Modeling in Revit Structure:

Tips & Tricks for Downstream Construction Utilization

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National BIM Manager – Black & Veatch – FSD
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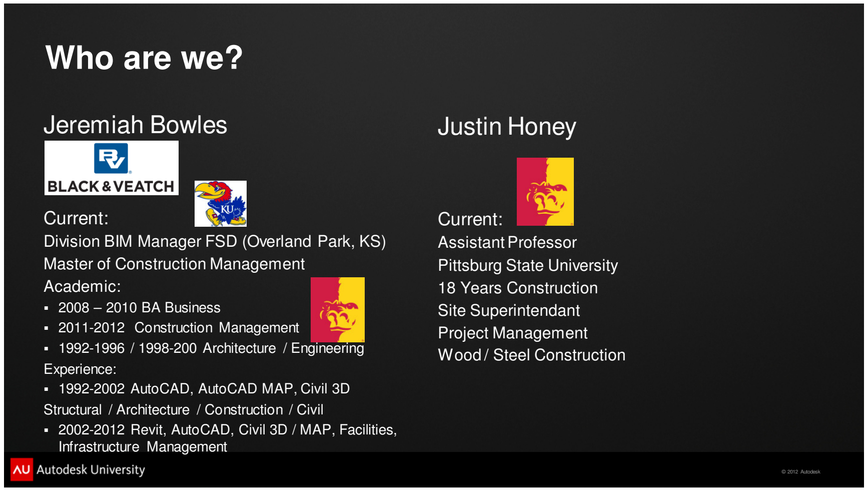
Professor – Construction Management - Pittsburg State University



Who are we?

Jeremiah Bowles

BLACK & VEATCH
KU

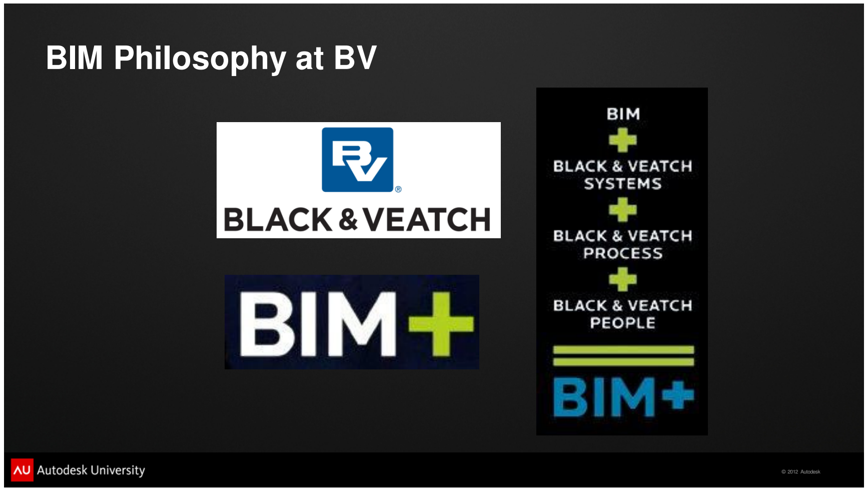
Current:
Division BIM Manager FSD (Overland Park, KS)
Master of Construction Management
Academic:
- 2008 – 2010 BA Business
- 2011-2012 Construction Management
- 1992-1996 / 1998-200 Architecture / Engineering

Experience:
- 1992-2002 AutoCAD, AutoCAD MAP, Civil 3D

Structural / Architecture / Construction / Civil
- 2002-2012 Revit, AutoCAD, Civil 3D / MAP, Facilities, Infrastructure Management

Justin Honey

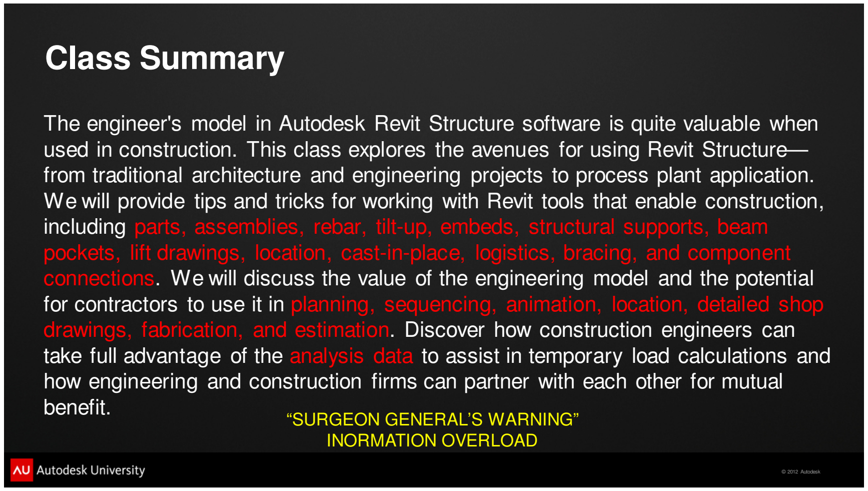
Current:
Assistant Professor
Pittsburg State University
18 Years Construction
Site Superintendant
Project Management
Wood / Steel Construction



BIM Philosophy at BV

BLACK & VEATCH
BIM+

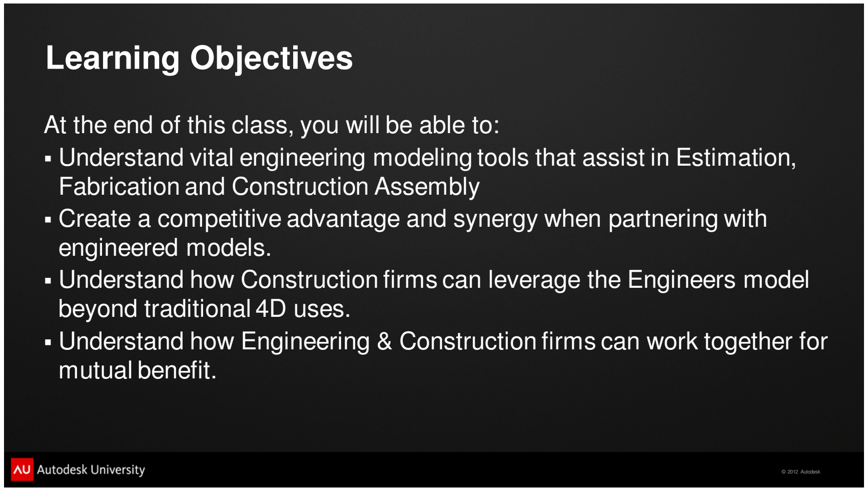
BIM
+
BLACK & VEATCH SYSTEMS
+
BLACK & VEATCH PROCESS
+
BLACK & VEATCH PEOPLE
=
BIM+



Class Summary

The engineer's model in Autodesk Revit Structure software is quite valuable when used in construction. This class explores the avenues for using Revit Structure—from traditional architecture and engineering projects to process plant application. We will provide tips and tricks for working with Revit tools that enable construction, including parts, assemblies, rebar, tilt-up, embeds, structural supports, beam pockets, lift drawings, location, cast-in-place, logistics, bracing, and component connections. We will discuss the value of the engineering model and the potential for contractors to use it in planning, sequencing, animation, location, detailed shop drawings, fabrication, and estimation. Discover how construction engineers can take full advantage of the analysis data to assist in temporary load calculations and how engineering and construction firms can partner with each other for mutual benefit.

