ETHICAL EVOLUTIONS:
APPLYING PROFESSIONAL RULES TO THE ENGINEER’S ROLE IN INNOVATIVE AND NON-TRADITIONAL PROJECTS

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What are the major areas of innovation and change in engineering?

- Materials
- Design methods
- Equipment
- Robotics/automation
- Construction methods
- Project delivery systems
Engineer’s Involvement in Innovation

- Inventors of new technologies and systems
- Users of new technology
- Users of existing technology in innovative way
- Participants in innovative design or construction methodologies
- Design and development of new products
Issues Associated with Innovative Products and Methods

- Rules of Professional Conduct /ethical issues
- Legal issues – tort (negligence, fraud, products liability) and contract liability
- Insurance issues - coverage
Ethics

- Rules and ideals for human behavior - tell us what we should do
- Interpretation/application influenced by individual experiences and background
- Business ethics, government ethics, professional ethics
- Defined differently for each profession
- Rules of professional responsibility and conduct - laws/regulations that are legally binding, and codes of conduct (not legally binding)
Sources of Ethical Requirements

- NCEES Model Law and Model Rules
- State legislation and regulations governing registered professional engineers and other professionals – legally binding, subject to administrative and judicial enforcement
- Professional societies and organizations (NSPE, ASCE, AIChe, IEEE, ASME, etc.) – required as a condition for membership
- State/federal statutes that may be incorporated by reference into government contracts
Virginia Regulations and Code of Professional Practice and Conduct

Va. Code § 54.1-404 authorizes the Board for Architects, Professional Engineers, Land Surveyors, Certified Interior Designers and Landscape Architects to adopt requirements for the proper discharge of registered professionals’ duties. Those duties include:

- The protection of the public health, safety and welfare;
- The maintenance of standards of objectivity, truthfulness and reliability in public statements by professionals;
- The avoidance by professionals of conflicts of interests;
- The prohibition of solicitation or acceptance of work by professionals on any basis other than their qualifications for the work offered;
- The restriction by the professional in the conduct of his professional activity from association with any person engaging in illegal or dishonest activities; or
- The limitation of professional service to the area of competence of each professional.
Virginia Licensing Law

Virginia Code § 54.1-400: The "practice of engineering" means any service wherein the principles and methods of engineering are applied to, but are not necessarily limited to, the following areas: consultation, investigation, evaluation, planning and design of public or private utilities, structures, machines, equipment, processes, transportation systems and work systems, including responsible administration of construction contracts. The term "practice of engineering" shall not include the service or maintenance of existing electrical or mechanical systems.
Exemptions – Virginia Code § 54.1-401

5. Practice of professional engineering, architecture, landscape architecture, or land surveying solely as an employee of the United States.

6. Practice of architecture or professional engineering by an individual, firm or corporation on property owned or leased by such individual, firm or corporation, unless the public health or safety is involved.

7. Practice of engineering solely as an employee of a corporation engaged in interstate commerce, or as an employee of a public service corporation, by rendering such corporation engineering service in connection with its facilities which are subject to regulation by the State Corporation Commission.
Key Rules of Professional Conduct

- Protection of public
- Competence
- Objectivity and truth
- Conflict avoidance
- Appropriate use of seal
- Unfair competition
- Confidentiality
Primary Rule of Conduct for Engineers

- Virginia: “The primary obligation of the [engineer] is to the public....If the judgment of the [engineer] is overruled resulting in circumstances when the health, safety, or welfare of the public is endangered, the [engineer] shall inform the employer, client, and appropriate authorities in writing of the possible consequences.”

- NCEES: Engineers…”shall be cognizant that their first and foremost responsibility is to safeguard the health, safety, and welfare of the public when performing services for clients and employers.”

- ASCE: “Engineers shall hold paramount the safety, health and welfare of the public...."
Conflicts

NCEES Model Rule:

Licensees shall disclose to their employers or clients all known or potential conflicts of interest or other circumstances that could influence or appear to influence their judgment or the quality of their professional service or engagement.
Competence/Use of Seal

NCEES Model Rules:

Licensees shall not affix their signatures or seals to any plans or documents dealing with subject matter in which they lack competence, nor to any such plan or document not prepared under their responsible charge.

Licensees may accept assignments and assume responsibility for coordination of an entire project if each technical segment is signed and sealed by the licensee responsible for preparation of that technical segment.
Objectivity and Truth

NCEES Model Rules:

Licensees shall, to the best of their knowledge, include all relevant and pertinent information in an objective and truthful manner within all professional documents, statements, and testimony.
Common Areas of Tension

- Protection of public welfare versus responsibilities to employer, clients, peers, whether based on other rules or on contractual provisions
- Responsibility to client versus responsibility to employer
- Pressures and responsibilities of project and project partners versus engineer’s obligations under professional standards of practice and conduct, generally
Violations of Others

**Virginia:** Shall not “knowingly associate in a business venture” if there is a “reason to believe” that the person or firm is violating the registration statutes or regulations.

