Using BIM360 Tools to Coordinate the Creation and Delivery of a Data Rich Model

Main Presenter: Rick Aspin
BIM Manager for Decco Ltd

Co-Presenter: Daniel Grimes
Senior BIM Technologist for Decco Ltd

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<th>Learning Objectives</th>
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<td>Create an intuitive Common Data Environment in BIM360 Docs that fosters collaboration &amp; delivers clarity for the VDC team.</td>
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<td>Use live Revit links in BIM360 Design (C4R) to facilitate real time collaboration for the Virtual Design &amp; Construction team.</td>
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<td>Use BIM360 Issues/RFI’s to foster clear, concise communications for the whole VDC team ensuring that a VC model is achieved.</td>
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Description

The design process is complex including dozens of participants from various disciplines required to manage thousands of pieces of information. To deliver an accurate, fully coordinated, virtually constructed model we must provide an environment that promotes collaboration, communication & access to current information. Attendees of this class will learn how to use the BIM360 tools to gain the clarity necessary to succeed. We will demonstrate how to create a Common Data Environment (CDE) in BIM360 Docs generating live links to Revit models with BIM360 Design. How to use BIM360 Issues & RFI’s to facilitate coordination activities during the design process providing a space for open & clear communication & how BIM360 Glue ensures that hard to find clashes are taken care of during design. By the end of the class participants will understand how to re-shape processes to deliver a fully coordinated & data rich Revit model inclusive of shop drawing information prior to 100% CD’s.
Speakers

Rick Aspin BIM Manager of Decco Ltd is an Architectural Technologist with 23 years’ experience in the AEC industry and is a seasoned BIM professional of 12 years. Decco is the design and construction management arm of DART Enterprises a fully integrated real estate developer based in the Cayman Islands. Its main focus is the 685 acre town of Camana Bay, a mixed-use development adopting new urbanist principles. Dart’s operations encompass business planning, design, construction and operations of over 1.5 mil sq.ft of Class A office space, retail, residential, educational & support spaces with a further 2 mil sq.ft in design.

Ricks career has passed through the UK, Bermuda, Canada & now the Cayman Islands where he has completed projects of many types including mixed use towers, hotels, railway stations, schools, fire stations, clean rooms, residential condo units, residential care units & golf course resorts. Since entering the AEC industry Rick has continuously searched for increased efficiency and quality in managing & documenting the design process. He has always approached his work with a BIM methodology even before using 3D modeling software, constantly searching for the single version of the truth. Over the last two years Decco has provided the perfect home for him to drive success in his unwavering commitment to BIM with the ability to affect change directly with all participants of the process from inception to demolition. The Decco BIM department is now showing the results that BIM promises to deliver in terms of increased quality in design, documentation and management ensuring that projects meet cost, quality and time expectations. Rick is passionate & dedicated to the cause of bringing BIM processes to the forefront and is unwavering in his goal of playing a part of driving change in the AEC industry.

Daniel Grimes Senior BIM Technologist of Decco Ltd is a skilled Senior Architectural Technologist with over 25 years’ experience, I have acquired a diverse and comprehensive range of practical experience covering all major aspects of Building Design and construction in the UK, Hong Kong, and Bermuda, both with Architectural and Structural Engineering practices. Currently a Senior BIM Technologist at Decco Design and Construction management, which forms part of Dart Enterprises in Grand Cayman, developing BIM processes and methodologies to create an environment that draws data from one source of the truth, allows for greater collaboration and coordination between design and construction teams, Costing and Asset Management.
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Introduction

The Opportunity

The role of BIM Manager at Decco Ltd can certainly be seen as a once in a lifetime opportunity. Decco is the design and construction management arm of Dart Enterprises, a self funded development company headquartered in Grand Cayman, Cayman Islands and located, in the Caribbean Ocean 315 km south of the coast of Cuba. Its main focus lies with the development of the 685 acre Camana Bay, a new urbanist mixed use development that stretches sea to sound from 7 Mile Beach on the West shore to the North Sound about 1 mile east. Dart Enterprises provides an ideal situation to develop and test BIM processes on numerous projects over a short period of time. In house Building Information Management/Modelling (BIM would be more appropriately known as management rather than modeling) Design Management, Construction Management & Operations & Maintenance departments provide the ability to reach into every corner. The in-house structure provides the potential for a 360 degree vantage including conception, design, construction, operations & maintenance and ultimately planning for renovations/demolition.

Prior to the creation of Decco’s BIM Team a number of projects had been completed with external consultants using Revit as a production tool. These projects delivered varying levels of success but BIM was generally misunderstood as merely a production focused task of 3D modeling, it is unfortunate that this remains to be an industry norm today. Before we can truly succeed and collaborate cohesively towards a common goal, BIM must be understood as a holistic approach to project planning, management & coordination of a 3D virtually constructed facility. The whole team must commit to communicating, collaborating and coordinating within a common data environment (CDE). Only when we achieve this, will we reap the maximum rewards of continued payback for the lifetime of a facilities operation.

The creation of the BIM team provided a blank canvas, but the task of painting the canvas needed to be strategically planned. The transition to BIM will never be a revolution, only an evolution. An evolution that gradually implements change, targeting processes that offer the most payback with some early wins to inspire commitment and belief.

The information provided in this handout is both a representation of current processes, as well as recent additions or thoughts that will gradually find their place for testing and further evolution throughout use on live projects. BIM implementation requires continuous assessment and redefinition of processes as we search for the utmost efficiency and quality. With that said it is close to 2 ½ years on and the main focus remains firmly on re-structuring the design process. It is recognised that the design process is the foundation from which all team members will work, through design, construction and operations. Without a successful design process, inefficiencies will exist for the lifecycle of the project from concept to asset management, having the potential to cause errors, loss of time and additional cost on a daily basis.

Successful design projects rely first and foremost on preparation. Without preparation and thorough planning, the foundation from which we all work is unstable and costly. To avoid
instability we must first understand the information needs of the whole team. Provision of structured information in an intuitive, easily accessible, common data environment (CDE) is critical to a project's chances of success. Initially, the client team is the most important piece of the jigsaw, it is their job to set the scene for the design team. The importance of the client team clarifying their needs and providing clear & concise direction is paramount to the success of the final design. To allow clarity, the client team must prepare in advance the existing & contextual information that the design team will need to successfully complete their design with a clear vision of needs and expectations. The term ‘haste makes waste’ is relevant here, the industry as a whole must switch focus from, ‘how fast can we start’ to, ‘how fast we can finish’. Allowing enough time for preparation at a project’s outset is one that requires experience, calm and a strategic approach to problem solving. We have all been in the pressure pot when given a huge task that must be completed yesterday. The skill however, is in breaking the problem down into small chunks, deciphering the priorities and being truthful about what really can be achieved in the time available. It is quite surprising, that the majority of the time, the real priority is a very manageable chunk of the bigger picture. At Decco we are focused on the change at hand and most importantly supportive of one another across departments. In fact our departments are starting to merge and become closer to a single unit, working together for a common goal and this only means that our evolution will accelerate with every step we take in support of one another.

