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DEFINING AND ALLOCATING "DESIGN RESPONSIBILITY" IN COMPLEX PROJECTS

By
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I. Introduction

- How do you define "design responsibility" in a multi-disciplinary construction project?

- How do you decide which engineer has ultimate responsibility (and potential liability) for a "final design"?

On the surface, these appear to be two simple questions. The research, however, reveals that these two questions could hardly be more complicated to answer.

As project delivery systems become more and more complex and design firms increasingly work in multi-disciplinary engineering "teams," traditional allocations of design responsibility and liability for "the final design" are no longer relevant. Design-bid-build projects with a single lead design firm and clear delegations of design responsibilities are ancient history. Now, one design firm may prepare a conceptual or preliminary design or prepare a performance specification, and then manage the process of soliciting final design services from other firms. Another design firm may step in and refine a design and prepare final construction documents. Yet other design firms may be brought in to "value engineer" the project, resulting in substantive design changes. Not only is it common to have multiple design firms involved in a single project, but some or all of them may routinely contract directly with a construction manager or a contractor, rather than the owner, to provide design services.[1] Given these changes to today's complex project delivery systems, it is not surprising that project participants have differing opinions as to what is the "design" and who has responsibility for it.

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[1] Construction managers, retained to manage the construction, often assume some of the design responsibility, along with the risk of construction cost-overruns and delays resulting from design errors. General contractors, subcontractors and suppliers are also increasingly assuming design responsibility. Contractors and suppliers frequently submit design elements for the approval by the design team. Contractors, subcontractors and suppliers can also be responsible for design-build elements that must be coordinated with the overall design concept.

This White Paper seeks to identify the regulatory, contractual and professional ethical "design responsibilities" that engineering firms may unknowingly assume on multi-disciplinary design projects. It will also offer concrete suggestions as to how design firms should contractually approach allocating design responsibilities, thereby managing risk.

II. Source of Duty – Source of Confusion

A proper definition of "design responsibility" begins with an analysis of a design professional's legal duties – whether imposed by state licensing laws, permitting agency rules or practices, professional ethical standards, or contracts. Design firms frequently do not fully understand the legal or professional duties that arise from these sources and, consequently, do not properly address them in their contracts.

A. Permit Requirements

Who is responsible for obtaining permits on a complex project? Any contract for design services should clearly spell out whether the design professional has any role in applying for such permits. To avoid misunderstandings, the owner and design firm need to identify the necessary permits as early as possible and specify the role the designer is to play in the permitting process. Avoid phrases like, "Engineer will provide assistance in obtaining necessary permits." This language is vague and naturally leads one to ask, "What level of assistance is being agreed to here?"

Even using the word "permits" without more description can lead to misunderstandings. "Permits" can include land use permits, environmental permits, clearing and grading permits, drainage and discharge permits, building permits and permits for the operation of a facility, such as permits regulating pollution discharges. All parties need to know what specific permits will be required and who will be responsible for obtaining them.

Design firm contracts rarely address financial risks associated with permitting delays. Permit delays can impact financing commitments from lenders, lead to significant construction cost escalation and potential lost profits for the owner, and raise the risk of contractor labor inefficiency or lost productivity claims. Design firms need to consider explicitly disclaiming responsibility in the contract for permitting delays beyond the control of that design firm.

The financial risks associated with permitting, however, are a small part of the problem. As will be seen below, design professional responsibility can and will be imposed by permitting officials during the permitting process.

B. Duties Imposed by Building Officials during Permitting

A May 2000 study of the National Counsel of Architectural Registration Boards (NCARB)

entitled, "How Building Officials Interact with Registered Architects and Engineers,"[2] concluded that building departments across the country are seriously under-funded and understaffed with few licensed architects and engineers. These departments rely heavily on licensed design professionals to ensure that local codes are followed. This reliance on design professionals to assure compliance with building codes can result in the substantial imposition of additional duties on design professionals.

NCARB has had a major influence in defining what building officials expect from design professionals. Its Model Handbook for Building Officials on Architectural and Engineering Registration Laws has been adopted by many local building departments.[3] The handbook clearly establishes that the architect or engineer who stamps and seals a drawing will be held responsible for errors in those drawings:

> Registered architects and professional engineers are, and should be, responsible for their professional services in their respective areas of expertise. The public as well as building officials rely on their professional expertise. As a result, professional submissions such as construction documents should clearly show the identity of the registered architect and professional engineer who prepared them by having affixed a seal and signature and otherwise complying with the requirements of state law. **Without proper identification, ultimate responsibility for any deficiencies may not be clear.**

NCARB Handbook, p. 3. The handbook, presented in a question and answer format, explicitly identifies the tasks that design professionals must perform:

- When construction documents are prepared by a licensed professional, no changes may be made except by that professional (or under certain conditions by another appropriately licensed professional.)

- Change Orders, additional construction documents and/or addenda that alter the construction documents that are required to be filed with the building department for non-exempt buildings or structures **must** bear the signature and seal of the registered architect or professional engineer responsible for the modifications.

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[2] *How Building Officials Interact with Registered Architects and Engineers*, National Council of Architectural Registration Boards (NCARB), New York, New York, May, 2000. The full text is available at www.ncarb.org.

[3] *See Model Handbook for Building Officials on Architecture and Engineering Registration Laws*, NCARB, New York, New York, August, 1999. The full text is available at *www.ncarb.org.* For examples of state manuals, *see*, e.g., *Handbook for Building Officials*, Colorado, March 2003; and *Reference Manual for Building Officials, Board of Registration for Architects, Engineers and Land Surveyors*, January 2003.

- *Who can be the applicant for a building permit?* The applicant can be the owner, contractor or the registered architect or professional engineer as appropriate. However, the name of the registered architect or professional engineer **shall** be listed on the application. All modifications or revisions to the signed and sealed construction documents required by the building official shall be provided to the registered architect or professional engineer by the building official.

- **MINIMUM STANDARDS FOR CODE SUBMISSIONS –** Construction documents for most projects consist of drawings, specifications and appropriate calculations. All elements shall complement each other. Completeness and coordination of all necessary information are the responsibility of the registered architect or professional engineer. Construction documents submitted to the building official must be of sufficient nature to clearly show the project in its entirety with emphasis on the following:

    1. Life safety;
    2. Means of ingress;
    3. Barrier free accessibility;
    4. Structural integrity;
    5. Building code compliance;
    6. Definition of scope of work.

NCARB Handbook, p. 5.

In addition to these submission requirements, if the facility to be constructed is perceived as presenting unique liability risks, building departments may require the owner to agree to indemnify the agency for such liabilities. The agency often asks for a financial guarantee to accompany the indemnification. Indemnity agreements are increasingly common for projects with earth subsidence risks (such as in constructing deep foundations, shoring systems, tie backs and tunneling) and in circumstances where lifting, hoisting or erecting structures create a risk to people or property adjacent to the project site.

The building department may also require, as a permit condition, inspections either by the design professional or by an independent inspection entity for the riskiest aspects of the project, including foundations and underground features, key structural features, such as steel frames, long-span roof systems and other highly engineered structures, structural welded and bolted connections, reinforced concrete elements, seismic tie-downs, and temporary shoring and false work. It is not uncommon for an agency to require the design firm to "certify" that the construction conforms to the permitted design.

Many building departments when confronted with a perceived "high risk" project will request or require that a single design professional serve as the architect or engineer "of record" or "in responsible charge." Design professionals fulfilling a "lead" role may be asked to "over-stamp"

the design work of others, even in design disciplines where the lead design firm does not have the technical competence.

C. Unique Permit Risks for Modern Project Delivery Systems

In most jurisdictions, the typical requirements for permit submittals and processing are based upon the submittal requirements for a design-bid-build project delivery system for a modest structure. The NCARB model "minimum standards" for code submissions look like a plan submittal requirements outline for a typical residential or light commercial structure. It assumes that a reasonably complete submittal will be available at the time of permit application.

