469283

Going Digital on Large Projects: BIM360 Design Coordination

Speaker:
George Ikonomakis
BIM Manager
Alternative Delivery Group, Transpotation
AECOM

Co Speaker:
Matthew Anderle
BIM Director
Americas Building + Places
AECOM

Learning Objectives

- Understand the interoperability between BIM360, Revit, Civil 3D & Navisworks
- Learn how to set up BIM360 to manage and maintain current progress of BIM Models
- Understand and learn how to coordinate your own internal design
- Understand and learn how to manage multi-discipline design coordination

Description

The BIM360 cloud collaboration services are enabling teams to work within an enriched review workflow by allowing them to evaluate and validate their design through clash reporting and spatial coordination exercises which enables teams to find, assign and track issues instantaneously with unprecedented access.

We will explore the evolving possibilities provided by these Autodesk services to enhance a workflow traditionally done through 2D digital files or hardcopies of progress sets in a detached workflow. Focused on the interoperability between BIM360, Revit, Civil3D and Navisworks, we will demonstrate the applications and best practices, discovered through large project use, which enables the team to become 100% digital using the web interface or mobile applications. We will highlight solutions for transitioning a team into BIM360 to conduct reviews and discuss some of the common challenges encountered during this migration.

Speaker: George Ikonomakis

An experienced BIM manager, currently working with AECOM under the Transportation Business Line. Embedding technology and processes on large scale projects. With 25+ years of experience, I have successfully demonstrated the of implementation of digital innovation throughout the AEC industry. I have developed a strong skillset in Virtual Design & Construction through BIM, CADD, Collaboration Tools, Reality Capture, Data and Asset Management with a large portfolio of from building to infrastructure projects of all types, sizes and delvery methods.

Mentoring is a passion of mine. I spent 4 years as a consultant implementing design authoring tools focused on BIM throughout North America within the AEC industry and have spent the last 5 years educating future technologists with technical skills and best practices of BIM at local colleges.

Co Speaker: Matthew Anderle

Matthew Anderle is the Building Information Modeling (BIM) director for the Buildings+Places business line of AECOM, with focus on the Americas. He is a BIM and technology evangelist with over 20 years of experience establishing global BIM workflows and standards around content, computational BIM, interoperability, and BIM consultation as a service. His experience spans over multiple market sectors with emphasis on large healthcare facilities, data centers, aviation, government projects, and science facilities. Mr. Anderle serves AECOM as a leader in the advancement and efficient implementation of BIM processes for a variety of project types. He manages and directs large distributed project teams to successfully implement BIM collaboration workflows, enabling global offices to work as one entity.

Introduction

Due to the sensitivity of security protocols associated with this project we are unable to share certain material without the consent of the Windsor-Detroit Bridge Authority.

Working on large scale projects can experience large scale issues. Issues that can be prevented with proper planning at the earliest stage possible of a project. Teams tend to wait for projects to be awarded and go live before they begin the “heavy lifting” of project set-up, coordination and collaboration processes. If you are not doing so already, consider setting up the project during the pursuit stage as it is in production. Management could push back looking at this as an overhead cost during a pursuit and not feasible. Consider the overrun of a budget and possible delay of production due to setup procedures and production tools after you have been awarded the project shifting to “full steam ahead”. My approach has always been to treat the pursuit as if it is a live project. The goal is to have the project ready for production immediately upon award.

Focused Project

The Gordie Howe International Bridge is the new crossing bridge between Detroit, Michigan, USA and Windsor, Ontario, Canada being delivered as a Public Private Partnership and Bridging North America (BNA) is Windsor-Detroit Bridge Authority’s (WDBA) private partner comprised of ACS Infrastructure, Dragados Canada, Fluor & AECON. AECOM is the lead designer and engineer on the project under BNA and will be responsible for the entire design along with its sub-consultants.

https://www.gordiehoweinternationalbridge.com/en

The project includes the main bridge crossing the river at a span of 2.5 km (1.55 miles) with a clear span of 853 m (0.53 miles) over 6 lanes. Two point of entries, one on each side of the border, combined for 121 hectares (299 acres) of land and an approximately 42,750 sq.m. (460,157 sq.ft.) of facility floor area. The project also includes a revamp of 3 km (1.86 miles) long highway Michigan Interchange I-75 that involves 4 interchange ramps and 5 pedestrian bridges.

