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Self-perform Concrete and Revit Structure

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Learning Objectives

- Learn how to plan a workflow for Concrete Lift Drawings
- Learn how to develop company standards in self-perform concrete
- Learn how to use Revit for Concrete Lift Drawing production
- Learn how to identify the required information to be provided in job specific Concrete Lift Drawings

Description

The number of contractors who are self-performing concrete is increasing. It is essential to establish an effective workflow and get the right people involved early on in order to successfully and efficiently produce concrete lift drawings that portray all the information required for each pour sequence. We will go through a dynamic workflow that you can tailor to each job and show how we use Revit software to incorporate specific information and produce Concrete Lift Drawings.

Your AU Experts

Jacob Koelliker *received his bachelor's degree from Brigham Young University in Construction Management and is currently working as a BIM Engineer for McCarthy Building Companies. While working for McCarthy, Jacob has worked on coordinating healthcare, waste water, parking garages, and multi-purpose facilities specializing in self-perform cast-in-place concrete. He has also been an essential part of developing work flows for both the production of Concrete Lift Drawings and the inclusion of Autodesk Point Layout, BIM 360 Layout, and Collaboration for Revit*

After receiving his Bachelor of Science in Design with a Major in Architectural Studies degree from Arizona State University, ***Robert W. Fout*** *spent 14 years working for an architectural firm based in Tempe which later relocated to Gilbert, Arizona. His scope of work began with production and later included being a Project Manager and providing Construction Administration services. Robert is currently a BIM Engineer for McCarthy Building Companies in Phoenix, Arizona. While at McCarthy, Robert's workload has included self-perform concrete coordination for cast-in-place parking garages, water treatment plants, multi-purpose and healthcare facilities. He has been instrumental in developing and refining the workflow for Concrete Lift Drawings and implementation of Autodesk Point Layout and Collaboration for Revit.*

How to plan a workflow for Concrete Lift Drawings

Concrete Lift Drawing Estimate Template

Each self-perform concrete project requires a budget from the BIM Department. We are required to create an estimate based upon the current drawing set. We have created an estimate template to improve our consistency and ensure we have accounted for all concrete that is within our scope. Our template breaks down the project by structure, level and pour. The estimated man hours are divided into modeling time, time for annotation and administration time (meetings, emails, conference calls, etc.). We also include a disclaimer which designates additional pours and/or workflows not accounted for in the estimate.

Galleria & Dave Wood Elementary School		60% Design Development Submittal			
		Model Hours	Drafting Hours	Number of Drawings	Total Hours (with 20% Admin Time)
Multi-Purpose 'A' (includes Central Plant)					
	Foundation Plan	10	16	2	31
	Concrete Tilt-up Wall Panels	40	150	50	228
	SOG	14	24	3	46
Administration 'B'					
	Foundation Plan	4	8	1	14
	Elevator Pit	4	8	1	14
	Elevator Shaft Tilt-up Wall Panels	8	12	4	24
	Concrete Tilt-up Wall Panels	12	45	15	68
	SOG	4	8	1	14

FIGURE 1: PARTIAL CONCRETE LIFT DRAWING ESTIMATE

Concrete Lift Drawing Checklist

Our BIM Department has created a "standard" checklist of items that can be provided on every Concrete Lift Drawing. This list is provided to the jobsite team, especially the Concrete Superintendent, to review and provide comments upon. Annotation can be added, deleted and/or revised to provide supplemental information per their review.

Concrete Lift Drawing Checklist

McCARTHY

Project #: Project Name:

Review Team	Name	Date	Signature
Concrete Superintendent			
Concrete General Foreman			
Concrete/Structural Project Engineer			

Drawing Checklist	✓	Comments/Notes
Dims/Location from Gridlines/Levels		always show Plan View with applicable Grid Lines
Edge of Slab/Deck		general notation for SOG thickness
TO SOG/BO SOG and/or TO Deck/BO Deck		

FIGURE 2: PARTIAL CONCRETE LIFT DRAWING CHECKLIST

BIM Execution Plan

This is the contract between the jobsite team and the BIM Department which provides general coordination information for the project such as naming conventions, project origin, etc.

Attachment No. 5

Attachment No. 5 is the self-perform concrete portion of our BIM Execution Plan. This document describes our workflows and processes and what is required of both the jobsite team and the BIM Department. Requirements will vary depending on the type of project, jobsite team and project schedule.

Kick-off Meeting

Before we begin producing Concrete Lift Drawings, we have a Project Team meeting to further review the BIM Department's processes and expectations. We then establish all individuals required to review each of the drawings and discuss the Concrete Lift Drawing Checklist.