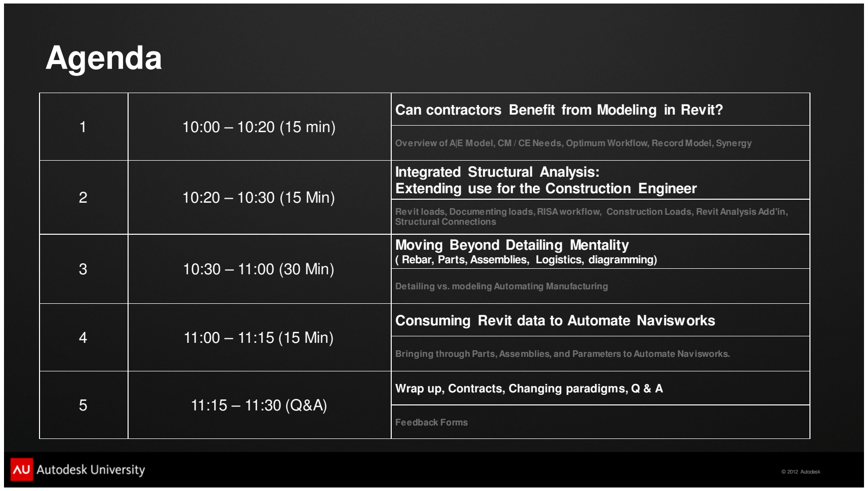
"SURGEON GENERAL'S WARNING"
INORMATION OVERLOAD



Learning Objectives

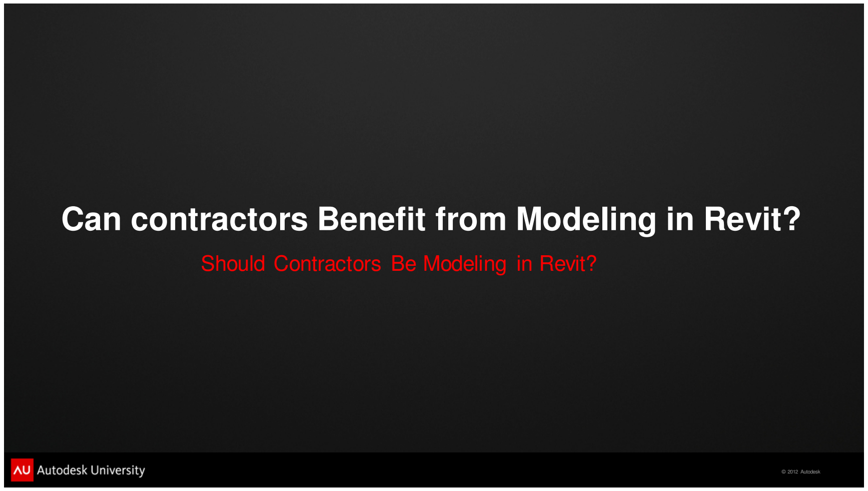
At the end of this class, you will be able to:

- Understand vital engineering modeling tools that assist in Estimation, Fabrication and Construction Assembly
- Create a competitive advantage and synergy when partnering with engineered models.
- Understand how Construction firms can leverage the Engineers model beyond traditional 4D uses.
- Understand how Engineering & Construction firms can work together for mutual benefit.



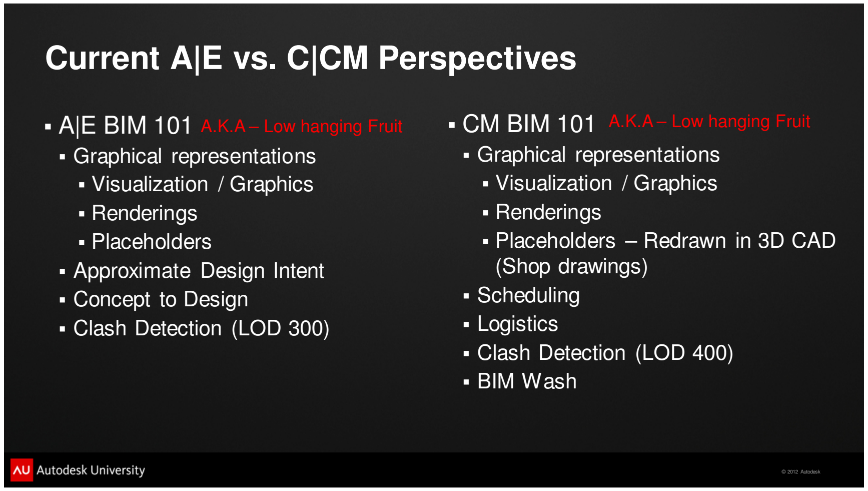
Agenda

1	10:00 – 10:20 (15 min)	**Can contractors Benefit from Modeling in Revit?** Overview of A|E Model, CM / CE Needs, Optimum Workflow, Record Model, Synergy
2	10:20 – 10:30 (15 Min)	**Integrated Structural Analysis: Extending use for the Construction Engineer** Revit loads, Documenting loads, RISA workflow, Construction Loads, Revit Analysis Add'in, Structural Connections
3	10:30 – 11:00 (30 Min)	**Moving Beyond Detailing Mentality (Rebar, Parts, Assemblies, Logistics, diagramming)** Detailing vs. modeling Automating Manufacturing
4	11:00 – 11:15 (15 Min)	**Consuming Revit data to Automate Navisworks** Bringing through Parts, Assemblies, and Parameters to Automate Navisworks.
5	11:15 – 11:30 (Q&A)	**Wrap up, Contracts, Changing paradigms, Q & A** Feedback Forms



Can contractors Benefit from Modeling in Revit?

Should Contractors Be Modeling in Revit?



Current A|E vs. C|CM Perspectives

- A|E BIM 101 A.K.A – Low hanging Fruit
  - Graphical representations
    - Visualization / Graphics
    - Renderings
    - Placeholders
  - Approximate Design Intent
  - Concept to Design
  - Clash Detection (LOD 300)

- CM BIM 101 A.K.A – Low hanging Fruit
  - Graphical representations
    - Visualization / Graphics
    - Renderings
    - Placeholders – Redrawn in 3D CAD (Shop drawings)
  - Scheduling
  - Logistics
  - Clash Detection (LOD 400)
  - BIM Wash

When should BIM be used?

- Every Project! Should We Ever Stop modeling in Revit?
- When the tools are better!
- When the client pays me to do it!
- Once the client asks for it!
- On days that don't end in y.

f(BIM) = Δ Strategy

What's in it for me?

- WIIFM Attitudes = Status Quo

- Why are some people resistant to change?
  - Who moved my Cheese?
  - Fear of the unknown?
  - Fear of the known?
  - Guarding their jobs (Status Quo)
  - Things are going well, why are we doing this?

f(BIM) = Δ Strategy

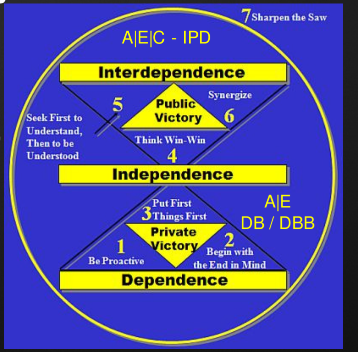
Bad habits are hard to break
Good Old Habits are even harder to break

Creating a Successful Strategy.

- The 7 habits are a good model for Developing BIM Strategies and Tactics.

- 7 Habits lead us from the "Private Victory" to the "Public Victory".

