

# NASCC Direct Connection Session

## Tips for structural engineers as they embark on their careers

### **Skills and Areas of Focus in School**

Master's Degree in Structural Engineering – There is a substantial amount of knowledge and learning gained in the additional year (or so) of school. You will never meet an engineer who regrets this degree, but many who wish they had pursued it.

Verbal and Written Communication –It is imperative that written communication be grammatically correct, spell checked, clear, and concise. Verbal communication must also be clear and concise, but often hinges more on listening than talking. Asking the right questions, never assuming, and being honest are all keys when speaking with colleagues and clients. Additionally, social skills cannot be overlooked.

Technology –Taking a course or courses on matrix analysis, structural modeling, or finite element analysis will give you invaluable knowledge on the inner workings of the “black box” software you will likely be using during your career. Without knowledge of how these programs work, it is incredibly difficult to correct or debug an analysis model which is not compiling or approximating expect values, or to inherently understand the limitations of the program. Additionally, learning a BIM platform (preferably Revit) before beginning your career will give you a big leg up on other potential hires without this skillset.

Anti-technology –Being able to free-hand sketch, perform approximate analysis calculations (back of the envelope), and design elements from tables are still essential skills that you must have.

Principles of Engineering – Make sure you have a good understanding of the basics of structural engineering and never forget them. No matter the complexity of any problem or structure, the basic principles learned in statics, dynamics, mechanics of materials, and material science will apply to everything you do throughout your career.

### **Job Search Considerations**

What interests you – consider what type of work interests you. Do you want to be involved in the design of new buildings or bridges, earthquake rehabilitation, specific component design, or perhaps failure analysis and investigations?

Research the Firms You're Interviewing At – Learn about the firms that you are interested in or applying at. Think about things like the firm's sector of involvement or specialty, typical project type or size, office size and total firm size, office location(s), firm culture, design and technology innovativeness, industry involvement, professional development or mentoring, and work/life balance. Firms of all shapes and sizes can offer different opportunities and environments, and this is based mainly on the firm's culture and leadership.

Ask Relevant Questions while Interviewing – Interviews should never be a sales pitch from either end, but rather an opportunity to see how a candidate and firm might fit together. Firm culture is an important area to learn about. Is it a collaborative environment or are you an independent operator? Is the office loud and bustling or quiet and calm? Are young engineers taught and mentored? What is the firm's stance on continued education and does it financial support this? What kind of project involvement is expected? Will you be working on entire projects start to finish or will you be focused more on one area of design or detailing. What is the firm's involvement in the industry?

Love What You Do – This sounds like a horrible cliché but it's the truth. You will spend more time at work doing your “job” than anything else in your life from here until retirement. Structural engineering can be an incredibly exciting, satisfying, and rewarding career if you can find the right firm/organization to work for.

### **Early in Your Career**

Ask Questions – In school you receive a very general base of knowledge and sharpen your ability to learn and problem solve, occasionally under pressure. It is important then to continue learning throughout your career, and the best way to do this is asking questions of and having discussions with your colleagues. A good firm should have a substantial knowledge and experience base, as well as “experts” in specific fields that you can learn from. Ask questions and learn from others at every opportunity.

Codes and Standards – Once you start your career get to know the building codes and standards you will be governed by (IBC or CBC, ASCE 7, and material standards like ACI and AISC). An early investment in your own personal copies will allow you to tab, highlight, and make notes throughout these documents. This will be of immeasurable help when sitting for your PE/SE exams as well as every day at work.

Load Path – Much of what you learn in school is specific to a single element or component. Start thinking about the big picture of what it is you are designing or investigating. Learn and understand load path of your structure. Loads are applied and must be resisted per the laws of physics. Most software programs make gross assumptions about how loads get into and out of a structure or its components, and it is up to the design engineer to understand and verify that this load path makes sense and can be designed and detailed for.

Review Your Results – Learn to spot abnormal or irregular results. There are many tricks and tips to analysis and design review that you can learn from “the old guys.” Always spot-check results with simple hand calculations. Verify reactions using tributary area. Verify approximate beam sizes using length over depth ratios. Check relative and global deflections and deformations.

Design Considerations – The design parameters you learned in school are only step one. Safe and code compliant design is assumed as a given by your client. Start to consider things like serviceability, constructability, and cost in your design. The end client (owner/developer) will be much more concerned with schedule and cost than anything else, and this is what long term relationships with the end client are built on. You cannot build a career or reputation on good design alone.

Project/Design Management – Learn to design to the needs and goals of your client. Certain projects type will be based on the most efficient design based on material cost. Others will be designed to have superior serviceability, or will need to be designed conservatively for unknown future use and modification. Some projects will have a very short and aggressive schedule, while others will move more slowly and have many iterations and changes. There is no one size fits all design approach in this industry. Gain understanding early in your career of this and tune your project management accordingly for each project.

Time Management – Work will move much faster and be more complex than school ever was. Create processes to manage your time and tasks like open-item or action-item lists, and don’t allow distractions to kill your productivity. Transition from a task-oriented to results-oriented mentality.

Relationships - This industry, like most others, is all about relationships. Treat everyone you work with from top to bottom with respect and kindness. This is true with your coworkers, industry colleagues, and clients. Be honest with everyone and accept the fact that you will occasionally be wrong and make mistakes.

Get Involved Outside of the Office – Join industry associations and organizations which interest you, such as your local structural engineer’s association or a chapter of ASCE, ACI, or AISC. Find interests outside of work that allow you to get to know your community. Find opportunities to volunteer and give back.