MP2857 - Finding the Flow with BIM: An Insight into Using BIM on Water and Wastewater Projects

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MP2857

Learning Objectives

At the end of this class, you will be able to:

- Explain how BIM processes can be used for water and wastewater projects

- List BIM management, risks, and expectations for water and wastewater projects

- Use specific methodologies and process organization for water and wastewater project deliverables

- Apply BIM process best practices to water and wastewater projects

About the Speaker

Carlos Orona is a Business Consultant for the Engineering / MEP / CAD / BIM industry. Over the course of his 18 year career, Carlos' has worked as Designer,BIM/CAD Manager, and engineer in the mechanical, electrical and plumbing/piping (MEP), water/waste (Headworks) consulting industry and has been involved in many large projects in and around the United States and international. He regularly conducts seminars on the use of CAD/BIM technology in building engineering where his MEP and engineering background brings a complete understanding to the process of helping companies effectively implement CAD & BIM in a production environment. He regularly provides CAD & Building Information Modeling implementation services, customization, content creation, training, and support for Autodesk AEC software.

Introduction

There seems to be a large separation between where the definition of BIM stands to be in a gray area in water/wastewater projects. This session is meant to expose everyone to projects that have been involved in the BIM process to one extent or another. The session is catered to those that are open to the BIM governance, its methodology and the strategic planning the needs to take place in order to be successful in the Building Information Modeling world. Since water/wastewater projects are such a niche area, there are not established best practices around such initiatives and the projects that we will review are to expose everyone to the gamut of these projects; their pain points and without limitation where they succeeded and where they may have failed.

The BIM process used for water and wastewater projects

When making a comparison between three (3) different types of BIM project in the water waste water industry, there needs to be an understanding of the BIM requirements of the project, the project scope and the deliverables required.

BIM management, risks, and expectations for water and wastewater projects

There are risks in using BIM as a solution; and the governance behind the process of BIM. In terms of BIM maturity there are guidelines and expectations that may have already been established and required by the extended design team. These expectations can be set in the form of BIM standards set by clients and BIM Execution Plans.

Use specific methodologies and process organization for water and wastewater project deliverables

The process around BIM begins with the recommended best practices and if the best practices falls under a solution or required deliverable. The understanding and definition of BIM is required and understood so there is no disconnect on the requirements' of the project.

BIM process best practices to water and wastewater projects

In this step we dive closer into the project scope, BIM maturity and also the governance behind building information modeling. Since there are many steps to account for in this session, we will talk about those that are part of the three projects that we will be evaluating.

What is BIM?

Given the nature of water/wastewater projects and also the requirements of different states and municipalities; the translation of BIM seems to stray to the left and right which leaves a larger gray area in between that poses certain risks and level of effort in understanding and executing a BIM project with the needed deliverables. Let's breakdown the BIM definitions in the project scope between our 3 projects:

Project – A: "Project will be delivered in BIM"
Project – B: None (Not Defined)
Project – C: None (Not Defined)

As you can see, the definition of BIM was vague at best for Project – A, and also set up for scrutiny on Projects B and C. This did give the design teams on Projects B and C the opportunity to educate their client and set the proper expectations around how the project deliverables will be created and also dive deeper into standardization. Unfortunately Project – A took a "learn-as-you-go", approach to their BIM philosophy that affected the level of effort needed, and the focus was made on unnecessary task; since we have been plagued with this mindset in one form or another, it does not promote success and is not sustainable in the long run.

Why BIM Governance?

The concepts of governance behind a BIM Strategy have proven to be a key driver for BIM Project success. In the case of Project B and C; BIM governance was assessed on behalf of the Design client and the Owner/Municipality. BIM governance clearly states the assessment and documentation of the following criteria. As stated earlier Project – A never defined a true BIM Strategy, the client/owner had a vague idea of Building Information Modeling thus as a whole it was left up to the stakeholder of the model (in this case GC) to develop these guidelines.

- **BIM Standards / Guidelines**
- **BIM Maturity**
- **BIM Execution Plan**
- **BIM Strategy**
- **BIM Uses**

The overall success of Project B and C; was in respect of established goals within the BIM Strategy. Project A did not define these goals and as a result of figuring out key mindsets and execution at the last minute did not meet the design teams margins, and was not profitable. This did create an open discussion from internal management as to a post-mortem of the successes and failures. This prompted an adoption of BIM Maturity for subsequent projects.