- Paradigm shift
  - Private Victory = A|E
  - Public Victory = A|E|C + O


7 Sharpen the Saw
A|E|C - IPD
Interdependence
5
Public Victory
Synergize
6
Seek First to Understand, Then to be Understood
Think Win-Win
4
Independence
A|E
DB / DBB
Put First
3 Things First
Private Victory
1
Be Proactive
2
Begin with the End in Mind
Dependence

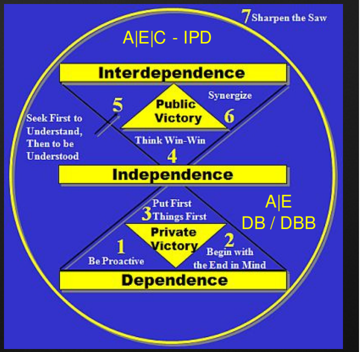
7 Habits of Highly effective People by Steven Covey

Outline strategy and define tactics.

- Is interdependence with BIM & IPD where we need to go?

- Create a clear strategy and define tactics.

- How can we:
  - Think Win-Win
  - Seek to understand / be understood
  - Find Synergy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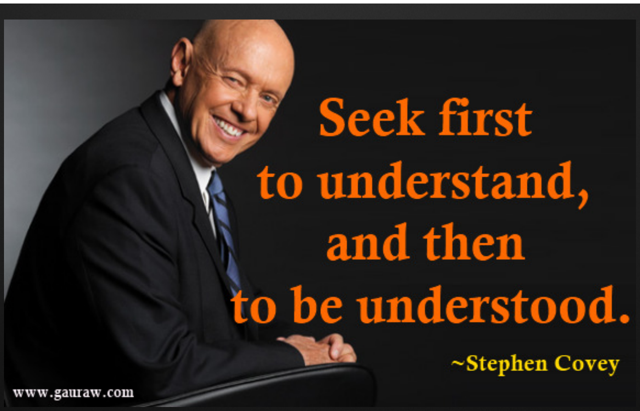

Seek first
to understand,
and then
to be understood.
~Stephen Covey
www.gauraw.com

Tactic 1: "Understand the construction mindset"

Construction Perspectives on BIM

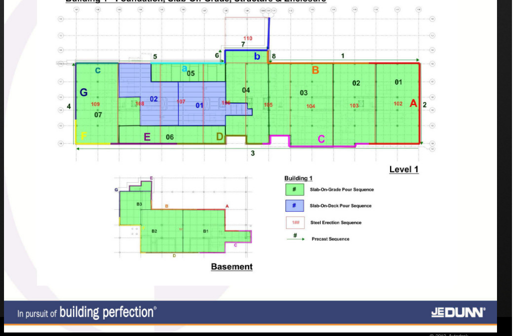
- Not enough time to re-"MODEL" a project, "Time Consuming"
- Trades don't use Revit
- Things will change
- We don't have time.
- Good Buzzword
- We'll get this in the as-built's
- The owner isn't requiring BIM
- Construction Planning processes don't really work well with BIM
- Great marketing material! Simulating in Navisworks is great dog and pony show.
- We already have 3D models, Revit is just new lipstick.

Did Autodesk Forget about Construction Professionals?

Where BIM can be extended in Construction?

Examples: Foundation, Slab-on-Grade, Structure and enclosure

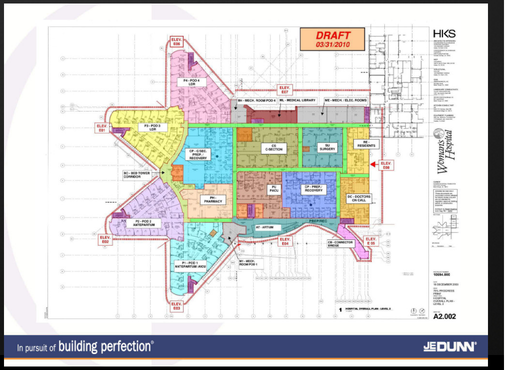
- Foundation
  - Sequence
  - Type of Foundation
  - Pile as-builts
- Slab Pour
- Wall
  - Sequence
    - By Type (TU,PC, CIP, CMU)
    - Casting beds for tilt-up
    - Lifting sequence


Building 1 - Foundation, Slab-On-Grade, Structure & Enclosure
Level 1
Basement
Building 1
Slab-On-Grade Pour Sequence
Slab-On-Deck Pour Sequence
Steel Erection Sequence
Precast Sequence
In pursuit of building perfection
JEDUNN

Where BIM can be extended in Construction?

Examples: Pre-cast + Interior Build Sequencing

- Tilt-up, Pre-Cast, Cast-in-place phasing.
- Wall Sequence
  - Break walls into Parts
  - Create Tag to label
  - Color Fills by lift sequence using Filters
  - Parameter map to Navisworks of Roof Parts
  - Shuffle the deck in Revit, not in Navisworks.
  - Shop drawings (Assemblies)


DRAFT
03/31/2010
HKS
Woman's Hospital
A2.002
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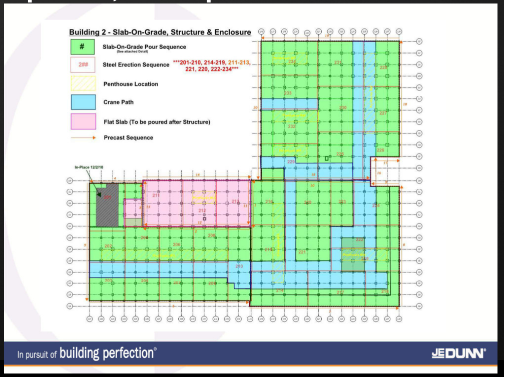
Where BIM can be extended in Construction?

Examples: Slab Pour sequence, crane path.

- Slab Pour
  - Break into Parts
  - Create Parts Tag to label
  - Color Fills by lift sequence using Filters
  - Parameter map to Navisworks of Roof Parts
  - Shuffle the deck in Revit, not in Navisworks.
  - Estimate Quantities by pour


Building 2 - Slab-On-Grade, Structure & Enclosure
#
Slab-On-Grade Pour Sequence
(See attached Detail)
2##
Steel Erection Sequence
201-210, 214-219, 211-213, 221, 220, 222-234
Penthouse Location
Crane Path
Flat Slab (To be poured after Structure)
Precast Sequence
In-Place 12/2/10
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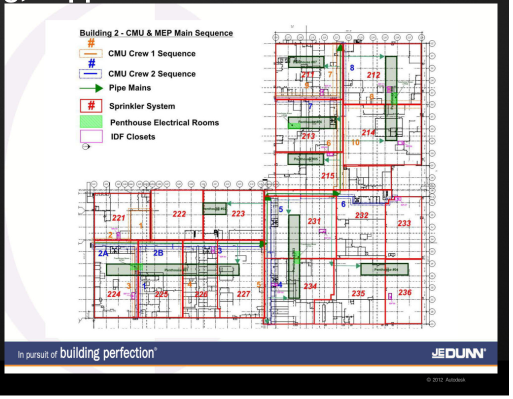
Where BIM can be extended in Construction?

Examples: CMU, Piping, Support Structure

- Break CMU walls into Parts
- Create Parts Tag to label
  - Different Tag color for different Crews
- Color Fills by shade filled region.
- Map Revit Parts Parameter map to Navisworks
- Shuffle the deck in Revit, not in Navisworks.
- Estimate Block by phase


Building 2 - CMU & MEP Main Sequence
#
CMU Crew 1 Sequence
#
CMU Crew 2 Sequence
Pipe Mains
#
Sprinkler System
Penthouse Electrical Rooms
IDF Closets
211
212
213
214
215
221
222
223
224
225
226
227
231
232
233
234
235
236
2A
2B
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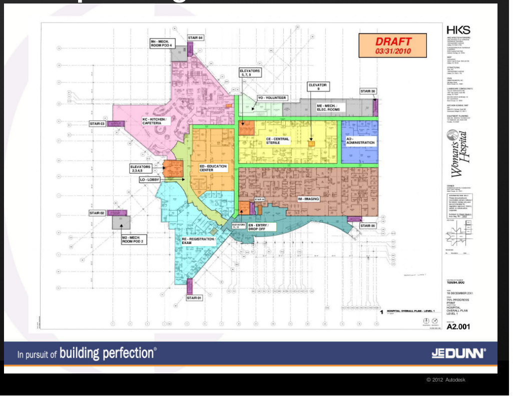
Where BIM can be extended in Construction?