A Need for Change

The beauty of the AEC industry is that it is generally filled with passionate people who truly love what they do. For the majority, waking to work in a diverse, creative and technical profession is one of anticipation and excitement. Although passion and excitement still exist, the needs and skills required to be successful in our professions have changed dramatically over the years. The industry has diversified with developments in codes & standards as well as increased complexity in design & construction methodologies. All of this requires far more communication and organisation between disciplines than ever before. Today there is a need for many more specialist consultants and the available options for product & material selections has exploded. This has lead to a massive increase in the size of project teams and their relevant data needs. It is a multi-layered environment that must be refined to the finest detail to allow each team member the clarity they need to collaborate effectively and produce clear and concise coordinated deliverables.

Over the last two or three decades, the introduction of technology had the potential to bring many benefits and added efficiencies; however, the industry has not made the most of the opportunity. Why is this? The answer is, we were simply not prepared or experienced enough to deal with the change. The introduction of AutoCAD in 1982 is a great example, AutoCAD became a fantastic tool as it developed, but only in the right hands was it truly effective. It takes a well organised team with attention to detail to succeed.

Step back in time to when drawings were created on drawing boards, all we needed was a pen, a razor blade and most likely, a packet of cigarettes and a huge ashtray. By the means in which we produced our drawings it was a relatively simple task to maintain a single version of the truth. Every team member knew the location of the current set of drawings, they were either hung on stick sets or taped to a drawing board. The only question we had to ask was, is there enough film on the sheet and oil on my nose to scratch out and change the design?
The introduction of AutoCAD and its ability to easily copy a design, allowed for quick iteration of many options and promised a great advantage over the drawing board. However, it has generally resulted in mass, uncontrolled duplication and poor data management. It also caused a gap in the passing of experience with the birth of the CAD Monkey. Many of the experienced designers who had spent their career honing their skills to produce exceptional, hand crafted drawings on the board, became somewhat segregated from the new entrants to the industry. New professionals in the early days of CAD were out on their own, figuring things out with few opportunities to seek experienced guidance. The experienced professionals, for the first time in their career were cut off from the production process, with less ability to pass on their expertise. Communication with the CAD operators came via sketches and redlines. These would then be transposed into CAD, but the copied lines were often not produced with any understanding as to what they depicted in reality. Once complete, the CAD drawings were printed to paper for checking, but even if a drawing printed well on paper, it did not necessarily mean, that it was well managed in its production in CAD. In the early nineties, email became the main vessel for communication and sharing of data, this was the start of an epidemic that still needs taming today. Digital drawings and documents are shared via email like pellets from a shotgun. They land in the inbox of a multitude of recipients, who then save them locally, even by numerous people in the same office, to different locations with various naming conventions. Information very quickly became disorganised and confusing, the single version of the truth, that was once so natural, quickly became almost impossible to achieve.

With advances in technology today, especially that of cloud computing we can almost guarantee that BIM won’t take a similar route. Today we have the benefit of living in a world that is accustomed to new technologies, the majority of people now have a mobile device close by, every minute of the day. With that said, the status quo is still a hard nut to crack, for many, change from the norm is actually quite uncomfortable and disorientating. The necessary change required in the AEC industry today, requires individuals, especially those in leadership positions, to reassess what they have come accustomed to in their career to date. Firms will only succeed if their management structure understands and supports the implementation throughout the whole firm.

As far as design disciplines are concerned, it is the bright spots from their current or ex CAD users in which they will find the required skills to lead the change. A good percentage of CAD users were able to achieve the promised efficiencies. They were well organised and technically savvy individuals, able to achieve the utmost quality in the data communicated via their CAD drawings. They managed x-references and layers in a way that provided a single version of the truth. These professionals today, most likely make up a good number of the successful BIM Managers who are passionately fighting for its success. The biggest obstacle for BIM remains to be the misunderstanding of what it actually means. The name Building Information Modelling has mislead the industry to believe that modeling is its main focus, merely a production tool. The focus is more about the ‘I’, the project management of information than anything else. BIM management reaches the finest of details in planning for success, for the industry to succeed, we must draw a line in the sand and re-assess how we manage and produce our design projects. We must remove the silos that exist to become a single team working in tandem towards a common goal. The single version of the truth experienced in the era of drawing boards will then return with multiplied benefits that are beyond anything that has ever been experienced.
Design Intent

The term ‘design intent’ refers specifically to the model and how it is communicated via the resultant drawings and any additional documentation. The combination of this information should convey indisputably, the functional and aesthetic requirements of the as-built facility. The process of generating the design intent requires comprehensive coordination of life & safety, human comfort, aesthetic, materialistic and spatial needs. Spatial needs, speaks not only to interior space planning, but also to that of constructibility and construction sequencing. To be successful, appropriate tolerances must be built into the design allowing enough flex during the procurement and shop drawings process for alternate products, materials and means and methods, without affecting the design intent.

Unfortunately, the industry today appears confused by the meaning of design intent. It is often used as a reason why the design isn't coordinated. A real world example in the following discussion occurred during the Construction Documentation (CD) phase of a 538 ft tall, mixed use tower while construction was underway.

Architectural Technologist: “There aren’t any posts supporting this beam, how is it intended to be supported?”

Architect: “It's just design intent, they'll figure it out on site”.

The conversation above was in reference to the entry lobby for both the hotel and residences, the designers proudly referred to it as the ‘Jewel Box’. Its design intent was a pristine, structurally glazed protrusion from the main building above. Following complete coordination and production of construction documentation, it is safe to say, the design intent delivered at the end of Design Development (DD) was not portrayed within the as-built facility. Similar issues existing throughout the whole of the CD process resulted in close to 1400 RFI's many of which included quite major redesign during the construction phase.

Another example below shows the misunderstanding of team roles and responsibilities that often occurs.

Mechanical Engineer: “We haven't coordinated the structural openings because the structural engineer hasn't given us the sizes yet”

Client “It's your responsibility to coordinate the size, not the structural engineer’s. Your ducts, insulation and installation needs define the opening sizes and their location. Provide them that and they will reinforce the opening suitably”

Design intent is of the greatest importance, but success will elude us if its intention and needs are misunderstood. The intention is to provide an unequivocal platform from which all that follow the design team will be able to perform using clear and concise documentation to coordinate accurate delivery of the as-built facility. In the construction phase a true design intent will reduce the quantity and complexity of construction RFI’s. Construction RFI’s have been studied and reported
to cost an average of $1000 each, additional cost that often ends up in the lap of the client. A design team has full control over design intent, only giving up that control when coordination takes a back seat. With poor coordination other factors come into play that can direct the design away from design intent during the creation of shop drawings and ensuing construction. With an appropriate design schedule in place there is no reason that the design team should not look proudly at every detail of the as-built facility, as is always stated, ‘design is in the details’.

Level of Development and Information (LOD & LOI)

Level of Development & Information (LOD & LOI) are at the very center of project planning. The progression of LOD/LOI for the various categories is planned with a just in time approach to project scheduling. A good example of this is the development of structural categories. As discussed in project phasing below the structural categories are developed in advance similar to their sequence in the construction process. To be able to fix the structure at LOD350 we need to have investigated every part of the models details spatially, to ensure that the structure is designed to accept all elements that follow its construction. Another very important factor is the coordination of major MEPF equipment and their respective service runs, it is critical they are spatially coordinated especially where they pass through structural concrete walls. The LOD progression for all elements tends to go hand in hand with the construction sequencing of the on-site construction process.

