Capitalizing On Revit Families to Improve Formwork Design of Parking Structures

Khoi Pham
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James Blair
Assistant Superintendent | jblair@mccarthy.com
About the speaker

Khoi Pham

Khoi is a VDC Specialist at McCarthy Building Companies, INC. During his 8 years in construction industry, Khoi expertise has developed in concrete construction of various project types, as well as design-build long-span parking structures. He has a unique experience working dual roles as both VDC engineer and traditional engineer that enabled him to merge a wide range of field knowledge with the virtual construction technologies and helped further leverage the brain power of operation teams through visual communication of models.
Introduction/Historical Background
About the speaker

James Blair

James is an Asst. Superintendent at McCarthy Building Companies, INC. He has 18 years of experience in the construction industry and has worked as a Carpenter, Carpenter Foreman, General Foreman and currently as Asst. Superintendent. He made the jump in 2018 to the VDC Dept. and has since worked on multiple projects such as hospitals, commercial buildings, schools, and parking structures. His responsibilities include model-based layout, creation and supervision of construction concrete models, form-work design, and design assistance. James’ experience gives him a unique understanding of all the aspects of the construction process and how the entire process comes together virtually. James is also the lead drone pilot for McCarthy’s SoCal region and heads the effort for incorporating drone data into job sites for quality control as well as its use for marketing and business development.
Introduction/Historical Background
Benefits of Formwork Modeling
Recyclability of Formwork Families
Productivity with Quality

- Model Update Automation.
- Data-rich model for wide use of application.
- Continuous improvement of families.
Formwork Buyout

- Bill of Materials/Material List (BOM)
- Fabrication/Assembly
Knowledge Vessel

- Capture field experience
- Content library development
Challenges of Formwork Modeling
Expectations

- Capabilities

- Capacities
Initial Investment

- **Schedule**
- **Resources**

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**Totals:**

- **Precon Estimate:** 181 hours
- **Actual:** 153 hours
Model Quality

- Level of Details
- Stability of Models
- Standardization
Field knowledge

- Terminologies
- Fabrication
- Assembly
- Installation/Stripping
Understanding Formwork for Long Span Parking Structures
Formwork Overview

- Specialized for Long Span Parking Structures.
- Compatible with Cunningham Beam system.
- Available experienced labor force
- Fairly easily removed from concrete
- Durable to last multiple concrete pours
- Bracing and Safety Railing
Column Forms

- Gates Columns (Proprietary)

- Stand-alone system. Independent of Cunningham system.
Upturn Beam Forms

- Enable Monolithic Pours of Moment Frame.
- Stand-alone system. Independent of Cunningham system.
Downturn Beam Forms

- “Handset Beam”
- Consists of 2 side panels and soffit
- Field assemble
- Installed and stripped with workers
Capitals

- Customized to fit Cunningham Beam forms
- Enable connection and transition of beam to columns.
- Field assemble
- Installed and stripped with workers
Cunningham Beam Forms

- Proprietary system
- Pre-assembled
- Installed and stripped with forklifts.
Deck Panels

• Customized to fit over Cunningham Beam forms

• Pre-fabricated

• Installed and stripped with Forklift
Safety – Railing Forms

- Typically not modeled.
- Accounted for support/connection in Deck table.
- Field installed as needed/required.
Applications of Formwork Models
Constructability Review

- Enhanced Communication
- Constructability Review through Virtual Construction
Phases/Stages

**STAGE 1**

**DETERMINE SCOPE**

Determine what the project team needs are. Provide estimate for approval.

**STAGE 2**

**MODEL**

Modeling begins! Concrete model starts and once complete, formwork families are applied.

**STAGE 3**

**FORMWORK REVIEW**

Formwork mappings, quantities and detail sheets are finalized and approved. Pour sequences will dictate the quantities of formwork.

**STAGE 4**

**FABRICATION**

The detailing sheets come together at the yard for mass production. We are currently looking into automating fabrication.
Phases/Stages

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DETERMINE SCOPE

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FABRICATION

The detailing sheets come together at the yard for mass production. We are currently looking into automating fabrication.
“The level of detail put into the drawings and views made understanding the various components of the formwork system very easy and user friendly. Also, it was helpful in communicating to subcontractors the formwork process as it relates to schedule. Lastly, I think it helped the McCarthy team as well as our trade partners in understanding formwork systems that perhaps they have not used before.”

Steve Finley - Concrete Superintendent - McCarthy Building Companies, INC.
Summary
In Review

- Benefits of Formwork Modeling
- Challenges of Formwork Modeling
- Understanding Formwork Elements and Terminologies
- Application of Formwork Models
Lessons Learned

• Understanding formwork
• Open mind
• Client focus
• Business case
Look Ahead

- Family Improvement
Dynamo Scripts

- Auto Slab Point Tool
- In Progress
  - Auto Placement of Deck Panels on a level
  - Auto Placement of Column Formworks
Assemble Integration

- Potential class for AU 2021
Q&A Available via class page between 11/17/2020 and 11/20/2020

Beyond AU:
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