Unfortunately, many modern complex projects are not delivered in this way. The owner may want to fast-track the project and file a permit application as early in the design process as possible to avoid delays in permit review and approval. An owner may also want to avoid investing in a final design before the permit requirements have been worked out to ensure that the design can be modified cost-effectively to meet these requirements.

Additionally, the design team preparing the preliminary design may not finalize the design. The design team that prepares the final permit drawings may not provide services during actual construction. These services, including shop drawing reviews, RFI responses, change order reviews and any required inspection and certifications, may be performed by a follow-on construction manager, design-build contractor or other entity. Alternatively, the design team may be working in a design-build relationship with a contractor or an at-risk construction manager. The responsibility for applying for permits may rest with the contractor and/or the construction manager and not with the owner at all. It also possible that the design team may consist of a number of design firms in parallel contractual relationships with the owner, construction manager or contractor. There may not be a clear designation of the architect or engineer "of record." One design professional firm may not have the ability to review or control the activity of another member of the team.

Given that the delivery method for a project could be much more complex than for a typical design-bid-build residential or light commercial structure, permit conditions imposed on a design firm, such as shop drawing reviews and approvals, and inspection and certification requirements, may be unreasonable for that firm to accept.

These are but a few examples of the substantial risks to a design firm, arising out of the permit submittal and review process for a complex project.

D. How Can You Manage These Permitting Risks?

1. The Design Professional/Client Contract

The most effective way by which design firms can manage permitting risks is to negotiate a contract with the client that is as specific as possible as to the design professional's

responsibilities in applying for permits and fulfilling any permit requirements. These contract terms must realistically reflect what the permit agency is likely to require from the designers.

Clauses like the following should raise a large red flag:

> *Engineer shall be responsible to obtain all necessary permits, governmental approvals and licenses for the performance of the Project, including all services to be provided by the design professional...*

Even less onerous clauses, such as the following, are highly problematic:

> *The Consultant will assist Owner in applying for those permits and approvals typically required by law for completion of the Project. All permit fees shall be paid directly by Owner, unless otherwise agreed to in writing.*

For a complex project, this clause lacks sufficient specificity to account for all of the risks that such assistance may impose.

Even the industry standard EJCDC clause can pose problems. The EJDCD language provides:

> *In addition to other responsibilities of Owner as set forth in the Agreement, Owner shall at its expense:*
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> *H. Provide reviews, approvals, and permits from all government authorities having jurisdiction to approve all phases of the project designed or specified by Engineer and such reviews, approvals, and consents from others as may be necessary for completion of each phase of the project.*

Ex. B, B201, EJCDC-E-500 (2002). The problem with this approach is that it ignores the responsibilities that permit agencies impose on design professionals, either through registration requirements or permitting practice or policy. These requirements and practices cannot be ignored. It is far better to identify these permitting responsibilities and the risks attendant to them, and then address these risks specifically in the contract documents.

In a typical design-bid-build project, the responsibilities of the various design team members for preparation of drawings, specifications and reports are usually apparent. The NCARB model contains a list of what should be submitted and who should submit what. In a complex project, however, the NCARB model can quickly become irrelevant. For example, in designing industrial processing facilities, major mechanical equipment - the working "heart" of the project - may be described only in a "performance" specification with the actual design to be provided by specialty contractors or vendors. Permits may be conditioned on subsequent Code Stamps as in the requirement for an ASME stamp for a pressure vessel.

Whole structural systems, even prefabricated buildings or major building components, may be provided by contractors or vendors. In these circumstances, submittal drawings take on the role of basic design documents.

For challenging structural designs and so-called "post card" architectural projects, the role of the structural engineer may take on special significance. In the same vein, for complex steel frame structures, the shop drawing submittals by the steel detailer take on critical structural and life safety significance.

It is impossible to characterize all of the variations on this theme in this paper. The point is that it is critical that the various design functions that will be necessary and that will be implemented by the various players need to be carefully set out and the risks fully allocated in the contract documents. It is also critical that all of the contracts be reviewed for uniformity and consistency on this point. All project agreements should be consistent in the allocation of design responsibilities to the various participants. Without accounting for design responsibility from conceptual design to final acceptance, the issue of permit responsibility cannot be meaningfully addressed.

2. Developing an Understanding with the Permit Agency

Many permit agencies have provisions for pre-permit conferences. Design professionals can take advantage of such conferences to discuss the nature and scope of the project, the project delivery system, and any special and other unique issues. The pre-permit conference can provide the agency with a clear understanding of the organization of the design team and what the design team intends to submit. Conversely, the design team can discover what the permit agency requires.

Although permit agencies will usually not commit to a course of action in these conferences, a great deal can be accomplished to help the design professional and, ultimately, the owner in defining an approach to permitting. Some permit agencies will prepare a memorandum of the pre-permit conference to memorialize what was discussed. The design professional should also memorialize the meeting and provide minutes to the permit officials and the owner. If the meeting resulted in the identification of permitting uncertainties, there is value in documenting these discussions as well, so that the participants understand what may be required for permits to issue.

There is often value in including a representative of the owner in the conference to ensure that the owner has some insight into what may lie ahead. If the meeting can occur before the details of the design firm's scope of services have been reduced to a final contract, the design firm may be in a better position to allocate specific permitting responsibilities between the firm, other design firms and the owner. If the contract is already in place, the design firm should revisit its contractual responsibilities for the permitting process and propose any necessary changes as a result of the conference.

E. Who will be in Responsible Charge" and What Does "Responsible Charge" Mean?

1. Building Official Expectations – NCARB Model Code – Variations from State to State

The NCARB Model Handbook for Building Officials is premised on the notion that:

> [b]uilding codes and professional registration or licensing laws are meant to work together.
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> If building officials require all documents for non-exempt buildings and structures bear the appropriate signature and seal of a registered architect or professional engineer**, then the registration system will share responsibility for protecting the health, safety and welfare of the public**.

NCARB Model Handbook, p. 2 (emphasis added). However, the Model Handbook is not specific as to whom amongst the design team members will be "responsible" for particular professional services:

> Registered architects and professional engineers are, and should be, responsible for their professional services **in their respective areas of expertise.** The public as well as building officials rely on their professional expertise.

NCARB Model Handbook, p. 3 (emphasis added). The versions of the Model Handbook adopted by many states contain lists of "common services" that should be the "responsibility" of architects, engineers, land surveyors and landscape architects.[4]

There can be a high level of professional tension and confusion as to the respective roles of architects and engineers for a particular project. This confusion can lead to ambiguity as to the allocation of professional duties. For example, the Alaska Reference Manual quoted above identifies "Overall Project Management: construction management and inspection; planning; application of federal, state, and local codes; and design standards" as within the professional purview of both the architect and the engineer. Alaska Reference Manual at p. 13-14.

