

From Concept through Construction: Real-World Construction Management Techniques and Best Practices with Autodesk® Revit®

Ken Stowe - Autodesk
and Mike Juros (Co-Speaker)

AB314-2P Revit is far more than a design tool! This panel will discuss and provide real-world “concept-through-construction” examples and solutions, including:

- Best practices for model creation and sharing between design teams and the builder
- Best practices and important items to consider when the model is made by the builder
- Helping every project construction stakeholder understand the scope of the project, from cost to constructability to sustainability, and beyond
- Real-world examples for producing a reliable, computable database including tools for integrating with existing estimating software
- Learning how to migrate, mitigate, and integrate building information modeling (BIM) data across a number of formats for 4D construction visualization, planning, logistics, and execution

While technical best practices are evolving, competitive business advantages are being called “monumental” by the Associated General Contractor’s BIM Forum. This presentation will help you make informed career decisions and help lead your company in the right direction as BIM takes its place on the world construction stage!

About the Speaker:

Kenneth is a construction technology expert at Autodesk. His team is responsible for combining the company’s AEC Division with construction business development and strategy initiatives for North America, creating a partnership between product development and the construction community. This partnership also provides Autodesk’s Consulting Services teams with project management and construction expertise. Kenneth has experience in project estimating, scheduling, purchasing, field engineering, site supervision, and project management. He has also served as project executive on a multitude of assignments in industries ranging from hospitality, retail, and medical to a \$1.4-billion Disney theme park in Paris, France.



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AB314-2P “From Concept to Construction: Real-World Construction Management Techniques and Best Practices with Autodesk™ Revit™”

While the technical “Best Practices” are evolving, the **competitive business advantages for builders** are being called “monumental” by the Associated General Contractors of America’s BIM Forum. This presentation will help you to make informed career decisions and allow you to help lead your company in the right direction as BIM takes its place on the world construction stage!

Revit is far more than a design tool!



THE PANEL – Five Innovative Builders and Five Construction Management Techniques

This panel will discuss and provide examples and solutions across a number of “concept through construction” scenarios:

Construction Visualization – Logistics and 4D Sequencing – *Chris Tschirhart of JE Dunn*

Model-to-Cost Integration – Quantities from Revit and Preconstruction Services – *Darin Peters of Hathaway Dinwiddie*

Model-Sharing with Designer and Builder - A New Level of Teamwork – *Jan Reinhardt of Turner*

Prefabrication with Confidence – Rethinking the Process – Detail, Fit, Lean – *Ken Bracken of GE Johnson*

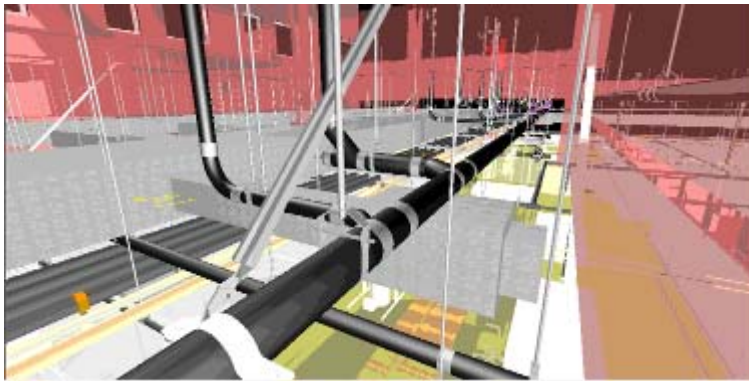
Coordinating and Executing in the Field - 3D Clash Detection and 4D – *Dan Russell of Sundt Construction*

Moderator: *Ken Stowe – Autodesk’s AEC Division- Construction Business Development*

What are owner's saying that they want from BIM?

“As an Owner, I would like to see improved cost certainty and predictability, and muted or controlled cost inflation as an outcome of improved design and information management (with BIM), wider intra-project collaboration, improved scheduling, production management and controls, and reduced waste.”

