

Building Information Modeling



Benefits of BIM

BIM and IPD afford manufacturers, designers and integrators advantages in design efficiency and quality control. A single, connected model improves communication within the design and construction teams and the parametric elements of the model create a robust database. The building owner and facility manager can utilize the data within the model during the occupation of the building. Harvesting the information in that database can help everyone be more efficient and also create new opportunities for revenue expansion. Modeling, instead of drawing, is the new paradigm, fostering new cooperation, innovation and building life-cycle savings.

Modeling vs. 2D Drafting

Building modeling improves over 2D drafting by allowing designers to view the building and its contents from all angles, and revealing problems at earlier stages to allow for correction without costly change orders. Truly parametric design saves time by creating and editing multiple design portions simultaneously. Sections, elevations and three dimensional views can be created instantly, reducing the need for check plots. Changes to any one of these elements affect all of the others, including materials, costs and construction schedules. The two-dimensional printed documentation becomes the quick and accurate byproduct of parametric design.

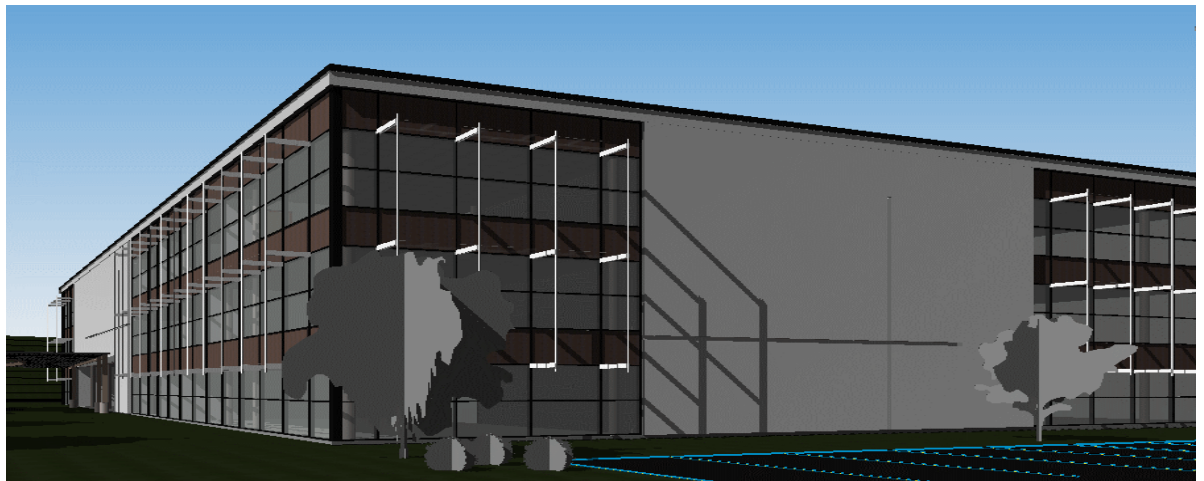


Figure 3: 3D perspective views of buildings can be quickly generated using BIM software.

Parametric Elements

Parametric elements allow for the creation of large, versatile sets of building components with little effort. One generic element can serve as a template with predefined ranges of characteristics. This parametric data allows the element to be easily reconfigured to suit the unique requirements of implementation in various areas of the model.

The following are examples of parametric data and element relationships:

- Chairs are arranged evenly across an elevation. If the length of the elevation is changed then the equal spacing of the chairs will be maintained. The data parameter in this case is proportional.
- The edge of an electrical box is related to an interior wall such that when the wall is moved, the electrical box remains connected. In this situation, the parameter is association or connection.
- The parametric data in a collaborative model can also save time during the design process and the construction administration phase by improving coordination and reducing the need for additional site visits, printing and manual drawing checks. Changes and additions to building elements update simultaneously across all views, schedules and sheets.