Below are example images showing LOD/LOI documentation for foundations. The purpose is to provide a simple graphic representation of the various model categories and their related progression through each stage of design.
The Level of Information gradually increases and becomes more trustworthy as we pass through each stage of design. Foundations are perfectly placed in the design process to achieve LOD400 prior to issue of the 100% VC - IFC documentation.

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<tr>
<th>LOD 100 (ACD)</th>
<th>LOD 200 (IDF)</th>
<th>LOD 300 (FDF)</th>
<th>LOD 350 (FDF)</th>
<th>LOD 400 (IFC)</th>
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<td>Elevation. (In Coordination)</td>
<td>Elevation. (Fixed)</td>
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Redefine Design - A Fresh Look at the Design Schedule

As far as the design process goes, Decco’s BIM team has felt the need to adjust the traditional, industry standard, design schedule. The Schematic Design (SD), DD, & CD phases have been replaced by a Virtual Construction (VC) Schedule. The purpose, to strike a line in the sand, a statement that expresses we as a client expect different results and here’s how we’ll do it. A traditional CD set as tended, to reach a Level of Development (LOD) that should actually be expected at completion of SD or 50% DD at best. With these issues in mind the design schedule has been restructured to coordinate LOD/LOI responsibilities with all disciplines.

The restructure maintains Concept Design in its traditional format but SD is extended to what was around the 50% DD deliverable. Within this extended SD process are two major milestones, ‘Initial Design Fix’ (IDF) & ‘Final Design Fix’ (FDF). Upon completion of the extended SD phase and a client's approval of the ‘FDF’ the VC process begins. The VC phase replaces the traditional DD & CD's focusing the design team towards achieving a fully coordinated, virtually constructed and data rich model. Following ‘Final Design Fix’ (which can trigger a Foundation Permit) the engineering teams are able to engineer the facility with far less worry that architectural design changes continue and hinder their progress. Obviously the essence of design involves iteration, but the focus on using Level of Development and Information (LOD/LOI) to instigate questions in priority order, drives design forward in a cohesive manner and in response to the needs of the whole team.

The review processes at the end of each stage confirm that each team member has delivered their expected LOD/LOI to the acceptable quality for each stage. The aim of the final VC model is to achieve total spatial coordination, inclusive of tolerances required to allow alternate product selections during procurement without the need for major redesign.

![Virtual Construction Schedule Diagram](image)
Concept Design

The Concept Design phase is maintained in its traditional format. For this phase to be successful, it is of utmost importance that the client team provides the program data required to successfully design conceptual options that meet their needs and budget. The conceptual process is also reliant on regular, clear and concise communications to ensure that the design is being directed effectively. The results should see a series of workable options that can be chosen and or blended in respect to the client’s preferences. This phase should be fluid with limited controls, allowing fast turnaround of multiple iterations throughout the creative process.

Initial Design Fix (IDF)

The ‘Initial Design Fix’ (IDF) milestone deliverable has the majority of production tasks in the hands of the Architectural team. Initially the Architects remain in a fluid iterative process, as they refine the design direction decided during the conceptual phase. As the design stabilizes into a single vision, the Architects collaborate with the Engineering teams. The engineering teams IDF models are created by linking the Architect’s model(s) to generate sheet views that can be marked up digitally in Revit and/or BIM360 Document Management.

Communication occurs via Design RFI’s in the BIM360 Project Management module allowing a centralized location for communication and collaboration to take place. The engineer’s early modeling tasks are based on the key spatial requirements that ensure the facilities design will both work and have the tolerances to adjust with design changes (designing to worst case). For instance, the MEPF engineers must model their large equipment (including clearances required for equipment venting and access requirements) early in the process to ensure that the service rooms and major duct runs have been fully considered during the IDF phase. MEPF model the entry requirements of all major services into the facility using the existing utilities plans provided by the client team prior to project kickoff. The structural engineers involvement in this process is to mark up their Revit sheet views (created purely from the Architects linked model) to guide the architects on the spatial needs of the structure.

Once the IDF milestone is reached a review process begins to ensure that the LOD & LOI requirements have been met. At the same time a cost check ensures that the design is within budget and executive approval is gained from the client team. A preliminary code review is also a part of this process to ensure any code related requirements have been fully considered and rolled into the design proposal. Once full approval of the IDF is achieved, the Planning Approval documentation is prepared and submitted.

Final Design Fix (FDF)

The ‘Final Design Fix’ (FDF) milestone deliverable, allows the design team to move forward with confidence that the necessary questions for meeting the facilities program have been addressed during the IDF phase. The production role of the Structural Engineers now picks up pace with the
aim of fixing the foundations and superstructure based on the IDF floor plans. The Architects maintain full control of the superstructure (note: may change with a structural steel frame) allowing them to tweak the design down to the millimeter with ease and yet in full collaboration with the structural team. The structural team model all subgrade walls and foundations (aligning them to the architecturally owned superstructure) in preparation of issuing documentation for submission of a Foundation Permit following the Approval of the FDF published documents. The MEPF team is now responsible for coordinating and modeling the major service runs that will pass through any structural elements. Following the FDF, the model is approved to have been fully coordinated with all necessary parties and modelled to the extremities of every detail providing a 100% spatially coordinated model. The model at this stage is built with the required tolerances to allow specified products to be switched out without consequence (designing to suit worst case) during procurement phases that begin to be introduced during the Virtual Construction process.

Virtual Construction (VC)

The VC phase is broken into two sub-phases, both aiming to develop model details to meet the required LOD/LOI progression of various items. The first phase is the 50% VC phase and the second is the 100% VC that closes with approval of the Issued for Construction (IFC) documents, allowing for submission of a full Building Permit (BP). Projects will sometimes require early permit submissions to suit the projects schedule. The first of the early permit submissions is the Foundation Permit that occurs following approval of the structural engineers IFC (LOD350) foundation documentation (most likely following an approved IDF model). The second is a Structural Permit submission that will occur following approval of the structural engineers IFC (LOD350) superstructure documentation (most likely following approval of the FDF model). It should be noted that the choice to submit for early permits does not change the progression of LOD/LOI on a project, but it will require any changes thereafter to be bubbled and the relevant sheets issued with an official revision. This will add a little more complexity in controlling the issued documentation and future IFC revisions.

The LOD/LOI in the VC stage is managed to allow for early procurement packages to be issued, the aim being to receive approved shop drawings prior to 100% VC and issue of the IFC documentation. This approach allows for the avoidance of design teams over-detailing and making assumptions of how a manufacturer/supplier may choose to install their product on site. Designers can avoid the effort that is currently placed into detailing elements that do not actually represent what is built. This leads them to achieving the true sense of the term ‘design intent’ by creating a model that depicts the details they wish to see via modeled spatially accurate elements only, avoiding 2D detailing almost completely. The details are then taken to LOD400 by the supplier/manufacturer during the shop drawing process although certain details may be required at LOD400 by the design team, these will be planned for on a project by project basis.

