CCS225345 - Building Owner Managing a Major Airport Redevelopment Project with BIM 360

Emmy Thammasine
BIM/Asset Manager, Denver International Airport
**EMMY THAMMASINE**

is the BIM/Asset Manager of the Special Projects Division at Denver International Airport, DEN, and currently managing the "Great Hall Project," a major redevelopment of the airport's main terminal. DEN has grown and has become of the busiest airports in the world, and in the BIM and Asset Management world, DEN has set the bar high for Airports by being a leader in BIM Technology and Innovation. Emmy has contributed to DEN's BIM adoption and implementation in ways of research & development, establishing standard operating protocols and discovering solutions to enhance existing workflows & procedures and turning latest ideas and visions into reality. If he wasn't busy with managing projects, it'd be hard getting him to step away from Dynamo.

**BRENDAN DILLON**

is the Manager of the Digital Facilities & Infrastructure Program for Denver International Airport. DEN is the sixth busiest airport in the United States and has developed a comprehensive BIM and Asset Management plan unsurpassed by any airport in the country. DEN’s DFI program manages over 120 projects at a time with a net value in excess of $2 billion. Prior to joining DEN, he had managed over $1B in BIM projects, including as the BIM standards coordinator for the design team on Denver International Airport’s South Terminal Redevelopment Project. Brendan is also the founder of the annual Airport Information Integration and Innovation (AI3) forum and is the founder of Red5ive Consulting, specializing in BIM deployment and integration for airports. Along with managing DEN’s Digital Facilities & Infrastructure program, Brendan still enjoys getting into the weeds with Revit, writing scripts in Dynamo and generally getting his hands dirty.
IGNACIO DE LA HERA SOL

is a senior architect experienced in overall project lifecycle management, including design, construction, coordination, and execution. Ignacio is currently a BIM Manager at Ferrovial Agroman US corp. and working on the remodeling and commercial operation of the Jeppesen terminal at Denver International Airport, handling the BIM process from the conceptual stage through design, preconstruction, execution and maintenance.

Between 2015 and 2017, Ignacio worked in the BIM Department in TYPSA, a multidisciplinary team focused on providing support to the design and management teams in implementing BIM processes on projects, gathering state-of-the-art information, developing procedures and helping to consolidate and increase company's BIM related “know-how” and, therefore, its overall capacities.
At 23 years old, the Denver International Airport (DEN) is going through major renovations and the main terminal, the Jeppesen Terminal, is a big part of it, reclaiming the full use of its main hall, The Great Hall.
The Great Hall Project (GHP), at 1.5 million s.f., will enhance security, provide a more flexible and open airline check-in space and add new dining and shopping options. It will also increase the capacity of the Terminal, update the aging facility and improve the overall passenger experience at DEN.
Class Summary

Building Owner Managing a Major Airport Redevelopment Project with BIM 360

Denver International Airport (DEN) is more than 23 years old and currently going through major redevelopment, including adding 33 new gates to all of its concourses and renovating the main terminal. Having already constructed the Westin Hotel and Convention Center with the aid of BIM (Building Information Modeling) and cloud collaboration, DEN has gone full-blown with implementing BIM 360 Docs software for the Main Terminal Renovation, a.k.a. The Great Hall project. It was the logical choice and platform. The intelligent models needed to be centralized and collaborate with several design teams across different offices throughout the United States and South America. We'll present our approaches, challenges (there were undoubtedly plenty), and solutions from project kickoff through construction. BIM 360 Docs software became the single source of truth for a large and complex project. Autodesk products used in the project include BIM 360 Docs, BIM 360 Glue software, BIM 360 Field software, Revit 2018 software, and Navisworks Manage 2018 software.
Learning Objectives

1. THE SETUP
Set up BIM project files to be collaborated in BIM 360 Docs with different firms in different offices and continents.

2. THE PLAN
Use a well-developed BIM Project Execution Plan to guide management and production throughout the entire Project timeline.

