

crunch
'n learnsm

eVisolutions

An Introduction to Building Information Modeling

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Professional Education for the Security Industry

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- Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Course Description

Building Information Modeling (BIM) is revolutionizing design processes through the construction industry, and security is no exception. Just as Computer Aided Design (CAD) represented a sea change in how drawings are produced and shared, BIM, with its 3-D modeling capabilities, will deliver an equivalent or greater impact to the industry. This course presents a basic grounding in the technology and its benefits, potential applications in security, and likely implementation issues.

Learning Objectives

At the end of this program, participants will be able to:

- Understand BIM Basics & the Benefits
- Describe how BIM can be used as a communication and collaboration tool, and its contributions to Scheduling, Estimating, and Facility Management .
- Manufacturers BIM Objects
- Explain the process of implementing BIM and how BIM-based designs for Structural, Mechanical, Electrical, Plumbing, Communications, Security, Fire Protection fit into the overall Construction Document fabric

- BIM is a huge buzzword in AEC Industry. It shows up in magazines; there are multiple conferences a year about it; software developers headline their products as BIM tools.

- What is it?
- How is it different?
- Why should you care about BIM?



What is BIM?...BIM Defined..

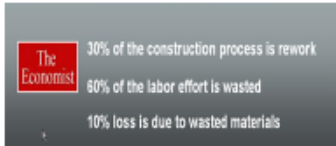
- An Elegant Definition**
 - BIM: An Intelligent Simulation of Design Intent
- A More to the Point Definition**
 - Moving From 2D Drawings to 3D Models That Carry Intelligence/Data
- A Technical Definition** (National BIM Standard Definition of BIM – buildingSMART)

A Building Information Model (BIM) is a digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle from inception onward.

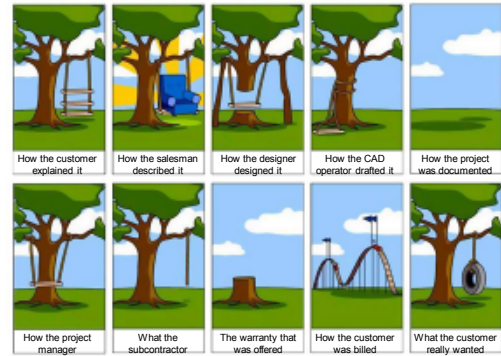
The National BIM Standard is part of the global buildingSMART Information Delivery Manual Initiative.

Wikipedia: **Building information modeling** (BIM) is the process of generating and managing building data during its life cycle

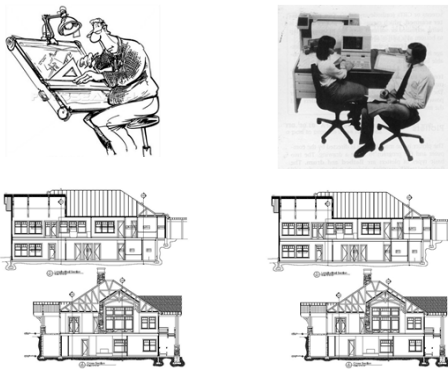
The Problem..



- In North America construction is the only industry that has seen a consistent decline in productivity over the past 40 yrs
(US Dept. of Commerce, Bureau of Labor Statistics)



The past...

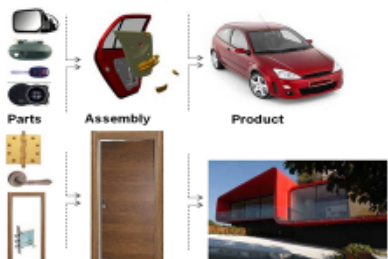


Learning from Others



- We design and build a project and then turn it over to client to manage and in any other industry our finished product would be called a **Prototype**
- We can now build the **Project Twice** through a BIM/VDC process
— **Once Virtually and Once in the Field**
- The Benefits of BIM/VDC are tremendous for the project team just due to the enhanced information that can now be reviewed well before construction even begins.

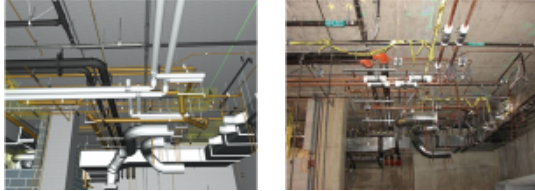
From manufacturing to AEC



Now...