Because all shop drawings must be approved by the design team to confirm that the design intent has been met, we can see that there is currently duplicated effort that can be avoided if the design schedule is managed appropriately. Bringing the procurement process into the design phases, avoids the issuance of information that is not true to that of the constructed facility maintaining clarity for all involved. This approach will also provide far more understanding & accuracy in cost checks. Upon approval of shop drawings the design models can be adjusted if required to
represent the approved shop drawing detailing prior to issuing for IFC. Links to the final shops are then provided within the CDE to allow all team members access to the latest details from both design intent and site installation angles.

**Communication, Collaboration & Coordination**

An RFI process traditionally run during the construction phase is being brought into the design phases and termed Design RFI’s. Similar to the progression of LOD following construction sequencing we also need to bring construction type processes into the design process. The incorporation of RFI’s in design has created a centralized area for communication & collaboration leading to a much higher degree of coordination that ensures all team members have access to the information they need and the ability to inform their needs in developing a fully coordinated design. The industry still uses email heavily for communicating and sharing information but this only leads to holes in the level of coordination.

**Clash Detection.**

Our approach in virtual construction is to firstly avoid designing in clashes by coordinating them out throughout the design process. Clash detection is a great tool but it is relied upon far too much to catch mistakes, usually well after they could have been dealt with. Modeling in 3D with the inclusion of current disciplines latest information should allow the ability to design with far more clarity than ever before and avoid the majority of clashes through coordination activities. The issue now is to upskill our project teams to make the most of the latest technologies potential and understand the importance of coordination. Clash detection can then be used as a final QA/QC safety net to catch the more difficult to find clashes.

**Learning Objective #1: Create an intuitive Common Data Environment in BIM360 Docs that fosters collaboration & delivers clarity for the VDC team.**

The Common Data Environment (CDE) is the single most important progression that project teams can implement to promote Communication, Collaboration and Coordination throughout a whole project team. The ability to have current information at our fingertips and to communicate (via RFI’s) in a central location can go a long way to completely transforming the level of quality achieved by all team members. Below is explanation of the CDE that is incorporated to help instigate a team environment.
Setup a Projects Folder Structure Using an Existing Project as a Template.

During activation of the Document Management module an Account Administrator can copy the filing structure of an existing project. Creation of a project startup template would be wise to allow the evolution of project standards to be maintained and passed onto all newly created projects.

An existing project (effectively a template project) can be selected during step 2 of 2 of the Document Management service activation under ‘Copy project settings’ prior to assigning at least one Project Administrator per the image below. Upon creating a project using another project as a template, its folder structure is automatically created within the new project.
Organize the BIM360 Design Folder Structure to Aid Intuitive Collaboration.

Note: Refer to the BIM360.xmind file provided within the Additional Class Materials for a full interactive map of the folder structure discussed below (download the xmind software for free here.)

The introduction of BIM360 Design has allowed for the simplification of a projects folder structure. The recent addition of ‘Sets’ has also brought an added level of simplicity when searching for information that has been issued officially at major milestones.

The folder structure is still split into two sections named ‘Plans’ (renamed ‘DO NOT USE THIS FOLDER’ opposite) and Project Files. The Plans & Project files folders are quite traditional in their approach similar to the ‘Drawings’ & ‘Administration’ folders that have commonly been used throughout the design industry for years. The Plans folder contains an OCR (Optical Character Recognition) system that allows users to set up title block templates in order to read the information in drawing title blocks, automatically naming & numbering uploaded sheets to suit.

The Project Files folder structure has no such OCR system and is directed towards administration documents that do not have standardized title blocks such as letters & reports. The most exciting and influential development coming from the introduction of BIM360 Design is the ability to publish Revit based sheets and views directly to the BIM360 Design folder structure. This replaced a convoluted and timely process to achieve the same results through the additional step of having to first publish to BIM360 Team via C4R followed by a manual upload to BIM360 Docs. The interesting thing is that Autodesk made the decision for the BIM360 Design published Revit views to upload to the ‘Project Files’ folder structure and not the ‘Plans’ folder structure. Our team has recognized that the two tier structure of both ‘Plans’ & ‘Project Files’ only confused the project team members who had to decide which folder structure was relevant for each issue. It also required that Milestone Issue’s be uploaded in two locations rather than a single archived location. Now that BIM360 pushes Revit views into the Project Files structure we have decided to retire the use of the ‘Plans’ folder altogether. Autodesk’s ultimate goal is to take BIM360 into a single vault for all team members to collaborate and share their data in a centralized location and this is obviously a step in that direction, our team applauds that approach.
The only piece of the jigsaw that is still forced into the ‘Plans’ folder structure is the ‘Model Coordination’ module (still in preview mode) as the only option when choosing a folder for Clash Models is under the ‘Plans’ tier. It is our guess that this will ultimately change in the future and Model Coordination will be connected directly to the live Revit models located in the ‘Project Files’ structure. This would make the utmost sense providing live clashing to live models and avoiding the current need to duplicate the models for the purpose of clash detection.

### Folder Controls

Before we get into a projects folder structure itself, let’s take a look at the options available in regards to Document Management folders. When right clicking any folder you will be provided the options in the image to the left.

**Add Subfolder** – Creates a new sub-folder to be named as required.

**Rename/Delete** – As expected allows a folder to be renamed or deleted. Please note that files and folders can always be recovered if needed at a later date by use of the Deleted Items button (top right of Document Management window).

**Upload** – Files, allows standard files to be uploaded. The **Linked Files** option allows the likes of Revit models with links to be uploaded. During the upload of linked files you will be asked which of a number of files is the parent, this will then reassemble the Revit model within BIM360 Document Management exactly as it was produced.

**Share** – Share files or folders via email. Please note that only team members with the required access permissions will be able to view the shared documents.

**Add Attributes** – Allows custom attributes to be created in by use of a custom ‘Text Field’, Date Picker or Drop down List.
**Sort By** – Allows for sorting of documents by Name A-Z, Name Z-A or by Date order.

**Permissions** – See below for a detailed overview.

**PDF Viewer** – This option allows the user to select their preference of default PDF viewer. You can use a browser but this does not allow for use of mark ups and issues.

It is recommended that the BIM Viewer option is chosen to gain the benefits of using mark ups and issues to communicate and collaborate with the team.

**Permissions** – See below for a detailed overview of the Permissions strategy.

**Subscribe** – When clicking the Subscribe the choice will be provided to subscribe only to the folder in question or the folder and all of its sub-folders.

Any folders that are subscribed to will instigate email notifications for any changes that occur within that folder(s).

When a folder is subscribed to a tick will be displayed next to it.
Autodesk Desktop Connector

Autodesk Desktop Connector (ADC) creates a folder on your desktop (similar to Dropbox) that syncs your BIM360 projects between your desktop and the cloud. It allows files to be opened in applications from your desktop and then saved which in turn automatically creates a new version of the file in Document Management.

This has proven invaluable especially for allowing team members to use whatever tools they are most comfortable with. For example some team members, especially during the early design phases still prefer to use CAD (amongst other tools) to develop early stage designs. ADC is allowing for ease of iteration within the CDE while maintaining a well-organized single version of the truth.