The Gordie Howe International Bridge, once completed, will be the longest cable stayed bridge in North America and will be the longest composite-deck cable stayed bridge in the world. The result will set an advanced precedent in cable stayed bridge design and distributed team collaboration.

Complexities & Challenges

AECOM faced unique and complex design challenges unlike usual issues. It required innovative digital workflows and technology to resolve these issues. One of the biggest design challenges, was collaboration due to the scale and complexity of the project. Gordie Howe International Bridge consists of 4 major infrastructures and 18 facility structures that span across 2 countries with a globally dispersed design team of 500. Not to mention, each country uses a different unit of measure and design standards that need to comply to municipal provincial/state, federal and border crossing authorities. Unique security protocols from various federal agencies added a layer of complexity in how we managed our design teams and controlled access to the project data.

The Study

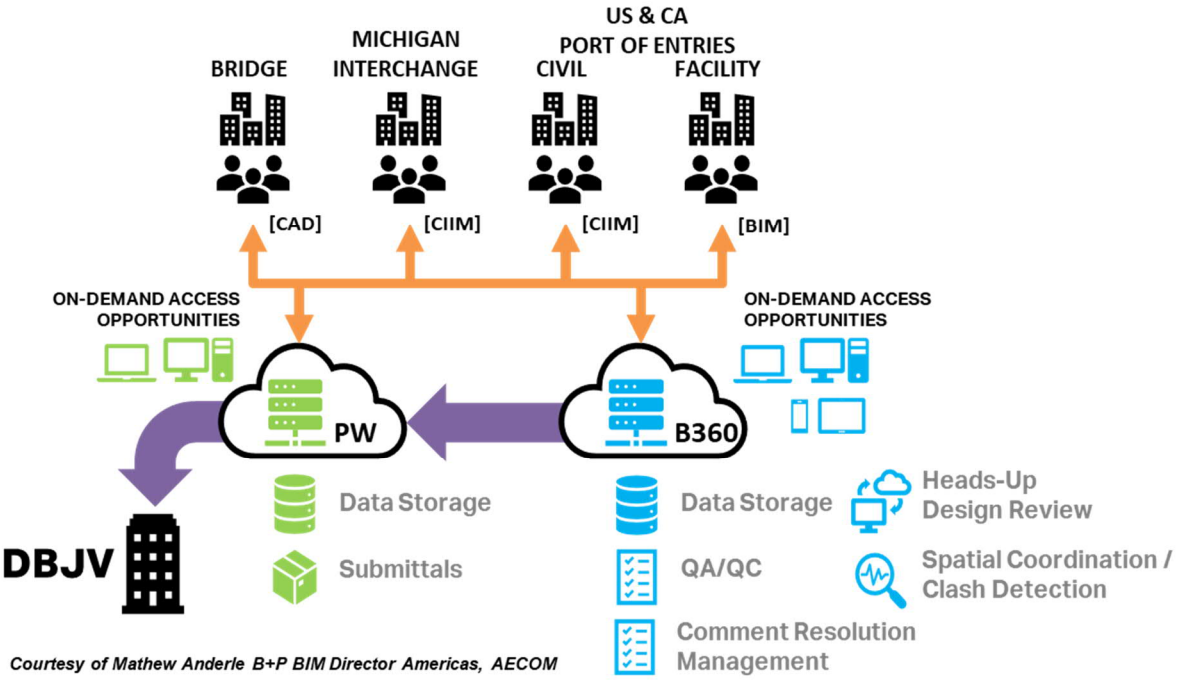
The collaboration platform(s) needed to easily navigate these complexities and flawlessly move between requirements. For example, dual units of measurement were required in the bridge design so both governments could review and validate the bridge capacity in native format. A wide variety of software authoring tools are in use due to stakeholder requirements – each software requiring a unique workflow into the data environment.