In August 2004, in an NCARB paper entitled "Architecture as it Differs from Engineering," the organization staked out a very broad role for architects, including the assembly and coordination

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[4] *See*, for example, *Reference Manual for Building Officials, Board of Registration for Architects, Engineers and Land Surveyors* (January 2003), issued by Alaska Department of Community and Economic Development, Division of Occupational Licensing; Common Services Provided by Architect, Engineers, Land Surveyors and Landscape Architects; pp. 13-18.

of a design. This "coordination" role was offered as the unique province of registered architects and not of engineers:

> [A] registered architect is expected to prove his or her ability to understand, assemble, and coordinate all of the disciplines and specialties that a building comprises. A registered architect must have demonstrated the capacity to act as "the generalist" in the design process. **In contrast, the education, training, and examination of a registered professional engineer demonstrate the engineer's competence as a specialist dealing with one branch of engineering knowledge.**

Id., at p. 2. Needless to say, professional engineering organizations were not pleased with NCARB's suggestion that engineers cannot coordinate the activities of a design team. The National Society of Professional Engineers reported on the NCARB paper by asking:

> Really? The bottom line to this issue is that not all PE's are qualified and competent to design a building. However, some are. Blanket statements like "the registered architect is the only design professional capable of coordinating all disciplines for all buildings intended for human occupancy and habitation" are not helpful, nor do they reflect reality.
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> In many cases an architect may be the best professional to lead a job. This does not mean that in every case an architect is the best professional to lead a job. State legislatures, state and federal agencies, and the courts have recognized the authority of both PEs and architects to serve as prime professionals in building design. **It's up to the owner to decide who should lead the team.**[5]

For any project with both a lead architect and an "engineer in responsible charge," divisions of professional responsibility need to be addressed both within the design team and with the owner, and the decisions on this important topic need to be clearly set out in the contract documents. The expectations should be disclosed to the permit agency. This issue can have profound significance for the proper handling and processing of documents with design significance during design development, permitting and during construction.

Not surprisingly, the engineering profession has weighed in with regard to the proper role of the "engineer of record" or the "engineer in responsible charge" in handling the diverse duties of design management, coordination and construction observation. The National Council of Examiners for Engineering and Surveying (NCESS) has adopted a Model Registration Act that is increasingly becoming the standard for state engineer registration laws. The NCESS Model Law provides an expansive definition of the "practice of engineering:"

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[5] *NSPE Engineering Times*, November, 2004, p. 1 (emphasis added).

> "Practice of Engineering" – The term "Practice of Engineering," within the intent of this Act, shall mean any service or creative work, the adequate performance of which requires engineering education, training and experience in the application of special knowledge of the mathematical, physical, and engineering sciences to such services or creative work as consultation, investigation, expert technical testimony, evaluation, planning, design and design coordination of engineering work and systems, planning the use of land, air and water … performing engineering surveys and studies, and the review and management of construction for the purpose of monitoring and/or ensuring compliance with drawings and specifications; any of which embraces such services or work, either public or private, in connection with any utilities, structures, buildings, machines, equipment, processes, work systems, projects, communication systems, transportation systems, and industrial or consumer products, or equipment of control systems, communications, mechanical, electrical, hydraulic, pneumatic, chemical, environmental, or thermal nature, insofar as they involve safeguarding life, health, or property, and including such other professional services as may be necessary to the planning progress, and completion of engineering services.

NCEES Model Law, Def. 5, "Practice of Engineering," p. 2. This licensing scheme contemplates that the designation "professional engineer" will be applied to the "specific discipline" in the specific branch or discipline of engineering in the "area in which the engineer has demonstrated competence." Definition – Professional Engineer, p. 2.

The duty to seal (or not to seal) documents is derived from the concept of professional competence:

> Whenever the seal is applied, the document must be signed by the licensee thereby certifying that he or she is competent in the subject matter and was in responsible charge of the work product. Documents must be sealed and signed in accordance with the Rules.

Id., Certificates and Seals, p. 13. We suggest that for projects involving both registered architects and engineers, a forthright discussion be had on the front end as to the respective role for each professional discipline. The scope of services for all of the professionals will flow from this discussion. To allow a turf war to interfere with the seamless delivery of services is an invitation to disaster. The client, armed with sound and, hopefully, consistent advice, should ultimately decide the role to be played by the various professionals. This decision must be made with due regard for the professional competence of the firms involved, as well as the expectations and the requirements of the permit agencies involved.

2. Responsible Charge

The NCEES Model Law defines "responsible charge" as "direct control and personal supervision of engineering work or surveying as the case may be." Model Act, Definition E, p. 4. NCEES's "Model Rules" accompanying its Model Law gives greater detail to the duties

and responsibilities of the engineer in "responsible charge." Individual states adopting the NCEES Model Law have followed the same pattern and have left to state licensing agencies to add meat to the term "responsible charge."[6]

Under the Model Rules:

- All final engineering specifications, reports, drawings, plans, design information, calculations or land surveys, reports, plats, drawings, plans and calculations are to be sealed, whenever presented to a client or any public agency.

- The purpose of the seal is to demonstrate what was done by the licensee or under the responsible charge of the licensee.

- Two or more engineers can seal a document. However, there must be a note under the seal indicating the specific subject matter for which each is responsible.

- The seal and signature shall be placed on work only when it was under the licensee's complete direction and responsible charge.

- The licensee shall sign and seal work only within the licensee's area(s) of competence.

The Model Rules also provide clear and specific requirements as to when documents will be deemed to have been prepared under the licensee's "responsible charge:"

- The client must first request that the engineer or the engineer's firm serve the function as the engineer "in responsible charge."

- The licensee in responsible charge must supervise the preparation of the documents and have input into their preparation prior to their completion.

- The licensee must review the final documents and make any necessary and appropriate changes.

- The licensee has these obligations even if the work is not performed locally.[7]

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[6] The NCEES web site contains a link to the licensing statutes and regulations of each of the 50 states. In considering the requirements in a specific jurisdiction, design professionals should inquire as to the statutes and rules that apply in that jurisdiction and consult with knowledgeable counsel, if necessary.

The obligations of the engineer "in responsible charge" continue after the initial submittal and endure throughout the life of the project. Revisions to documents are to be signed and dated. If the revisions are not done by the original licensee, the revisions must also be signed and sealed by the licensee "in responsible charge."

A successor licensee may take "responsible charge" "by performing all professional services to include developing a complete design file with work or design criteria, calculations, code research, and any necessary and appropriate changes to the work. … The burden is on the successor licensee to show compliance. The successor licensee shall have control of and responsibility for the work product and the signed and sealed originals of all documents." NCEES Model Rules, Seals on Documents, pp. 18-19.

The concept of "successor licensee in responsible charge" is especially pertinent for projects of long duration and in the current climate of frequent movement of engineers amongst design firms.

3. Architect or Engineer of Record

The Model Law, Model Regulations and the NCARB Model Handbook do not use the phrase "architect of record" or "engineer of record." Many permit agencies, however, do. The agencies frequently require that there be a lead architect or engineer of record for every project. This requirement may have sprung from the concept of lead designer that runs through many building official reference manuals. This requirement may also have its roots in NCARB's advocacy for the role of a "lead project architect."

The concept of "Architect or Engineer of Record" is also probably driven by the need of over-worked building department officials to identify a single point of responsibility for a large and multi-disciplined design team. Whatever the drivers for the "Architect or Engineer of Record" concept, that concept is probably here to stay.

4. Sealing and Stamping

There are often no clear-cut answers as to what documents must be sealed and who is responsible for their sealing.[8] Engineers need to consult the specific state registration act, administrative rules of the licensing body, and rules and practices of the particular building authority. The NCEES Model Act and Model Rules have clear and specific requirements as to the circumstances when an engineer in responsible charge is authorized to seal a document. Section 240.20 of the Model Rules specifies a long list of documents that must be stamped by an

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[7] The trend to out-source document preparation offshore creates unique and difficult burdens for the engineer "in responsible charge." The topic of international out-sourcing is beyond the scope of this paper, but the same cautions as are presented here are relevant to this issue.

[8] *See When to Seal? It's Not Always Black and White*, NSPE Engineering Times, July, 1999.

engineer in responsible charge. The Model Rules contain only one narrow exception for documents that do not need to be sealed:

> Working drawings or unfinished documents …. If the working drawing or preliminary contains a statement to the effect "PRELIMINARY, NOT FOR CONSTRUCTION, RECORDING PURPOSES OR IMPLEMENTATION."

