



Delegated Design

It is All about Communication

By the CASE Guidelines Committee

Project design and delivery systems have become more and more complex. The days when the Structural Engineer of Record (SEOR) designed all aspects of a project in a straight-forward design-bid-build environment are becoming few and far between. Today, with the pressures on construction cost, design fees, and design and construction schedules, SEORs are looking to do more for less fee and in less time, while also delivering superior service. So, in addition to delegating the responsibility for the design for secondary structural elements (such as stairs, cladding, elevator rails, etc.), SEORs are also delegating the responsibility for the design of many primary structural elements (such as steel joists, metal deck, precast concrete slabs and beams, etc. in addition to traditional connection design) to a Specialty Structural Engineer (SSE). All of these elements introduce additional structural engineers into the process and, given concurrent changes in the design and delivery systems (design-build, design-assist, integrated project delivery, etc.), it is not surprising that project participants have differing opinions as to what is the “design” and who has the ultimate responsibility for it.

In such environments, the SEOR’s relationship with the SSE may be tested and strained and may become confrontational, particularly if the process is not managed well or if the motive of the SEOR for delegating is less than altruistic. Obviously, this is not the desired SEOR/SSE relationship; the project will be better served with an atmosphere of trust, openness, understanding and cooperation. The owner, contractor, subcontractor and design team will all benefit from a non-controversial attitude with appreciation and acceptance of each other’s knowledge, expertise and experience.

Communication

There are three keys to this or any relationship, and they are not new. They are communication, communication and more communication that is clear, concise and non-compromising. The first step is the proper delegation of design responsibility and a well-defined scope of services within the SEOR’s initial engagement on the project. The Owner and the SEOR need to

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agree to what will be designed by the SEOR and what aspects of the project will be designed by SSEs. It continues with concept development, the preparation of the specifications and construction documents, and is followed by pre-bid and pre-construction conferences. However, the process is not complete until the SSE’s submittals have been reviewed by the SEOR to confirm that the SSE’s interpretation of the design criteria is appropriate and acceptable, and the totality of the work is coordinated and complete.

Primary and Secondary Structural Elements

The issue that has most complicated the relationship between the SEOR and SSE has been the recent trend of including primary structural elements in the process. Design delegation of secondary structural items such as stairs, handrails, davits, and elevator support rails and beams, has been accepted for some time; their design is governed by time tested industry standards and practices. However, the delegation of the design for primary structural elements such as light gage trusses, wood trusses, structural precast concrete panels, post-tension concrete members, metal deck, and structural steel connection design has established the necessity for the SEOR to fully define the loading, design criteria and performance standards for each primary structural element to enable the SSE/subcontractor to properly develop their design/proposal.

While the secondary systems are important to the functionality of the completed structure, the primary systems have unique needs associated with structural stability and coordination requirements of code compliance and public safety. Therein lies the rub. The SEOR’s delegation of the design of primary structural elements to an SSE requires project specific loading, design and acceptance criteria, and a comprehensive understanding of how the

entire, sometimes unique, structural system is to perform while secondary elements may be acceptable as more standardized “off-the-shelf” type items. As a possible rule of thumb, to develop a base line for what information is needed by the SSE, the SEOR needs to ask the question “what would I need if I had to design it myself?” More often than not, the SEOR probably does not spend as much time thinking about the “to be delegated” items, as he believes that the responsibility has passed on to the SSE and they are now someone else’s concern. This is definitely the wrong attitude to have, since the responsibility for the entire project still lies with the SEOR. If various SSEs design less than adequate systems based on poorly drafted or considered design and performance criteria, the result will be a poor project with many design and construction problems. In a worst case scenario, the SEOR will wish that he had just designed the delegated systems in-house.

As an example of possible pitfalls, roof systems like steel joists, light gage trusses and wood trusses may require special loading as necessary for snow drift, mechanical units, solar panels, roof drain piping, seismic bracing, and sprinkler piping. The snow drift and roof drain piping loading are definable and should be shown on the contract documents. On the other hand, mechanical units loading and size may not be known until a mechanical subcontractor has been selected and requires the SSE to coordinate with the general contractor. Seismic bracing loads will be provided to the SSE by another SSE who was selected to design anchorage and bracing for piping and equipment. Sprinkler piping is even less defined than the mechanical units. Many times, the only information known about the sprinkler system is the location of the water line entering the building. Again, the layout and loading from the sprinkler is known after the sprinkler subcontractor is selected and the system is designed

by his SSE. The fundamental issue with these unknowns is whether the SSE is aware they exist so that he is not blindsided after or during his design effort. The owner will not be happy to be drawn into a war between the SEOR and the contractor and a small army of SSEs.

As another example, the Steel Joist Institute (SJI) 2010 *Code of Standard Practice for Steel Joists and Joist Girders* states that the SEOR shall “calculate and provide the magnitude and location of ALL JOIST and JOIST GIRDER LOADS”. The term “ALL” implies a level of completeness that might not be achievable by the SEOR. There will probably be some unknowns that the SEOR will need to make the SSE aware of, and there are loadings that will require his coordination with other trades. This SJI Code also identifies five (5) options that are to be used to specify joist design loads.