COMPONENT	STANDARD	AUTHORING TOOLS
Michigan Interchange (I75)	Michigan Dept. of Transportation (MDOT)	Power GeoPak OpenRoad
US Port of Entry	MDOT National CAD Standard (NCS) Ministry Transportation of Ontario (MTO)	Revit Civil 3D
The Bridge	MDOT	Power GeoPak
Canadian Port of Entry	MTO NCS	Revit Civil 3D

The AECOM team looked for a common data environment solution with the ability to translate references, software languages, and units of measurement into a common digital language that is pushed into the master model. The project team looked for an agnostic environment capable of handling the complex software flows that included geospatial data, which was critical in order to ensure alignment between all project components and accurate measurements for placement of the entire project. The unprecedented integration and use of technology will set the standard for the design lifecycle of the project.

After a series of discovery workshops, the decision of Autodesk's BIM360 and Bentley's ProjectWise, as paired collaboration platforms, ensured real time access to project component, data by over 500 design personnel across 25+ subconsultants, and 40+ offices embedded across

the globe. BIM360 was incorporated to handle about 80% of the workload and consisted of Data Storage, Design Coordination, QA/QC execution and hosting issue tracking across the whole project process and team. We embraced a digital strategy and were able to have the project available at 100% digital using web and mobile interfaces, which in return allowed unprecedented access by stakeholders to real time updates.



Courtesy of Mathew Anderle B+P BIM Director Americas, AECOM

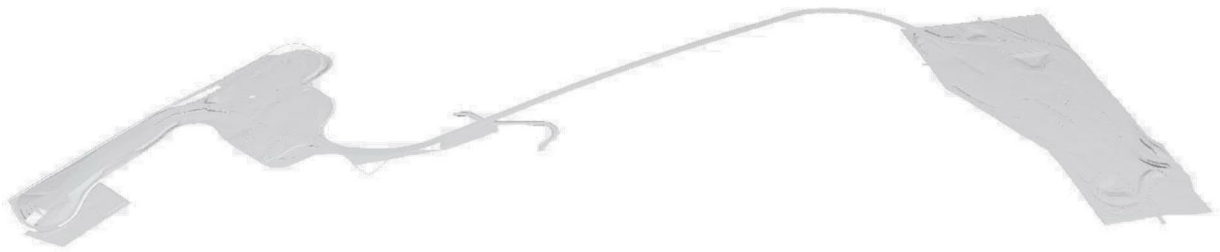
Resolutions

Establishing digital workflows for each authoring software allowed us to quickly coordinate design data regardless of file type instantly across our design team. The project to date coordinated thousands of electronic design files with smooth transitions throughout the design progression. This also allowed sharing of feedback and design scenarios instantly, which improved our teams' ability to coordinate information in real time.

GeoSpatial Coordination

Establishing coordination through geospatial coordinates for all components of the project was the outmost importance from the start. We identified a global coordinate to act as our monument/muster point for the project campus which all components will align their design on at a "x, y, z origin". To ensure component to component transitions, we identified coordinates at pivotal origins from one component to another. For example, between the bridge and civil teams the bridge approachment points were identified as coordination points. For the port of entries, we identified coordination points that are related to both the civil and facility teams design for each building structure.

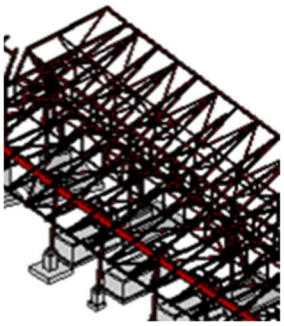
A Campus file was created for each component and appended in Navisworks to create a federated model to review alignments and obtain verification by our technical experts. This ensured confidence to our architects and engineers to review the design within BIM360 Design.



