

Coordination and Completeness of Structural Construction Documents

By Jeff Morrison

As structural engineers, at the end of the design phase, our work product consists of the construction documents (drawings and specifications), which detail the requirements to construct a given structure to serve an intended purpose. The degree to which the project will be considered a success is directly related to the quality of the construction documents. The documents must be complete, coordinated, clear, concise, and constructible. Poor quality construction documents lead to significantly more time, frustration, and potential liability when issues need to be corrected during shop drawings or, worse, during or even after construction. Building structures today are more complicated than ever, and a successful project involves proactive management of both the technical and administrative sides of the project.

The intent was...

In life and structural engineering, communication is essential in making sure we are understood, and we understand others. Without good communication amongst the design team and between the design team, owner, and contractor, you will not have a successful project. The construction documents are the primary means of communicating with the contractor. It is essential always to keep this in mind and make sure the drawings provide the information the contractor will need to successfully construct the building as we intended.

We must also be proactive in communicating with other design team members the information *we* need to produce a quality set of structural documents within the project schedule. Requesting this information in writing keeps the project organized and tracks outstanding issues or items awaiting resolution. In today's fast-track projects with early structural packages, this becomes even more critical. In addition, it is important to have a clear understanding of the intended use of any early structural submittal packages to verify that our drawings are adequately developed and complete for their intended use.

Off on the right foot...

It is well-known that the early stage of a project is the most effective time to influence project cost beneficially. As such, it is

crucial to get every project off on the right foot. Major decisions such as determining the appropriate structural system, lateral load resisting system, typical details and wall sections, foundation system, and coordination with major architectural or MEP systems are critical. If these items wait until too late in the project design phase, we are often left with less-than-optimal structural options. Therefore, we should provide valuable input early in the project when it can be most useful. In addition to discussing and reviewing these items with the external project team, having regular meetings with our internal design team, including the engineering staff, BIM staff, and QA reviewers, ensures that all members of the team have the same information and can offer valuable input early in the project and at regular intervals.

Details matter...

This is the hard part. After the initial excitement of the new project has worn off, the structural details need to be developed, optimized, and coordinated with the architectural and other consultants' scope of work. The everyday task of advancing the project's design and details must remain in step with the entire design team. Developing details that are as simple as possible and constructible, without issues, will often prove to be better than designing every unique condition. For example, how many unique column base plate details should I have, can I have the same detail for supporting cladding at every level, can the edge of slab dimensions be simplified. A quality assurance/quality control (QA/QC) plan consistently implemented on all projects is necessary for any firm. Utilizing a checklist to review the level of coordination and completeness at each major milestone submittal is strongly recommended.

Back to the drawing board...

Changes invariably occur on most projects throughout the design phase and often even during construction. Projects that require re-design due to budget, owner changes, or other reasons often put time pressure on coordinating these revisions and making sure the ripple effect of these changes is appropriately accounted for throughout the documents.

These changes must be carefully documented in the same way as the original drawings were produced. Oftentimes, unforeseen issues arise if changes are made hastily and without thorough coordination.

It looked good on paper...

Now we have to build it. The construction phase provides valuable insight into the actual quality of the construction documents. Some examples are the number of Requests for Information (RFI's), the extent of questions a detailer has on the shop drawings, and how well the structure integrates within the architectural finishes and other trades. **Take note of any issues during construction and use these as lessons learned to apply to future projects.**

Summary

Producing a quality set of structural construction documents is as much of an art as a science. It requires the structural engineer to have a good understanding of structural engineering issues such as load path, structural analysis, design, and detailing. It also results in an awareness of how buildings are constructed with consideration of construction methods, tolerances, and how to develop the most efficient details. This is a learned skill that takes time to develop, and the process dramatically benefits from involving senior-level engineers who can share their past experiences. Sharing experiences and regularly discussing the importance of producing high-quality construction documents with all staff will prove valuable. ■



Resources

The following resources are valuable tools for more in-depth learning and development:

CASE 962-D: *A Guideline Addressing Coordination and Completeness of Structural Construction Documents (Updated 2020)*

CASE Tool 9-1: *Coordination and Completeness of Structural Construction Documents (Updated 2021)*

CASE Tool 9-2: *Quality Assurance Plan*

Jeff Morrison is Vice President and Senior Project Manager with Lynch Mykins in Raleigh, NC, and a CASE Toolkit Committee member. (jmorrison@lynchmykins.com)