The NCARB Model Handbook is also expansive in what it recommends that building officials require to be sealed:

> As a general rule, building officials should require that all construction documents have the seal and signature of either a registered architect or professional engineer as appropriate, or have a notation on the construction documents or building permit application noting the state law exemption from the general rule requiring that all construction documents be prepared by registered architects or professional engineers in that jurisdiction.

NCARB Model Handbook, p. 3.[9]

The building codes, practices of building officials, licensing and registration acts and other legal requirements for sealing of documents vary greatly amongst the various states.

Recommendations:

- **Consult the applicable licensing or registration act, building code(s) and handbook or regulations of the building department in the particular jurisdiction early in the project to determine what must be sealed.**

- **Consider preparing an index of proposed deliverables for presentation to the building official at a pre-permit submittal conference showing what documents are contemplated, both in the initial submittal and throughout the project. This index can indicate who will be "in responsible charge" of the area of work and who will be sealing the documents.**

- **Invite the building official to point out any other requirements for sealed documents.**

- **Insure that the contracts for the necessary professional design services are uniform and consistent with regard to sealing requirements.**

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[9] The text that follows the blanket sealing requirement in the Model Handbook is instructive: "Building officials facing litigation or other occurrence of harm affecting the public's health, safety or welfare should not have to explain why they could have required construction documents to be prepared, signed and sealed by a registered architect of professional engineer, but chose instead to accept construction documents from individuals when the law or building codes may not have allowed the non-licensed individual to prepare the construction documents in the first place."

- **Anticipate the need for the preparation, review and sealing of documents after the permits have issued and construction has commenced (such as inspection reports and those categories of shop drawings that may need to be sealed).**

F. The Move Toward Uniformity

Design professionals, especially on larger and more complex projects, are practicing in multiple jurisdictions. Consequently, personnel are assigned to projects in jurisdictions away from their home offices. It is critical to understand the licensing and regulatory requirements in the jurisdiction that has control over the project.

Fortunately, there is a growing trend toward uniformity in licensing laws, regulations and code compliance practices. Part of this trend is driven by the multi-jurisdictional nature of architecture and engineering.[10] It is burdensome for the profession to deal with different and at times inconsistent licensing requirements and divergent building code enforcement practices in multiple jurisdictions. The National Society of Professional Engineers (NSPE) endorses the enactment of uniform licensure laws in the fifty states.[11] In the meantime, design professionals need to stay abreast of the requirements imposed by each jurisdiction in which they practice.

G. The Move Toward Specialization – Example: Structural Engineers

As project designs become more challenging and complex, there is an increased need for specialized design services. This need, in turn, leads to specialists or specialized firms on the design team. Whether driven by the unique design needs of the project or by the requirements of the permitting agencies, there is an increased reliance on specialized design services in the delivery systems for complex projects. Along with this increase in specialized services come new duties and new requirements for the integration and coordination of design responsibilities.

The increasing role for specialized services from structural engineers is a good example of this trend toward specialization. The following comments, however, have equal application to the role of other specialists, including geotechnical engineers, mechanical and electrical engineers and a host of others.

Virtually all building project permit submittals require structural drawings. For projects with any structural complexity, many local permit agencies expect, and in some jurisdictions now require, that these drawings be prepared by a licensed professional engineer practicing in the specialty of "structural engineering." As of May 2006, Illinois required a licensed structural engineer for all projects of any complexity. Oregon, California, Nevada and Utah require a separate structural engineer for more structurally complex projects. Washington, Idaho, New Mexico, Nebraska and Hawaii have recognized a separate engineering specialty of structural

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[10] *See Mobility Requires United State Boards,* Exchange (an NCEES publication).

[11] NSPE web-site, *Licensure and Qualifications for Practice (#1737).*

engineering, but do not yet require that a structural engineer submit plans to local permit authorities.[12]

In May 2007, the Washington Legislature amended the state engineering registration act to require that an engineer be specially registered to provide structural engineering services for "significant structures."[13] "Significant structures" include essential facilities, such as hospitals, fire and police stations, structures holding water or fire suppression materials, emergency vehicle shelters and garages, standby power generating equipment, government communications centers, aviation control towers, and buildings having critical national defense functions; structures exceeding 100 feet in height; buildings of five stories or more; bridges with spans of more than 200 feet; piers with a surface area of more than 10,000 square feet; and buildings where more than 300 people congregate in on area.

This new requirement takes effect on July 1, 2008. The Act contains 'grandfather' provisions for engineers who can demonstrate sufficient experience to justify an exemption. We anticipate that specialty registration laws of this kind will increasingly become the norm.

The Model Handbook for Building Officials and the handbooks most jurisdictions have in place do not specify the discipline of engineer or indeed, architect, who can submit structural drawings and calculations. For example, the Colorado Handbook for Building Officials requires the submittal of documentation relating to seismic risks, design loads, and structural systems, but does not require that these documents be prepared by a structural engineer.

By contrast, the Alaska Reference Manual for Building Officials makes distinctions between services to be provided by architects and engineers. For example, the architect deals with "building structural systems, including gravity and lateral forces (wind and seismic forces)." In contrast, the engineer deals with "structural systems: seismic design and analysis; foundations; soil-structure interaction; connections; beam sizing; horizontal/vertical loading and forces; load and stress analysis; truss design; failure analysis." Of course, these descriptions of design tasks are provided only "for general guidance" and the state leaves it to the architects and engineers to determine who is the most appropriate to prepare, stamp and submit which design documents.

We anticipate a rapid increase in requirements for design submittals by professionals with specialty licenses. A review of the literature regarding structural engineers provides good insight into how this specialty has responded to this trend.

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[12] Jon A. Schmidet, P.E. SECB, Burns and McDonald, *Structural Engineering,* Whole Building Design Guide. See also**,** *Report on the National Summit on Separate Licensing of Structural Engineers,* sponsored by: the Council of American Structural Engineers, the Structural Engineers Association National Council, and the Structural Engineering Institute of ASCE (CASE National Summit), for a sense of how rapidly this trend toward specialization has grown in the past few years.

[13] RCW 18.43.040.

Structural Engineers have a strong professional organization, the Council of American Structural Engineers (CASE). Recently, CASE held a national summit to address some of the issues of professional responsibility that are the subject of this paper. The CASE National Summit observed:

> The field of structural engineering is changing rapidly. Buildings and other structures are becoming larger and more complex and are being constructed with new materials and methods. Along with these advances in the state-of-the-art practice, owners and the public alike have increased expectations for performance. Some structures are expected to remain serviceable even after experiencing a traumatic force such as a seismic tremor or winds. As a result, it is more important than ever for all engineers with responsibility for structural projects to have appropriate credentials, stay current in the field, and demonstrate sound judgment that comes only with experience.

CASE National Summit, p. 4. CASE evaluated a number of models for the education, testing and licensing of structural engineers. There were a few broad areas of agreement; principal amongst these was the recommendation for uniformity in professional requirements, testing and examinations. CASE proposed the development of a model law to provide more uniform licensing requirements and the creation of a National Examination Board.

The Model Rules that accompany the NCEES Model Law now contain provisions for specialty licensing of structural engineers. These rules require the successful completion of an approved engineering curriculum at an accredited engineering program and passing a series of NCEES and state examinations. The NCEES Model Structural Engineer concept establishes a two-tiered licensing system (Structural I and II) with the latter tier intended for those licensees who have achieved more in-depth structural knowledge. It also recommends the creation of a separate entity, known as the Structural Engineering Certification Board, to issue "certifications" to structural engineers separate from state licensing and other registration requirements.

Owners are also beginning to focus on structural engineering as a unique sub-specialty. One commentator noted in *Aren't All Structural Engineers The Same?,* Today's Facility Manager, (January 2006):

> A more experienced engineer can quickly identify problems in a design that an inexperienced engineer may miss. A firm specializing in a client's specific needs will already have the knowledge and design processes in place to work more efficiently. Its structural engineers should have a better understanding of current building codes and updates. This could save money and valuable construction time equating to few change orders.