Examples: Interior Build Sequencing

- Interiors Sequence
  - Add Build Seq. parameter to room category
  - Use existing rooms
  - Color fill by build_seq param.
  - Simple label text
  - Parameter map to Navisworks of Build sequence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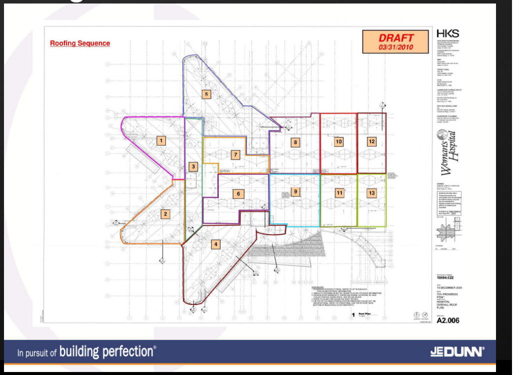
Where BIM can be extended in Construction?
Examples: Roof Sequencing

Finding synergy:

Why re-draw use Revit

- Roofing Sequence
  - Break into Parts
  - Create Tag to label
  - Color Fills by Filled Region
  - Parameter map to Navisworks of Roof Parts


Roofing Sequence
DRAFT
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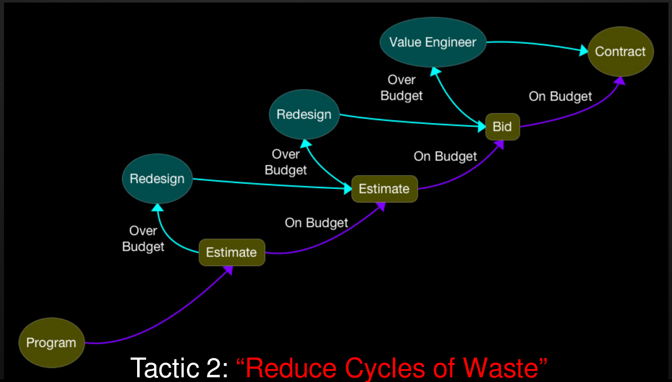
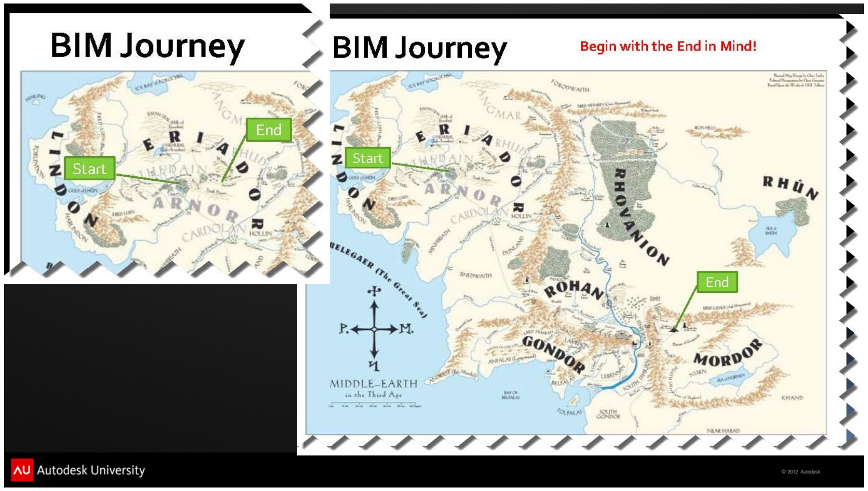
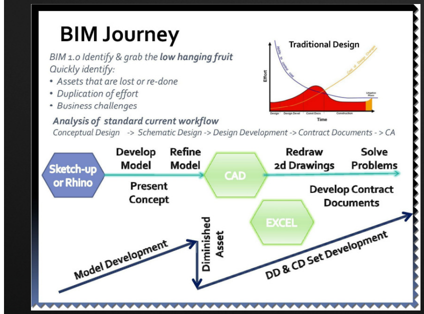
Lessons learned from Past Successes


Program
Estimate
Over Budget
Redesign
On Budget
Estimate
Over Budget
Redesign
On Budget
Bid
Over Budget
Value Engineer
On Budget
Contract

Tactic 2: “Reduce Cycles of Waste”


BIM Journey
Start
End
BIM Journey
Begin with the End in Mind!
Start
End
LINDON
ERIADOR
ARNOR
RHOVANION
RHÛN
ROHAN
GONDOR
MORDOR
BELEGAER (The Great Sea)
MIDDLE-EARTH in the Third Age

Lessons Learned in Past BIM Journey



BIM Journey

*BIM 1.0 Identify & grab the **low hanging fruit***

Quickly identify:

- *Assets that are lost or re-done*
- *Duplication of effort*
- *Business challenges*

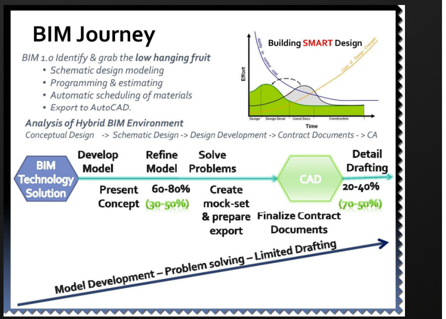
Analysis of standard current workflow

Conceptual Design -> Schematic Design -> Design Development -> Contract Documents - > CA

Traditional Design
Effort
Time
Sketch-up or Rhino
Develop Model
Refine Model
Present Concept
CAD
Redraw 2d Drawings
Solve Problems
Develop Contract Documents
EXCEL
Model Development
Diminished Asset
DD & CD Set Development

Traditional Design

Building Smart Method



BIM Journey

*BIM 1.0 Identify & grab the **low hanging fruit***

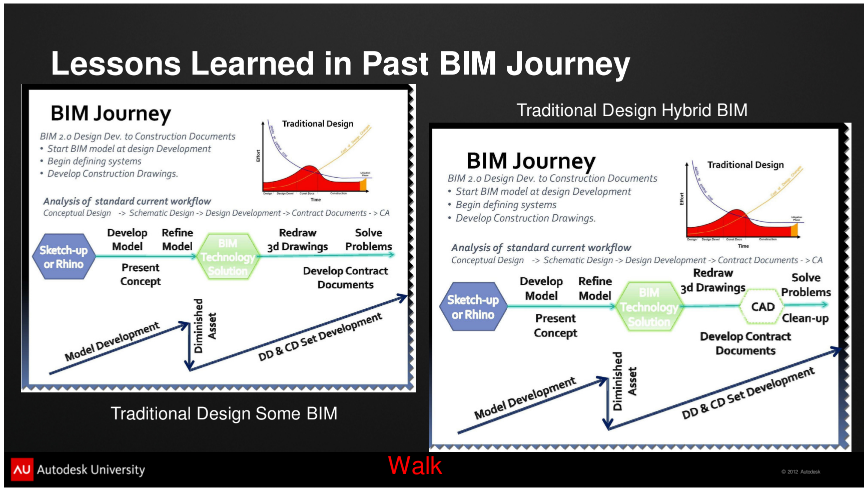
- *Schematic design modeling*
- *Programming & estimating*
- *Automatic scheduling of materials*
- *Export to AutoCAD.*

