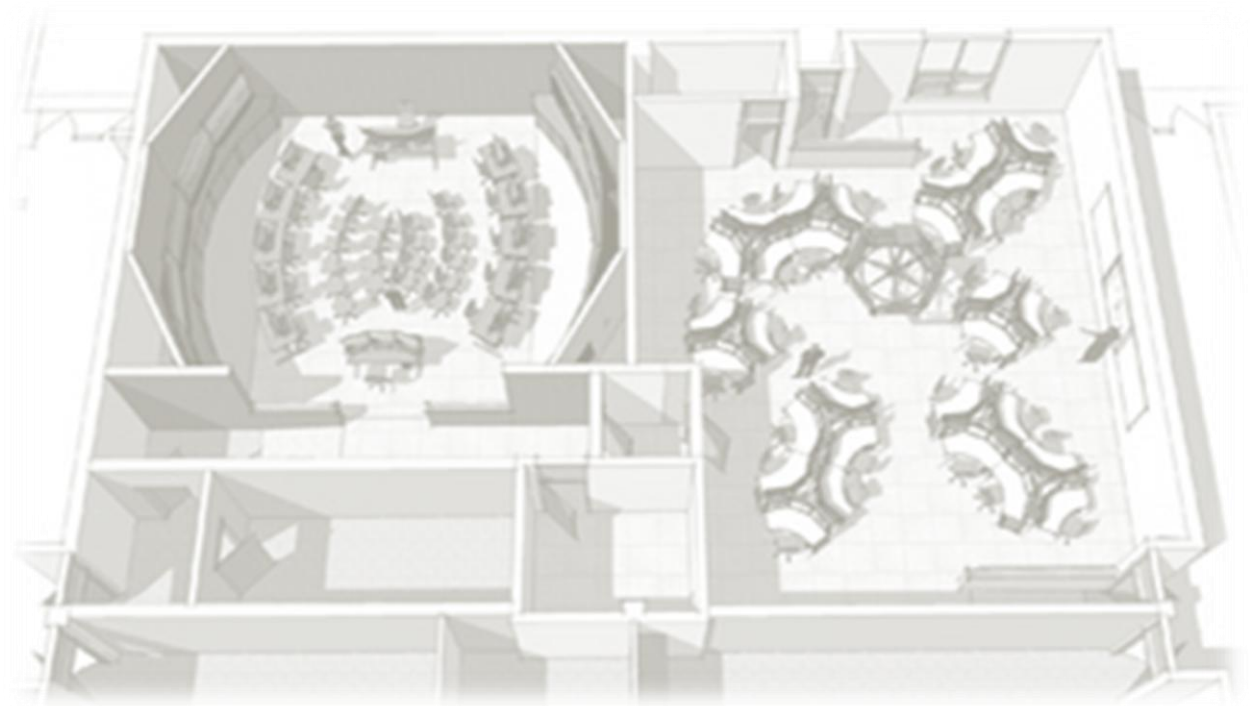


Building Information Modeling in K-12 Facilities

12th Annual Facilities/Operations Director Conference and Expo
October 5, 2010. 8:30 AM to 9:50 AM

Building Information Modeling, or BIM, is a technology that increases efficiency in facility design and construction. This session will explain how BIM can benefit your district in the design process and what you should know in order to get the most out of it. BIM will change the way you look at planning and maintaining your facilities.

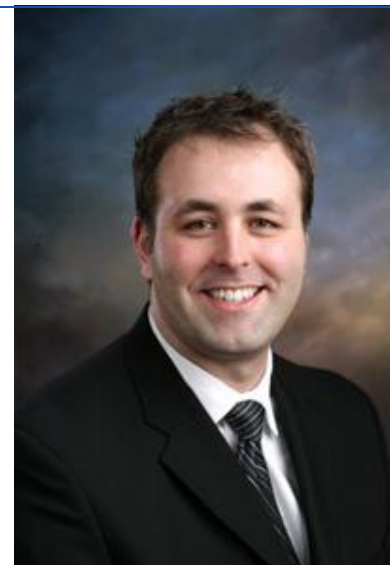


Presented By, Jon Anunson, AIA, NCARB.

BIM Coordinator, URS Corporation.

A registered architect and database programmer/software engineer, Jon has 30 years of experience in computer graphics, 3D Modeling and programming and 20 years of experience in architectural design and production. He's worked with enriching 3D design models and documents with client, design, and construction data for over 15 years, and has been an active Autodesk Revit® user since version 1.0. Jon has coordinated BIM implementations of complex architectural and engineering projects such as hospitals, airports, and secure and federal projects ranging in size up to 1.5 Million Square Feet. He consults on projects with a variety of special needs including 3D construction coordination, complex delivery methods, the utilization of IPD Protocols and model collaboration, and the integration of specialty data and computational needs. He has presented BIM concepts and techniques to various trade & industry groups, Local and Regional AIA meetings, University and Community college lectures and symposiums.