Assessing BIM Maturity is based on status quo of the Building Information Modeling concepts and execution plan of a given design firm. The part of assessing is also defining the strategies behind BIM and the BIM Uses. As all of these factors are part of the governance of the BIM Project there is opportunity to establish goals along with all trades and owner/client to meet proper expectations. As part of the maturity assessment certain factors need to be established like:

- **The existing BIM support structure within the design groups must be sustainable, scalable or adequate**
- **BIM adoption and usage must be easily tracked, at the project, or organization level.**

There also is a corporate focus on utilization that inhibits the growth of BIM from the production side. Even though being billable is key to corporate success, there should always be non-production staff assigned to move the BIM process forward with key strategic milestones. This staff should be responsible for content development, BIM governance template updates, and creating best practices documentation. The idea behind this is that there are always those BIM/CAD Managers or COO/Directors to keep the adoption for BIM and the continued development of Building Information Modeling moving forward.

Once the benefits of using a BIM-based project deliverable can be leveraged; and taking advantage of these benefits throughout the development and construction of a project, you can more easily maintain and manage a structure or facility. Understanding and fully utilizing the BIM Process, the project team must begin a project with the potential end uses of the BIM model in mind. The future use of this data can impact the methods and even resourcing required to develop the model.

If project stakeholders are identified early on in the project, the most appropriate uses for BIM on the project, given the project goals, characteristics, and the teams' capabilities, can be determined.

It is also understood the there are several ways to use BIM for maintaining accurate information and managing the information to create a better process versus the traditional two-dimensional (2-D) approach and that BIM is an internal process that is evolving, and not solely based on a particular deliverable, as long as that deliverable has been defined.

Even though Project – B and C are well under way of being successful; it did not come without several roadblocks through BIM adoption that were discovered during project assessment:

- **The BIM Process is an internal initiative, rather than a particular deliverable dictated by project requirements.**
- **The pricing model does not change because of adoption of BIM (an added value), resulting in no additional reward for the extra effort needed to incorporate BIM or**
- **Client deliverables are still 2-D documentation, and/or 3-D models**
- **Delivering projects using BIM has not been discussed as another profit center or there is no marketing support**

These teams recognize that a learning curve exists when implementing BIM and that can affect productivity and budget adversely if not accounted for. There has been much discussion about front-loading the model with all the correct meta-data on models and that documentation is also needed in the initial phases of the project. Some engineers are not designing in the Revit platform and some are starting to fully design in Revit, though; they still perform the analysis, basic layout work.

This is especially true for the senior design leadership, as they are not using the Revit platform. There needs to be discussion and then agreement between the model authors and design teams to identify what they each need without it becoming a wasted effort.

Toward that end, there needs to be an advanced matrix of BIM Uses and Goals that is used to provide internal templates and process-related charts that reflect the minimum standards as part of the BIM Process implementation on any given project. The BIM Initiation Checklist and governing documentation is required from project inception, which has been defined by that matrix of BIM Goals and Uses. Key stakeholders identifies specific business workflows, creates a BIM Implementation Plan for the project, and a BIM Execution Plan is then discussed and agreed upon with the extended design teams and/or Owner/GC. The Engineering project team then determines the project requirements, and then creates the BIM Initiation Checklist and the BIM Documentation Matrix.

The BIM Uses are also defined here and are established with the team. During initial maturity assessment there are several factors that must be expanded on.

- Drawing Production for Design

Is a process for producing drawings and plan deliverables for projects. In a BIM approach, these deliverables are created as a by-product of the building model. If Drawing Production was not carried out in a BIM approach, project content may also consist of related drafting production and standards.

- 3D Coordination for Design

Is a process in which Clash Detection software is used during the coordination process to determine field conflicts by comparing 3D models of building systems. The goal of clash detection is to eliminate the major system conflicts prior to installation.

- Design Visualization

Design visualization permits project teams and other stakeholders to rapidly evaluate design alternatives through 3D imagery and videos. Design visualizations are produced directly from native building models, or are produced through processing the models for use in other visualization software platforms.

- Schedule Production for Design

Schedule production is the creation of lists detailing of the equipment or components within a design. Examples of this would be mechanical equipment, piping components and/or accessories etc. These lists are not associated with time (4D) or cost (5D) in this BIM use. The focus of this BIM use is the creation of schedules in the form of files, tables, or other formats from the model.

Summary

As you can imagine and have read; there are a number of requirements that you may encounter in a BIM Project when it comes to water/wastewater projects and any BIM project for that matter. Where it differentiates is that water/wastewater projects differ from general design/bid/build or design build projects. Its these differences' that can make a building information modeling project of this nature hard to manage and gain adoption from key team members. As we continue with the presentation we will investigate further the issues discovered on our three projects.

[End of Section]