Analysis of Hybrid BIM Environment

Conceptual Design -> Schematic Design -> Design Development -> Contract Documents - > CA

Building SMART Design
Effort
Time
BIM Technology Solution
Develop Model
Present Concept
Refine Model
60-80%
(30-50%)
Solve Problems
Create mock-set & prepare export
CAD
Finalize Contract Documents
Detail Drafting
20-40%
(70-50%)
Model Development – Problem solving – Limited Drafting

Crawl



Lessons Learned in Past BIM Journey

BIM Journey

BIM 2.0 Design Dev. to Construction Documents
- *Start BIM model at design Development*
- *Begin defining systems*
- *Develop Construction Drawings.*

Analysis of standard current workflow
Conceptual Design -> Schematic Design -> Design Development -> Contract Documents - > CA

Traditional Design
Effort
Time
Sketch-up or Rhino
Develop Model
Refine Model
Present Concept
BIM Technology Solution
Redraw 3d Drawings
Solve Problems
Develop Contract Documents
Model Development
Diminished Asset
DD & CD Set Development

Traditional Design Some BIM

Traditional Design Hybrid BIM

BIM Journey

BIM 2.0 Design Dev. to Construction Documents
- *Start BIM model at design Development*
- *Begin defining systems*
- *Develop Construction Drawings.*

Analysis of standard current workflow
Conceptual Design -> Schematic Design -> Design Development -> Contract Documents - > CA

Traditional Design
Effort
Time
Sketch-up or Rhino
Develop Model
Refine Model
Present Concept
BIM Technology Solution
Redraw 3d Drawings
CAD
Solve Problems
Clean-up
Develop Contract Documents
Model Development
Diminished Asset
DD & CD Set Development

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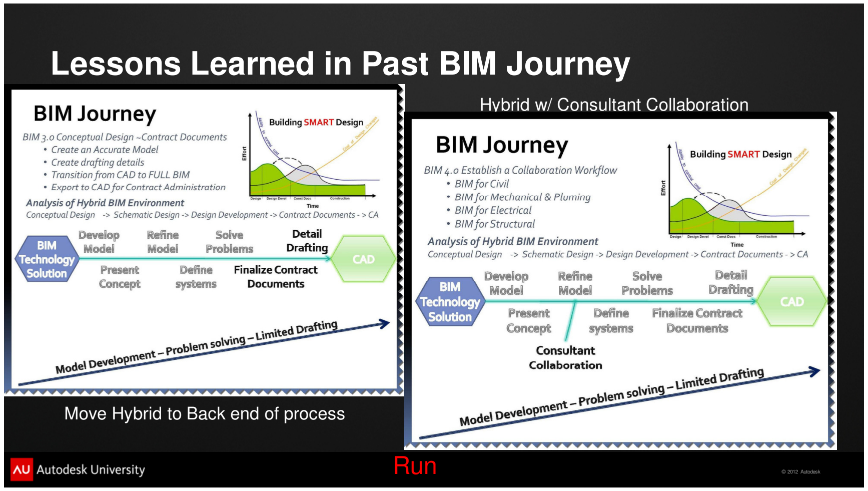
Walk



Lessons Learned in Past BIM Journey

BIM Journey

BIM 3.0 Conceptual Design ~Contract Documents
- *Create an Accurate Model*
- *Create drafting details*
- *Transition from CAD to FULL BIM*
- *Export to CAD for Contract Administration*

Analysis of Hybrid BIM Environment
Conceptual Design -> Schematic Design -> Design Development -> Contract Documents - > CA

Building SMART Design
Effort
Time
BIM Technology Solution
Develop Model
Refine Model
Solve Problems
Detail Drafting
Present Concept
Define systems
Finalize Contract Documents
CAD
Model Development – Problem solving – Limited Drafting

Move Hybrid to Back end of process

Hybrid w/ Consultant Collaboration

BIM Journey

BIM 4.0 Establish a Collaboration Workflow
- *BIM for Civil*
- *BIM for Mechanical & Pluming*
- *BIM for Electrical*
- *BIM for Structural*

Analysis of Hybrid BIM Environment
Conceptual Design -> Schematic Design -> Design Development -> Contract Documents - > CA

Building SMART Design
Effort
Time
BIM Technology Solution
Develop Model
Refine Model
Solve Problems
Detail Drafting
Present Concept
Define systems
Finalize Contract Documents
CAD
Consultant Collaboration
Model Development – Problem solving – Limited Drafting

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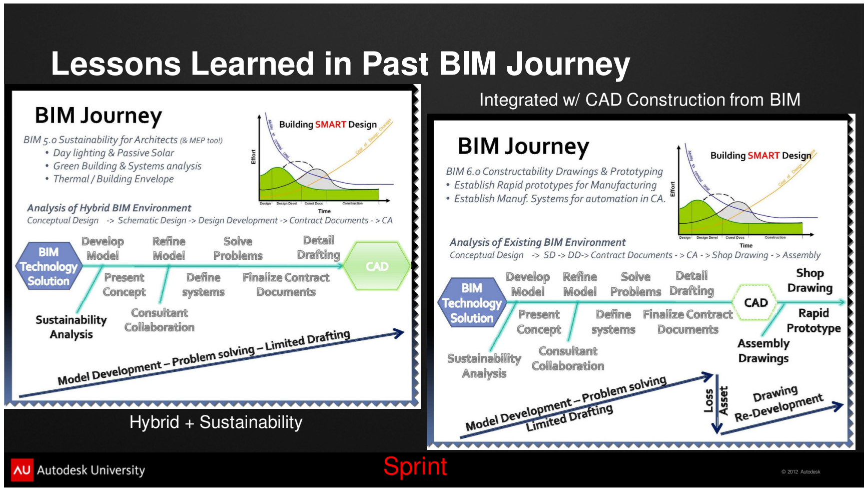
Run



Lessons Learned in Past BIM Journey

BIM Journey

BIM 5.0 Sustainability for Architects (& MEP too!)
- *Day lighting & Passive Solar*
- *Green Building & Systems analysis*
- *Thermal / Building Envelope*

Analysis of Hybrid BIM Environment
Conceptual Design -> Schematic Design -> Design Development -> Contract Documents - > CA

Building SMART Design
Effort
Time
BIM Technology Solution
Develop Model
Refine Model
Solve Problems
Detail Drafting
Present Concept
Define systems
Finalize Contract Documents
CAD
Sustainability Analysis
Consultant Collaboration
Model Development – Problem solving – Limited Drafting

Hybrid + Sustainability

Integrated w/ CAD Construction from BIM

BIM Journey

BIM 6.0 Constructability Drawings & Prototyping
- *Establish Rapid prototypes for Manufacturing*
- *Establish Manuf. Systems for automation in CA.*

Analysis of Existing BIM Environment
Conceptual Design -> SD -> DD-> Contract Documents - > CA - > Shop Drawing - > Assembly

Building SMART Design
Effort
Time
BIM Technology Solution
Develop Model
Refine Model
Solve Problems
Detail Drafting
CAD
Shop Drawing
Present Concept
Define systems
Finalize Contract Documents
Rapid Prototype
Assembly Drawings
Sustainability Analysis
Consultant Collaboration
Model Development – Problem solving Limited Drafting
Loss Asset
Drawing Re-Development