Recent industry publications suggest that there should be a "Structural Engineer of Record (SER), who should be made a part of the project design team as early as possible and before the architectural design and mechanical and electrical systems for a structure are finalized. This project staffing scheme envisions that the SER will delegate specialty structural engineering

functions to specialty structural engineers. However, the SER typically retains responsibility to ensure that the overall design will be responsive to the needs of the other design disciplines as the design progresses:

> Early SER involvement is especially critical for fast-track and design-build projects, when it is often necessary to issue the structural construction documents well in advance of those prepared by other disciplines. Even in conventional design-bid-build situations, the structural system is the first to be constructed, providing the underlying framework for the rest. Close coordination among all members of the design team is essential throughout the design process.

Whole Building Design Guide, p. 3. This heightened role for the SRE is proposed as necessary "to assure adequate coordination of design work" performed by multiple specialty structural engineers. Id.

There is intuitive logic for the concept of a "lead" structural engineer, who has the responsibility for coordinating all of the structural design work with the other design specialties. However, assuming this level of design coordination responsibility is not without increased risk. Many contractor claims for cost overruns are premised upon defects in the design coordination process. "Clashes" between structural elements and mechanical, plumbing, electrical and HVAC systems are often at the root of expensive contractor claims against owners. These claims frequently morph into contribution and indemnity claims by owners against the design team. The issues that a structural engineer of record would need to coordinate are frequently the issues out of which cost-overrun claims are born, including:

- *Floor and Roof Penetrations* – Special framing is often required to accommodate stairs, elevators, mechanical chases, exhaust fans and other openings;
- *Floor-to-Floor Heights* – Adequate space must be provided for not only the structure itself, but also raised floors, suspended ceilings, duct work, piping lights, and cable runs for power, communications, computer networks;
- *Equipment and Utility Arrangements* – Large equipment (air handling units, condensers, chillers, boilers, transformers, switchgear, etc.) require adequate support, especially in areas subject to seismic activity that can induce significant horizontal forces.

The Whole Building Design Guide also recommends that the SER remain involved in the project until completion of construction to address the review of submittals and "conflicts between disciplines or misinterpretations by the contractor at a point in time when it is still possible to correct them with minimal cost and schedule impacts. Whole Building Design Guide at pp. 2-3.

This level of design coordination by a lead structural engineer would clearly lead to better and more cost-effective project delivery. However, getting the coordination function wrong is an open invitation for claims. Even if all coordination occurs as planned, the SER would remain a

claim target, with substantial costs of defense, every time a contractor seeks to blame a cost overrun on lack of design coordination between the structural and other elements of the design.

Owners need to be educated as to the risks and benefits of design coordination by a Structural Engineer of Record and appropriate contract language needs to be included in the design agreement to protect the structural engineer from unwarranted claims.

Recommendations:

There is a clear trend toward specialized structural engineering services for the preparation of construction documents. Building departments may require specialty structural engineering services in reviewing permit submittals for complex structures, such as finite element analysis and other special studies. Owners are also becoming more sophisticated in insisting on specialty structural engineering services for their projects.

The design team needs to assess the need for structural engineering services (and other specialty services) as early as possible, educate the client about the needs and determine how these needs will be met. The need for specialty structural engineering services will not end with the submittal of the permit documents. There may be a need for continuing consultation during the review process. There also may be a need for inspection/observation services from the structural engineer during construction and for the review and approval of shop drawings for project elements of structural significance. Finally, the owner and/or permit authority may require final inspections to obtain confirmation that the project was built in conformance with the structural elements of the design.[14] All of these potential issues need to be identified when the design team is being assembled and proper contractual arrangements made to ensure continuity of these critical services through all stages of the project delivery.

Structural engineers who are willing to take on an expanded coordination role need to be knowledgeable about the increased risk of claims and need to identify and negotiate appropriate contract terms with their clients. Broad form indemnity clauses in favor of owners, which would require the structural engineer to defend and indemnify the owner from contractor claims, would be particularly risky.

H. Shop Drawings

1. Who Will be Responsible for the Preparation, Review and Approval of Shop Drawings?

- How will shop drawings relate to the overall delivery of the design?

- What design responsibility will be allocated to those who prepare shop drawings?

[14] See, for example, WAC 51-50-1709, which specifies the observations that structural engineer must make during construction.

- What responsibility will the design team members have for the review and approval of shop drawings?

- What will the permit agency expect regarding the review and approval of shop drawings?

- What are the owner's expectations on this important topic?

These issues need to be considered and responsibilities allocated in the design professional contracts.

Most form contracts for design professional services do not require the engineer to sign and seal shop drawings prepared by others. Indeed, many of these contracts limit the role of the design professional to the review of shop drawings for conformity with the general intent of the design. EJCDC E-500, for example, provides:

> *Shop Drawings and Samples:* Review and approve or take other appropriate action in respect to Shop Drawings and Samples and other data which Contractor is required to submit, **but only for conformance with the information given in the Contract Documents and compatibility with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.**

EJCDC E-500, Ex. A at A.1.05A.11 (emphasis added). Section 2.6.4.1 of the AIA B141 form (1997 Ed.) contains virtually identical language.

If life were only this simple! Some building officials may require that certain shop drawings be stamped by someone "in responsible charge." There is little uniformity on this issue from jurisdiction to jurisdiction. The NCARB Model Handbook poses this rhetorical question and answer:

> *Do shop drawings have to be signed and sealed by a registered architect or professional engineer and submitted to the building official for approval?*
>
> No, typically shop drawings are intended as contractor or fabricator details. These are not part of the filed construction documents.

NCARB Model Handbook at 4. State building official manuals are more equivocal. For example, the Alaska Building Officials Manual provides the same general answer, but qualifies it with this comment: "The contract specifications for a given project may require stamped shop drawings." It goes on:

What are examples of a component, supplemental designs or shop drawings which are required to be sealed by a design professional when submitted to the building official for approval?

This is just a small list of examples:

(a) Prefabricated metal buildings
(b) Roof truss systems (complete system)
(c) Post-tension or pre-stress designs
(d) An alternate to an original submittal
(e) Component or system substitution which substantially changes scope of work or code application
(f) Precast concrete building components

Alaska Building Officials' Manual at p. 11.

The Colorado Manual is even more equivocal:

> Typically shop drawings are intended as construction and fabrication details. These are not usually part of the filed construction documents. (See exceptions below.) **However, they should be reviewed and signed by the Architect or Engineer in charge.**

Colorado Handbook for Building Officials at p. 4.

Not surprisingly, the building contractors' standard contract documents are guarded with regard to any assumption of design responsibility by the contractor. Paragraph 3.15 of AGC Document No. 200 provides:

> **3.15 Professional Services.** The Owner, through its Architect/Engineer shall provide all professional services required for the completion of the Work, except the following: ____. **The Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering unless the Contractor needs to provide such services in order to carry out its responsibility for construction means, methods, techniques, sequences and procedures, or unless such services are specifically called for by the Contract Documents. If professional services are required of the Contractor, the Owner shall indicate all performance and design criteria to be satisfied. The Contractor shall not be responsible for the adequacy of such performance and design criteria….**

The AGC has consistently opposed the delegation of any design responsibility to contractors. *See*, for example, *Guideline for Design Responsibility,* Guidelines for a Successful Construction Project, The Associated General Contractors of America, American Subcontractors Association, Inc., Associated Specialty Contractors (2003):

All owners, architects and other design professionals are urged to uniformly accept responsibility for design related plans and specifications applying to construction projects… [including]… accepting ultimate responsibility for the safety and utility of all project design elements.