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Introduction

00:05

What is your role in educational facilities?

- Architect, Engineer, Designer
- Constructor
- Owner/Operator
- Facility manager
- Other

What is BIM?

00:15

How many facilities are in your district?

- 1-5
- 6-14
- 15-40
- More

A Technology

As a documentation technique, BIM augments the design teams ability to create *coordinated, accurate design* documentation, respond to changes more rapidly, and predict and avoid construction conflicts. The BIM model is a 3D representation of the building and the equipment and furnishings within,. Each object in the BIM Model represents an actual object, and contains information about itself, such as its relationship to other objects, its utility requirements, clearances; Even warranty and specification information can be embedded in each item so that users of the model can navigate to equipment in specific locations within the building and review a full complement of information about the object. The design then, becomes a database of objects, relationships and specifications. This database of multiple forms of information captures more design intent than traditional drawings, and creates a platform for managing work, schedule, and change during design and construction. By documenting a design in a BIM model, we create a more intelligent, and nimble facility plan that enhances the construction process, predicts conflicts before they occur, and can adapt to changes with less effort.

As a technology BIM forms a relational database of facility information that can create the backbone of a facilities management and operations process for the lifecycle of the building.

- INFORMATION model
- Relational
- 3D?
- CAD?

A Process

Creating a BIM model in the early design phases of a project creates a rich collection of information about project requirements, design intent, and building performance. BIM design places enhanced design and coordination effort for all design disciplines earlier in the design process where greater change can be affected with less cost and schedule impact. This allows designers to make more informed decisions, and test more concepts for greater benefit to the finished design. Scenarios for building layout, building performance, and construction strategy can be simulated and quantified. The construction can be more easily quantified to understand the cost impact of design options. Alternate energy, air, and lighting strategies can be tested for performance and cost. Quality and Quantity can be better understood, quantified, and evaluated by all parties involved. Better designs come from informed decisions, and the ability to more fully investigate and evaluate design concepts during the early design process.

- Collaborative
- Holistic
- Iterative
- Front-Loaded
- IPD

A Game Changer for Construction and Operations

How does a facility owner manage the building information when they occupy a new or renovated facility? A BIM-based design process creates a platform for *full lifecycle management* of a facility. We can coordinate early in the project with owners and operators to understand the management needs they'll have for their facility when in operation. These information management needs can be incorporated into the BIM database for use throughout the buildings operation. BIM models are uniquely capable of interfacing with existing *Facilities Management* software or databases. As a delivery method, URS provides the BIM database ready to support operational management per your requirements. This can include operations manuals, warranty information, maintenance schedules and other information about the building and its fixtures and equipment. An As-Built BIM model creates an excellent tool for understanding facility operations, evaluating future modifications, and as a basis for future design efforts. Combined with FM Software, this BIM database becomes part of a *live platform* that can integrate system and operational information with real work orders, maintenance requests, documentation and management, Occupancy and departmental growth planning, facility scheduling, and much more.

- Data-Centric Approach
- Basis of a new method for unifying and coordinating information, providing opportunities to improve efficiency, responsiveness, and quality.

Summary

Advantages for Operators

00:20

Have you ever had a BIM-Delivered facility project?

- None
- One
- Several
- Don't Know.

Design Advantages with BIM

During the design of the project BIM -base processes allow for more detailed collaboration between the designer and the owner, and between the design partners. Because the facility is created and shared in 3D, the coordination between disciplines is enhanced and because conversations about design can address spaces and functions in comprehensive 3D views, facility owners can have detailed feedback on the qualities of space, and design issues and tradeoffs being considered.

In addition, a BIM Database provides a much larger reservoir of design and construction information earlier in the design process. This data can be leveraged for analysis and simulation, to provide owners very early feedback on building construction and operation costs, sustainable design goals and the building efficiency, and to predict the performance of systems, thermally, acoustically, visually, and otherwise.

At the end of the design phase, by using collaborative processes based on a shared BIM database, owners can have a better coordinated set of documents that illustrate a more thoroughly considered, tested, and approved design. A facility owner can know in great detail what the building will look like, cost, perform like, how long it will likely take to build. They can also understand the specific impact of the selection of each design alternative had on this performance.

- Clarity of Communication, Interaction
- Coordination, Synergy
- Documentation
- Analysis (LEED?)