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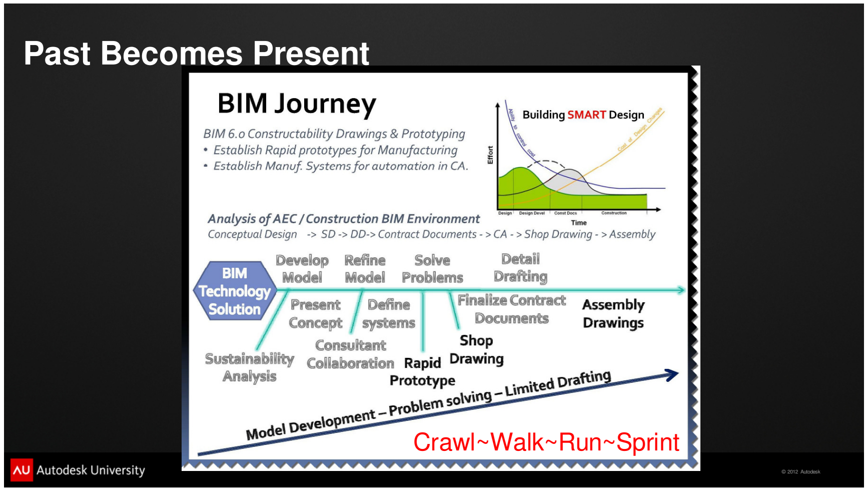
Sprint



Past Becomes Present

BIM Journey

BIM 6.0 Constructability Drawings & Prototyping
- *Establish Rapid prototypes for Manufacturing*
- *Establish Manuf. Systems for automation in CA.*

Analysis of AEC / Construction BIM Environment
Conceptual Design -> SD -> DD-> Contract Documents - > CA - > Shop Drawing - > Assembly

Building SMART Design
Effort
Time
BIM Technology Solution
Develop Model
Refine Model
Solve Problems
Detail Drafting
Present Concept
Define systems
Finalize Contract Documents
Assembly Drawings
Sustainability Analysis
Consultant Collaboration
Rapid Prototype
Shop Drawing
Model Development – Problem solving – Limited Drafting

Crawl~Walk~Run~Sprint

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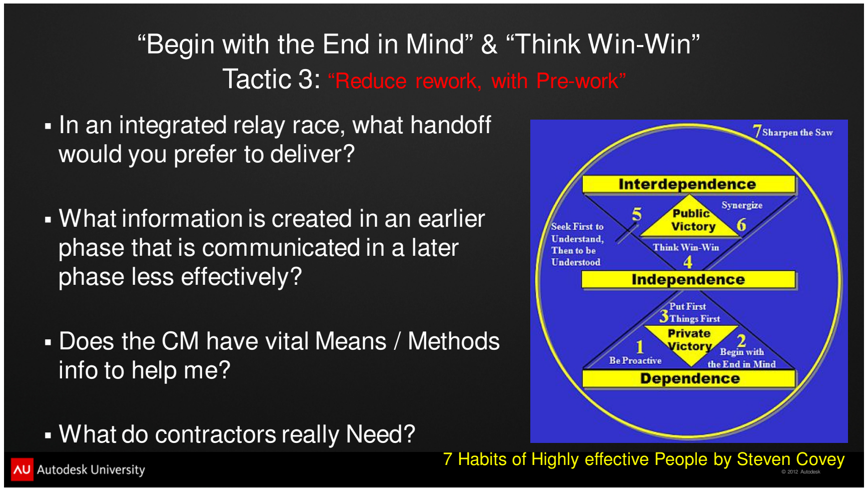

"Begin with the End in Mind" & "Think Win-Win"
Tactic 3: "Reduce rework, with Pre-work"

- In an integrated relay race, what handoff would you prefer to deliver?
- What information is created in an earlier phase that is communicated in a later phase less effectively?
- Does the CM have vital Means / Methods info to help me?
- What do contractors really Need?

7 Sharpen the Saw
Interdependence
5
Seek First to Understand, Then to be Understood
Public Victory
Synergize
6
Think Win-Win
4
Independence
Put First Things First
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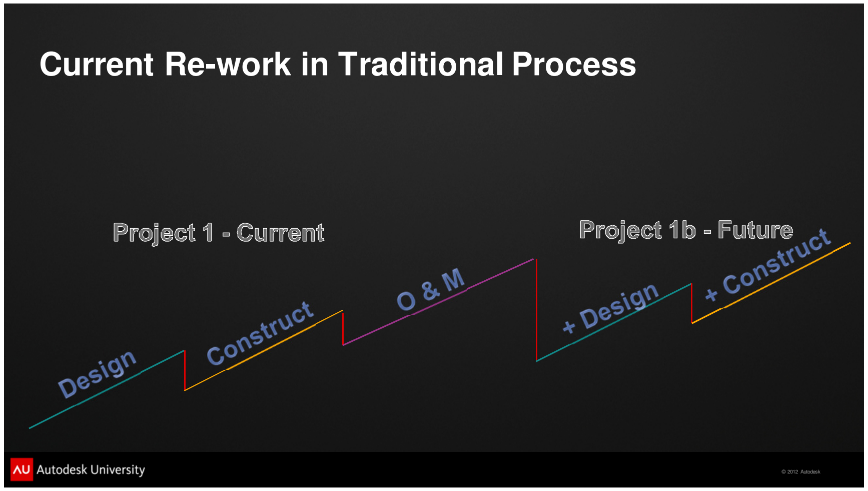
Private Victory
1
Be Proactive
2
Begin with the End in Mind
Dependence

7 Habits of Highly effective People by Steven Covey

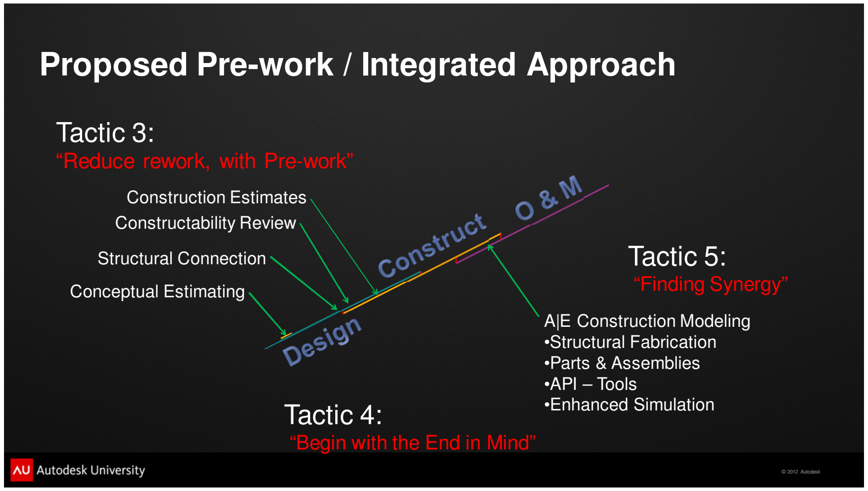


Current Re-work in Traditional Process

Project 1 - Current
Project 1b - Future
Design
Construct
O & M
+ Design
+ Construct

What can Construction Learn from A|E's?
What can A|E's Learn from Construction?