***

3. The architect or other owner designated design professional must approve all design related work performed by others and coordinate the overall design integration, safety of the public, compliance with codes and other legal or owner requirements as contracted.

4. Contractors and subcontractors must not be held responsible for the adequacy or the performance or design criteria indicated by the contract documents.

***

8. Review and approval of contractor submittals by the designer is another area that can create distress for the project team. Some designers will "approve" a submittal with an approval stamp that contains language absolving the designer of responsibility for any mistakes in the review process. During contract negotiations and initial meetings between the owner, designer and construction team, this issue should be frankly discussed.

Various owner organizations and associations have also weighed in on the issue of ultimate design responsibility for shop drawings, especially in areas of high risk. For example, on the topic of shop drawings for structural steel connections, certainly a high risk element of any project, the U.S. Army Corps of Engineers' policy since July 1994 has been:

6. <u>Policy</u>

a. Design responsibility for in-house or A-E design of structural steel connections will remain with the Corps of Engineers designer or the A-E firm respectively; **transfer of this responsibility to the construction contractor will not be permitted….**

b. In cases where simple connections are not shown in the contract documents, the design responsibility will be retained by the Corps of Engineer designer or the A&E firm respectively, **through the shop drawing review and approval process.**

7. <u>Design Responsibility</u>

b. The A-E will be held fully accountable for the design of the structural steel connections in accordance with the "Responsibility of the Architect-

> Engineer Contractor" clause set out in FAR 52.236-23 and in accordance with ER 415-1-10.

ER 1110-345-53. The issue of who has design responsibility for shop drawings occasionally flares up with licensing and registration boards and even in state legislatures. In the June 20, 2005 edition of ENR, an article entitled *Design Detail Responsibility Again at Issue in New York State* detailed the efforts by the Northeast Subcontractors Association, a trade association representing over 450 eastern New York subcontractors, specialty contractors and material suppliers, to amend New York regulations to require prime designers to review and approve "without exception" those parts of the overall project design which had been prepared by a secondary design professional. Relying on Section 29.3(b) of the rules adopted by the New York Board of Regents in 1996, NESCA concluded:

> (e) The [lead designer] shall be required to review and approve the design submitted by the delegate for conformance with the established specifications and parameters and such determination shall be in writing.
>
> (f) The [lead designer] shall be required to determine that the design prepared by the delegate conforms to the overall project design and can be integrated into such design and such determination shall be in writing.

NESCA, Vol. 20, No. 9, March, 2002. NESCA has advised its members to "watch those weasel words" from engineers on shop drawings:

> Shop drawings stamped with what the Courts call "weasel words" such as "reviewed," "checked," or any other language falling short of approval, should raise a red flag and are contrary to the NYS Board of Regents Rules.

Id.

Frank omissions in shop drawing preparation and review have been at the root of many notorious construction failures. We think the better course is to determine in the planning stage of the project how shop drawings will relate to the overall design, to whom design and review and approval responsibility in the shop drawing process will be allocated, and to provide complete and uniform delegation of responsibility in all of the project documents.

2. Shop Drawing Issues in Fast Track Delivery Systems

There are special risks regarding shop drawing requirements in any fast-track project-delivery system. The design team may not fully understand at the front end of the project how shop drawings will relate to the overall delivery of the design as the project design is fully developed.

In fast-track delivery systems, identifying the necessary shop drawings and providing a uniform system for preparation, submittals, reviews and approvals can be a special challenge. As with any area of uncertainly, this issue leaves room for disputes between design team members,

between contractors and the design firms, or between all project participants and the permitting agencies.

The goal should be an integrated and consistent approach to the shop drawing issue throughout the design, permitting, procurement and construction phases of the project. At a minimum, the organization responsible for overall design coordination and delivery needs to be alert to this issue as the design delivery system develops.

Design professional organizations are beginning to promote the value in coordination and completeness of construction documents. *See,* for example, CASE Document 962 D (2003), *ACEC, Counsel of American Structural Engineers, A Guideline Addressing Coordination and Completeness of Structural Construction Documents*. This guide strongly advocates coordination of the work of the design team and design coordination for the benefit of the contractor:

> Design teams are most successful when the parties freely discuss expectations and relationships before the project starts. Those discussions need to include the division of responsibilities among the parties, the project milestones, and the expected deliverables at those milestones. The outcome of these discussions should be formalized in the contract between the parties.
>
> ***
>
> The contractor also has a right to expect that the work of the design team has been coordinated ….

CASE, pp. 3-1 – 3-2. The CASE guideline includes a "Drawing Review Checklist." The list includes shop drawing submittal and review requirements. Such a checklist would be invaluable in a complex project because it can help the engineer identify specific shop drawing requirements and remind him or her as to how those requirements are to be met for the specific project.

Recommendations

- **Identify the requirements for review, approval and stamping of shop drawings in the specific jurisdiction. This review should include state licensing or registration requirements, permit agency requirements, and owner requirements (especially public agencies and major institutional clients).**

- **Set out the responsibility for shop drawing review, approval and stamping in the contracts between owner and designers and in contracts amongst the design team.**

- **Discuss shop drawing review, approval and stamping requirements with the permit agency at a pre-submittal conference or permit intake meeting.**

- **Review all procurement documents for consistency as to shop drawing preparation, submittal, review, approvals and stamping requirements.**

- **In fast-track delivery systems, provide sufficient flexibility in contract documents to identify shop drawing requirements down the line and provide for necessary submittals, reviews and approvals.**

I. Hidden Design Duties in Reference Standards

Construction documents often include lists of reference standards, such as industry standard specifications, design manuals and codes of technical societies, that design professionals and construction contactors are required to follow. Many form General Conditions contain a list of reference standards that are incorporated wholesale into the contract documents. It is also common for standard General Conditions to include an omnibus clause to the effect that all such reference standards are to be the version of the referenced document at the time the bids are opened.[15]

Most building officials expect adherence to "industry standard" codes in permit submittals and many building codes have incorporated "industry standards" in total.

The unwitting inclusion of reference standards in contract documents is not without risk, however. First, elements of the reference standards can sometimes conflict with the more carefully chosen "custom" design elements. CASE suggests a review of critical reference standards to assure they are in conformance with the intent of the engineer. For example, for structural steel systems, the CASE Guideline suggests that the engineer verify that the AISC Code of Standard Practice that is being referenced has been amended, as necessary. Similar recommendations are made for the Structural Welding Code of the American Welding Society, and ACI and CRSI standards.

Second, an even more insidious risk can arise from the automatic inclusion of reference standards. Some of these standards contain clear and specific allocations of design responsibility that may be inconsistent with the design professional's contract or permit agency requirements. For example, the American Institute for Steel Construction (AISC) Code of Standard Practice for Steel Buildings and Bridges contains the following:

> **1.5 Responsibility for Design**
>
> 1.5.1 When the Owner's Designated Representative for Design provides the Design Drawings and Specifications, the Fabricator and the Erector are not

[15] For example, see EJCDC General Conditions, Paragraph 3.3.1.

responsible for the suitability, adequacy or building-code conformance of the design.

1.5.2 When the Owner enters into a direct contract with the Fabricator to both design and fabricate an entire, completed steel structure, the Fabricator shall be responsible for the suitability, adequacy, conformance with the Owner-established performance criteria, and building code conformance of the Structural Steel design. The Owner shall be responsible for the suitability, adequacy and building code conformance of the non-Structural Steel elements and shall establish the performance criteria for the Structural Steel frame.

***

1.8.2 **The Structural Engineer of Record shall be responsible for the structural adequacy of the design of the structure in the completed project.** The Structural Engineer of Record shall not be responsible for the means, methods and safety of erection of the Structural Steel frame. See also Sections 3.1.4 and 7.10.