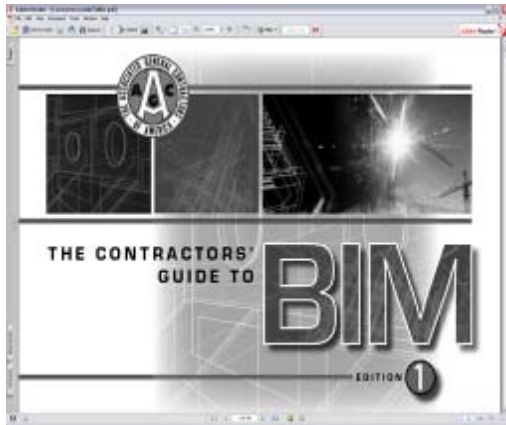
Michael Bade, UCSF, VP of Facilities - At the BIM Summit, Aug. 23, 2006, UCSF Mission Bay



Many teams are just scratching the surface, but this is how Revit is starting to improve the performance of project teams:

- **BIM allows the team to better communicate** with powerful light models on free 3D viewers, creating unprecedented communication with all stakeholders.
- **BIM makes coordinated documents** easier and more affordable to achieve.
- **BIM allows the team to produce a reliable, computable database** with tools for integration with existing estimating, energy, light/shadow and other systems.
- **BIM allows the team to produce 4D construction visualization** for better construction planning, logistics, and execution.
- **Designer-Builder collaboration with BIM invites *lean digital teamwork*** to support owner decisions around scope, cost and sustainability.
- **BIM allows for clash management**, allowing the team to save time and money by prefabricating confidently and avoiding costly delays and rework in the field.

What are builder's saying that they get from BIM?



“The use of BIM, for those who react quickly, will propel them beyond their competition in monumental proportions.”

The Associated General Contractors of America - Contractor's Guide to BIM

Construction Visualization – Logistics and 4D Sequencing

Chris Tschirhart of JE Dunn



Quotes from various building JE Dunn trainees after 4 days of Revit (in Construction) Training

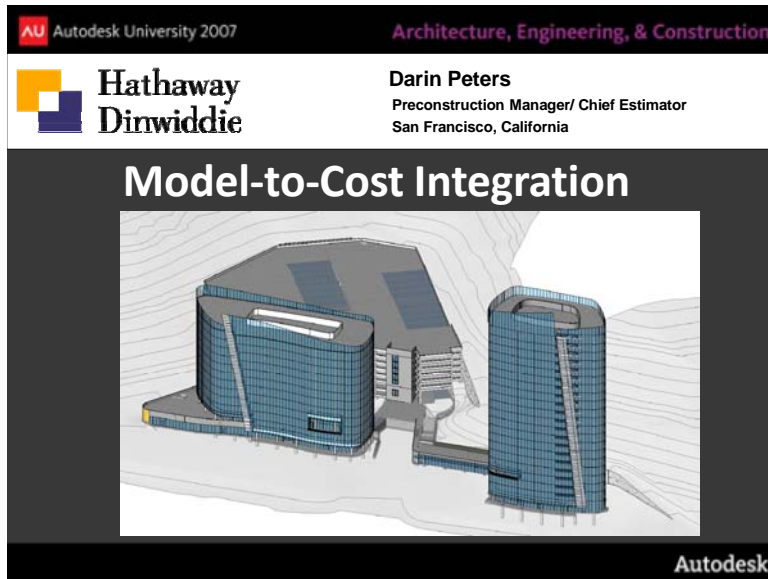
- “This will save us money on our self-performed work.”
- “This gives us fast, accurate quantities for estimating.”
- “We should use this on all design-build work.”
- “This makes the owner’s job so much easier when it comes to making decisions.”
- “It’s a communication tool, and a great one.”
- “This is 100 times better than what we’ve been using for site logistics planning.”