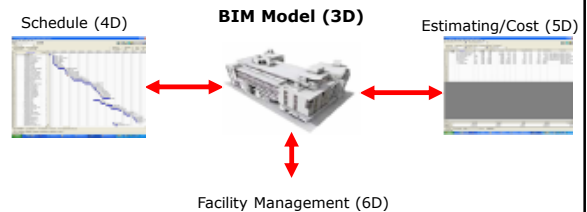
Build the Project TWICE



13

What BIM is and Why is it Different?

- For most of history design and construction of building has relied on drawings for representing the work to be done.
- BIM involves representing a design as objects
- Modern BIM design tools go further.



What is a BIM? - Lifecycle Information View



Big Trends

Building life cycle: DBO

More integrated supply chain

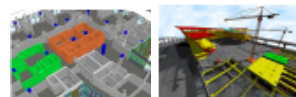
Dramatic technological change



BIM BENIFITS

• PRECONSTRUCTION BENEFITS TO OWNER

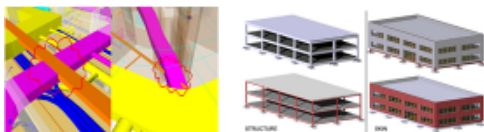
- Concept, feasibility, design benefits
- Increased building performance and quality
- Near instant material takeoffs



BIM BENIFITS

• DESIGN BENEFITS

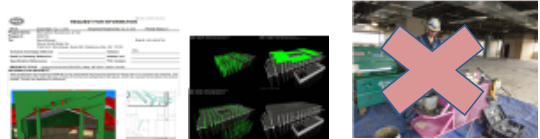
- Earlier and more accurate visualization of a Design
- Automatic corrections when changes are made to a design
- Generate accurate and consistent 2D drawings at any stage of the design
- Earlier collaboration of multiple design disciplines
- Check against design intent
- Extract Cost Estimates during design
- Improve energy efficiency and sustainability



BIM BENIFITS

• CONSTRUCTION AND FABRICATION BENEFITS

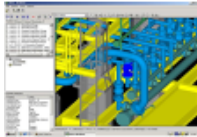
- Synchronize design and construction planning
- Discover design errors and omission before construction
- React quickly to design or site problems
- Use design model for fabrication components
- Synchronize procurement



BIM BENIFITS

- POST CONSTRUCTION BENEFITS

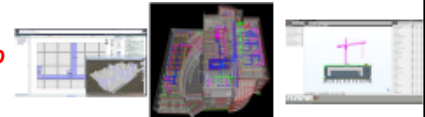
- Better manage and operate facilities
- Integrate with Facility operation and management systems



BIM SOLUTIONS

Software

- Dprofiler
- Onuma
- Autodesk Revit
- Tekla
- Bentley
- ArchiCAD
- CAD Duct
- CAD Pipe
- QuickPen
- AutoSPRINK



BIM Extraction

- Vico Software
- Autodesk QTO
- EcoDomus



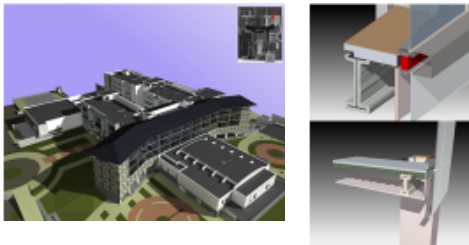
BIM Coordination

- Autodesk NavisWorks
- Tekla BIMsight
- Solibri



BIM PROJECT EXAMPLES – LAUSD Central High School

- Goal - coordination
- 3d details of areas of concern
- Navisworks was uses the collaborative platform



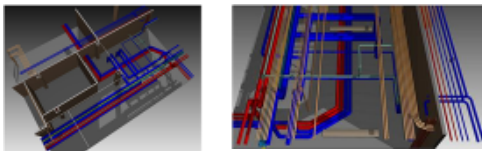
BIM PROJECT EXAMPLES - Turtle Creek Casino

- Goal - coordination
- responsible for all piping, plumbing, electrical modeling
- Navisworks was used as the collaborative platform