***

3.1.4 When the Structural Steel frame, in the completely erected and fully connected state requires interaction with non-Structural Steel elements…..for strength and/or stability, those Structural Steel elements shall be identified in the Contract Documents as required in Section 7.10.

***

7.10 Temporary Support of Structural Steel Frames

7.10.1 The Owner's Designated Representative for Design shall identify the following in the Contract Documents:

(a) The lateral-load resisting system and connecting diaphragm elements that provide lateral strength and stability in the completed structure; and

(b) Any special erection conditions or other considerations that are required by the design concept, such as the use of shores, jacks or loads that must be adjusted as erection progresses to set or maintain camber, position within specific tolerances or prestress.[16]

[16] The commentary to these sections includes specific recommendations for the content of the specifications as to how the total structure will relate and support the structural steel elements.

These code provisions set out very specific design responsibilities for structural elements, the temporary support of these elements during construction and the integration of these elements into the completed whole of the final project. Yet, the allocation of design responsibility and, thus, allocation of design risk may not be the same as the allocation of responsibility set out in the design firm's scope of services. By incorporating these code provisions into the contract documents, the design firm may inadvertently be changing its scope of services and assuming unanticipated professional duties.

Choices in design responsibility need to be knowingly made with due regard for the requirements for the sealing of necessary submittals to the permit agency and the sealing of the construction documents, and the consistent with the design responsibility of other participants in the design process.

Another code that engineers regularly include as a reference standard in construction documents is AWS D1.1.2000, the Structural Welding Code promulgated by the American Welding Society (AWS). Section 5.13 of the AWS Code, entitled "Compliance with Design," gives the "Engineer" sole authority to approve a change in the location of welds. The Code also provides a myriad of acceptance criteria for welds. Any deviations from the acceptance criteria spelled out in the Code are only allowed if "approved by the Engineer." How many engineers who include AWS as a reference standard in contract documents are aware that any changes in weld acceptance criteria by a fabricator or a steel erector require approval by them?

Finally, the Building Code Requirements for Structural Concrete, ACI 318-02, has also been incorporated into many building codes and is a required specification element for many procurement codes and regulations.[17] Chapter 1 of ACI 318-02 sets out both minimum requirements and recommendations for the form and content of design documents to be submitted to permit agencies. With the ever-growing use of ACI 318-02 and its incorporation into so many building codes and procurement standards, it can be expected that there will be a growing reliance on both its requirements and its recommended design practices.

One of the recommended practices in ACI 318-02 is an on-going inspection by the "Registered Design Professional" during the course of construction. ACI recommends such inspections, even if there is an independent third party inspector for the construction of the structural elements of the project. The inspection role of the "Registered Design Professional" would be limited to evaluating conformance of the construction with the intent of the design. Many building departments may require or expect this level of inspection during construction. Owners, however, frequently do not want to retain the services of a registered design professional during construction. If the ACI Code applies to a project, the owner and its design professional may not realize that such inspections must be made.

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[17] A Google search of ACI 318-02 produced over 26,000 hits. Many were public and private entity standard specification requirements that directly incorporate ACI 381-02 by reference.

If the design professional believes a structural concrete inspection is necessary during construction, but the owner is unwilling to authorize and pay for these services, the design professional must document this refusal and disclaim liability for any claims arising out of that portion of the project. If the requirement is known on the front end of a project and the owner is reluctant to accept the cost of the inspections, the design professional may need to raise the issue with the permitting agency, preferably in the owner's presence.

A related issue is the availability of the "Registered Design Professional" or other designated lead designer under various codes to attend to design responsibilities, other than inspections or construction observation, after the permits have issued and construction has commenced. The lead designer or owner may be expected to respond to contractor submittals, including shop drawings, respond to contractor Requests for Information, and address change order requests, the disposition of which may have significance for elements of the design. Under many of the most common reference standards, these functions require the ongoing participation of the lead design professional for the design discipline involved. The nature and extent of this important post-design participation should be anticipated and spelled out in the controlling contract documents.

Recommendations:

- **Know before design work commences what reference standards will be required by the permit agency and the owner, and which will be imbedded in the procurement documents.**

- **Evaluate the contents of the important reference standards for internal consistency and for consistency with the duties that the design professional has assumed in the design professional contract.**

- **Negotiate a fair and reasonable set of duties and a tolerable level of risk early on in the contract negotiation process with the owner.**

J. Special Inspections

Design professionals often play a role in the inspection of construction work. The nature and extent of this inspection function role can vary greatly. Some building code jurisdictions will simply endorse "special inspection" requirements on the approved plans and leave it to the party applying for the permit to propose an acceptable "special inspector," who is typically paid by the owner (not the contractor) to perform the required inspections. This inspector is then required to report on the inspection results to the building department.

Other building departments are very specific as to what reports, certifications and other writings will be required from the special inspector. Building departments can also be far more proactive and will specify "approved" third-party inspectors and the nature of the inspections and inspection standards that will be required. We have seen some building departments insist upon the use of their own "inspection certification" or "verification" forms. The language of some of these documents is especially troublesome, because they impose duties on design professionals

in carrying out the inspection function that are far more onerous than the duties design professionals are willing to assume in their contracts.

The trend clearly seems to be in the direction of more "special inspections" by third party inspectors with increasingly detailed inspection requirements incorporated into building codes or within incorporated reference standards. *See*, e.g., International Building Code (2000 and 2003), Chapter 17. Originally, requirements for special inspections were limited to structural elements of the design. More recently, special inspection requirements have expanded to include other life safety building elements, including those mechanical and electrical systems with life safety consequences.

There are a few reasons for this trend. One reason is clearly the inability of local building officials to maintain the inspection expertise in-house and to be able to adequately perform the often time-consuming and highly specialized inspection procedures that are called for by the codes. Another reason is the increasing complexity of designs. The increased complexity of building designs results in the need for highly specialized quality assurance/quality control systems. Code requirements for quality assurance/quality control lead to the need for more sophisticated inspections.

Additionally, governmental and industry inquiries after high profile construction failures often result in the call for more rigorous inspections. High visibility failures, such as the Hyatt Regency walkway collapse in Kansas City, often lead to much industry and governmental soul searching on how to prevent such failures in the future. The U.S House of Representatives' Committee on Science and Technology Report on Structural Failures in Public Facilities, House Report 98-621, 98th Congress, recommended that "[Building Codes and Building Code Officials] should make every effort to ensure that provisions are written into building codes and adopted in public forums which make the on-site presence of the structural engineer mandatory during the construction of structural components of public facilities.[18]

It seems inevitable that more recent high visibility failures, such as the "Big Dig" tunnel ceiling collapse and the collapse of the I-35 Bridge in Minnesota, will lead to increased governmental and industry calls for more rigorous inspection requirements on public and private sector high-risk projects.

There is also a trend toward mandating increased training and certifications for those who perform specialized inspections. For example, CASE Form 101, Qualifications of Inspectors and Testing Technicians, identifies various certifications and grades for inspectors performing inspections under the standards promulgated by the American Concrete Institute, the American Welding Society, the American Society of Non-Destructive Testing, the International Code Certification, the National Institute for Certification in Engineering Technologies and the Exterior Design Institute. Each of the identified codes and reference standards includes various

[18] For a full discussion of the impact of high-visibility structural failures on new code requirements for Special Inspections, see CASE, Guide to Special Inspections and Quality Assurance, 3rd Ed. (2004).

levels of certified inspectors and is backed by a host of technical inspection details, methods and inspector training requirements.

As these special inspection requirements have grown, the design professional community has responded with a number of approaches. The CASE approach envisions that the "Registered Design Professional in Responsible Charge" will be proactive in identifying what special inspections are required under the applicable building codes. The Registered Design Professional then nominates a "Special Inspection Coordinator" and the "other approved agencies for conducting these special inspections and tests." CASE Form 101, Statement of Special Inspections (2004). The CASE form provides that this submittal be sealed by the Design Professional in Responsible Charge.