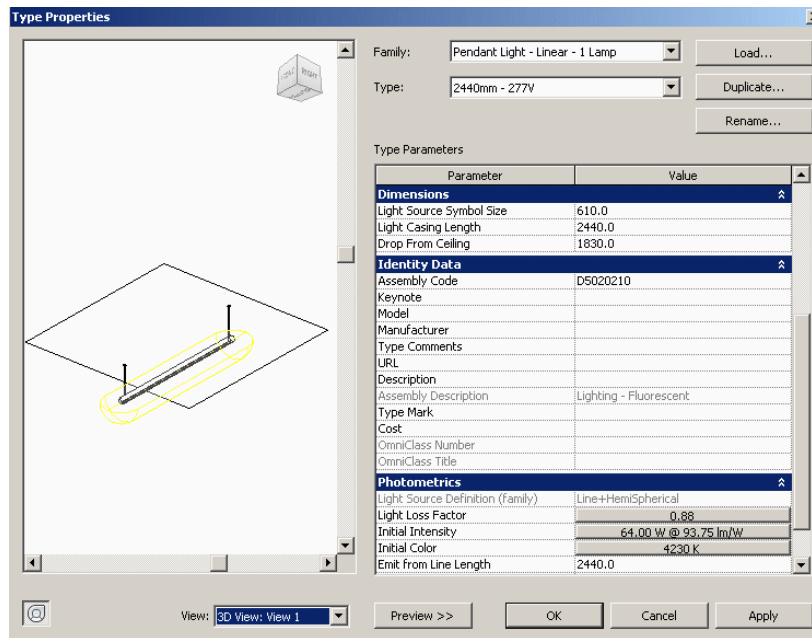


Figure 4: The type properties window shows parameter data for a pendant light fixture.

Change Management

Parametric elements that are changed in one location change in all corresponding views and locations. Warnings and flags can also be created between elements to allow managers to see element changes in any view. These warnings can be arranged into an element change report to facilitate coordination.

Leveraging Data

The Building Information Model is a database that contains manufacturer information, pricing, physical information (such as weight, size, and material finish) and electromechanical data for many of the devices in the building. Leveraging this data means that very accurate material schedules can be created from the parametric model elements and they will change automatically with visual component. Having accurate material schedules allows designers and integrators to project material usage before construction is complete and to create real-usage reports for building management after construction. Additionally, this data contained in the model can be used to identify and create manufacturer ubiquity to ease with service, or if desired, reveal opportunities for manufacturer variety.

Parametric data can be used to populate any database application and extracted to create take-offs, usage reports, and in some cases, shortcuts for photo-real rendering applications.

Value-Added Tasks

A powerful BIM adopter can turn commodity lighting level recommendations into a value-added Lighting for AV Study service, with included 3D renderings to demonstrate the need for appropriate video-teleconferencing lighting. Accurate photometric studies that are focused on AV can be marketed as added service.

The availability of building information that is inherent to the model aids in the generation of reports that may be provided to the client as value-added services. Power and heat load calculations can be converted into green AV reports. These reports can also be generated from building power usage data after the building is occupied. Because accurate usage data can be collected and stored in the Building Information Model, new value can be added to predictive usage reports.

Room drawing snapshots to accompany a training manual can be transformed into an online training manual which includes a user experience walk-through video. New usage scenarios can be explored after occupancy, and new training demonstrations can be created and sold.

Improved Coordination

With BIM, detailed information about each building component is contained within its modeled element. BIM allows all team members easy access to information, such as power consumption and weight, to verify that the building element in question will be compatible with the components of the building for which they are responsible. BIM improves coordination among team members by making design changes, and all consequences of those changes, evident and available to all users of the model and to all parametric model elements. Building element collision with AV devices can be caught early and clearly communicated to every member of the design and construction teams. Design team members stay in sync with one another's progress, leaving no trade trying to play catch up after a release.

BIM makes it possible to quickly create sections and elevations of a room without the need to create them from scratch or ask the architect to provide sketches.

The synchronized and collaborative nature of BIM allows for earlier clash detection between the numerous members of the design team. When areas of conflict are identified earlier, conflicts over space allocation are initiated and resolved sooner. Earlier clash detection therefore shortens the time required for building design and reduces costs associated with correcting clashes that were undetected during design reviews. Interference detection with BIM is as simple as identifying the elements that need to be checked and running a report. Clash detections also happen as elements are moved or added.