Folder Permissions

Recently Autodesk added an additional twenty ‘User Roles’ providing a little more finesse in controlling access to Document Management and its folder structure.

Borrowing the explanation from ‘Autodesk Knowledge Network’ below you can see that various BIM360 modules are turned on automatically based on a users role.

‘When members are invited to a BIM 360 project, they are granted access permissions that correspond with their project role. Assigning a role to a member automatically grants the member access to the services associated with that role. For example, assigning someone the "Architect" role grants them access to Document Management, Project Management, Design Collaboration, Model Coordination, and Field Management.’

Follow the Role-based Default Permissions link to see the full explanation on the Autodesk Knowledge Network.

See below for an explanation of how Decco’s BIM team has chosen to set up permissions.
**Permissions by Role:** Roles will be used as the first level of controlling permissions to files and folders. The roles below are the current available roles in BIM360 Docs divided into respective groupings to suit our specific approach to project management.

<table>
<thead>
<tr>
<th>Internal (Owner) Roles:</th>
<th>Primary Consultant Roles:</th>
<th>Secondary Consultant Roles:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspector - RFP Reviewers</td>
<td>Architect - External Consultant</td>
<td>Engineer - Specialist Engineers</td>
</tr>
<tr>
<td>Project Manager - Design Management</td>
<td>BIM Manager - External Consultant BIM Leads</td>
<td>Surveyor - Land Surveyor</td>
</tr>
<tr>
<td>VDC Manager - VDC/BIM Team</td>
<td>Designer - External Landscape Architect</td>
<td></td>
</tr>
<tr>
<td>Construction Manager - CM Team</td>
<td>Civil Engineer - External Consultant</td>
<td></td>
</tr>
<tr>
<td>Contract Manager - Procurement Team</td>
<td>Electrical Engineer - External Consultant</td>
<td></td>
</tr>
<tr>
<td>Document Manager - CM Team</td>
<td>Fire Safety Engineer - External Consultant</td>
<td></td>
</tr>
<tr>
<td>Quality Manager - CM QA/QC Team</td>
<td>Interior Designer - External Consultant</td>
<td></td>
</tr>
<tr>
<td>Quantity Surveyor - Commercial Team</td>
<td>Mechanical Engineer - External Consultant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plumbing Engineer - External Consultant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structural Engineer - External Consultant</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Misc Roles:</th>
<th>Construction Team Roles:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive - Internal Executives</td>
<td>Contractor - External Contractor</td>
</tr>
<tr>
<td>Owner - Operations &amp; Maintenance</td>
<td>Sub-Contractor - External Sub-Contractors</td>
</tr>
</tbody>
</table>

**Unused Roles**
- Commercial Manager
- Cost Engineer
- Cost Manager
- Drafter
- Foreman
- HVAC Engineer
- Project Engineer
- Estimator
- Safety Manager
- IT
- Scheduler
- Superintendent

**Permissions by Company:** Permissions by company will be used as the next level of granularity. For example if a company has many roles within its team, permissions could be provided to a folder by company allowing permission control via a single source.

**Permissions by User:** The final level of permission granularity will be applied by individual users to assign permissions for unique situations.

Follow the Autodesk Knowledge Network [To Manage Folder Permissions](#) for an in depth description each permissions restrictions, below is an over view of the most used functions.

**Note:** The roles of VDC Manger (internal) and BIM Manager (external) will be applied to any team members who will be responsible for collaboration and coordination within the CDE. This allows open collaboration to take place on a single source of the truth created within the CDE.
Permission Level: Upload-only

**Files:** Can upload, view and copy or move target folders.

**Folders:** N/A

**Collaboration:** N/A

---

Permission Level: View-only

**Files:** Can view and download documents including version history.

**Folders:** Can Edit Attributes.

**Collaboration:** Can add, edit & delete private mark ups and work with Issues.

---

Permission Level: View + Upload

**Files:** As above + upload.

**Folders:** As above.

**Collaboration:** As Above

---

Permission Level: View + Upload + Edit

**Files:** As above + rename files, & make current.

**Folders:** As above + create folders & attributes.

**Collaboration:** As above + publish/archive markups.

---

Permission Level: View + Upload + Edit + Control

**Files:** As above

**Folders:** As above + add members/set permissions.

**Collaboration:** As above.
BIM360 Design Folder Structure

Arriving at the project's Document Management page, the only options available to team members are the folders that they have been given permission to view under the 'Project Files' structure. The structure is laid out intuitively allowing team members to find their way to share or view information as quickly as possible. The folders are structured in number order based on their sequence of use within a project. For example, the folders named '0 Admin Private - Decco Only' & ‘1 Request for Proposals (RFP)’ are the first to be used in a project during feasibility tasks and procurement of consultants via the RFP process.

0 Admin Private - Decco Only

This ‘0 Admin Private - Decco Only’ structure is for internal use only. The structure of this folder will vary by the needs of each project and the private information that is necessary to be shared throughout the course of the project.

Permission Level: View + Upload + Edit

In this folder permissions are set by Company allowing all internal staff to access any folder with View + Upload + Edit permissions.
1 Request for Proposals (RFP)

The ‘1 Request for Proposals (RFP)’ folder structure is used to share, receive, assess and archive all documentation throughout the RFP process. Four sub-folders take care of each stage of the process from sharing RFP’s to receiving submissions, assessing them and archiving the final decisions.

Initially only the role of **Contract Manager** (Procurement Team) are given access to this folder and all of its sub-folders while preparation of publishing RFP’s takes place. RFP documents are created via Office 365 cloud based collaboration maintaining a single source of the truth for all RFP team members.

1.1 Published

Documentation is published to the ‘1.1 Published’ folder for invited firms to download and use in preparation of proposals. The permissions in these folders allow invited firms to view and download the documentation for their reference in preparing a proposal for submission.

The role of **Inspector** (RFP Reviewers) is added to the ‘1.1 Published RFP’ folder prior to RFP documentation being issued. This allows them to subscribe and be notified when the RFP documentation has been issued to vendors.
Once the RFP documentation has been prepared and uploaded to the Published folders the vendors representatives can be invited by email setting permissions to View-only giving access only to the folder specific to them.

1.2 Submitted Proposals

Sub-folders are created for each invited firm with permissions set to allow access to their specific folder only. Each firm’s folder has two sub-folders named ‘Fees’ & ‘Proposal’. The internal assessment team are not given access to the ‘Fees’ folder until they have completed and submitted their final assessments. The purpose of this is to ensure that the assessment team make recommendations based on the quality of proposal and interview alone and are not swayed by the fees.

Two folders specific to each submitting vendor are created under Fees and Proposals. Fees and proposals are split into two to avoid the RFP assessors being swayed by submitted fees allowing focus purely on the quality of submissions and interviews. The fees folder will be held back until all assessors have submitted their final assessments and made decisions without the influence of fees.

Firms are invited to their specific proposal folders by use of email with View + Upload permissions. Inspectors are only invited to the proposals folder once confirmed that proposals and fees have been uploaded in the correct locations by the Contract Manager.
1.3 Internal Assessment

Sub-folders are created for each individual assessor to provide their assessments information privately with the RFP manager. Once all assessments have been uploaded and approved the RFP manager compiles them into a single master assessment schedule to relay the average assessed value for each proposal.