Design Coordination

Establishing digital workflows for each authoring software allowed us to quickly coordinate design data regardless of file type instantly across our design team. The project to date coordinated thousands of electronic design files with smooth transitions throughout the design progression. This also allowed sharing of feedback and design scenarios instantly, which improved our teams' ability to coordinate information in real time.

Design Coordination: Generative Design



Dynamo workflows were developed to assist with complex design changes. What would have been labor intensive changes to elements of the design was simplified. The Dynamo script allowed our structural engineering team to input engineering data required for the design and select architectural canopies in "mass" form, which then layout the framing of the canopy as per the engineer's calculations. The team avoided repetitive design tasks and calculation errors while minimizing design coordination complications that improved design validation. This allowed the team to test multiple iterations of design to provide the client and community stakeholders with several design solutions at a time.

Our leverage of Autodesk Forge development techniques has created a new design process that reduces our labour for iterative design scenarios now and in future designs.

Design Coordination: Reviews

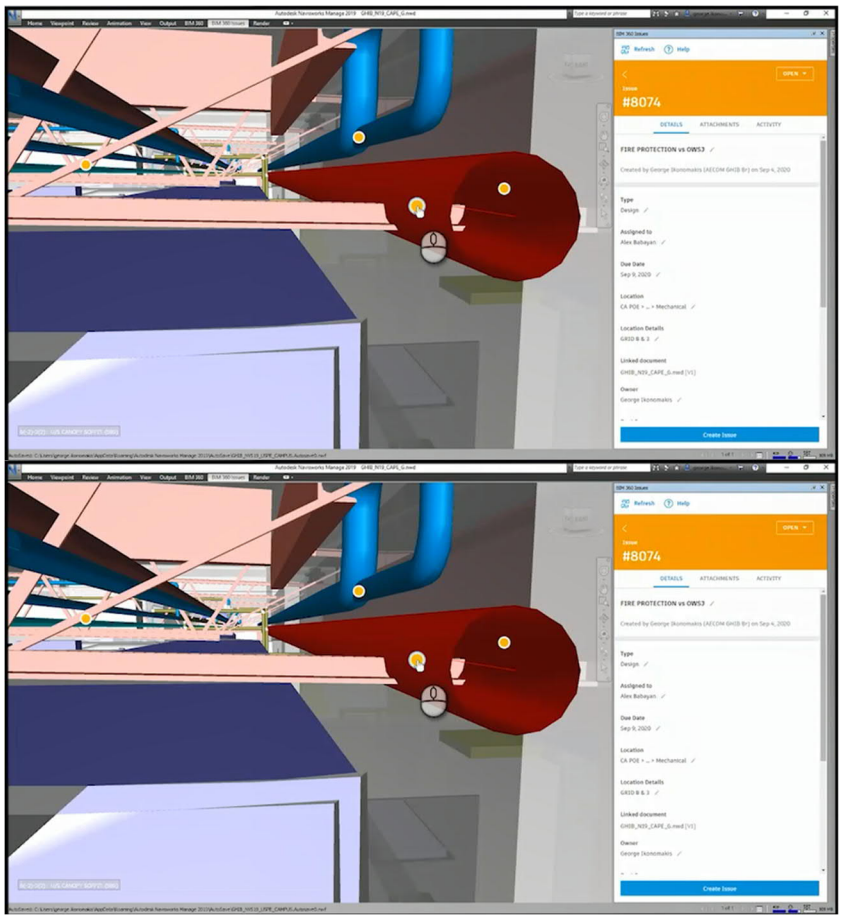
AECOM's multi-discipline/multi-nation design teams were able to work in a virtual cloud representative of the physical project components in a federated model scenario. Further, all disciplines on all phases of the project created design intent with virtually geo-referenced locations to the physical site. The downstream effects of this not only provided federated model coordination, but also physical real time design intent relative to site development, utilities, grading, and drainage.