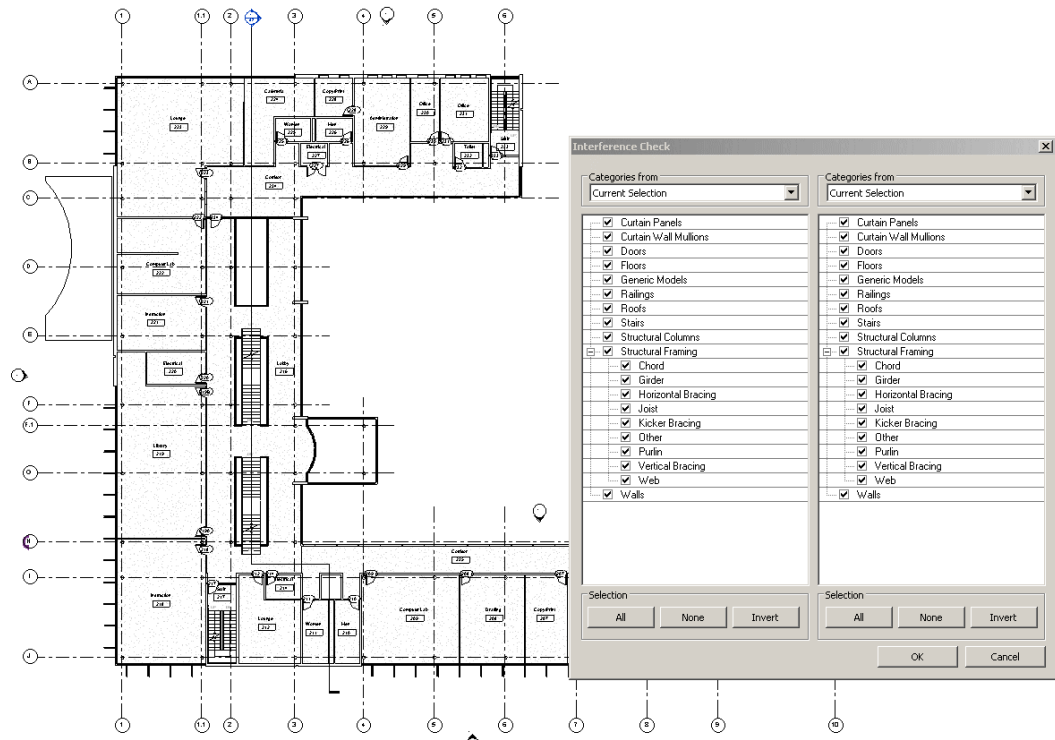


Figure 5: An interference check performed in Revit can identify conflicts earlier than past methods of clash detection.

Improved Accuracy and Efficiency

BIM affords integrators increased accuracy for quantity takeoffs. Metadata attached to objects allows for accurate counting and price modeling, improving the accuracy of bids and project pricing. Designers can enjoy receiving fewer requests for information and change orders. Integrator scheduling based on material availability and construction progress can be mapped visually. This allows project managers to quickly optimize construction schedules with ever-changing material deliveries, seasonal costs and availability.

BIM helps reduce errors and omissions (E&O) which should in turn reduce E&O claims and professional liability. A reduction in insurance costs, bonding fees and a positive impact on firm reputation should increase the number, scale and variety of opportunities available to design and integration firms.

Delivery Process Efficiencies

Design and drawing production requirements should evolve so that managers, designers and drafters spend less time developing designs and more time providing creative solutions for clients. The physical demand for the creation of multiple views of a building in 2D can be reduced to a short time with a BIM solution. A workflow shift should begin to occur in design departments following the adoption of BIM practices, moving away from lower-level drafting positions and toward the creation of more technical design positions.

Electronic reviews of every portion of the building design including equipment schedules, room views, system designs, fabrication schedules, green building information, pricing and more are possible as BIM is the single repository for all of this information. With the possibility of full electronic reviews, delivery to the client can be expedited.

Virtual conflict resolution saves time and money over traditional conflict resolution by providing a clear and automatic view of conflicting issues and a quick demonstration of the resolution paths.

Parametric Building Information Models allow for the discovery of design errors early and significantly reduce the probability of extensive redesign. Model elements that are dependent upon one another maintain their relationships throughout changes to either element. For example, an electrical outlet in a wall will remain at the correct location in the wall if the wall is moved. The cost of repairing design errors increases as the project design progresses and the earlier discovery of these errors lessens schedule overrun from redesign.

Client Satisfaction

Visual verification of design intent and knowledge sharing through Virtual Design and Construction (VDC) and BIM make for happier clients. The rapid preparation and exchange of visual information mitigates the time needed for communicating complex ideas and allows more time to be creative for your clients, which should result in repeat business and excellent references.

Ongoing Technology Management

Technology professionals can use the information in a model to schedule routine maintenance, plan special events, tie to room scheduling applications and issue trouble reports to technology service personnel. The administration of service contracts can become more predictive and less reactive. Parts replacement becomes easier and quicker and maintenance can be completed with fewer errors.

Facility Management

BIM can link data from manufacturers, construction data and communications into one fully integrated and robust facility dashboard. Facility managers can use BIM to gather usage data, prepare maintenance schedules using predictive data, manage daily operations and plan for future purchases and construction additions. Full equipment data including operating parameters, usage data, predictive data, service history, replacement price and links to other manufacturer data, combined with a fully rendered 3D depiction of the equipment creates a powerful tool for facility managers.