall to resist pressures from wind gusts that hit the adjoining sides of the building. This wall needs some special treatment.



Watch out for floor spans over 18 feet — these push the limits of dimensional lumber for strength and stiffness.



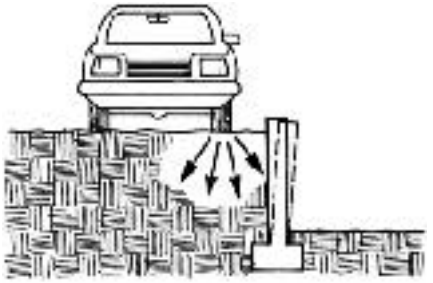
Though it may solve an architectural design problem, a point load on a header can create structural problems in the surrounding framing.



When a wall is more than 60% openings, racking will be a problem unless you take precautions.

- ***When a retaining wall is more than 4 feet high.*** Retaining walls are deceptive. They take a long time to fail. When they are erected, it is nice and warm and dry and everything looks good. Then the rains and the frost come and the wall starts to move, but only a little. The next season they move a little more, and by the third year it gets really bad and the wall needs some serious work — quite a long time after you've spent the money you earned from the project.

  Walls are even hairier than beams — the problems are related to the cube of the height. A 10-foot-high wall needs *eight* times the strength and stability of a 5-foot wall. If your proposed wall comes much over your belt buckle, give it a careful look.
- ***When a vehicle is to be parked within 3 feet of the top of a retaining wall.*** Walls are often used to get nice level spaces, and these are great for parking. But a car wheel can put a severe con-



A car parked near a retaining wall increases the soil's lateral pressure against the wall.

centrated load on a retaining wall.

- ***When a slope is steeper than 2:1.*** Nice shallow slopes are easy to grade and quite stable, but they do take up a lot of space, and the space is often in a critical spot. Steeper slopes can be built, but then there are often stability problems. An engineer can help design the grading for those cramped corners.
- ***When you get worried.*** This is a real situation that calls for an engineer. If you simply don't understand what is going on with your building structure, ask for help. Within an hour or so most engineers can see whether you're very okay, pretty much okay, or in real trouble.

So, though you don't usually need to call the engineer, sometimes doing so can be beneficial or even necessary. You can probably find the help you need in the phone book, but you should interview the engineer first, mostly to find out if the person can actually work on your problem in a timely and effective manner (not every engineer is into small building problems). A good engineer can supply another viewpoint that may help take care of a problem before you build it in. And best of all, we're a lot more economical than attorneys. ■

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Got a Question?

Is there a building practice you've always wondered about? Or a lunchtime debate you'd like settled? We'd like to hear from you. Please send your engineering questions to *Practical Engineering, JLC*, RR#2, Box 146, Richmond, VT 05477; Fax: 802/434-4467.