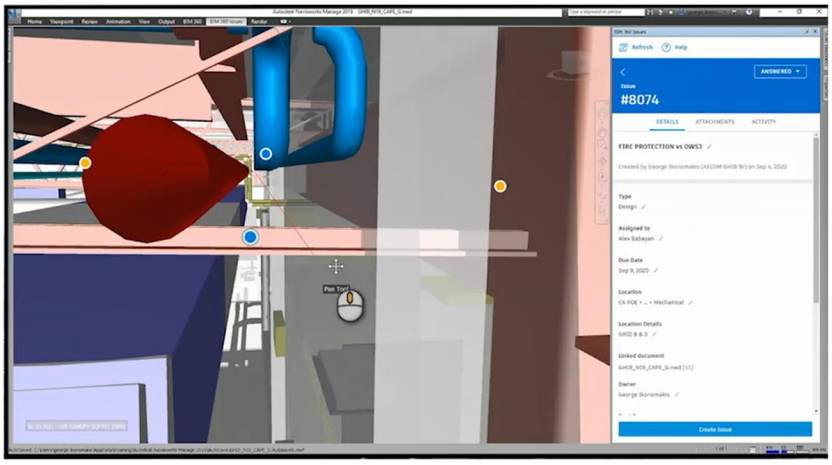
AECOM developed a 2-System virtual digital review environment to investigate design clash and spatial coordination issues. The 2-System came from the leverage of each Federated Model software environment, namely Navisworks & BIM360.

Navisworks was chosen as the primary environment to review the building facility interdisciplinary review. The reason is as a result of the direct understanding of Revit element identifiers, which was used as the design authoring tool for the facility structures, that allows to assemble areas of concern and coordinate more efficiently.

Building Facility's Interdisciplinary Review:
Design Files ➔ Navisworks ➔ BIM360 Issue Tracking

1. The issue is found in Navisworks (NWF) through a federated model and saved as a publish Navisworks file (NWD).
2. Using the NWD file, use BIM360 Issue to assign issues to design team members.
3. Issue is reviewed in BIM360 by design teams.
4. Changes are made in the discipline file and issues are updated through BIM360
5. Final review is done in Navisworks and Issues are closed either through Navisworks or BIM360.