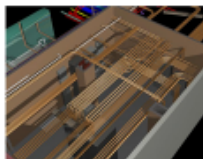


BIM PROJECT EXAMPLES - Turtle Creek Casino

- Piping and Plumbing



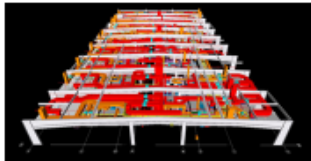
- Electrical



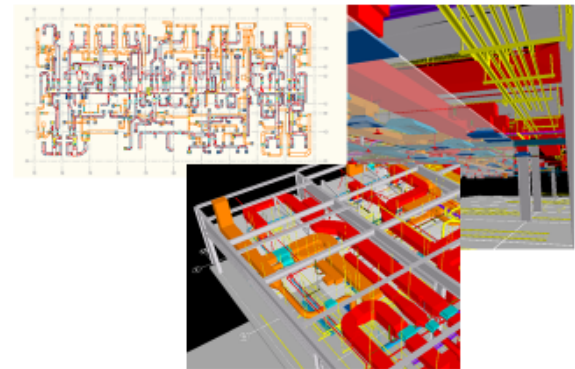
BIM PROJECT EXAMPLES - Turtle Creek Casino

- Navisworks reports and clashes were discussed at coordination meetings

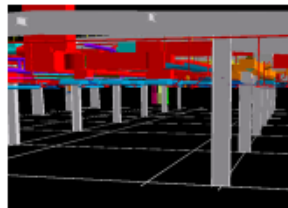
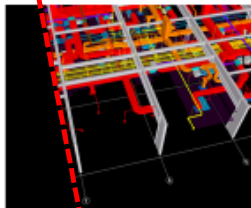




- Modeled all structural, and complex systems for coordination



Section cut the model anywhere



- Section cut in any direction, top, bottom, left, right
- Easier to view and discuss isolated area

Clash Detection

| Name | Status |
|--------------|--------|
| HVC vs BL | OK |
| HVC vs PP | OK |
| HVC vs WED | OK |
| HVC vs PLUMB | OK |
| HVC vs PCF | OK |
| HVC vs BL | OK |
| HVC vs PP | OK |
| HVC vs WED | OK |
| HVC vs PLUMB | OK |
| HVC vs PCF | OK |
| PLUMB vs BL | OK |
| PLUMB vs PP | OK |
| PLUMB vs WED | OK |
| STR vs BL | OK |
| STR vs PP | OK |
| STR vs WED | OK |
| STR vs PLUMB | OK |
| STR vs PCF | OK |

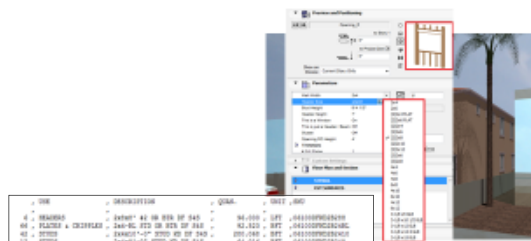
- Clashes run trade versus trade



- Results highlighted, plumbing – HVAC clash

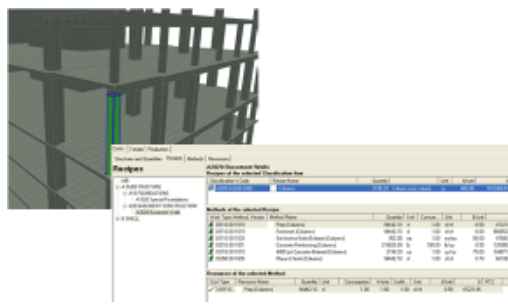
BIM Project Examples – Residential Home Builder

- owner, interest in BIM
- Goal - savings in production & estimating
- Solution - developed smart objects to aid in CD production and estimating

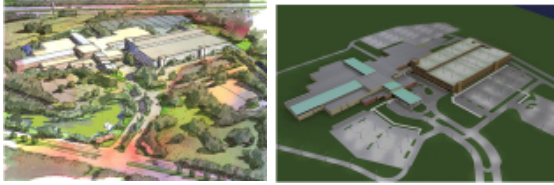


BIM PROJECT EXAMPLES - Four Seasons

- owner, interest in preconstruction costs
- Goal - savings in production & estimating

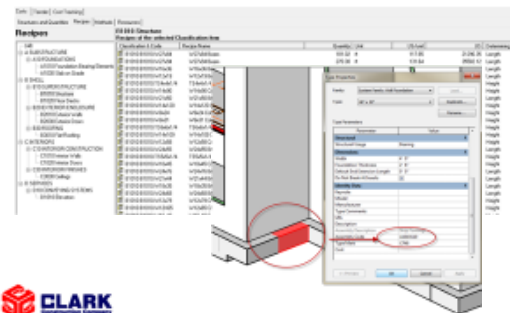


BIM PROJECT EXAMPLES - Firekeepers Casino



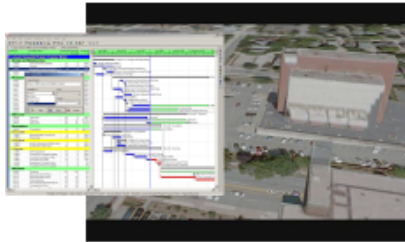
BIM PROJECT EXAMPLES – Firekeepers Casino