This approach is far more rigorous than the earlier practice of requiring a simple letter from the engineer of record to the building official stating that "Based on observations conducted during the progress of the Work, the project has been constructed in accordance with the intent of the design."

The CASE Guide to Special Inspections and Quality Assurance also recommends that a single entity coordinate the inspections and testing for the structural elements of the project. Id., p.3. This Guide appropriately points out that the "Special Inspection Coordinator" should have "no control over the Contractor's means and methods of construction and ... not have the authority to stop work. The SI's role is to verify construction compliance with the Contract Documents as supplemented with shop drawings or other submittals." Id. at p. 4.

The use of the word "verify" is of critical significance under this inspection scheme. "Verification" is given various meanings in the several codes and industry standards that contain inspection criteria for project elements with structural and life safety significance. CASE summarizes many of these inspection and testing requirements for the various structural elements in its Statement of Special Inspections. A few examples make the point. Under "Concrete Placement," the inspector is to verify that concrete is properly consolidated. Under "Welding," the AWS or ANSI certified inspector is to verify the size and length of fillet welds.

There are suggested subtleties as to what is meant by "verification" in some instances. For example, in addressing certain inspections in concrete construction, CASE observes:

> The inspector is not expected to verify the precise location of anchor rods, but he should verify that the Contractor has taken appropriate steps to correctly position them, such as engaging a surveyor or setting up a system of string lines and batter boards.

Id. at p. 16. What is meant by "verification" can only be determined through a code-by-code and system-by-system review of all of the construction elements for which special inspections will be required. Will the inspections be periodic or continuous? Will the inspections or tests require the use of personnel with special training and certifications, as required by many of the codes and reference standards? Will the inspections require "verification" and, if so, will the

"verification" speak only to the implementation of appropriate systems by the contractor versus a specific "verification" that all of the elements requiring inspection that make up the work have been actually constructed as required by the plans and specifications?

We are not arguing against this growing trend toward requiring special inspections and testing of structural elements in projects. We are suggesting that it is critically important to anticipate these responsibilities and allocate them amongst the appropriate project participants.

The CASE approach is commendable. Inspections by a "Special Inspections Coordinator," who is completely independent from the Engineer in Responsible Charge and from the construction contractor, make sense. However, the goal of independence, however laudable, may be difficult to implement under some project delivery systems. For example, a design-build-operate-and-maintain project does not have the kind of separation of economic interests that allows for this recommended degree of independence. The designer may be the project owner. By way of another example, a project where the owner also serves as the developer and general contractor does not have the requisite level of economic separation to achieve the independence CASE has urged.

The CASE approach envisions a "Report of Special Inspections" at the end of the project in which the Special Inspector states:

> To the best of my information and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following: _____.

CASE Form 102, Final Report of Special Inspections (2001). This final report places the burden of certifying that the inspections have been carried out on the Special Inspections Coordinator and not on the Design Professional in Responsible Charge.

It is unclear how much acceptance this approach is finding in industry practice. It remains common for permit agencies and owners to require design professionals "in responsible charge" or "engineers of record" to inspect construction and to "certify" their findings.

Recommendations:

- **Appropriate risk management should include anticipating:**
  - **Evaluating what special inspections and testing will be required?**
  - **Evaluating who should properly perform these inspections and tests?**
  - **Evaluating who will be required to report on the results to the owner, permit officials and others?**

- **Determining in advance what certifications or other assurances will be required?**

- **Negotiating responsibility for all requirements for inspections, testing and for certifications and other assurances and setting them out in the contract documents.**

K. Professional Ethical Standards; the Model Rules Approach

The licensing and registration laws in each state usually include professional ethical standards. Licensing and registration boards have also expanded on these standards in rules and regulations. In addition, professional organizations have adopted ethical standards and codes of conduct for their members.[19] Most jurisdictions, however, have followed the NCEES Model Rules.

Section 240.15 of the Model Rules sets out the NCEES Rules of Professional Conduct -- 18 clear and concise statements of professional duty arising in three broad categories: the engineer's duty to society, the engineer's duty to his employer and clients, and the engineer's duty to other professional engineers.

1. Obligation to Society

A licensed engineer's first and foremost responsibility is to the public welfare. This concept runs through all licensing and registration schemes, professional ethical standards and building codes. Under the Model Rules, a licensed engineer may approve and seal only those design documents that "conform to accepted engineering and surveying standards and safeguard the life, health, property, and welfare of the public." Model Rules at 240.15 A (2). If a licensed engineer's professional judgment is overruled, endangering the health and welfare of the public, that engineer must notify the employer, client and, in some instances, other public officials. Model Rules at 240.15 A (3).

This duty to report is not always understood by design professionals and their clients. We recommend that the design professional's agreement with the client contain a provision notifying the client that under certain circumstances, the design professional is obligated to report conditions where "the life, health, property or welfare of the public is endangered."

2. Obligation to Employer and Clients

[19] It is beyond the scope of this paper to address the specific code and ethical regulations in each of the 50 jurisdictions and for the various boards that exercise authority over particular design disciplines in these jurisdictions. Suffice it to say that any professional practicing in a particular jurisdiction should be sure he or she fully understands the local ethical requirements. NCEES provides a link on its web site to the laws and regulations in each of the 50 states.

Licensed engineers have a duty to undertake only those assignments they are qualified to perform and may not sign or seal any plans or documents dealing with a subject matter in which they lack competence. Model Rules at 240.15 B (2). While engineers may coordinate the work of other engineers, they must ensure that the engineer responsible for preparing each design sign and seal that portion of the design. Model Rules at 240.15.B (3).

3. Obligation to Other Professional Engineers

The Model Rules contains a blanket prohibition against paying any gratuities to obtain work:

> Licensees shall not offer, give, solicit, or receive, either directly or indirectly, any commission, or gift, or other valuable consideration in order to secure work, and shall not make any political contribution with the intent to influence the award of a contract by public authority.

Model Rules at 240.15.C (2). There appears to be an unfortunate increase in criminal investigations, prosecutions and convictions of construction professionals for payment of such gratuities or bribes. Design professionals are not immune from scrutiny. We recommend that every design professional firm adopt a code of ethics which prohibits the payment of any gratuities aimed toward getting work.

4. Relevance for Civil Liability

In many jurisdictions, the imposition of discipline by a licensing board can be used as evidence in a subsequent civil damages case for an alleged violation of the professional standard of care. Conversely, a judgment in a civil action or even an acknowledgment of fault in a settlement agreement can be used by a Registration Board as evidence of a violation of the Rules of Professional Conduct.

Recommendations:

- **Know the ethics requirements for the jurisdiction where the project will be built and where the work will be performed.**
- **Pay particular attention to the requirements for signing and sealing of documents.**
- **Be sure that there is a clear understanding among the members of the design team and with the owner as to whom will be responsible for signing and sealing particular elements of the design and for coordinating the design.**
- **Provide notice of professional disclosure and reporting requirements in contract documents.**

- **Reduce design responsibility requirements to clear and consistent contract terms, both in the professional services agreement with the owner and in the contracts among the various members of the design team.**

- **If there are ethics questions to be addressed, seek competent advice as early in the process as possible.**

III. Conclusion

The seemingly simple questions of "What do we mean by "design responsibility?" and "Who actually has the "design responsibility?" are not simple questions at all. For there to be reasonable risk management for architects and engineers, there must first be a systematic and complete assessment of what design responsibility will be required, the sources from which the imposition of design responsibility will flow, and, then, the identification of to whom that responsibility should be allocated. Once these responsibilities are identified and assignments for these responsibilities are clearly negotiated, the issues of the proper allocation of design responsibility can then be consistently and uniformly addressed in all of the relevant contract documents.