**Virginia:** “An [engineer] who has direct knowledge or reason to believe that any individual or firm may have violated or may currently be violating...[any of the relevant licensing laws or regulations]...shall immediately inform the board in writing and shall cooperate in furnishing any further information or assistance that may be required....”
Legal Implications

- Discipline by State Board
- Civil Penalties
- Criminal Penalties
  - Misdemeanor
  - Felony for subsequent or repeated offenses
- Professional malpractice
Sources of Professional Standard of Care

- Practice in industry – international, national, state, community
- Codes and criteria
- Scholarly literature
- Best practices or reports
- Regulations (which includes regulations that apply to professional conduct)
How Courts Handle Violations of Professional Conduct Rules in Negligence Cases

- Conclusive proof of negligence – minority of states
- Rebuttable presumption of negligence – minority of states
- Evidence of a standard of care – majority of states
- Not applicable to analysis of standard of care – extreme minority

- Virginia Supreme Court, 2016 – violation of rules of professional conduct used as primary means of defining standard of care for professional engineer
Typical Design-Build Project

- Owner has a contractual relationship with the “design-builder”, but not separate contracts with AE/designer.
- Owner may have a contract with a quality assurance manager/design reviewer.
- Design-builder is either a joint venture of construction contractor and design firms or entity led by a construction contractor with AE firms, specialty contractors, and suppliers as subcontractors.
- Engineer/AE firms are the only entities on the team with special responsibilities under rules of professional conduct.
- Although all members of team could be liable for negligence, design professionals are subject to a higher standard.
Traditional (Design-Bid-Build)

Owner

- Design Professional
- Design Consultants
- Issues Bid Documents
- General Contractor
- Specialty Trades Subcontractors
Design Professional

Builder / Contractor
AS
CONTRACTING ENTITY

OWNER

Design-Build

Preliminary Design; Project Criteria; Developer; QAM

Teaming Agreement

Specialty Trade Contractors

Design Consultants
Contractor’s Standard of Care

- Contractor warrants to the owner that all work is of good quality, free from faults or defects, and in conformance with the contract documents.

- Contractor must comply with owner-furnished plans and specs, but is responsible for its own negligence in interpreting plans and for means and methods. (Contractor must demonstrate that it reasonably relied on the accuracy of the owner’s design documents to recover under the Spearin doctrine.)
“The standard of care for all design professional services performed by Designer and its Design Consultants pursuant to this Agreement shall be the care and skill ordinarily used by members of the design profession practicing under similar conditions at the same time and locality of the Project. If the Design-Build Agreement contains specifically identified performance standards for aspects of the services, Designer agrees that the applicable Services shall be performed to achieve such standards.”
The parties commit to working with each other, and with any other design professionals working on the Project with Design-Builder to facilitate the coordination and integration of Designer’s Services with the Project’s overall design concept. Design-Builder is responsible for the services performed by design professionals employed by or under contract with Design-Builder.

The parties are fully committed to working with each other throughout the Project and agree to communicate regularly with each other at all times so as to avoid or minimize disputes or disagreements. If disputes or disagreements do arise, Designer and Design-Builder each commit to resolving such disputes or disagreements in an amicable, professional and expeditious manner so as to avoid unnecessary losses, delays and disruptions to the Services.
Critical D/B Contract Terms w/r/t Engineer’s Professional Responsibility Concerns

- D-Builder’s responsibility to pursue changes with owner, upon appropriate notice from Designer (interpretation of contract documents, etc.)
- Interim design submittals to D-Builder and to Owner
- Communications with Owner
- Responsibility for estimates and quantity take-offs
- Designer’s responsibility during construction phases
Major Liability Issues for Designer

- Disparities in standards of care and professional responsibilities among team members
- Ambiguities in communications with owner
- D/B contracts usually reference a long list of sources of “design standards” – priorities, inconsistencies between sources or with contract documents/performance standards
- Ability to vigorously pursue position in disputes with Owner during design/construction
- Cost issues/value engineering/"alternative technical concepts"
Major insurance carriers have identified **communication** as the primary (by a large margin) “non-technical” factor in design-build claims.

Top five communication issues:

- Lack of **procedure** to identify conflicts, errors and omissions
- Project issues and potential disputes not handled correctly
- Scope of services not explained, discussed, or otherwise worked out in detail among parties
- Lack of any or adequate documentation regarding changes in scope, budget, schedule, etc.
- **Project staff not aware of responsibilities**
Innovative Technologies and Non-Traditional Project Delivery Methods

- Use of innovative products and technologies – as survey or design tools, or in specifications – raises special issues related to competence (your own and that of others associated with the products), diligence in protecting public welfare, and responsibilities to the client/employer.

- Recent case law in Virginia provides illustrates judicial willingness to use rules of professional practice and conduct to define professional standard of care for negligence.

- Teaming, joint venture and sub-contracting arrangements in design-build and P3 projects create a variety of potential difficult situations for design engineers.
Many different claims against manufacturers, formulators, distributors, merchants, users – any parties in chain of delivery of final end product.

Products liability claims - negligence (negligent manufacture, design, failure to warn, failure to test), “strict liability”.