About JE Dunn:

Acquisitions rounded out the team today known as the JE Dunn Construction Group: six operating companies supporting 17 offices located coast-to-coast. In 2006, we were ranked as the 5th largest general building company in the United States based on revenues of \$2.3 billion in 2005.

Model-to-Cost Integration – Quantities from Revit and Preconstruction Services

Darin Peters of Hathaway Dinwiddie



Process:

Created a Construction Model based on a Design Concept.

Validated modeling assumptions with project team .

Exported quantities of materials from Revit and develop into trade “worksheets”

Created Scope packages including quantity surveys for subcontractors.

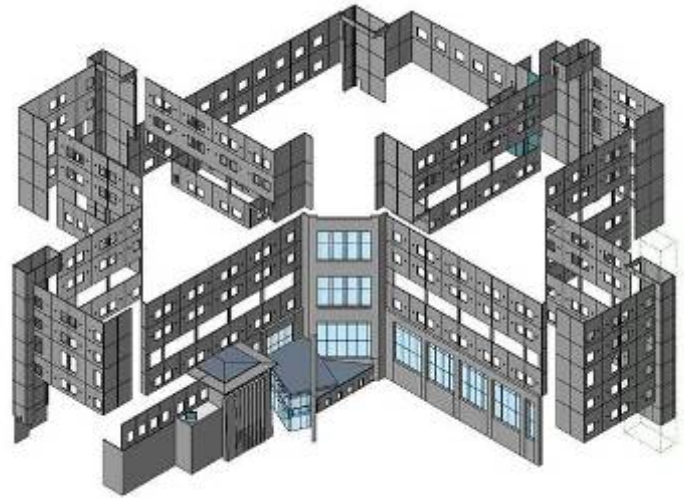
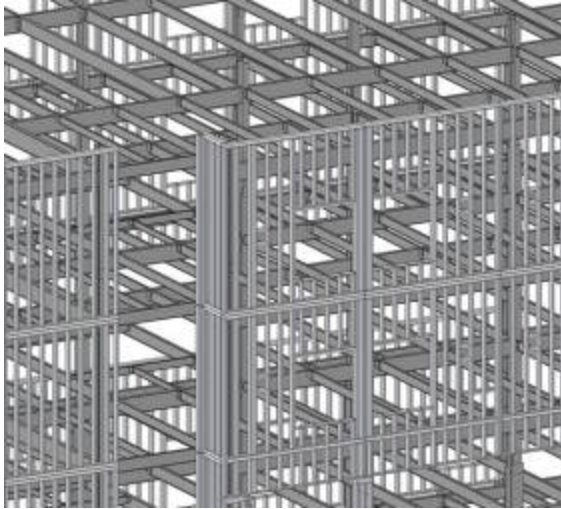
Created cost estimate using worksheet scope and quantity information.

The Construction Model was continually developed with the progressing design to ensure timely value engineering and constructability reviews.

Progressive design information such as bedrock profiles and water table elevation profiles were continually updated in the model, providing more accurate pier, slide repair, debris basin, and retaining wall estimates.

We continued to find new ways to improve wall design, off-haul efficiency and construction method efficiency throughout the design process.

Darin Peters (continued)



Results:

Hathaway Dinwiddie views Revit as an opportunity to “build” the project in a computer model during conceptual design, far ahead of building in the site.

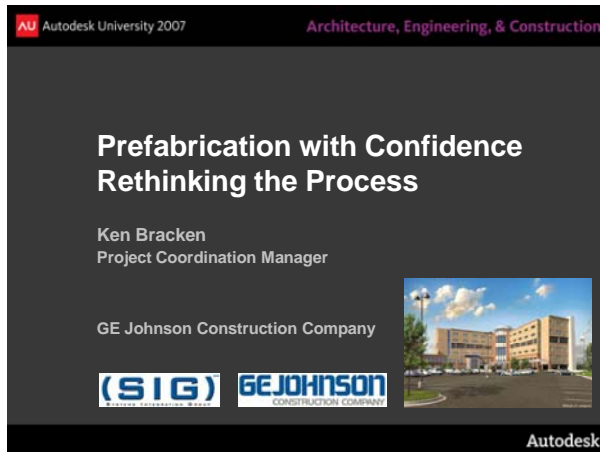
Our company uses the software to develop a quantifiable set of design assumptions for cost modeling that can be managed throughout the design documentation process.