- Model information tied to a database



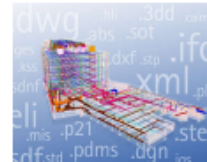
BIM PROJECT EXAMPLES – Ann Arbor City Hall Expansion

- Used Revit + Google Earth, showing model at different stages in construction (4D)
- Image taken from Google Earth (sketchup models)



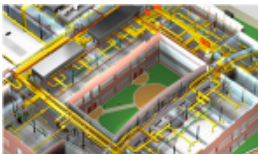
The Common Misunderstandings

- THERE IS NO SUCH THING AS A MASTER MODEL!!!** What this means is you will never have one model that encompasses all of the detail each of the individual project team members have in their stand alone models used from design to fabrication. Each Project will have a **FEDERATED Model**
- Each team member should use those applications that work best for their scope of work.
- You Don't need to all be in the same software to collaborate. Technology now allows for work to be done on the same model by various team members all over the globe.



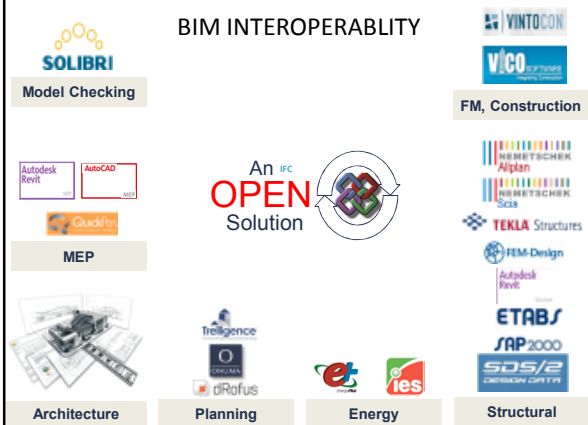
BIM INTEROPERABILITY

- Collaboration between the disciplines that come to play in the design, production, construction and management of buildings.
 - The most important (but not the only) technology vehicle for collaboration is IFC-based information exchange



<http://www.buildingsmart.com/>

BIM INTEROPERABILITY



BIM INTEROPERABILITY

- IFC (Industry Foundation Classes)
 - <http://www.buildingsmart.com/bim>
- COBie (Construction Operations Building Information Exchange)
 - <http://www.wbdg.org/resources/cobie.php>
- NBIMS (National BIM Standard)
 - <http://www.buildingsmartalliance.org/index.php/nbims/>
- Green Building XML (gbXML)
 - <http://www.gbxml.org>

BIM MANUFACTURERS OBJECTS

- Adoption of BIM is driving the migration of A/E/C to 3D CAD platforms where advanced visualization, simulation, and analysis software tools have pushed the product selection process earlier than ever before.
- Now, manufacturers have begun to create high-quality, digital product models that contain an array of useful product information and performance characteristics, and are fully compatible with the BIM process. Giving manufacturers an opportunity to influence the product selection process and increase the odds that design professionals will specify your products into designs—a *potentially tremendous competitive advantage*.

BIM MANUFACTURERES WEBSITES

Websites with modeling objects being leveraged today:

- <http://seek.autodesk.com/>
- <http://smartbim.com/SmartBIMObjectFinder/ObjectFinder.aspx?area=2>



