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CS224015

A Couple of Guys and a BIM Computer

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Learning Objectives

- Learn how to determine your project's BIM needs
- Discover how long coordination should take
- Learn ways to handle common problems in BIM
- Gain insight into our large and small projects

Description

With many projects being vastly different from one another, it can be hard to figure out what exactly your Building Information Modeling (BIM) and virtual design and construction (VDC) needs will be for your project. AECOM Hunt has had the fortune to work on and coordinate many different projects. We have learned that, while perhaps similar, no two projects or teams are the same, and that each must be handled uniquely. During this course we will share our experiences on four projects: Little Caesars Arena, home of the Detroit Redwings; Aloft Magnificent Mile, Chicago; Mount Carmel Hospital, Grove City; and Client Confidential Pharmaceutical Project. Other topics will include BIM stages such as coordination, completion and turnover.

Your AU Experts

Andrew Cooper
VDC Engineer
AECOM Hunt

Andrew is a VDC Engineer for AECOM Hunt, the Construction arm of AECOM. He works out of the AECOM Hunt Innovation Center based in Indianapolis, Indiana where he is responsible for the BIM needs of many projects, such as coordination, laser scanning, and UAS. Andrew started his career in 2003 at an architecture and engineering firm designing every aspect of projects from civil to MEP. He later moved to an engineering firm where he designed a variety of facilities ranging from pharmaceutical labs to engine manufacturing plants. Andrew most recently made the jump from the design side of the world to the construction side working on multiple projects such as sports venues, hospitals, hotels, and condominiums. Andrew has gained insights on coordination and other valuable lessons while working on a variety of projects such as Allison Transmission, AM General, Cummins, Eli Lilly, Little Caesars Arena, Miami Dolphins, Philips Arena, USTA Louis Armstrong Stadium, Aloft Magnificent Mile Chicago.

Cliff Ragan
VDC Engineer CM-BIM
AECOM Hunt

Cliff is a VDC Engineer for AECOM Hunt, the Construction arm of AECOM. He works out of the AECOM Hunt Innovation Center based in Indianapolis, Indiana. He is responsible for BIM implementation in all aspects of the construction progress including business pursuits, design assist, pre-construction, construction, and closeout. Cliff is also responsible for all 360 Field training for the company across the nation. With 15 years of experience in the AEC industry including Construction Laborer, Revit Specialist, Mechanical Designer, and BIM Project Manager, Cliff's experience gives him a unique understanding of all aspects of the construction of a building from design to completion. He is a Certified Professional in both Revit MEP and Revit Architecture. Cliff is also a certified UAS Pilot and flies for AECOM Hunt and helped develop AECOM's strict safety guidelines and processes for flying drones within AECOM. He is also experienced in laser scanning and uses it on many projects.

How to determine your projects BIM needs

While it would be nice and easy to say that you do everything for every project, the truth is, it is not always practical or needed. Let us take a look at some of the things you need to consider when getting ready for your project.

Project Size

Project size and duration are the two main factors in determining if your project will require more than one coordinator. Project size is possibly the biggest factor in figuring out what your project will require. Project size is not just about square feet; it is also about complexity. A 10,000 sq. ft. central utility plant can easily require much more time and effort than a 100,000 sq. ft. warehouse.

For reference, here are some examples of how we might classify a project:
Small – short rise hotel or a few hundred unit apartment building
Medium – medium rise building or large hotel
Large – Stadiums, arenas, or multi-million square foot buildings
Complex – Multiple systems, trades, and detailed

Does your project require an onsite or remote VDC presence

To have onsite VDC presence or remove VDC presence, that is the question. First and foremost, to answer this question you have to take your project's budget into consideration. If you do not have a budget that will allow for travel to the project site and/or have a space onsite usable for coordination meetings, then a remote presence would probably be best. You will also need to consider, will your subcontractors have an onsite BIM presence or will they be running remote from their office?

You are not limited to one or the other. There have been many projects where I have done a mix of onsite and remote, even on mega projects. At a minimum, I recommend doing a kick-off meeting in person (if possible) because it is important to know who everyone is and to start building relationships with your team members. An in-person meeting can jump start that process faster than a teleconference. For relatively small jobs the best option is most likely going to be conducting an in-person kick-off meeting and continue remotely with all subsequent meetings.