The software facilitated the visualization of complicated design issues. Solutions were then developed, quantified, priced and communicated to the design team in a matter of hours versus weeks.

Revit has become a valuable tool on all of our base building and large scale interiors projects over the last 3 years of using it. We couldn't imagine trying to do a project like this without the benefits of BIM technology.

Prefabrication with Confidence – Rethinking the Process – Detail, Fit, Lean

Ken Bracken of GE Johnson



Project Challenge:

- 500,000 sf new hospital for Centura Healthcare in Colorado Springs, Co.
- \$137m contract value
- GE Johnson was CM/GC at risk
- Self-performed concrete, exterior stud framing, rough carpentry and miscellaneous metals

Planning

- Define project scope and panel variety
- Discuss panel tolerances
- Identify and pre-plan panel supports
- Assign stud types based on design team specifications
- Collaborate with project team to determine panel numbering system
- Complete key plans for approval by project team
- Detail sample of panel types for review by project team
- Develop production schedule consistent with construction schedule

Ken Bracken of GE Johnson (continued)



Results

The Reactions of the People Involved:

At first some were skeptical but after the system proved its self the project team found it to be invaluable.

Benefits:

- Seven figure savings to owner
- Self-performed fee enhanced
- Improved Quality – controlled environment
- Eliminated scaffold
- Made budget possible
- Schedule Efficiency – Allowed early building enclosure and early interior start



Model-Sharing with Designer and Builder - A New Level of Teamwork

Jan Reinhardt of Turner

Project Team and the Decisions to go with BIM

- ***Collaborative approach***
- ***Mirror General Contractor***
- ***Encourage Design Team to share models***
- ***Appreciate and enable subcontractors***
- ***Don't do everything that you can do, but involve design team and subcontractors***
- ***Provide the environment for sharing information***



The Reactions of the People Involved:

- ***Week 1 – This will never work?***
- ***Week 3 – The system is working?***
- ***Week 5 – Where can we buy NavisWorks?***
- ***Week 7 – Can we do more projects with you?***

RESULTS:

- ***Trusted Models***
- ***Consistent Results***
- ***Near zero coordination issues in the field***
- ***Consistent Results***



Jan Reinhardt – Turner (Continued)

About Turner

Turner provides building services to institutions who recognize the value of a partner who works diligently and creatively to find the best possible solution for each particular project.



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With construction volume of \$8.6 billion in 2006, Turner ranks first or second in major segments of the construction industry. Turner maintains a nationwide network of offices and a staff of more than 5,700 employees, performing work on over 1,600 projects each year.

Techniques and Functionality Needed

Software Used and the Tips and Tricks Utilized

Tools and Tips

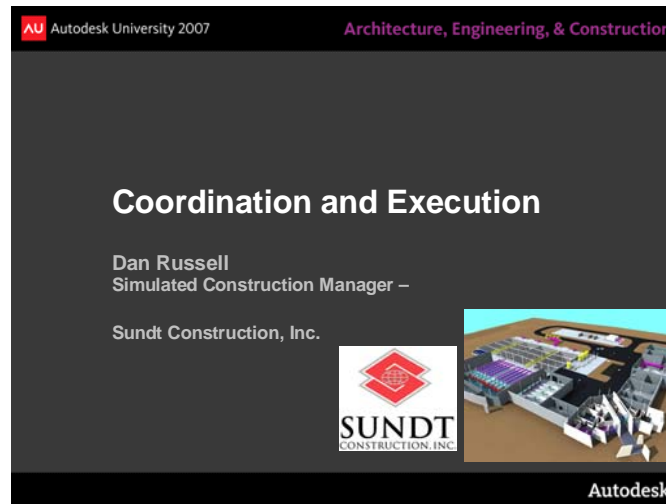
- ADT, ABS, Revit, SprinklerCAD, QuickPen
- NavisWorks
- Custom Clash Report Generator

