professional issues

A Matter of Degrees

Disconnect Between Academia and the Work Place for the Structural Engineer

By Eric L. Hung

*As part of an ongoing discussion on the **Quality of Basic Engineering for Structural Engineers**, STRUCTURE magazine is pleased to present the views of a relatively recent graduate. Mr. Hung provides insight into the jump from a university environment to the working world, frankly discusses course options available in college, and talks about the need for on-the-job learning opportunities.*

Several years ago, I graduated from Northeastern University, Boston, MA with a Bachelor of Science in Civil Engineering. I took all the basic civil engineering required courses Northeastern offered. I imagine a civil engineering student from a different school would have taken similar courses.

I recently read an article, *"Basic Education for Certification as a Structural Engineer"* (STRUCTURE magazine, April 2003). The article suggested that the basic education for a structural engineer should include the following courses: Concrete 1, Prestressed Concrete, Steel Design 1 & 2, Structural Analysis 1 & 2, Dynamic Behavior (including seismic), Masonry Design, Timber Design, Matrix Methods and Technical Writing.

At the time I was in school, Northeastern did not offer Prestressed Concrete, Timber Design, Masonry Design, Dynamic Behavior and Matrix Methods in the undergraduate program. Northeastern does offer a graduate program for Dynamic Behavior and a course similar to Matrix Methods. I was unaware of the need for these courses as I started my career as a structural engineer.

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My first full time job after graduation was with a small structural consulting firm in Boston. This company provided engineering services for a variety of structures including steel, concrete, timber, masonry, and lightgauge metal construction. Many projects were wood frame residential housing. I quickly learned the need for education in masonry, timber, and cold formed metal. In my opinion, timber and masonry design should be included in the curriculum of undergraduate schools with structural engineering concentration.

In order to obtain the *Basic Education* level, attending graduate school may be one alternative. Using my experience as an example, I took Steel Design 1 as an undergraduate. The course included instruction on: types of steels used in steel construction; the design of tension and compression members; the design of members subjected to combined stress; application of AISC-Manual of Steel Construction; introduction to steel connections. The Northeastern graduate school course, Behavior of Steel Structures, covers the behavior of structural steel members subject to static and dynamic loading; simple shear and moment connections for beams; composite columns; beam columns; development of strength curves; buckling about major and minor axes. I see these topics as being necessary in my career as a structural engineer.

"I have faced some of these engineering challenges…"

The graduate school concrete design course includes moment-curvature relationships for reinforced concrete cross sections; ductility; moment-curvature and load-deflection relationships for reinforced concrete beams; effective stiffness; combined bending and axial load; shear and axial load; shear and torsion; and pre-stressed concrete structures. I have faced some of these engineering challenges during my brief work experience. One of my projects related to the analysis of a sixty foot long pre-stress concrete T-beam in a parking garage. Pre-stressed concrete, also required as basic education for a structural engineer, is unavailable in undergraduate education at Northeastern. Dynamic behavior and Seismic are only offered in the graduate program.

In summary, several *Basic Education* courses are not available in the undergraduate school program. In my opinion, it would be beneficial to make selected graduate school programs available to the undergraduate. It could be the introduction of the Master's level programs and include career counseling.

"…a class that showed how a job progresses…"

Structural academy is very important to the career of an engineer. Work experiences are also very important. As a new engineer entering "real" engineering practice in a structural consulting firm, I was very confused about almost everything at the beginning of my career. In the absence of formal instruction, it took a long while to sort out my confusion. I would have benefited a great deal in my transition to a professional career if my undergraduate studies included a class that showed how a job progresses from beginning to end. Three topics I would suggest are covered in this course would be:

1. The relationship between all parties involved in a project. What is the role of an architect? Who does the architect work for? What is the responsibility of an architect in a project? What is the role of a structural consulting engineer? What are the responsibilities of a structural engineer? What are the responsibilities of a contractor?

2. Regarding different phases of a project. What are the design phases in a project? What work product is required in each phase of a project? How much information does a structural consultant need for his/her design from the architect on each phase? How does the structural engineer interface with other design trades?

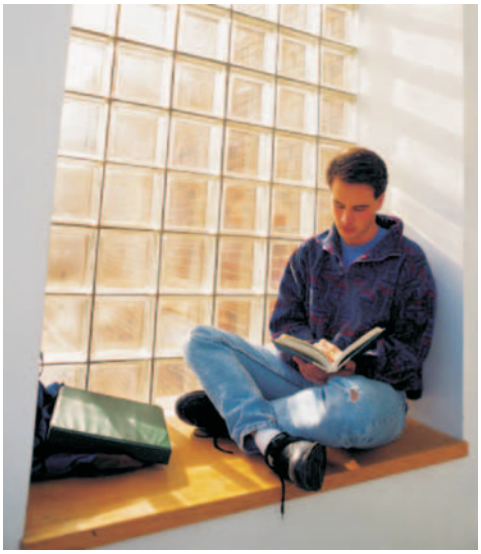
*Please see the previous article discussing the **Quality of Basic Engineering for Structural Engineers** in the April issue of STRUCTURE magazine (page 10). And, watch for future articles throughout 2004. As always, we are interested in feedback. Please forward your comments on STRUCTURE articles to **comments@structuremag.org**.*

3. What are the types and purpose of contract documents on a project? How do plans and specification relate for a construction project.

Virtually hundreds of similar questions were raised in my early career. Although many of my questions were answered through work experiences, I believe having a general course in college covering these topics would be very helpful. It would provide a general overview, and good foundation, to someone entering a structural consulting firm.

"…in-house technical seminars would be very helpful…"

I faced new challenges whenever my employer gave me an assignment not covered in my undergraduate study. My principal would give me related textbooks and references, and I would finish the assignment with their help. It is very helpful and very important to be able to self-study. I found when I studied the subject on my own it would stay longer in my memory. I believe in-house technical seminars would be very helpful to both employer and employee. Seminar topics would be selected by employer and employee, topics valuable to their related needs. This would help the employee bridge the gap between employer need and employee formal education.▪



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