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DESIGN IDEAS
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The Epidemic of Incomplete Drawings

An unfortunate and contagious epidemic is sweeping the construction world. Aggressive timelines are creating a scourge of incomplete drawings that leaves joist manufacturers guessing at intent and unclear about direction.



Owners are pushing to save cost by compressing project timelines, telling the architect to push critical details further down the stream to the structural engineer, who pushes them to the fabricator, who pushes them to the joist manufacturer. But when you squeeze a balloon, the air just goes to the other end.

Saving time upfront by leaving out information in the drawings just transfers that work to a different stage of the project and can lead to mistakes, RFIs, and cost overruns. The answer: upfront collaboration with all members of the team and a shifting of responsibility back to the project phase where it belongs.

Timeline Driven Shortcuts Don't Save Time

Specifiers and engineers are under pressure to complete their projects, just like everyone else. It's important to work quickly in order to meet deadlines, but working fast sometimes causes people to forget or overlook things. "One of the first things I thought of on the topic of incomplete drawings that we see a lot is uplift," says Phillip Knodel, Design Engineer with New Millennium Building Systems. "On ballasted roofs, uplift is not a concern once the construction is complete. But, when uplift is a concern, it's often provided as a gross value right out of the ASCE 7 code, instead of the net uplift required for the

joist design. It's then up to us to factor down using the actual roof dead loading, which may not be specified in the design loading."

If no uplift is indicated, it then is up to subcontractors to sort out if uplift needs to be considered or not. "If we're calculating net uplift, we do the calculations and confirm it with the EOR and it ends up being more work on the back end of the project, which takes time away from moving forward with other things," he adds.

A similar issue is related to rollover forces. Lyndsay Cross, Engineer with New Millennium, says, "When we're informed there are rollover forces on the job, sometimes it isn't clear how those forces are going to be resolved. It's left up to us to figure it out, and that just adds time to the project. For example, if they are not installing channels, tube steel, or something similar in between the joists to pick up the diaphragm, then we need to design the joist seats to handle the rollover. This can become difficult depending on the size of the forces. It can go either way, so it needs to be clearly stated on the drawings if the joist seats need to be designed to handle the rollover forces. If it's not actually designed one way or the other, and we're simply notified rollover is a possibility, that isn't very helpful."

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Fatigue Design and Cranes

Another example of introducing uncertainty into a project because of a reluctance to make a decision early on is the use of cranes. “When crane loading on the joists is specified, we have to account for the cyclic loading in the joist design, otherwise known as fatigue,” says Chris Rodes, Design Supervisor with New Millennium. “We need to know the crane’s classification, the type of crane, and how it’s being controlled because that determines the impact and fatigue factors that are used in the joist design. “It seems to be a matter of not having the information at the time of design but then also not going back and providing that information when it’s available. The fatigue these joists would be subjected to is similar to bending and unbending a paper clip repeatedly. Eventually the paper clip will snap,” he says. “When we have this specific information, we can design the joists to handle the repeated loading of the cranes over the lifespan of the building.”

Diaphragm Capacity

Another area in which drawings often lack critical specificity is transferring diaphragm capacity through deck attachments. “I have noted deck jobs where it’s specified that the deck attachment has to be able to transfer a specific diaphragm capacity,” says Lyndsay. “But the Steel Deck Institute explicitly states that deck attachment is to be specified by the specifying professional (often the EOR). Instead of trying to delegate that out, it would be more helpful if they would design it at the outset. It’s possible EORs don’t realize that the Steel Deck Institute has standard practices regarding diaphragm transfers. That lack of information could easily lead to RFIs on the issue and that’s just going to slow the project.”

Avoiding the RFI

While often a necessary part of construction projects involving many teams to clarify areas of concern or confusion, RFIs complicate and slow down project timelines. Pushing critical

decisions to later in the lifecycle to compress project schedules can lead to more and more RFIs which ironically slow the project down even more.

“When we receive drawings with poorly labeled sections, incorrectly labeled sections, or conflicting information, that’s all fodder for RFIs,” Phillip says. “It’s our standard process when we send our drawings out for approval to do everything all at once. We try to catch everything we can so there aren’t a bunch of separate RFIs and all of our concerns can be addressed simultaneously. Often our drawings come back from approval and not all of our concerns were answered, or the answers don’t make sense, and then an RFI goes out.”

This can happen with the design of joists with cantilevers. “We are experts on the capabilities of joists and joist girders,” Phillip says. “Cantilevers are situational and sometimes architects call for them but there’s a knowledge gap. Some engineers may not be aware that joists can have a significant cantilever. And throw in the issue of camber with that. If you have a really long cantilever, you don’t want to camber the joist or else before it’s even loaded, the curvature of the joist will cause the end of the cantilever to dip significantly, which is likely not what the EOR is expecting. So we would question that and send out RFIs or approval notes. If we were consulted earlier in the project, we would have been able to help them specify exactly what they need, speeding the project along.”

Going Faster Can Slow You Down

Attempts to save time and money by compressing project timelines will often have the reverse effect. Leaving critical decisions until later will only lead to additional questions and RFIs. An inoculation against the epidemic of incomplete drawings is simple: take your time at each phase of the project and consult with experts who have specific knowledge instead of squeezing the balloon.



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