Concrete Lift Drawing Tracker

Our BIM Department has created an Excel spreadsheet for tracking the progress of our Lift Drawings. Similar to our estimate template, data entry for each Lift Drawing is based upon the structure and type of pour, i.e. foundation pour, SOG, deck pour, etc. Using the current project schedule, we provide the jobsite team with a preliminary drawing schedule that encompasses the duration of our Lift Drawing scope. Dates are based upon form dates and review time required (agreed upon during the Kick-off Meeting). As our drawing schedule changes from week to week, we provide the jobsite team .pdf files as snapshots of the project status.

How to develop company standards in self-perform concrete

BIM 360 Glue

BIM 360 Glue is a tool we use for all of our self-perform concrete projects to coordinate with all other trades. All trades can view the progress of the model and add comments via Glue at any time to ensure we have the most current model.

Signatures and redlines for each drawing

As discussed during the Kick-off Meeting, a minimum of three (3) signatures are required during the jobsite team review process. This allows for multiple individuals with different expertise to review each drawing and ensure that all of the required information is provided for each pour. We are making the effort to produce a quality project as efficiently as possible.

Review Time

Upon Submittal for Review, the jobsite team has three (3) days to review the Lift Drawing in its entirety, mark-up all required revisions, obtain the required signatures and send back to the BIM Department. On certain occasions, review may be extended out to five (5) days. The BIM Department then has the same number of days to make the revisions and issue the drawing for construction.

Getting the right co-workers bought-in and involved in the process

Though technology is ever changing and there are faster and more efficient ways to build, there are those in the work force that have done things a certain way for many, many years. They have done a very good job at it as well. Throughout each project, our department attempts to work with the jobsite team as much as possible to improve the efficiency of the existing process and demonstrate how essential Lift Drawings can be.

How to use Revit for Concrete Lift Drawing production

Revit template

To begin each self-perform concrete project in Revit, our team starts with our Revit template. The project base point and survey point are designated at Grid Line A / 1. Our department has continued to work on and make revisions to our template as on ongoing process to refine and allow our workflows to be as efficient and consistent as possible.

Collaboration for Revit (C4R)

We have eleven (11) BIM Engineers on staff in our Phoenix office and another working remotely out of our Denver office. The Concrete Division has multiple projects ongoing at all times and multiple engineers working on the Revit file(s). Collaboration for Revit allows us to work efficiently in the same file, all at the same time whether we are in the office, on-site or working remotely.

Linking files to Revit Concrete Model

Concrete Lift Drawings require a vast amount of coordination and review of several different trades including (but not limited to) Architectural, Structural, Mechanical, Plumbing and Structural Steel. Linking files to our Concrete Revit Model allows us to review all pertinent information within one (1) file. From .dwg files to .ifc files, we are able to incorporate all other trade files into our model.

Revit Demonstration

We have created a mock project to walk you through some of our typical workflows for creating Lift Drawings.

- *Project Browser*
- *Sheet Title Block*
- *View Setup*
- *Color Coding*
- *Sections and Details*

How to identify the required information to be provided in job specific Concrete Lift Drawings

Banner Estrella Medical Center

The concrete deck pours, which included Cunningham Beams, required a large number of steel embeds at perimeter locations as well as post-tension (PT) cables. In effort to coordinate steel embeds, PT cables and steel reinforcing, the jobsite team requested a 12'-0" look ahead. This 12'-0" look ahead allowed the jobsite team to locate the steel embeds required in the subsequent pour and coordinate the locations of the PT cables and steel reinforcing.

Presbyterian Rust Medical Center

The concrete foundations included caissons, grade beams, sloped tie beams and six (6) sided pier caps. All of these structural elements required vast amounts of steel reinforcing at specific locations. This complexity required coordination with the jobsite team to provide the information that was required and most useful for each Concrete Lift Drawing. This process ensured structural accuracy for the concrete foundations.

Arizona Fallen Firefighter Memorial

The Arizona Fallen Firefighter Memorial design is all based upon a central radial point and varying slopes throughout. The entire project is cast-in-place concrete that has been clad with granite. Due to the gradual slopes and radii of the concrete walls, we provided section cuts at 5'-0" increments to annotate the profile progression.

Odysea Aquarium

Due to the radial nature of the Odysea Aquarium, grid lines and dimensioning were inefficient to locate any concrete elements. It was essential that we were able to precisely locate the concrete tanks, columns, etc. allowing all other systems to be installed correctly. The use of Autodesk Point Layout (APL) provided us with a workflow to locate all concrete elements without the use of grid lines. For each Lift Drawing, our BIM Department provided coordinate points in addition to APL files for back check and layout on site.

Town of Gilbert Vaughn Avenue Parking Structure

The parking structure design designated minimal slope at each deck pour for all levels above grade. Upon completion of the structure, even though all slope requirements were accounted for, Level 2 had standing water issues. Autodesk Point Layout (APL) was used to provide a contour map annotating the high and low points of the concrete deck. The jobsite team was able to use this information to properly re-design the diversion of any water.