Assessors are invited by user and given View + Upload + Edit permissions in order to complete their assessments in privacy from other assessors, ensuring that individuals are acting without influence from any other source.

1.4 Accepted Proposals

All successful proposals are archived to the ‘1.4 Accepted Proposals’ folder.

Following completion of the RFP process all successful submissions are archived within the Accepted Proposals folder. Internal team members are then provided View-only permissions to view the accepted documentation.
2 Project Documentation

The folder named ‘2 Project Documentation’ is one of two most important folder structures in a project. This folder allows for sharing of and collaboration on, all project documentation, other than drawing sheets. This folder is the workhorse of the Common Data Environment (CDE) allowing the whole project team to have current data at their fingertips from any location. The sub-folders that lie below the main folder are broken down intuitively per the descriptions below.

All other roles receive View-only permissions.

The internal Project Manager(s) are given full permissions to ‘2 Project Documentation’ and all of its subfolders. VDC Managers (Internal Collaborators) are given View + Upload + Edit permissions allowing access for them to collaborate fully within the CDE. All other roles internal or external are given View-only permissions allowing access to view the whole folder structure.

2.1 Gen Admin, Standards & Templates

Folder 2.1 is provided for general project administration, project planning, QA/QC standards and standard project templates. This structure is self-explanatory and grow as required to suit the life of each project.
Permissions are maintained from the high level ‘2 Project Documentation’ folder as the information in this structure is provided and maintained by the client project management team requiring the wider internal/external team only to view the information.

2.2 Context – Guidelines & Information

Folder 2.2 is the folder in which all information regarding the existing site and its context are shared with the design team prior to the project kickoff meeting. The aim is to ensure that all design team members have access to the information they need prior to starting any design oriented tasks. It is critical for the client team to be well prepared ahead of the Kickoff meeting to ensure that the utmost efficiency is gained from access to current and accurate information from the outset.

Permissions are maintained from the high level ‘2 Project Documentation’ folder as the information in this structure is provided and maintained by the client project management team requiring the wider internal/external team only to view the information.

2.3 Program, Schedules & Deliverables

Folder 2.3 contains all information regarding the facilities program, functional needs, schedule and deliverables. This folder contains all information required to ensure that the project stays on schedule and meets the needs of the end user.

See below Folder 2.6 for permissions strategy.
2.4 PPD’s, Cut Sheets & Specs & Shops

Folder 2.4 contains all project information regarding specifications from the outset of the project to the end. The first folder allows for consultants to upload a Preliminary Project Description (PPD) while the folders below allow for more detailed information to be shared as the quality of information in the project increases with the progression of LOD/LOI.

2.4 CSI Divisions & Sub Folders

Folder 2.402 is broken down into the standard CSI Masterformat Divisions. Each division is then provided two sub-folders, the first is ‘Cut Sheets & General Information’. This folder is for provision of cut sheets, as the design develops the designers share their current outlook on project specifications, the cut sheets relate to the current products and materials that are being proposed for the project. The second folder is ‘Specifications’ where the final specification documents will be uploaded for issue with the IFC documentation.

See below Folder 2.6 for permissions strategy.

2.5 Sustainability

Folder 2.5 is for all things Sustainable. This is a self-explanatory structure that grows or adjusts with the needs of the project.

See below Folder 2.6 for permissions strategy.
2.6 Presentations, Meetings & Reports

Folder 2.6 is a single repository provided to store all Presentations, Meetings & Reports by all teams. This allows any team member to intuitively find their way to the information they require easily and quickly, no matter who the author may be. The folder 2.604 is also located here to host documentation that is being prepared for applications to Government agencies etc.

Folders 2.3, 2.4, 2.5 & 2.6 all receive the same permission levels with Administrators and Project Managers having full administrative controls. The roles of VDC Manager and BIM Manager are provided View + Upload + Edit permissions to allow collaboration to take place.

<table>
<thead>
<tr>
<th>Role</th>
<th>Permissions</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Manager</td>
<td>View + Upload + Edit + Control</td>
<td></td>
</tr>
<tr>
<td>VDC Manager</td>
<td>View + Upload + Edit</td>
<td></td>
</tr>
<tr>
<td>BIM Manager</td>
<td>View + Upload + Edit</td>
<td></td>
</tr>
</tbody>
</table>

All other roles receive View-only permissions.

<table>
<thead>
<tr>
<th>Permission Level</th>
<th>View-only</th>
</tr>
</thead>
</table>
The work in progress (WIP) folder is the second of the two most important folders in a project. A single repository in which all latest published drawings and model views are shared with the team. In this structure each consultant is provided a main folder with four sub-folders creating a single version of the truth for centralized collaboration activities.

‘1 Revit Models’ live Revit models for each consultant are hosted in these folders.

‘2 CAD Links’ the recent introduction of Autodesk Desktop Connector (ADC) allows CAD files to be live linked into the current Revit models. Anyone working on a CAD file within the ADC folder structure will be able to version their CAD files automatically within Document Management keeping all links current for all parties.

‘3 Exported Views’ consultants can export files from the model as required by their deliverables or for the projects collaborative needs.

‘4 Sketchbook’ the sketchbook folder is folder that allows for quick-fire iterative collaborations to take place. This folder is particularly useful for the early design phases when many iterations are developed. Used in tandem with versioning the design progressions can be easily tracked with and the ability to make a previous favored version current keeps clarity for the whole team. Previous versions can also be downloaded as a starting point for an alternative direction.
Each consultant is given View + Upload + Edit controls to their own folder (the permissions in the image above are relevant to the ‘3.3 AR – Architect’ folder) allowing their team to work on and save their models to the cloud. The VDC & BIM Manager roles also have View + Upload + Edit permissions allowing them to collaborate within the sheets & views of the models with mark ups and RFI’s etc. This maintains a single version of the truth for collaborative activities to take place.

All other roles receive View-only permissions allowing them to access all consultant models and CAD files for linking within their own models.

### 4 Milestone Issues

The ‘Published Milestone’ folder is a single repository for all reviewed documentation that has been confirmed to meet the needs of the current deliverable. This folder structure is a fixed archive of all milestones throughout the design process.
External BIM Managers are given View + Upload permissions to each folder as the milestone date arrives. Following a full review of documents and confirmation that they meet the needs set out by the deliverable the consultants can print drawing sheets and export views as set out in the deliverables requirements. These documents can then be uploaded for a final check by the client team prior to locking the folder and adding the documentation to a Set.

<table>
<thead>
<tr>
<th>Role</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDC Manager</td>
<td>View + Upload + Edit + Control</td>
</tr>
<tr>
<td>Project Manager</td>
<td>View + Upload + Edit + Control</td>
</tr>
<tr>
<td>BIM Manager</td>
<td>View + Upload</td>
</tr>
</tbody>
</table>

All other roles receive View-only permissions to view the archived information.

| Permission Level: | View-only |

5 Archived Documentation

The ‘Archives’ folder is the final landing zone for documentation to archive the documentation that was provided at the end of the design phase, the end of the construction phase and the model that is used for Operations and Maintenance.

