

A Structural Engineers Manifesto for Growth

Part 2

By Erik Nelson, P.E., S.E.

This is the second installment of what I am calling my manifesto, which presents some of my thoughts about our profession and how we can grow as individual designers. For steps 1-7, please see Part 1 in the April 2012 issue of STRUCTURE®.

8: Kick Butt

Design is an incredible process. It is good for you to make the process of design your own. Drive the process, and in so doing, you will grow and become a better engineer. Cooperate, listen, be humble, but do not let that prevent you from kicking butt.

You need a love of learning and a pursuit of excellence. Focus on the present and take action now. As the philosopher Immanuel Kant put it, act as though everything you do will become universal law. Your pursuit of well-being will help others, which will in turn come back to yourself. Do not picture yourself as a great engineer, a rich engineer, or a famous engineer. Do great engineering now and you will be great—not the famous type of great, but the non-famous type of great, which is more worthy of the word.

9: Improve the Codes

Codes are good and extremely important, but they are getting completely out of control. There is an old Faraday adage, “Make every effort to ensure that the results of your experiment are proportional to the evidence and assumptions that produced them”. The code committees should keep in mind the approximate nature of this enterprise called structural engineering. Not only are there large uncertainties in our loads and material strengths used in design, there are huge uncertainties in construction. Before meeting in a conference room, the code committee members should visit a construction site to remember how reinforcing is placed within a slab on grade. While they

are there, they can see what a true “pinned” base support looks like (a thick base plate with four heavy anchors). They can see the soil and the assumptions used for designing the footings. They can see what shear connections look like that purportedly do not resist moment. They will notice the large non-structural interior and exterior walls that were completely neglected when modeling structural stiffness. In summary, the code committee should ask themselves the following two questions:

- Is this provision important to the design of safe structures?
- Is the provision too exact?

Or in Faraday’s words ... “Is the proposed provision proportional to the assumptions and uncertainty inherent in structural design (loads, strengths, construction, etc.)?” If they would ask these questions, then the codes would not balloon to the size they are now.

I understand that the codes are becoming more and more sophisticated, and provisions are being improved in an effort to reflect reality better. But there was a time when people understood that code requirements needed to exist to ensure public safety, and that was the only standard that they needed to meet. We need to join code committees and take our profession back.

10: Teach Engineering

I never thought being a teacher would make me a better engineer. It is undoubtedly the best decision I have ever made as an engineer. It allows you to reflect on important concepts and theories that you thought you understood, but never really did. In order to teach, you must be able to convey complex ideas into clear language, which requires one to master the material. It also allows you to explore how best to communicate to people with different learning styles. It is a constant challenge and highly rewarding.

11: Become a Material

Talk to materials. You can ask a brick if it likes to take compression. Feel a brick (or bolt, concrete sample, etc.) in your hand and discuss with it what it wants and where it wants to be in the building. (For more, see my article, *Participation Mystique*, in the May 2007 issue of STRUCTURE.) You can gain a better understanding of structures by becoming the thing itself, by manifesting yourself in the building, beam, connection, or bolt.

I remember visiting a project where I designed all the connections for a large box truss spanning 100 feet supporting four stories of concrete. The erector was proud to show me his work and described the installation, weld and details as craftsmen often do. He and I both knew that the architect was going to cover it all up for no one else to see. He was still deeply satisfied, as was I. I realized much later that the satisfaction was not really about the truss or even the workmanship. What he was really showing me was himself, a manifestation of himself in the steel connection; he was quality just like the connection. He was the inanimate object, and it was beautiful.

We can learn a great deal about ourselves in the same way. In his book, *Zen and the Art of Motorcycle Maintenance*, Robert Pirsig suggests:

You want to know how to paint a perfect painting? It's easy. Make yourself perfect and then just paint naturally. That's the way all the experts do it. The making of a painting or the fixing of a motorcycle isn't separate from the rest of your existence... The machine that appears to be "out there" and the person that appears to be "in here" are not two separate things.

Therefore, according to Pirsig, if you want to become an expert structural engineer, make yourself an expert structural engineer, then engineer. ■

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