The SEOR shall use one of the five options to allow:

- The estimator to price the joists;
- The joist manufacturer to design the joists properly; or
- The owner to obtain the most economical joists.

These issues of properly estimating the cost, properly developing the design and providing the economics for the Owner seem to be creditable goals for the relationship of the SEOR and the SSE.

Standards

But let's go beyond the not so straightforward issue of developing specific design and performance criteria. How is the delegated design going to be achieved and what standards are going to be followed? There are many important issues to consider:

- Do you understand the industry code of standard practice for the element being delegated? Does it even exist? Is it insurable?
- If you don't like what is in the code of standard practice, you have the opportunity to change it via the contract documents. Do you know what needs to be changed? Does your understanding of the code enable you to be certain that a particular change does not impact other aspects of the code?
- Is the SEOR responsible for specifying and also verifying the qualifications and experience of the SSE?
- Is there a means to ensure that the SSE has interpreted the SEOR's requirements properly during the bidding stage?

- Who is responsible for the coordination and/or compatibility of the primary structure (designed by the SEOR) with the delegated design portion (designed by SSE)?
- How are the material quantities, details and loadings of the delegated design portion being accounted for in the final design by the SEOR?
- Who is responsible for the final product? Again, communication plays a key role.
- What is the impact of the elements designed by the SSE on the primary structural system?
- Must SEOR review the results of the SSE's design to establish compliance with the governing codes and specifications?


Selecting the SSE

After the scope of work, including the project specific loading, design and acceptance criteria, is defined, the next step is the selection of the subcontractor. To ensure the contractor's SSE is knowledgeable and experienced in the design of the designated elements, the SEOR should establish in the contract documents the minimum qualifications and experience of the SSE. One might say that the subcontractor that is retaining the SSE should be responsible for his selection, and ultimately the subcontractor will have to live with the designs prepared by his SSE. However, a poor selection, possibly the low bidder, may lead to not just the subcontractor having issues but the total design and construction team having to live with the poor results, extensive rework or modifications and the possibility of litigation.

The possibility of litigation leads to the question – does the SSE have liability insurance and, if so, how much? Is it sufficient based on the nature of the element and its importance in the strength and integrity of the overall structure? It is important to note that being a licensed Professional Engineer or licensed Structural Engineer does not mean that he or she has the knowledge and experience to perform the design services needed. It is imperative that the SEOR's contract documents adequately define the SSE's qualifications and experience requirements.

Limits on Delegation

What about the material that has not been designed and is to be designed after the bids have been taken? If the bids or proposal to do the work establish qualifications to these unknown quantities, this can lead to controversy. Again, establishing the complete scope,




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definition and responsibility of the work to be performed by the SSE is the principal duty of the SEOR. While the construction documents, drawings and specifications are the primary tools, the pre-bid and pre-construction conferences can be useful in clarification and confirmation that the project requirements are understood.

The 2010 AISC *Code of Standard Practice* (COSP, AISC 303-10) includes a codification of an undefined and uncontrolled but widely employed industry practice that had existed since the 1960s. Section 3.1.2 defines the connection design or selection process, identifies the loading and connection information that must be supplied by the SEOR and SSE, and addresses any project or design concept specific issues or restraints that are to be considered.

The COSP has designated delegated steel connection design as Option (3). This option is to be noted "In the structural design drawings or specifications, the connection shall be designated to be designed by a licensed professional engineer working for the fabricator". The COSP establishes the information needed by the SSE and emphasizes needs for conferences, pre-submittals and proper review and approval by the SEOR. The CASE Guidelines Committee has recently published a white paper on this facet of

delegated design in *A Review and Commentary of the American Institute of Steel Construction 2010 Code of Standard Practice for Steel Buildings and Bridges*. Incorporated in this new document are examples of Pre-Bid and Pre-Construction Conferences agendas.

The ability to delegate design elements may also be limited by local building codes, regulations, and professional licensure requirements. When developing standard language for inclusion in contracts, the SEOR should review these requirements before attempting to delegate design responsibilities. A local jurisdiction may have specific code language requiring the SEOR to design items which are not normally included in the SEOR's basic services. On those occasions, the SEOR should address those secondary items, modify the contract documents accordingly and include the design of these elements in his basic services and not delegate the design of such elements.

Summary

In summary, it is important to view delegated design as a way to achieve the best possible project result for the owner given the project constraints on fee, schedule and quality. It is obviously a complicated process that requires

considerable knowledge and skill in order to achieve success. Communication is the key, and it starts at the very beginning of the project. It requires that the SEOR continually thinks about what will be needed by the SSE, how best to specify the requirements of the design, how to define the process and how the interaction of other designers is going to work, and who can and cannot be an SSE. It is much easier to discuss concerns and issues as the project is developing during the design phase or in the pre-bid/pre-construction meetings, than it is to correct the problems after the fact. You are part of a team, and part of the process, so be proactive within your discipline and promote efforts to coordinate. Insist on two-way communication with an open mind to ensure the best understanding possible to those interpreting your design and intent. ■

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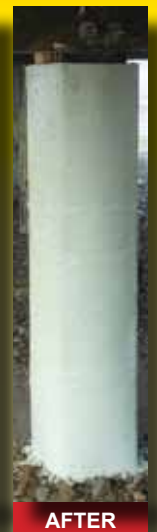
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