- Kick off meeting, and charter for project
- Buy in of all participants

- Trade Secrets: Eliminate excuses not to collaborate
 - Transparency
 - Simplicity
 - Efficiency
 - Protocol
 - Accountability
 - Involvement
 - Support

Coordinating and Executing in the Field - 3D Clash Detection and 4D

Dan Russell of Sundt

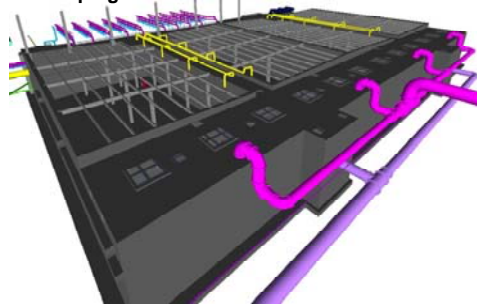


The People and Tools :

- Full time modeler on site
- Creation of Structure Models
- Creation of Concrete Lift and Sequencing Drawings
- Lift Drawings exported to AutoCAD for Formwork Design
- Navisworks Collaboration
- Navisworks Timeliner (Project Schedule)
- Part time modelers at main office
- Creation of Utility and Yard Pipe Models
- Creation Process Piping Models
- Project Superintendent
- Review of Navis model to resolve collisions
- Primavera Schedule
- Design Engineers
- Review and help resolve collisions
- Update Contract Documents to reflect Decisions made

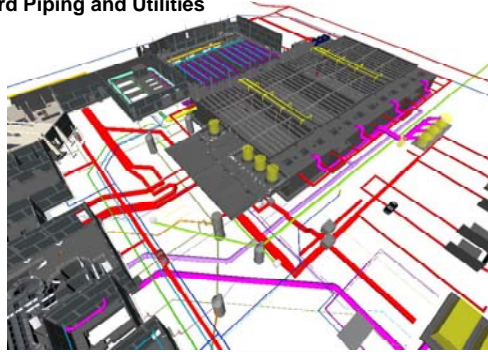
Techniques and Functionality Needed

Process Piping



Techniques and Functionality Needed

Yard Piping and Utilities



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The Reactions of the People Involved:

“I would never want to do another Water Treatment Facility without the use of BIM”

Andrew Apostolik – Senior Project Manager

“Something is wrong, things aren’t supposed to go this smooth”

Scott Little – Senior Field Superintendent

Butler Treatment Plant Clash Savings		
CLASH #	DESCRIPTION	POTENTIAL COSTS
1	Grid dimensions were wrong	\$10,000.00
2	A-Basin - Shortened Corbel along side wall	\$2,000.00
3	A-Basin - Beam pockets sizes	
4	A-Basin + Membrane - being able to see the section at the channel deck and wall joints.	Priceless!
5	Headworks - Grit Chambers ftgs./eliminated underslab	\$5,000.00
6	Headworks - Sluice Gates blockout sizes and location	
7	Admin. - Battered walls needed to be elongated due to clash with Curtain Walls	\$10,000.00
8	Admin. - Columns in the middle of the 2 main center walls were in the wrong place	\$5,000.00
9	Admin. - Chase blockouts on plans were not big enough for all HVACs and Electrical to go through.	\$5,000.00
10	Admin. - By putting in steel beams we were able to see what size blockout and plates were needed, caught mistake from Able Steel in the process.	\$5,000.00
11	Admin - Eliminated steel beam	?
12	Admin. - Ftgs and stems were layed out incorrectly on plans and were wrong size.	\$25,000.00
13	By modeling the masonry we were able to lay out all the door and louver openings.	
14	Modeling piping & ductbanks	\$150,000.00
TOTAL SAVINGS		\$217,000.00