3. MANAGING AND CLASHING
Discover, manage, track and resolve clashes with Navisworks.

4. WHAT DID WE LEARN
Not everything was perfect. Take heed of the Do's and Don’ts to reduce wasted time, errors, coordination issues and headaches.
Initial Project Plan

BIM Project Kick-off Meeting
DEN BIM Design Standards Manual (DSM)
BIM Project Execution Plan
Initial Project Plan

DEN BIM Design Standards Manual (DSM)
Initial Project Plan

BIM Project Execution Plan

LOD Matrix
Features & Challenges of B360 Team
Features & Challenges of B360 Team

Features

A Single Source of Truth!

With over 400 users spread out through three continents, sharing files needed to be done efficiently. For tight coordination, all files and documents, in addition to Revit models, were shared in the B360 Team environment. It is the single source of truth for the GHP. B360 Team was a perfect and logical platform of choice.
# Features & Challenges of B360 Team

## Features

### Folder Access and Rights

There is a certain level of access right and limited to 3 types of users: **Project Admin, Editor and Viewer**. Not yet available on B360, there were not any option to filter to what user can do.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Viewer</th>
<th>Editor</th>
<th>Project Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>View</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Files(online), folders, comments(view and post) and people</td>
<td>✓</td>
<td>ü</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Discussions &amp; Calendar</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Access to conversations and events</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Edit, Upload, Download</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Copy, move, rename and delete files/folder</td>
<td>✓</td>
<td>ü</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Manage Sharing</strong></td>
<td>ü</td>
<td>ü</td>
<td>✓</td>
</tr>
<tr>
<td>Enable and set public sharing, invite others to project</td>
<td>✓</td>
<td>ü</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Project Admin</strong></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Project settings, approve people in project, set access levels</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Features & Challenges of B360 Team

Features

Versioning & Model Comparisons

The system works with versions. Versions are published from Revit, having the capability to publish and share “views”, 3d views and sheets. Versions can be used to compare between two version. This allows users to monitor the evolution of the design and work-in-progress.

Comparisons and differences can be exported to a spreadsheet.
Features & Challenges of B360 Team

Challenges

Big Team, Little to No B360 Experience

In general, the GHB team was new to B360 and looking to DEN’s support and experience was key for success. C4R worked very well and the teams were able to produce without too much interferences. This is a high trust environment where there is no chance of limitation what other consultants were permitted to do.
Big Team, Spanning the Globe

Denver, Houston, Dallas, New York

Madrid, Barcelona, Bilbao

Amsterdam

West Bengal
Features & Challenges of B360 Team

Challenges

Model Sizes and Performance

In general, B360 Team worked extremely well, but the sizes on the model were increasing weekly and the performance started to become sluggish. Teams were experiencing long file opening, synchronizing and publishing.
Features & Challenges of B360 Team

Challenges

Model Sizes and Performance

In general, B360 Team worked extremely well, but the sizes on the model were increasing weekly and the performance started to become sluggish. Teams were experiencing long file opening, synchronizing and publishing.
Launch of B360 Design
Launch of B360 Design
Launch of B360 Design

Model Viewer, Markups, Issues and Version Comparisons
Changing Platform Midstream

Things Considered Before Making the Change
Changing Platform Midstream

**TIME AND DOWNTIME**
A couple months to plan and coordinate but only a weekend to execute

**GETTING CONSENSUS AND AGREEMENT FROM ALL DESIGN TEAMS/COMPANIES**
Coordinate, get inputs, anticipate issues, plan for anticipated issues and get an all thumbs up

**PLAN, PLAN, PLAN, THEN DOCUMENT**
Devise a game plan, test it, re-pan, test again, and document the entire process

**BACKUP AND ARCHIVE**
Just in case, CYA, what if???? Always backup and archive, locally and in the cloud.
Changing Platform Midstream

Plan, Plan, Plan, Then Document

Download Models & Archive

- Download the most current versions of the models to a local network location.

- Notify DEN to set the current Team environment to “Archive” to prevent anyone from working in it.

Upgrade to 2018.3

- If you get the popup to the right, select “Save this model…”

- Magic happens! Depending on the particular file, you might want to take this moment to get a cup of coffee.
The conversion to the new platform was successfully executed in one weekend.