- BIM Information Centric Strategy
  - Conceptual Design with Conceptual Estimating
    - Conceptual Massing (wall, floor, roof, energy)
  - Constructability Review
    - Is it buildable, means and methods discovery
  - Identify data rework and data improvements.
    - Steel Connections
  - Record Modeling of Structural Analysis
    - Model capture of analysis (not just calc books)
  - Rebar, Pre-fab, Panelization, embeds, Sequencing information.
    - Using Parts, Assemblies & Rebar



Proposed Pre-work / Integrated Approach

Tactic 3:
"Reduce rework, with Pre-work"

Construction Estimates
Constructability Review
Structural Connection
Conceptual Estimating
Design
Construct
O & M

Tactic 5:
"Finding Synergy"

A|E Construction Modeling
•Structural Fabrication
•Parts & Assemblies
•API – Tools
•Enhanced Simulation

Tactic 4:
"Begin with the End in Mind"

Steel Fabrication Process Opportunity

- Pinch Points:
  - Order Steel (4-6 weeks)
  - Shop drawing approval
  - Review
  - Errors / Omissions

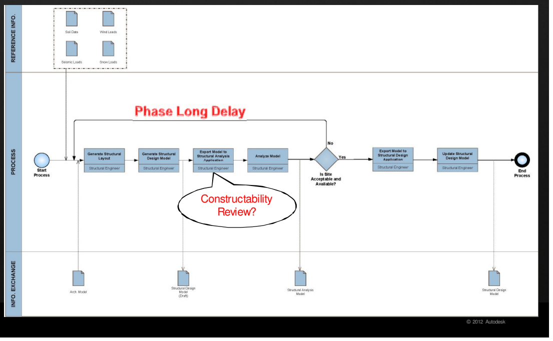
Current Challenges

- Consuming Current Deliverables
  - Assumed correct
  - Means and Methods not considered
  - Subject to interpretation
  - Short Shop drawing creation time
  - Review / Re-draw, re-order?
  - Fragmented Process
  - Re-entry = introduce new errors

Validate Current Process

- Is it efficient?
- Is there any lag?
- Where are the pinch Points?
- ID Fragmented processes?
- ID Phase long Delays!
- Is data redone?

- Is It Integrated?


REFERENCE INFO.
Soil Data
Wind Loads
Seismic Loads
Snow Loads
PROCESS
Phase Long Delay
Start Process
Generate Structural Layout
Structural Engineer
Generate Structural Design Model
Structural Engineer
Export Model to Structural Analysis Application
Structural Engineer
Analyze Model
Structural Engineer
No
Yes
Is Site Acceptable and Available?
Export Model to Structural Design Application
Structural Engineer
Update Structural Design Model
Structural Engineer
End Process
Constructability Review?
INFO. EXCHANGE
Arch. Model
Structural Design Model (Draft)
Structural Analysis Model
Structural Design Model

Analytical and Physical Model Synergy

- What synergy can exist from an Integrated Approach?
  - Less re-entry / data entry? (reduced mistakes)
  - Multiple options / iterations.
  - Reduced rework and value engineering?
  - Dynamic Physical / Analytical Models
  - Data transfer to Fabricators?
  - Reduced rework with Pre-work?
  - Asset to Construction Engineers for Temporary Loads?

Existing Analysis Paradigm

- Traditional workflows don’t fully leverage the analytical model.
- Diverse Analytical Model | Physical Models
- Fragmented documentation of graphics and equations.
- Data transfer facilitated through RFI, re-draw/model, interpretation.
- Manual change management, or lack thereof.
- Few iterations?
- Manual data transfer plan vs. automated (increased chance for error)

“Begin with the End in Mind”

- Structural Fabrication Software Requires Analysis Data.
  - Add-in to Revit Structure
  - SDS/2 connection design, complete with longhand calculation
  - Includes model round-tripping with the Revit Structure model
  - Consumes Stored Revit Loads & Analysis Data
    - Risa
    - Ram-Stad
    - CSC Fastrak

Tactic 4: “Finding Synergy”

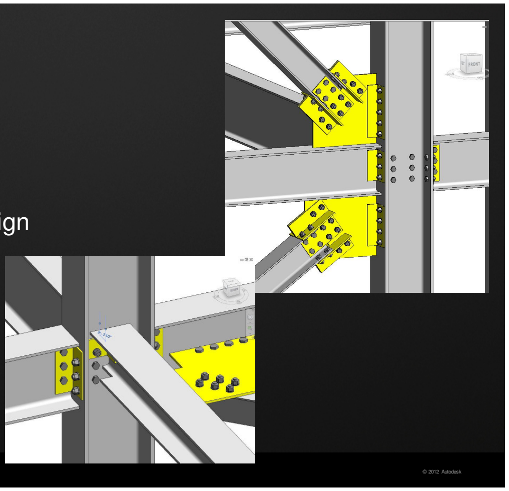
“Begin with the End in Mind”

- Structural Fabrication Software Requires Analysis Data.
  - Quick access to connection design calculations
  - Value Engineering in Revit
    - Quickly test connection scenarios
  - An API based model transfer between Revit and SDS/2 for BIM.
    - Structural & connections
    - Works better than IFC or CIS2 for connections and structural components
  - Full Joint Analysis

Tactic 4: “Finding Synergy”

Revit SDS Connect

- Framing Conditions
- Revit Loads (Risa / Ram)
- Connection Specifications
- “Intelligent” Connection Design
- User Connections
- Limitations
  - Steel to Steel
  - Concrete Embeds (SDS/2)



A|E Analysis Data Strategy

- Redefine Traditional Analysis Paradigm
  - Improve Data Transfer Fidelity
  - Model QA/QC process
  - Model Loads in Revit
  - Transfer Reactions into Revit from Analysis

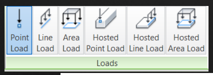
- Overcome Existing Technology Constraints
  - Improve Analysis Documentation / Communication methods
  - Reduce Rework Effort

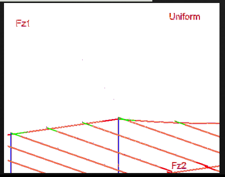
Analysis Documentation Demo

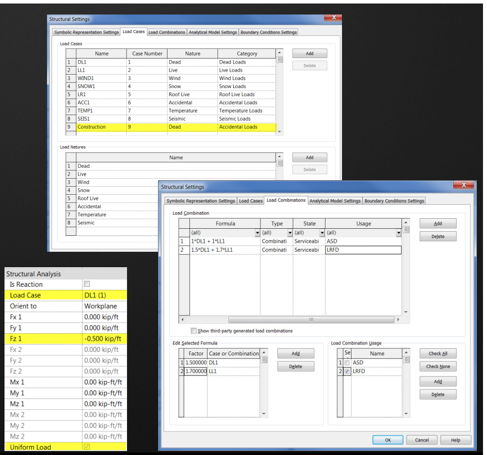
- See AU Whitepaper for detailed instructions.

Modeling Tips

- Set Loads Cases
- Define Load Combinations
- Place Loads in Model


Point Load
Line Load
Area Load
Hosted Point Load
Hosted Line Load
Hosted Area Load
Loads


Fz1
Uniform
Fz2


Symbolic Representation Settings
Load Cases
Load Combinations
Analytical Model Settings
Boundary Conditions Settings
Add
Delete
OK
Cancel
Help
Check All
Check None

Structural Settings

Load Cases

	Name	Case Number	Nature	Category
1	DL1	1	Dead	Dead Loads
2	LL1	2	Live	Live Loads
3	WIND1	3	Wind	Wind Loads
4	SNOW1	4	Snow	Snow Loads
5	LR1	5	Roof Live	Roof Live Loads
6	ACC1	6	Accidental	Accidental Loads
7	TEMP1	7	Temperature	Temperature Loads
8	SEIS1	8	Seismic	Seismic Loads
9	Construction	9	Dead	Accidental Loads

Load Natures

	Name
1	Dead
2	Live
3	Wind
4	Snow
5	Roof Live
6	Accidental
7	Temperature
8	Seismic