What platform to use? Navisworks or BIM 360 Glue

In my professional opinion, this really comes down to your personal preference and what the situation is. We have done projects with both Navisworks and Glue individually and together.

Personally, I use Glue exclusively. I like that I can access the files from any computer, at any time, as long as I have an internet connection. I require that all my subcontractors upload their files to Glue every time they make a change so that everyone has real-time access to the most accurate and up-to-date information. I can put all markups on Glue and my subcontractors know to check Glue frequently for updates. My expectations and the way I use Glue are explained to my team from the beginning. The expectation for how we utilize this tool and work

together allows for many issues to be resolved without ever needing to discuss them and take away time in our one-hour meetings.

AECOM Hunt runs multiple projects in Glue thus we have an unlimited number of users and projects. However, costs a lot of money for that functionality. Navisworks is still the powerhouse when it comes to running clashes and can be a great alternative if your project cannot support the cost of 360 Glue. Another workflow, my coworkers personal favorite, is to use 360 Glue as your file repository and utilize the super user features of Navisworks for running clashes through the BIM360 tab. This also gives your subcontractors a way to run clashes, in Glue, if they do not have access to Navisworks.

There is no right or wrong answer to this. You must weigh the options and go with whatever you personally find to be the most beneficial. But, it is hard to find a better alternative for model storage than Glue.

How long should coordination take

Once again, every project is different and there are multiple factors that go into figuring this out. Let us take a closer look at how we set our initial schedule for projects.

The magical 90 days

When we first start a project and come up with our coordination schedule, we base it on Mechanical, Electrical, Plumbing (MEP) rough-in dates. We set our first sign-off to be 90 days before the first MEP gets laid for the underground. Our last sign-off is scheduled for 90 days before the final MEP overhead rough-in. The coordination schedule can easily be shortened on a simple project, such as a warehouse or a small maintenance facility. Inversely, it can be a challenge to make those 90-day deadlines on a large complex project. This is where our recommendations on setting expectations with your team and adhering to frequent, but brief meetings comes into play and is vital to moving a project forward. In our experience, the 90-day window gives you sufficient time to finalize shop drawings, have these reviewed by the design team, and fabricate long lead-time items in a timely manner.

Meeting frequency and length

Meeting frequency and length can be a somewhat of a personal preference to how you like to run things or what is necessary based on what your schedule will allow. Some people tend to go the route of one meeting a week, which can work great on a simple project. However, I challenge you to avoid increasing the length of that once-a-week meeting for more complex or time sensitive projects. I have attended coordination meetings that have been over two hours long, every time. These meetings always tend to be counterproductive.

In my experience, the most efficient and timely way to keep the project moving is a one-hour meeting, twice a week. It is important to keep a balance between time spent attending a meeting and time spent modeling. From my experience, I found that doing two short meetings every week keeps everyone engaged and moving quickly because we are not delving into a

massive amount of issues at one time. By allowing one to two days between meetings provides enough time to take care of most issues that were discussed in the previous meeting. It also allows for focused discussion because everyone understands we need to be concise and problem solving focused during these meetings due to our limited time. There will always be issues that arise that are complicated and require a large amount of time to discuss. In those circumstances, you can certainly extend beyond an hour, but be strategic about how often and when you extend these meetings. It may be necessary to keep a few key players on the line to discuss the complications further or to schedule an additional follow-up meeting for later that day or the next day to delve into some issues.

Coordination schedules

When trying to figure out how I want to split up a large project I take a couple of different approaches. First, I look at how the design team split up the building and see if those sections will work for my coordination schedule or if I need to split it up more or combine areas. Second, if the design team has not split up the project, then I will start splitting it up at grid lines into areas that I feel I can get signed off in four meetings.

To make this work as efficiently as possible you have to have a team that works well together and is proactive. As the goal is to get every section signed off in four meetings, I organize my meetings as follows:
1st meeting: high level review / major clashes
2nd meeting: review changes made, dig into smaller clashes (such as branch lines)
3rd meeting: review changes made, discuss new clashes created
4th meeting: review changes, confirm model with review and sign-off. Start preview of next area.