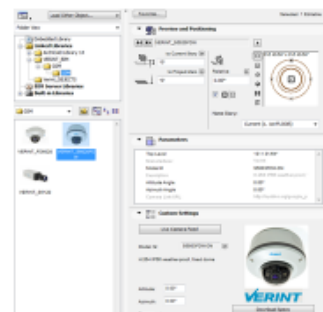
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| 07.00.00 General Requirements |
| 08.00.00 Concrete |
| 09.00.00 Masonry |
| 10.00.00 Metals |
| 11.00.00 Wood, Plastic, and Composites |
| 12.00.00 Thermal and Moisture Protection |
| 13.00.00 Openings |
| 14.00.00 Finishes |
| 15.00.00 Equipment |
| 16.00.00 Furnishings |
| 17.00.00 Special Construction |
| 18.00.00 Carpentry Equipment |
| 19.00.00 Fire Suppression |
| 20.00.00 Plumbing |
| 21.00.00 Heating, Ventilating, and Air Conditioning (HVAC) |
| 22.00.00 Integrated Automation |
| 23.00.00 Electrical |
| 24.00.00 Communications |
| 25.00.00 Electronic Safety and Security |
| 26.00.00 Earthwork |
| 27.00.00 Exterior Improvements |
| 28.00.00 Utilities |
| 29.00.00 Transportation |
| 30.00.00 Structures and Marine Construction |
| 31.00.00 Process Integration |
| 32.00.00 Material Processing and Handling Equipment |
| 33.00.00 Process Heating, Cooling, and Drying Equipment |
| 34.00.00 Process Gas and Liquid Handling, Purification, and Storage Equipment |
| 35.00.00 Pollution Control Equipment |

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| 25.00.00 Electronic Safety and Security |
| 25.05.00 Common Work Results for Electronic Safety and Security |
| 25.05.10 Conductors and Cables for Electronic Safety and Security (1) |
| 25.05.13 10-City Communications Conductors and Cables (1) |
| 25.05.15 16-Axis Control Communications Conductors and Cables (1) |
| 25.05.17 18-Axis Detection Communications Conductors and Cables (1) |
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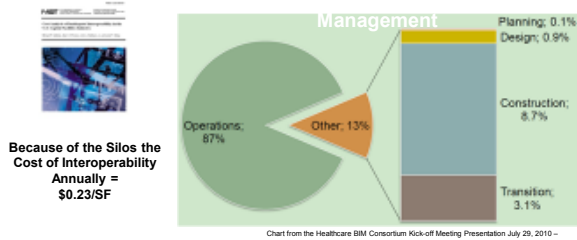
BIM MANUFACTURERES EXAMPLE

| | |
|-------------------------|--|
| Model Number - RF 5-320 | |
| Types/Specifications | |
| Ammonium | 32 LCD type, 32 ADE type |
| Application | Fire |
| Depth | 1.5-2.0" (38-51mm) |
| Electrical | 1.5-2.0" (38-51mm) |
| Height | 1.5-2.0" (38-51mm) |
| Humidity Range | 80% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F) |
| Industry Standards | UL 864, UL 864C, UL 864D, UL 864E, UL 864F, UL 864G, UL 864H, UL 864I, UL 864J, UL 864K, UL 864L, UL 864M, UL 864N, UL 864O, UL 864P, UL 864Q, UL 864R, UL 864S, UL 864T, UL 864U, UL 864V, UL 864W, UL 864X, UL 864Y, UL 864Z, UL 864AA, UL 864AB, UL 864AC, UL 864AD, UL 864AE, UL 864AF, UL 864AG, UL 864AH, UL 864AI, UL 864AJ, UL 864AK, UL 864AL, UL 864AM, UL 864AN, UL 864AO, UL 864AP, UL 864AQ, UL 864AR, UL 864AS, UL 864AT, UL 864AU, UL 864AV, UL 864AW, UL 864AX, UL 864AY, UL 864AZ, UL 864BA, UL 864BB, UL 864BC, UL 864BD, UL 864BE, UL 864BF, UL 864BG, UL 864BH, UL 864BI, UL 864BJ, UL 864BK, UL 864BL, UL 864BM, UL 864BN, UL 864BO, UL 864BP, UL 864BQ, UL 864BR, UL 864BS, UL 864BT, UL 864BU, UL 864BV, UL 864BW, UL 864BX, UL 864BY, UL 864BZ, UL 864CA, UL 864CB, UL 864CC, UL 864CD, UL 864CE, UL 864CF, UL 864CG, UL 864CH, UL 864CI, UL 864CJ, UL 864CK, UL 864CL, UL 864CM, UL 864CN, UL 864CO, UL 864CP, UL 864CQ, UL 864CR, UL 864CS, UL 864CT, UL 864CU, UL 864CV, UL 864CW, UL 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864ZZ |