Strict liability – liability without fault for “defective product” that is not fit for intended purpose or for reasonably foreseeable uses.
Engineers have always been subject to negligence standards in specification or approval of products.

Did engineer act as a “reasonably prudent engineer” in reviewing product (due diligence) and making decisions regarding use of specific product?

William H. Gordon Associates, Inc. v. Heritage Fellowship, United Church of Christ, a/k/a Heritage Fellowship, Supreme Court of Virginia, February 12, 2016.
Expert testimony that 18 VAC (Virginia Administrative Code) §10-20-760 applied:

“No professional shall affix a name, seal, or certification to a plat, design, specification or other work constituting the practice of engineering which has been prepared by an unlicensed or uncertified person unless such work was performed under the direct control and personal supervision of the professional while said unlicensed or uncertified person was an employee of the same firm as the professional or was under written contract to the same firm that employs the professional.”
Engineering design, as presented to contractor, should be “clear and constructible” and “very likely to serve its purpose” once it is in operation.

Design must be “clearly understandable” to the contractor and all other parties during construction.

“Requires investigation of all elements that need to be conveyed to the contractor and addressed in design to assure the design will perform as required.”
Implications

- Engineer has **duty to investigate** product and site.
- Engineer may have to perform **additional “due diligence”** for product specification if the project falls outside the manufacturer's specifications or recommendations.
- Engineer that adopts general plans and specifications prepared by a manufacturer falls below the standard of care expected for professional engineers and violates rules of professional conduct.
- **Special concern with respect to specification of innovative products or methods** – enhanced diligence and questions regarding independent investigation.
Example #1

Engineer works for a firm that is advising and providing design reviews on a fast track design-build project that involves construction of a pedestrian bridge across a busy multi-lane roadway through a university campus. Prior to completion, the bridge collapses on cars stopped at traffic light, resulting in several deaths and multiple injuries. NTSB writes a detailed report, finding that the contractor, the contractor’s design firm, and Engineer’s firm were all responsible for design and construction defects resulting in the failure of the bridge. Engineer and colleagues told NTSB investigators that the scope/schedule/budget did not provide for the type of design review that would have caught the design errors.
Pedestrian Bridge Collapse Over SW 8th Street
Miami, Florida
March 15, 2018

Accident Report
NTSB/HAR-19/02
PB2019-101363
After researching manufacturer’s literature, including product testimonials, test results, and other material, engineer specifies a certain brand of guardrail that employs new and proprietary technology to absorb shock of end collisions and, in theory, minimizes vehicular damage and personal injury in crashes. In fact, there is evidence (actual injuries/death, follow-up testing by consumer groups and state governments) that the particular design turns the guardrail into a “spear” that can breach the passenger compartment of vehicles.
Engineer is a member of an integrated project delivery team on a complex, high-stakes infrastructure project. Engineer’s firm is a “general civil engineering” consulting firm, and engineer is registered as a civil engineer. Because of the unique aspects of the project, Engineer’s firm has “delegated design” of certain structural elements to a firm that specializes in that type of work.
Example #4

Engineer, employed by a corporation, is a member of a team responsible for the development and implementation of an autonomous vehicle project. The team is multi-disciplinary and includes non-engineers. Engineer also serves on the board of a university research center that is independently testing practical and operational aspects of these projects. The vehicle project is the subject of significant investment and media attention, but has resulted in crashes/fatalities as the technology develops. Nevertheless, the CEO of Engineer’s company remains aggressive and has said he believes it would negligent not to move forward with it.
Engineer is considering the use of a particular type of trenching technology and equipment that has been successfully used on other projects and is widely used in other countries. However, the particular project requires use of the equipment from a platform in the ocean, for a longer tunnel span that attempted in any of the previous projects.
Example #6

Engineer is a subcontractor to a contractor on a design-build project. During the procurement phase of the project, Engineer is encouraged by the contractor and owner to explore “alternative technical concepts” that result in added value and operational efficiency for the project.
New Approaches to Engineering Ethics?

- Systemic – addresses broader issues, analyzes each decision in context of broader goals (i.e., public welfare, best interests of client)

- IEEE - "Third generation" of engineering ethics:
  - First generation - focus on legal compliance
  - Second generation - focus on secondary stakeholders to an emphasis on the larger global community.
  - Third generation codes values focus on "the social and material conditions as well as the reflexivity associated with globalization, and ethical behavior grounded in the larger interconnected environment within which an organization functions"
Risk Management

- Do not assume that all existing personnel or new hires are familiar with relevant state’s rules or other applicable standards related to professional responsibility, or with the relevant contractual/regulatory requirements.

- Develop protocols for reporting and reviewing ethical issues, that can be carried out efficiently in context of projects.

- Create a culture of open communication and honesty where people are encouraged to raise/discuss potential ethical issues.

- Identify an internal point/lead person with respect to ethical issues.

- Require relevant and regular CONTINUING EDUCATION for all personnel.

- A system of reporting/review is especially important for “gray areas” subject to interpretation.
Moral of the story: Be careful out there and don’t be afraid to speak up for your profession and professional standards!

Questions? Comments?