Therefore, at the end of two weeks, all four meetings will have been completed and that section should be signed off. This is of course in a perfect world where you are not waiting on RFI's or changes are being requested by the owner or design team. I will normally review my coordination schedule after 3-4 weeks once everyone has had time to get familiar with how each other works. The first few weeks are always slower as everyone gets into the flow and starts working with a new team. If a particular section ends up taking longer than four meetings, I will adjust the timeline of other less complicated sections. There will be sections that we are able to sign off faster than four meetings and this helps to keep the schedule on track.

One of the biggest factors in keeping to your schedule is the design team. A design team that is willing to actively participate is key to having great success. Everyone knows that no design is perfect and it is not possible to think of every little detail beforehand. This is why we go through the coordination process. We find issues and need help from the design team in making everything fit. Establishing a strong professional relationship with your design team will help the project run as smoothly as it possibly can.

I am proactively working on every project throughout the week. I have been asked before why I put time on a project every day when I only have meetings twice a week. I have to sometimes remind people that my job is not just to run meetings but to keep an eye on every possible moving target to proactively collaborate to keep the project moving forward. I keep an eye on the RFI's we are waiting on, track down information as needed, make sure everyone has all of the current files, update models as the design team releases them, and keep 4D's up-to-date. If

I am onsite then I am walking the job site reviewing field issues and coming up with solutions in real-time. In order to have the most efficient coordinating schedule and meet all deadlines, I have to be working on some elements of the project every day.

Common problems

There will always be problems with every job. Hopefully, the issues are able to be resolved quickly and not cause any major disruptions. But, we are tasked with the responsibility to be able to handle whatever comes our way. Let us review a few challenges that we have experienced on our projects and how we have handled them.

Lack of participation from the design team

This is one of the most harmful issues to a project that can arise and one of the hardest to fix. I believe it is sometimes perceived as a criticism of the design team's work when we, as a team, are discovering and discussing issues. We want to be clear, that it is not an issue about the design team's quality of work. We are trying to communicate there are some issues that we need to look at and modify to make everything work together. We need the design team's help in trying to make the changes minimal, as we do not want to change ceilings, move walls or shafts, thus eliciting the team's participation in the coordination effort is so important.

For the most part, I think I am able to communicate effectively with the design team to help them understand how important they are to our on-going project. But, when I have a design team that refuses to participate in meetings or is unwilling to make any changes, I take one of two approaches. First approach is to send the design team a RFI and call them for every issue until they are willing to spend an hour a week on a call (if for no other reason than to keep their RFI count down). Second approach I use if I cannot get a response to calls or RFIs, is to send them a marked up drawing with moved walls and ceiling heights with a note telling them this is what their building will look like without their help and we will be submitting these drawings to the owner in 'x' number of days. The latter is an extreme tactic, but you must do whatever it takes to get your projects done.

Communication barriers

Language or ineffective communication barriers can be very challenging at times. It also can be hard to try to improve without coming across as insensitive. When you have to keep asking for clarification or someone is asking you to constantly repeat yourself, it can be very aggravating for both parties. The need to be understood is deeply engrained into ourselves and as such makes conversations about not being able to understand someone that much more sensitive.

I have experienced a few barriers and would like to share some tips that helped the whole team become successful in communicating. When there were significant concerns about being able to understand someone on the phone, I followed up every call with an email confirming what we talked about and asking if I missed anything. We would then continue to maintain frequent communication via e-mail to ensure clarity on what was being asked and needed for follow-up. I also recommend having some additional 1-on-1 calls with the individual you are having difficulty communicating with because the more time you spend talking with someone, the easier they

are to understand (whether this is due to a language barrier or someone who has difficulty explaining things verbally). In an extreme case, when the above mentioned tactics did not assist with clearing up the confusion, I did ask for a different person to be on the calls. When the change was made we were able to move forward quickly and efficiently, which is the goal of the coordination process.

Uncooperative subcontractors

Tensions and turf wars between the trades can and do happen. I found the length of time a team is together directly relates to the amount of tension that can build between everyone. Especially on large or complex jobs, subcontractors initially are in a honeymoon stage of where everyone is offering to move but then it starts to shift to resentment about having to move for everyone else.