BIM MANUFACTURERES EXAMPLE

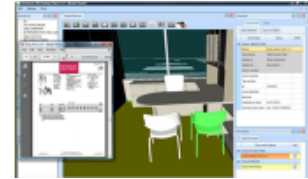


Life Cycle Benefit



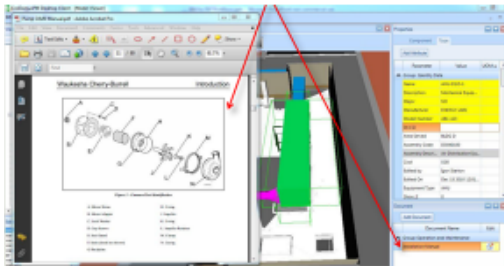
Real Life BIM / FM Business Cases

- Maintenance Work Order Management
- Emergency Service Request / Disaster Recovery
- Energy Systems Analysis / "Greening of Facilities"
- Visual Work Orders
- Leasing Preconstruction and Analysis
- Visual Inventorying / Asset reconciliation
- Facility Condition Assessment
- Life Safety Assets Inspections



Maintenance Work Orders

- Maintenance Work Order Management: equipment's corresponding documents are attached and can be accessed immediately



Facility Data That Could Be Included in BIM

- | | |
|---|---|
| <ul style="list-style-type: none"> • Planning scenarios and site information • Architectural program • Floor plans • Space functions • Classified areas, vaults etc. • Area calculations • Volume calculations • Engineering calculations • Specifications • Contract documents • Legal description • Change orders • Supporting documentation for litigation • Shop drawings • Procurement documents • Progress photographs • Alarm diagrams • Warranty data | <ul style="list-style-type: none"> • Invoices • Purchase requests • Cost Estimates • Organizational occupants • Personnel lists • Seating plans • Handicap designation • Network diagrams • Hazardous materials • Operating manuals • Maintenance records • Inspection records • Electronic 3D model • Simulations • Continuation of operations plans • Disaster Recovery Plans • Contingency plans • Furniture inventory |
|---|---|

BIM APPLICATION DEMO - ArchiCAD

BIM APPLICATION DEMO - Navisworks

How Do We Begin Using BIM in Our Company?

- Form a dedicated group to take responsibility
- Outsource and observe the process
- Evaluate software, most have free trials
- Start small, pick a project
- Make a simple plan, stick to it
- Leadership commitment

Need to Have a Plan

It's All about PLANNING:

to get exactly what you need when you need it "No More No Less"



- Establish Who is to Model What and When
- Outline the LOD throughout the process
- Create the Execution Plan and then Manage it

BIM Guides



Getting Started: Reading

GSA BIM Guide

<http://www.gsa.gov/portal/category/21062>

NBIMS – National BIM Standard

<http://www.buildingsmartalliance.org/index.php/nbims>

Digital Building Lab @ Georgia Tech

<http://bim.arch.gatech.edu/>

AECbytes

<http://www.aecbytes.com/index.html>

Getting Started: Software

Autodesk

<http://usa.autodesk.com/building-information-modeling/>

Graphisoft

<http://www.graphisoft.com/products/archicad/>

Bentley

<http://www.bentley.com/en-US/Solutions/Buildings/About+BIM.htm>

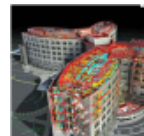
Tekla BIM Sight

<http://www.teklabimsight.com/>

Some Final Important thoughts on BIM

- BIM is not just a 3D package it is an Overall Process
- BIM gives power back to designers.
- BIM means a complete set of information, not just a single drawing.
- The more mature the model the more usable it is – but any collected data is better than how we do business today
- Some BIM models are not currently interchangeable between BIM software packages.
- BIM addresses the complete life-cycle of a project.
- Higher Quality Designs - Enhanced Coordination & Interference Checking
- Better Estimates - Accurate Quantity take-offs
- Consistency in product - Integration of standards models and materials
- Cost Savings
 - Lower RFI's
 - Fewer Amendments
 - Reduced Construction Change Orders
 - = **Better Buildings**

"In 10 years, we will be living in a BIM world. It's our new reality."
Cosima Crawford
Chief Engineer
New York City Transit Authority



BIM Accomplishes

- Reduction in field changes, tightened subcontractor bids, and improved information flow throughout the design and construction process.
- Clarity in design communications based on BIM visualization platforms. Three dimensional presentations of information allow everyone to see the project components and how they work together. This quickly and clearly conveys ideas and intent.
- Higher quality design that is not delayed during construction because of rework.
- = **Better Built Buildings**

"In 10 years, we will be living in a BIM world. It's our new reality."
Cosimo Crawford
Chief Engineer
New York City Transit Authority



crunch
'n learn

This concludes
Introduction to BIM
CNL1111T4S1

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Professional Education for the Security Industry

