



National Council of Structural Engineers Associations

## Structural Connection

July 2016

### The Complete Structural Package

Contributed by Thomas A. Grogan Jr., P.E., S.E., F.ASCE, Vice President

With over 35 years in the industry, it has always been impressed upon me that the structural documents for a project consist of: plans, notes, sections and details, and specifications. Together these documents form the complete structural package conveying the structural design and expectations to the contractor and QC team. This information should be issued as a coordinated set to provide clarity and eliminate the potential for change orders and mistakes by the contractor. As a project deadline draws near, the structural engineer typically completes the plans, sections and details, and coordinates them with other disciplines. Often, the final task is the review of the specifications in which the concrete, masonry, and steel sections are reviewed to ensure only the relevant project specific information is included.

Unfortunately, I have noticed a trend over the past decade or so where structural engineers, as a result of extremely aggressive schedules, are not spending adequate time editing the specifications. The engineer may issue the latest version of Master Spec with minimal editing with the intent to catch anything which may have been missed on the drawings. After all, if there is a conflict between the drawings and specifications, the specifications typically contain one of the following clauses: (1) the specifications govern or (2) the more stringent between the drawings and specifications governs. To further complicate the issue, some companies use a spec writer, who may not be familiar with the project, instead of the engineer, to generate the specifications. Under this scenario, the structural engineer loses the opportunity to learn the importance of the relationship between the specifications and drawings. Similarly, the spec writer may misinterpret significant details in the design.

Recently, I have been working on-site as part of the QC team and have come to the realization that this more recent approach to specification writing, while time efficient, provides too many avenues for misinterpretation and change orders, and leads to confusion for the QC teams. This is significant because these QC teams have been hired to ensure the contractor is building according to plans and specifications.

For example, one area of concern is reference standards. In many specification sections, there is a main clause that indicates the completed work must comply with all the reference standards of a particular section. The QC team must enforce compliance with the entire reference standard instead of a specific sub-section of the standard. The specifications should contain a note that clearly indicates the portion of the project to which the reference standard applies.

A second area of concern includes submittal requirements. Often times, specifications request submission of specific certifications. On my recent project, a specification section required that the contractor “certify that they are not associated with the proposed independent testing laboratory and that none of the contractor’s officers have a beneficial interest with the laboratory”. Although I am not aware of any contractors who have their own testing labs, determining the verbiage of this certification would have taken a significant amount of time.

In this instance, when the design team was questioned, they indicated this submittal was not required for this project and is just part of the company's master specifications. However, in order to arrive at that conclusion, the contractor, design team, and QC team each spent several hours of their time researching and documenting the change. A properly written section would have eliminated the need for the discussion. Another specification required the submission of samples of load indicator and/or direct tension bolts, and yet another section asked for a sample piece of roof decking. After speaking with the structural engineer, these submittal requirements were eliminated, but time was spent by the project team to reach that decision.

As a third example, this particular project contained a concrete specification section which required the testing lab to take sets of six cylinders for every 50 cubic yards of concrete. Breaks were required to be made as follows: one at 7 days, one at 14 days, and two at 28 days, with two to be held in reserve (one for a 56 day break if necessary and another to be used where necessary for early form removal). The industry standard is four cylinders for every 100 yards, with the contractor reserving the right to take additional cylinders if necessary to verify early concrete strength. From a QC perspective, specifications requiring six cylinders instead of four at twice the frequency represents a 150 percent increase above the industry standard. To have this requirement changed was a significantly arduous task as the owner liked the idea of more concrete breaks, even though they were far in excess of the industry "standard of care".

I share these lessons learned with you with the goal that as a profession we make a concerted effort to spend the requisite time to review specifications prior to issuing for bid. This relatively small additional effort will result in structural documents which are more accurate and clearly written, enabling the contractor and QC team to build a final product which will meet the expectations of the design engineer and customer.