To illustrate an example, I will discuss a scenario on one of my largest jobs. I had a subcontractor start to refuse to move anything, they felt they were the only ones that were being asked to accommodate by making a change or moving. Now granted, in some instances, it was a valid point. I think one of the causes of this complaint stems from taking the easy route. I believe when you find someone who is easy to work with and takes care of most issues you bring to their attention quickly then you tend to start leaning on them more. This problem can be an easy fix either by having a conversation about why you assign them more issues or by passing a few more issues off to someone else.

On the extreme end of the spectrum, I have had the unfortunate circumstance of a subcontractor flat out refusing to model anything for a portion of the project. In this situation, there was a separate person responsible for a small simple portion of a very large project and the individual adamantly refused to model that portion. The subcontractor felt it was not necessary to model it because it was an extremely simple section of the project. I tried to reason with the subcontractor by acknowledging he had a valid point but that the contract stated it had to be provided in the coordinated model of the entire project to the owner. Despite trying to reason and explain the why behind what I was requesting, as it was a necessary component of the contract, I had to escalate this situation through multiple different discussions. My last ditch resort to ensure compliance with the contract was to bring in our MEP Project Manager (or whomever holds the subcontractors' contracts). This is an absolute last resort in my mind. I encourage trying to resolve any disputes you can without having to resort to escalating the concerns up the chain to try to preserve the relationships you have established. For example, some subcontractors had discussed with me the lack of trust they have had for some coordinators because the coordinator's one-up was continually copied on all e-mails (minor and/or major issues). There are instances though, despite doing your best that you do need to ask for reinforcement and involve others. Even through this process, continuing to foster a great relationship with your team is extremely important.

I have always found the "I'll scratch your back and you scratch mine" philosophy effective. You have to be careful with this though and not cross any unethical boundaries. With that in mind, I always try and accommodate when someone comes to me and acknowledges that they would make the most sense to be the one to change or move but they are requesting not to move because they want to keep a certain design for a particular reason. If I feel that it is possible, I will get someone else to move even if it is a little more work for them. Then next time I am

trying to solve a dispute on who is going to move, I will go to one of them on the side and ask that they help me out on this one even though I know it is not the easiest and take care of it so we can move on. Normally this tactic works out great. I try to keep everyone happy and balanced within reason. My job is not just coordinating a model with these individuals, I have to also manage and guide them. If you are onsite and the modelers from the subcontractors are also onsite, go visit them in their trailers and discuss issues with them individually. Also, make it a priority to check in with them and see if they need anything.

Completion

You have determined your needs, adhered to your schedule, and overcome common issues. Now, comes the time for your role to end on the project. However, you're not truly done until the project is turned over to the owner.

Ending your role

Never expect that when you are done with coordination that your job is over. Yes, the bulk of your work will come to an end when coordination is completed. But, what you can expect is to receive calls periodically from the guys in the field needing to talk about some minor issues or get clarification. If you are not completely dedicated to one single project, you might get the question of "when will you stop billing this project?" The quick answer is, "when the job is done". The detailed answer involves understanding that there will still need to be clarification at various stages in the field and issues will continue to come up regardless. It is prudent to maintain the relationships you had established during your coordination meetings and be available to answer questions and assist in problem solving to move the project to completion.

On complex jobs, your level of involvement still may be very active up to the last minute. I have experienced coordinating until about a month before turnover. This was an extreme case because there were many changes from the owners and/or the design team up until the end of the project.

Turnover

From the BIM perspective there are a few different levels of turnover to the owner. The easiest is the owner does not want anything. A simple turnover would be providing the owner with a NWD of the coordinated model. Or, you could receive a request from the owner for a complete 6D model. In a complete 6D turnover, you can waste a lot of time and resources gathering a vast amount of information that the owner will never actually use. The key is to educate and work with the owner and their facilities manager early on to find out what information they want and need for their equipment. This way you're not wasting time and money gathering information that will end up being useless to the owner. Once you have established what the owner needs, start your team on populating that information as they are modeling. This will expedite the process and help everything go much more smoothly then trying to gather all of this information at the end of your project. We could spend an entire hour only discussing 6D, maybe I'll be able to come back next year and talk about this more!

The utilization of some or a combination of all of these elements should be applicable to many situations you face on a daily basis. We hope the recommendations we shared from our experiences have been helpful for you. Thank you for the opportunity to share and collaborate with you. If you have any questions, please feel free to reach out to us. If you attended the class please don't forget to submit the survey from Autodesk on this class.