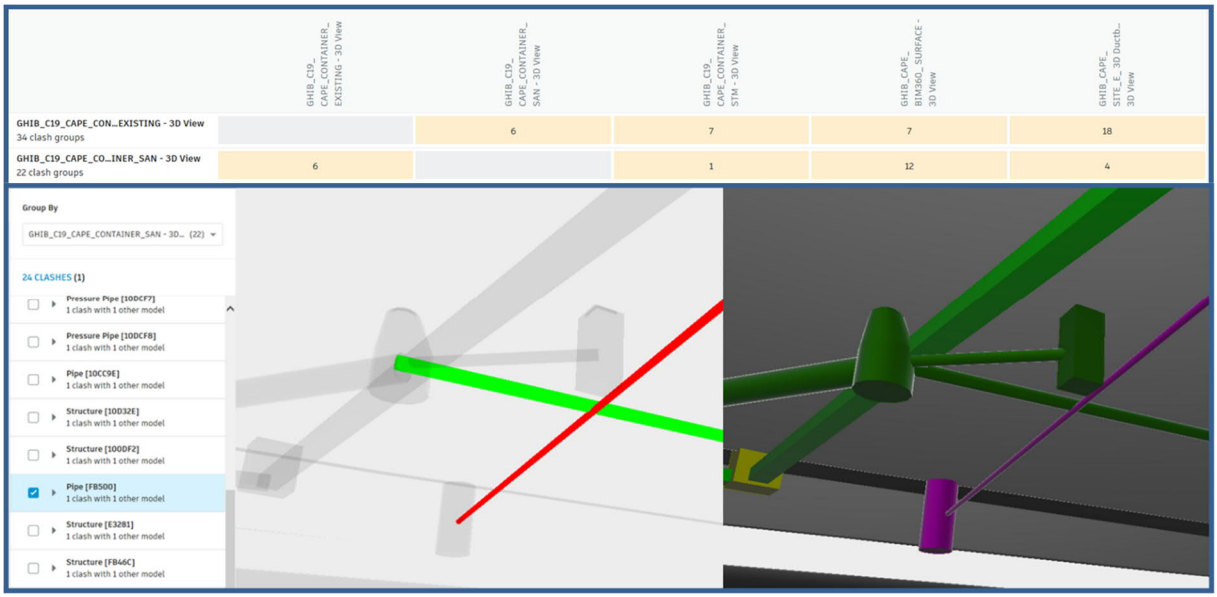




BIM360 Model Coordination was selected as the primary coordination tool to review between civil elements and facility's foundations and building systems. The reason for using for Model Coordination is primarily due to the size of the project not only for its physical size but also the electronic file storage.
BIM360 allows flexibility to be able to turn files on/hide that are not required for review at ease, which allows better navigation throughout the site.

Infrastructure vs Facility:
Design Files ➔ BIM360: Model Coordination Module

1. Review of federated model is performed in BIM360 Model Coordination module.
2. Issue is created in BIM360.
3. Design team makes necessary changes.
4. BIM360 Issue is updated.
5. Issue is reviewed in BIM360 Model Coordination module and closed.

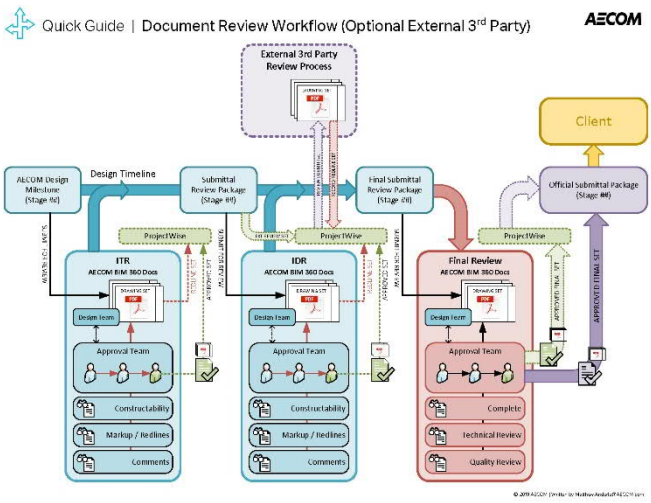


Design Coordination: Summary

The choice of collaborative cloud environment ensured our global teams worked in a 'pull' environment rather than a traditional 'publish and push'. This produced a 'just in time' environment that ensured all design professionals were working on the latest and correct iterations of the design.

Quality Assurance & Quality Control (QA/QC)

AECOM developed an 'electronic validation' of quality checks (managing 10's of thousands of sheets), which made QA exercises; trackable, reportable, and produced dynamic workflows for executive markups as well as issue tracking through BIM360 Design: Document Management Module. Design validation is only conducted on coordinated designs simplifying the design review process and enhancing collaboration.



The approach was identifying multiple milestones prior to each design submission, where each discipline was required to sign off on their design during "Internal Technical Reviews" prior to an all hands on deck Inter-Disciplinary Review where the disciplines involved in the submission would require an entire holistic review of the design. Each review went through a 6-Step QA/QC validation approval process.

Summary

AECOM will deliver all digital files and a coordinated design model to the construction team for complete digital representation of the design intent. This is an incredible accomplishment due to the varied software authoring tools, units of measure, security requirements, and design standards. The collaborative cloud platforms enabled the translation of incoming data into a common digital language for coordination, review, and markup. Selecting the right choice of technology ensured we could design in real time and deliver results to the contractor and client on schedule.

Upon completion, our team will have successfully designed a new Canadian port of entry connected to the longest cable stay bridge in the Americas, providing access to the Michigan interstate system through the new US port of entry all while accommodating stringent security protocols by both countries.

Special thanks to Jillaine Tuininga. Mathew Anderle & Russ Dalton for their contributions of this document.