The Archived documentation folders will only be activated at completion of the design phase, construction phase and prior to beginning operation of the facility.
Learning Objective #2: Use Live Revit (& CAD) Links in BIM360 Design to Facilitate Real Time Collaboration for the Virtual Design & Construction Team.

When we speak of a virtually constructed model we are not suggesting that it is a model including every nut and bolt, quite contrary in fact. What we wish to achieve is a model that is spatially coordinated, every element, product, and finish has been modeled to its extremities with required clearances for appropriate function, access and safety. The design has been fully coordinated with every necessary team member and the data required to construct the facility is included and clearly communicated. The resultant documentation allows the construction team to build without confusion. If RFI’s are required they are for the purpose of clarification and never re-design.

Modeling Techniques that Help Achieve a Virtually Constructed Model.

Family Warehouse

A key to easing the path toward virtual construction is to develop a family library that suits the needs of spatial coordination and standardized provision of data. This is no simple task and it certainly isn't a quick turnaround. The industry needs to find a way forward to a standard approach that allows designers the basic families they need with parameter's that fit a standard approach to documentation. Developments are occurring but we still appear a long way from having standardized families available that can do the job. Before that job can be completed we also need to agree on the standards required within the final design documentation. This is a much larger question than this paper can answer and so let’s show some of the approaches that we incorporate to achieve the level of development and information that we as a client expect to be delivered.

Assemblies

Assemblies such as Walls, floors, ceilings & roofs can be standardized in terms of the layers (materials) from which they are constructed and the settings and data that is embedded into them. This can help in the quality of modeling and data that can be produced via the model allowing clear and accurate coordination and ultimately communication of the design intent.

The images below are from the Autodesk Knowledge Network About Applying a Function to a Layer of a Compound Structure. Review this information and consider the importance of setting the appropriate layer functions that allow layer joins to work as closely as possible to that of construction sequencing and detailing.
Disallow Joins in Walls

Click the following link to watch a video showing the benefits of using Disallow Wall Joins to ensure that walls join up in order to show a true model detail that suits construction sequencing and detailing requirements.

The example below shows how if left to their own devices walls may not join as required by the design intent. The fire and STC rating views below use filters to color code the walls based on instance parameters that relate the required fire and STC ratings. As you can see the wall joins prevent the continuation of the demising walls to the column. This can be overruled by disallowing wall joins.

Note: Please refer to the 1-RESIOPT-01 – AR – 3BD-2BT-SM-8ft Ceiling.rvt model for full model and document set.
Fire & STC ratings are interrupted by the furring wall join.

Right mouse click the walls end node to disallow join (right image is corrected).
FILTERS ARE USED TO COLOR CODE THE WALLS (THIS EXAMPLE SHOWS FIRE RATING FILTERS)

The FIRE RATING_WCFC_60min filter shown above shows that walls, ceilings, floors & structural columns will be affected by this filter and will focus on any of these elements being set with a 60 minute fire rating. The Fire Rating (I) is a custom instance parameter (the standard Revit parameter is a type parameter) that we use to rate assemblies. Elements that are applied the 60 minute rating will be shown in views who’s visibility graphics include the filter and will be color coded to suit the users settings.

The reason that an instance parameter is used is to avoid having to duplicate the same wall type for each fire rating. Each wall is UL tested to meet a fire rating, the wall in this example is rated up to 2 hours (120min) and could therefore be used for locations that require 0, 30, 60, 90 and 120 minute ratings. The instance parameter allows a single version of the wall to meet all of these needs.

The assembly legend below is a standard approach to expressing an assemblies build up and its limitations. The walls ws18Ai code is part of a standard that remains the same on all projects. W = wall (element), s = steel stud (main structural member), 18A = unique wall type code, i =
insulated. As you can see insulated walls have a solid grey fill to allow visual communication of insulated assemblies within the model. This visual property allows for a simple quality review to ensure that insulation is continuous as required to maintain correct STC, Fire or Thermal needs of the design project. In the example above we can see that the thermal insulation is broken at the concrete column, a detail can be created here to express the need to provide additional insulation in this location.

Note: The legends below are explicitly stated as being for design guidance only. All details and data must be confirmed appropriate by a specialist in each particular field, for example STC ratings should be confirmed correct and suitable by an acoustic engineer. The tested UL assemblies include a great deal of detail and various options for constructing the assemblies all of which allow the fire ratings to be achieved. It is the contractor’s responsibility to decide the means and methods of construction in order to meet the requirements of the design. The information is however provided for designers as a guide to achieve accurate spatial coordination.

A good example is the provision of limiting heights for studs. This is provided as a guide to allow designers to choose an appropriate stud width (allowing an accurate spatially coordinated design) that allows the wall in question to support itself over the height it is intended to be constructed. From the limiting height table below we know that this wall can support itself up to 5003mm or 197” in the best case and up to 2743mm or 108” in the worst case. We should always seek specialist advice to ensure that our designs are constructible but these limits do provide designers an initial basis from which to direct their design during those early design development phases.
ws18Ai
Wall - 64mm (2-1/2") 18 Gauge Steel Studs @ 400mm (16") ctrs
Denising Wall

<table>
<thead>
<tr>
<th>Test Agency #</th>
<th>UL U493</th>
<th>UL (Finish) Fire Rating (LB)</th>
<th>N/A</th>
<th>UL Fire Rating (Non-LB)</th>
<th>2hr (120min)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>STC Rating</th>
<th>59</th>
</tr>
</thead>
<tbody>
<tr>
<td>STC Test</td>
<td>USG-020241</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Limiting Heights</th>
<th>L/120</th>
<th>L/240</th>
<th>L/360</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load: 5 psf</td>
<td>5003 (197)</td>
<td>3962 (156)</td>
<td>3479 (137)</td>
</tr>
<tr>
<td>Load: 7.5 psf</td>
<td>4368 (172)</td>
<td>3479 (137)</td>
<td>3022 (119)</td>
</tr>
<tr>
<td>Load: 10 psf</td>
<td>3962 (156)</td>
<td>3149 (124)</td>
<td>2743 (108)</td>
</tr>
</tbody>
</table>

NOTES:
1. REFER TO THE RELEVANT TESTING AGENCY OR CODE LITERATURE FOR SPECIFICS OF CONSTRUCTIBILITY AND MATERIALS.
2. LIMITING HEIGHTS PROVIDED FOR ARCHITECTURAL DESIGN ASSISTANCE ONLY. CONTRACTOR TO CONFIRM PRIOR TO CONSTRUCTION.
3. LIMITING HEIGHTS VARY DEPENDENT ON PRESSURE LOADS (PSF) AND ALLOWABLE DEFLECTION (L/120, L/240, L/360) CONTRACTOR TO CONFIRM PROJECT REQUIREMENTS WITH THE REGISTERED ENGINEER.
Learning Objective #3: Use BIM360 Issues/RFI's to Foster Clear, Concise Communications for the Whole VDC Team Ensuring that a VC Model is Achieved.

