Does the Perfect Deliverable Deliver Perfect Success?

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Why Has CEG pursued a Model-Based delivery approach?

• Opportunity for structural engineer to provide significant value to construction team
• We can significantly improve the effectiveness of our communication with the construction team
• Maximize what we could deliver for same fee or preferably deliver game changing data and charge more for it.
MODEL-BASED DESIGN DELIVERY

Efficiencies & Opportunities

• Real time visual coordination
• Better understanding of other trades
• Improved communication

Pitfalls & Barriers

• Requires experienced design team
• Everyone must be on board
• High trust level
• Commitment to accuracy “no cheating”
CONCEPT ESTIMATE

Efficiencies & Opportunities
• Live estimating within the model
• Monitor impact of changes
• Reduced takeoff time

Pitfalls & Barriers
• Need to understand what is NOT there (and when it will be)
• Need deep understanding of design process and TRUST!
# EARLY ESTIMATE/GMP

## Efficiencies & Opportunities
- Connected model at this stage
- Concrete/rebar complete
- Establishes accurate baseline price
- Provides way to specifically track changes to final design

## Pitfalls & Barriers
- Estimating carries contingency so subs do not need to
- Estimating and design need to talk so contingency accurately reflects design status
PRECONSTRUCTION

**Efficiencies & Opportunities**
- Model can improve preconstruction for owners and estimators
- Assist in logistics
- Visualization

**Pitfalls & Barriers**
- Need to understand the difference between nice graphics and reality
- Changes are fluid at this stage

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Applies to all three tracks for different reasons
LESS RFIs: DESIGN

**Efficiencies & Opportunities**
- Better visualization
- Better 3D coordination

**Pitfalls & Barriers**
- Designers are not constructors. Need to be willing to rely on construction team to fill in blind spots
LESS RFIs: PRICING

Efficiencies & Opportunities
- More visual observation of scope and mobile-based takeoff
- Less grunt work, time for higher level thinking

Pitfalls & Barriers
- Estimators need to retrain their thinking – just because it is in model does not mean it is done. Same for reverse.
LESS RFIs: CONSTRUCTION

Efficiencies & Opportunities

• More intuitive process
• Can see conflicts
• Can submit questions with model
CHANGE ORDER PROCESS

Efficiencies & Opportunities
• Model is basis for price
• Additions or deductions based on model changes only

Pitfalls & Barriers
• Add/Deduct Process
• Trust/Comfort with Model
DETAILING & FABRICATION

Efficiencies & Opportunities

• Detailer has less guesswork
• Accelerated detailing by pulling connection design forward
• Lets detailer focus on getting last-minute changes incorporated

Pitfalls & Barriers

• Requires very different staffing profile in design firms
• Requires detailed understanding of fab/erect economics
• Requires construction understanding (i.e. critical path, materials interaction, constructability)
Efficiencies & Opportunities
• Stakeout personnel can “see” what final goal is
• Data download from model

Pitfalls & Barriers
• **MUST** have common point during HD Scan > Model > Stakeout
• Requires early establishment of control
• Need critical dimensions or control to check during erection
CONSTRUCTION

Efficiencies & Opportunities
- Should go smoother if everything else goes correctly
- Tablets in field and in shop

Pitfalls & Barriers
- Humans are Building
- QC/Verification still matters
**REBAR**

**Efficiencies & Opportunities**
- Eliminate shop drawing
- Bid from model
- Major cost efficiency, very limited additional cost up front
- Savings may cancel, but less conflict and faster into the ground
- On larger jobs – savings outweighs costs

**Pitfalls & Barriers**
- Rebar fab should be model capable
STEEL

Efficiencies & Opportunities

• Does not eliminate shop drawing, but will allow detailer to start from a coordinated model
• No separate connection design
• Model is done to a bolt-bolt neutral type of fabrication
• Detailer finishes model – sends back as a model for review
• Drawings printed only for record and fab shop/field use
STEEL

Pitfalls & Barriers

• Detailer will have to adjust if fabricator wants to tweak
• Requires COMMUNICATION – favors a high skill level at detail shop
• Model ownership changes, need a
LIGHT GAUGE

Efficiencies & Opportunities
• ??
• ??
• This is our next step

Pitfalls & Barriers
• TBD!
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