GHB BIM manager updated all the files from 2017 to 2018.3, collaborated the files into the new platform and re-linked all references within the Revit files.

On the Friday of the conversion weekend, the consultants delivered a cleaned set of Revit files in the old platform and the following Monday, they started working in the new platform.
Results

The new platform is a hybrid in the sense of production. The team could either work with live models or the team can work with Shared information.

All Revit models were working well except for some minor unforeseen occurrences like lost dimensions, tags and references. However, the issues were resolved rather quickly.

During the upgrade the team decided to split the architectural model into three different models: a demolition model, a level 1 to 4 model, and a model from levels 5 to the roof because file size was increasing and compromising performance.

There was a span of 10 days where users could not access the new B3760 Design platform. It was resolved rather quickly.
Glue and Navisworks

Clash. Coordinate. Resolve. REPEAT.
GLUE is key for coordination! It is the common place where all the shared information provided is combined to generate the coordination models. GLUE is the HUB for the Navisworks.

With the models in the platform, a set of NWC is published to glue weekly to generate a set of coordination models. In total, there are five main coordination models Based on construction Phases.

For this project, most Glue users were DEN's design team and engineers.
Navisworks is the tool used by GHB for spatial coordination purposes, for both, design and construction Phases.

On Thursdays, the GHB team runs the clashes, generates the reports and share in B360 Design. Tuesday afternoons are reserved for the spatial coordination meeting that focuses on specific disciplines and the appropriate consultants attend this meeting with GHB and DEN and resolve clashes during the meeting.
Ready for B360 Field

Identify DEN Assets in the Model
Review Data Asset Information
Export Asset Data to B360 Field
Ready for B360 Field

Export Asset Data to B360 Field

### Table 11 - DEN Asset Types and Functional Areas

<table>
<thead>
<tr>
<th>Asset Type</th>
<th>Func Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE</td>
<td>ADM</td>
</tr>
<tr>
<td>Actuator</td>
<td>HVAC/Plumbing</td>
</tr>
<tr>
<td>Air Compressor</td>
<td>HVAC/Plumbing</td>
</tr>
<tr>
<td>Air Conditioning Unit</td>
<td>HVAC</td>
</tr>
<tr>
<td>Air Curtain</td>
<td>HVAC</td>
</tr>
<tr>
<td>Air Dryer</td>
<td>HVAC</td>
</tr>
<tr>
<td>Air Handling Unit</td>
<td>HVAC</td>
</tr>
<tr>
<td>Dessicant Filter</td>
<td>HVAC</td>
</tr>
<tr>
<td>Disconnect</td>
<td>Electric/HVAC</td>
</tr>
<tr>
<td>Domestic Water Pump</td>
<td>Plumbing</td>
</tr>
<tr>
<td>Door Internal Rolling Steel</td>
<td>Building</td>
</tr>
<tr>
<td>Drinking Fountain</td>
<td>Plumbing</td>
</tr>
<tr>
<td>Dynaco</td>
<td>Building</td>
</tr>
<tr>
<td>Ecology Air Unit</td>
<td>HVAC</td>
</tr>
</tbody>
</table>

### Data Type

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Data Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark</td>
<td>Asset identifier, e.g., VAV-13, FSD-12</td>
</tr>
<tr>
<td>Asset Type</td>
<td>DEN Asset Type, e.g., Fan Power VAV. Refer to Appendix C.</td>
</tr>
<tr>
<td>Functional Area</td>
<td>Functional Area group that will maintain the Asset, e.g., HVAC. Refer to Appendix C.</td>
</tr>
<tr>
<td>Status</td>
<td>This value shall be set to <strong>Designed</strong> for all Assets at 90 percent CD.</td>
</tr>
<tr>
<td>Asset</td>
<td>Indicating the element is an asset. If it is a DEN asset, set to <strong>Yes</strong>; otherwise, <strong>No</strong>.</td>
</tr>
</tbody>
</table>
Ready for B360 Field

Export Asset Data to B360 Field