The RFI Process

Requests for Information (RFI's) are traditionally a construction administration process that requires communication between the construction management team, their subcontractors, suppliers/manufacturers and the design team. Essentially an RFI's purpose is to request and/or resolve information that is required to allow construction activities to proceed with full clarity. The reason for an RFI's issuance can be one of many things but quite often it is a failure in the design process to coordinate and communicate the necessary information required to construct the facility. However it can also be a simple matter of a team member not reading the drawings correctly merely requiring direction from the design team to the source of the information.

The design schedule has been redefined as discussed in the Introduction to create an environment in which the RFI process has the potential to occur during the design process. The aim is to develop model elements to suit the LOD/LOI requirements (mostly LOD350) and ultimately open the door to introduce links to LOD400 (coordinated shop drawings) within BIM360 Document Management prior to issue of IFC wherever possible. This approach has the potential to reduce the number of construction RFI's by removing the need for designers to make assumptions when preparing the construction details. When a manufacturer or supplier prepares shop drawings they prepare them to suit construction sequencing, material availability, dimensions, cost as well as specialist installation requirements and more. This can be a vast number of decisions that traditionally the designers have made assumptions on without having the knowledge or expertise required to pull it off, even if they did, the time taken is essentially wasted because the suppliers/manufacturer's will re-create this information when producing their shop drawings, the shop drawings are then reviewed and approved to meet design intent by the design team, so doesn’t it just make sense for designers to place their efforts into coordinating the 3D model to produce basic but fully coordinated construction details? A fully coordinated 3D model provides far more value to the process than assumed construction detailing ever will and it is time that the industry recognized this and adjusted to suit.

The time that designers have previously spent creating assumed details is vast and only removes them from developing and coordinating the design which is really the task they have been hired to fulfill. The time saved in not detailing unnecessarily (generally 2D overlays of areas that will be produced in shop drawings) must be put into producing a 3D model that is spatially coordinated down to every millimeter, inclusive of the necessary tolerances to allow adjustments to take place throughout the procurement and shop drawing process. The RFI process provides the vessel to coordinate successfully in achieving an accurate spatially coordinated model that has been informed not only by the design team but by suppliers, manufacturers and installers who will construct the work on site.

BIM is project management first followed by modeling and documentation tasks to communicate the decisions made throughout the design process. We must first plan for success with the whole
team to understand the needs of the project and the team as a whole. With the clarity that we gain we can then execute the project effectively in respect of every team member.

Why BIM360 RFI's over Issues?

The Design RFI process should naturally use BIM360 Design ‘Issues’ and not ‘RFI’s’ to coordinate throughout the design process. However the ‘Issues’ function at time of writing does not provide the same functionality in notifications as RFI’s do. Seeing as Decco’s Construction Management team currently run the RFI process through an alternative platform it allows us to incorporate the preferred functionality of RFI’s into the design process with no crossover. Most firms may not have this benefit and may prefer/need to choose the Issues function, if that is the case there are work arounds that can make issues work effectively enough but with some minor aggravations.

BIM360 Design RFI’s - Communication & Collaboration = Coordination.

The use of RFI’s is showing early success in promoting communication, collaboration and coordination throughout the whole project team. This simple vessel removes the siloes created by email communications where team members choose who should be involved in a conversation and receive certain information. Centralizing all activities within the CDE ensures that no team member is removed from being able to interject with important directions to decisions being made, something that quite often happens all too late in the traditional process. Quite often this leads to late re-design that will always have negative effects on both schedule and quality. The RFI process is backed up by weekly Design RFI meetings ensuring that no subject matter is forgotten and not dealt with in good time.

Design RFI Process - Step 1, Setup

As the project is setup by the project administrators they choose to activate and assign admins to the BIM360 modules that are required. Generally the ‘Document Management’ module will be the first activated, with the rest following later. However because our current process uses the ‘Project Management’ module for RFI’s for the reasons stated above we must activate it at project startup. The reason that we recommend not activating modules until the design or construction process requires, is to maintain sharp focus on only the necessary tools.

In the image below the Document Management and Project Management modules have been activated while the Design Collaboration and BIM360 Glue modules remain inactive until required.
Following activation of the Project Management module there are a number of project settings required to allow for management of the RFI process during the projects lifetime. The image below shows the settings for the default RFI workflow that has been successful on projects to date.

**Creator:** This is set to all users allowing all project team members to submit an RFI to the Manager(s) for review.
Manager: In our case the client BIM team is assigned the Manager with a minimum of two members from that firm responsible for managing the process. This ensures that the project is driven in respect of the needs of the client.

Reviewer: Each firm assigns at least one reviewer but it is preferable to have a minimum of 2 reviewers to ensure vacations/sick days allow for effective response times to continue. Reviewers have the ability to not only coordinate via the RFI but also to provide an official answer. The RFI should only be officially answered once agreed by all involved as an officially answered RFI cannot be everted back to open.

An alternate Workflow is available that allows an additional Reviewer to participate as shown below.

Design RFI Process - Step 2, Create

There are two methods for creating RFI’s. The first is to create a general RFI that is not directly connected to a drawing or document. This can be done from the ‘Project Management’ RFI list view, by choosing the blue Create RFI button in the top right corner of the list.
The second is to create an RFI that is specific to a document or drawing. This can be done from the Document Management module when in a sheet or document view. The ‘RFI’ button can be found below the ‘Issues’ button and above the ‘Sheets & Views’ button within the vertical command bar in the top left corner of the document viewer. In either of the two methods noted above the option to create either a Draft or Submitted RFI’s will be available to you. A Draft RFI will allow the ability for it to be edited before choosing to submit the RFI to the Manager but a submitted RFI is locked to the creator once submitted.

When a Manager creates an RFI the available options are Draft and Open because the Manager does not need to submit an RFI to themselves for approval before opening.

After clicking to create a new RFI you ‘Click a location to place the RFI push pin’. (Only in 2D or 3D views)

Initially you can place RFI’s as Draft or Open, Draft will place a grey pin and open will place a yellow pin.
Design RFI Meetings

Early successes are beginning to show in current construction projects following the introduction of Design RFI’s and their weekly coordination meetings. The meetings have created a centralized area for all team members to communicate and collaborate on the resolution of the latest and most pressing design issues. The importance of this collaboration is the fact that all team members have access to it and specialists can be brought into the conversation as required. This opens the door for open and clear communication between all parties to take place. Once the Design RFI meetings have ended the meetings facilitator writes up minutes of the meeting to record decisions made within the RFI’s activity feed and re-assigns the RFI’s to the parties currently responsible for progressing the issue closer to its closure. The RFI’s become a log of activity allowing all team members whether in attendance of the meetings or not to stay informed with the current state of play. Traditionally coordination of the design issues would take place most likely by email and phone calls which are rife with risk that a party who holds vital information that will direct the Design is left out of a conversation. For the majority of information shared on a design project it should never be down to any one member to decide who should see what information but it should be the individuals themselves who decide what to do with it.

Learning Objective #4: Manage projects with clarity, expedite design, achieve excellence & allow construction to be completed on time & in budget.

The fourth and final learning objective can be achieved with a combination of everything we have discussed in the sections above and during the presentation at Autodesk University. Once the processes have been developed the final ingredient required for success is that of an experienced and competent project manager who can lead the whole team in respect of every team member’s needs.