

Lessons for Young Engineers

By Jim Lintz, P.E., S.E., LEED AP BD+C

“That which we obtain too easily, we esteem too lightly.”
—THOMAS PAINE

Structural engineering is a stressful profession, especially for young engineers. The construction industry is highly competitive regardless of your niche in it, and clients are always looking for designs to be maximally efficient and executed as quickly as possible. Unfortunately, projects run even faster today than they did a decade ago, leaving less time for young engineers to learn how to produce quality work quickly and communicate effectively with their clients.

As a young engineer, your top concern is probably not efficiency or schedule, but rather doing your job competently and avoiding unpleasant consequences if you do not. It is not uncommon to make a simple mathematical error, make an invalid assumption or estimate, misinterpret a code section, or miss an important note that should have been added to the drawings. Consider these as learning experiences.

You will soon appreciate that there are many safeguards to ensure appropriate design solutions but remember that the best way to gain your colleagues' trust and earn more responsibility is to produce consistently good work. Review of your work through your company's Quality Assurance/Quality Control (QA/QC) process is intended to catch invalid assumptions, improve the design solutions, and ensure code compliance. You will learn to welcome this oversight. Any issues that slip past the QA/QC process are likely to be spotted by detailers since they closely examine the project drawings as they produce shop drawings. Experienced contractors also often question designs if a size or spacing is out of the ordinary or if they think they have a better idea. At first, you may not welcome their comments and questions, but their ideas are often well-founded and result in a better product.

Fabricators and contractors may also make unintentional errors or omissions that could affect the structure. They could misinterpret the drawings, forget to put an embedded plate in a concrete wall, layout rebar incorrectly, make an unacceptable weld, etc. As a structural

engineer, you will be called upon to determine if what the contractor has done is acceptable or design a correction if it is not and do so as promptly as possible to not hold up construction. Again, another learning experience.

The stress that these everyday occurrences cause never completely goes away. However, the level of stress does get more tolerable.

The more projects you complete, the greater your understanding becomes, and the more your engineering judgment grows. And the more conversations you have with clients, the more comfortable these interactions become. All of this helps. Unfortunately, there is just no substitute for spending time and gaining experience. Or maybe it is fortunate. After all, “That which we obtain too easily, we esteem too lightly.” — Thomas Paine

There are things that you can do to lower your stress level. Review your work and bring questions to your supervisor or a colleague with more experience. This can be humbling, but it is also an excellent opportunity to learn. Most people like to help others; it feels good to pass on knowledge, and explaining ideas to others helps build their understanding. However, learning how to come up with answers on your own is part of growing as an engineer. Look for the answer in an old textbook, use an internet search engine, read a journal article. If you are like me, the complex problems that you have during the workday remain with you at night. Sometimes the cleverest solutions pop into your head out of the blue when you shower or climb into bed.

If your firm does not have checklists, create your own for calculations to be done and items to be on drawings — and use them. Please do not view the checking of shop drawings as something you would like to delegate to others but as a way to confirm that everything is as it should be before construction begins. Pay close attention, and you will find the detailer's mistakes and any design issues that slipped through previous reviews.

We are lucky to live at a time when, each year, our design tools become more powerful,

allowing us to create ever more sophisticated models. However, it is helpful to keep in mind mathematician George Box's quip: “All models are wrong, but some are useful.” To improve efficiency and get the right answers, keep structural design models as simple as possible while still maintaining their usefulness. It generally takes a few years to develop the intuition for when a member is under- or over-sized, so it is even more important early in your career to understand what the software you are using can and cannot do, and to be intentional with the design assumptions inherent in the model. For example, if a steel beam connection is modeled as fixed, the drawings ought to have connections at the flanges, and if a concrete slab is necessary, do not model it as a flexible diaphragm.

In this author's experience, it takes about four years to develop confidence in most daily tasks. I still had questions. I still have questions, but I realized around the time that I took the P.E. exam that requiring four years of experience before allowing someone to be professionally licensed is not just an arbitrary period. Four years really is a reasonable amount of time to develop acceptable competence.

So, strive to get better each day and find and learn from your mistakes. Take personal responsibility. Try to keep things in perspective and remain humble, and in doing so, you will be able to push through and overcome.

Structural engineering is an honorable profession that plays a valuable role in society. When storms blow through, or earthquakes shake the ground, our communities rely on us and our expertise to keep them safe. It is, however, not an easy profession. All of us have had times when the job presented a real challenge, but it is a challenge worth pursuing. The rewards are significant. ■



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