Construction Advantages with BIM

Once the design has been documented in BIM, there are further opportunities to leverage the BIM model for construction. With a collaborative environment based on shared BIM Data, design partners can provide a platform for construction partners to find further efficiency in the construction process. The model can be analyzed for constructability, and construction data like scaffolding, cranes and delivery can be added to the database. Issues like sequence and staging can be visualized and planned in detail. Time (4d) and Cost (5d) data can be added to the BIM Database to analyze the cost and sequence/speed of construction. This analysis will allow the constructor to reduce field costs such as on-site storage,

enable just-in-time delivery of construction materials, and provide for a safer, better planned work site, all of which allow for significant savings. The 4D (time analyzed 3d) model also becomes a tool to track project process, identify schedule issues very early, and address them to keep construction on pace. The 5d (Cost analyzed 4d) model provides the same tracking / oversight ability for material costs.

Fabrication drawings can be added to the model in 3D, reducing the possibility of conflicts during installation in the field. 3D shop-drawing procedures further reduce waste and errors, and reduce owner liability for in-field change orders due to conflicts in installation or clearance issues.

As a change management engine, the BIM Model remains useful throughout the construction process, ensuring accurate assembly and installation, coordinated construction, and compliance to design documents. At the end of the construction process the well-maintained construction model is a digital document that represents the construction as-built, including the steps in construction that created the facility.

- Coordination
- Just -In-Time
- Schedule Tracking
- Verification
- Overall Efficiency

How do you manage facility & Maintenance information now?

- Paper, Files
- Digital Files, Spreadsheets
- Database
- FM Software

FM Advantages with BIM

With an as-Built BIM model, owners now have a facility management tool that is far more detailed and useful than 2D drawings. Because a BIM is a database, direct data about individual elements in the building is much more accessible. The BIM Database can be accessed directly, or converted into an FM (Facility Management) Database, where work orders and office assignments can be managed based on accurate 3D information on the facility. Through the lifecycle of the building, the accurate As-Built BIM model is a tool that can be used for maintenance and alterations to the facility, as well as to test and manage operational alternatives, even to validate systems commissioning.

Throughout facility design and construction, the use of BIM technology encourages collaboration, enhances coordination, and provides better tools to predict performance and manage change

- Inventory
- Moves, Occupancy, Scheduling
- Maintenance, Tracking, fulfillment
- Organization, Filing, paperwork, Warranties

Summary

How Can BIM work for you?

00:25

What concern do you think BIM may BEST help Solve for School systems?

- Maintenance costs
- Filing, Organization
- Optimal Design (efficiency & Performance)
- Decrease construction costs

How to ask for BIM that pays

BIM Technology and delivery procedures are still evolving rapidly. There are many options in the market for partial standards for delivery, but they are still developing as quickly as the technology and techniques. The most important factor is to understand what, specifically, your end use for BIM data will be. Only when you can define how you'll use BIM data can you be sure you're asking for the elements you can use. Because of the database structure of a BIM model, The end format and data points that will be included can significantly affect the process of creating the database. This means that

defining your requirements early will likely be much more cost effective than adding requirements later in the design process.

- Did you ask for it?
- What are your capabilities?
- What needs do you want to address?
- Can your AEC team deliver?
- Existing Standards:
 - [COBIE](#) = Construction Operations Building Information Exchange
 - [CIS/2](#) = CIMsteel Integration Standards (structural Steel Only)
 - [Penn State BIM Delivery Standard](#)
- [NBS National BIM Standard](#)
- Your Own Requirements
 - AIA [IPDG](#) and [E202](#)
 - [Model Progression Matrix](#)
- What processes will you use to manage BIM data after construction?
- What processes will benefit?
- How will you verify that deliverables will meet your needs?

How to utilize your BIM when the facility is done

Autodesk Revit stores a BIM in an [ODBC](#) format, and exports to a variety of other file types. This means that you can mount a Revit file as a data source and/or export the database to Excel or Access, SQL Server, or any other database program. Many Facilities management software applications, like [FMS](#) and [Archibus](#) will read data directly from a Revit model to create a new facility entry in a facility management system. Revit will also output rich 3D BIM data to free viewer formats like [IFC](#)(from [buildingSMART](#)), [DWFx](#), [PDF](#) and [VRML](#).

- You don't have to invest in software
- You don't have to invest in computer hardware
- You do have to have a plan
- You do have to know your data is good.

Summary

Building Information Modeling in K-12 Facilities - Why?

00:05

Opportunities to increase value, reduce cost, and improve facility performance

A Better Design Process

A Better Construction Process

Tools to manage Facilities and Maintenance

Leverage for the future

Summary

Q&A

00:10

NOTES