Structural Settings

Load Combination

	Formula	Type	State	Usage
	(all)	(all)	(all)	(all)
1	1*DL1 + 1*LL1	Combinati	Serviceabi	ASD
2	1.5*DL1 + 1.7*LL1	Combinati	Serviceabi	LRFD

☐ Show third-party generated load combinations

Edit Selected Formula

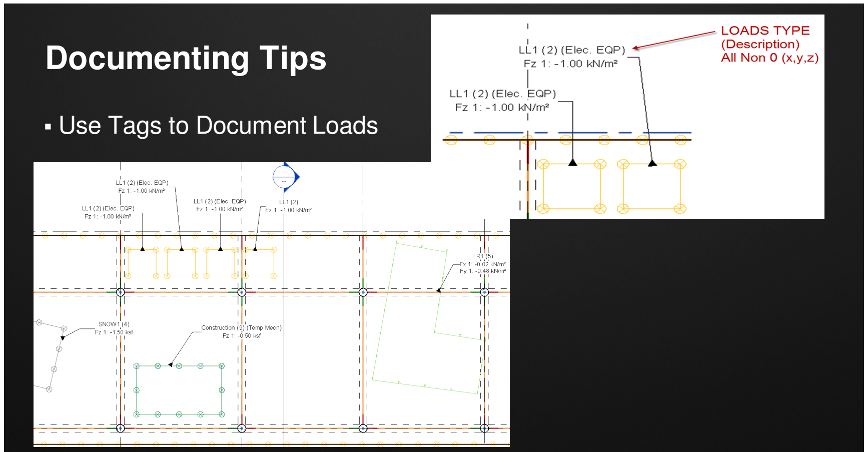
	Factor	Case or Combination
1	1.500000	DL1
2	1.700000	LL1

Load Combination Usage

	Se	Name
1	☐	ASD
2	☑	LRFD

Structural Analysis

Is Reaction	☐
Load Case	DL1 (1)
Orient to	Workplane
Fx 1	0.000 kip/ft
Fy 1	0.000 kip/ft
Fz 1	-0.500 kip/ft
Fx 2	0.000 kip/ft
Fy 2	0.000 kip/ft
Fz 2	0.000 kip/ft
Mx 1	0.00 kip-ft/ft
My 1	0.00 kip-ft/ft
Mz 1	0.00 kip-ft/ft
Mx 2	0.00 kip-ft/ft
My 2	0.00 kip-ft/ft
Mz 2	0.00 kip-ft/ft
Uniform Load	☑


LL1 (2) (Elec. EQP)
Fz 1: -1.00 kN/m²
LL1 (2) (Elec. EQP)
Fz 1: -1.00 kN/m²
LL1 (2) (Elec. EQP)
Fz 1: -1.00 kN/m²
LL1 (2) (Elec. EQP)
Fz 1: -1.00 kN/m²
LL1 (2) (Elec. EQP)
Fz 1: -1.00 kN/m²
LL1 (2)
Fz 1: -1.00 kN/m²
LR1 (5)
Fx 1: -0.02 kN/m²
Fy 1: -0.48 kN/m²
SNOW1 (4)
Fz 1: -1.50 ksf
Construction (9) (Temp Mech)
Fz 1: -0.50 ksf

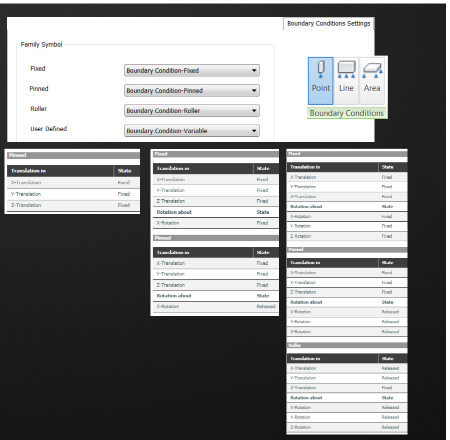
Documenting Tips

- Use Tags to Document Loads

LOADS TYPE
(Description)
All Non 0 (x,y,z)

Documenting Tips

- Set Boundary Conditions
- Document Boundary Conditions
  - Graphically Verify Via Tags.



Family Symbol

Fixed	Boundary Condition-Fixed
Pinned	Boundary Condition-Pinned
Roller	Boundary Condition-Roller
User Defined	Boundary Condition-Variable

Pinned

Translation in	State
X-Translation	Fixed
Y-Translation	Fixed
Z-Translation	Fixed

Fixed

Translation in	State
X-Translation	Fixed
Y-Translation	Fixed
Z-Translation	Fixed
Rotation about	**State**
X-Rotation	Fixed

Pinned

Translation in	State
X-Translation	Fixed
Y-Translation	Fixed
Z-Translation	Fixed
Rotation about	**State**
X-Rotation	Released

Fixed

Translation in	State
X-Translation	Fixed
Y-Translation	Fixed
Z-Translation	Fixed
Rotation about	**State**
X-Rotation	Fixed
Y-Rotation	Fixed
Z-Rotation	Fixed

Pinned

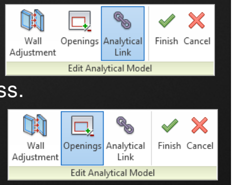
Translation in	State
X-Translation	Fixed
Y-Translation	Fixed
Z-Translation	Fixed
Rotation about	**State**
X-Rotation	Released
Y-Rotation	Released
Z-Rotation	Released

Roller

Translation in	State
X-Translation	Released
Y-Translation	Released
Z-Translation	Fixed
Rotation about	**State**
X-Rotation	Released
Y-Rotation	Released
Z-Rotation	Released

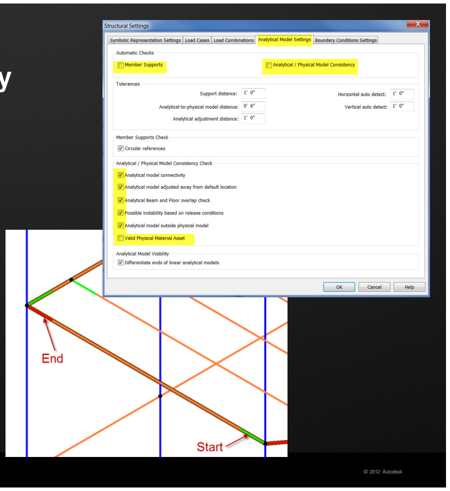
Existing Technology Constraints / Obstacles

- Traditional Concerns of Integrated Analysis
  - Physical vs. analytical model – Things don't connect
    - Analytical Link, Openings, wall adjustments (2013)
  - Documenting the analysis doesn't follow our existing process.
  - Won't work with Bentley tools, to many eggs in a basket.
    - (we are a Dual Platform Office)
  - Structural Tools are not designed for Engineers
  - Revit tools are not complete? Define Needs
    - (I would ask, are any of the tools we use perfect)
  - That's not our responsibility! (Data Silo issues)
  - I don't trust it. (Trust but Validate)



Before Export:
Check Analytical Connectivity

- Revit Analytical Model Settings
  - Automatic Checks
  - Use Tolerance Checks
  - Consistency Checks
- Set Modeling Rules
  - Left to Right (Start / End?)


Structural Settings
Symbolic Representation Settings
Load Cases
Load Combinations
Analytical Model Settings
Boundary Conditions Settings
OK
Cancel
Help
End
Start

Automatic Checks

☐ Member Supports
☐ Analytical / Physical Model Consistency

Tolerances

Support distance: 1' 0"
Analytical-to-physical model distance: 0' 6"
Analytical adjustment distance: 1' 0"
Horizontal auto detect: 1' 0"
Vertical auto detect: 1' 0"

Member Supports Check

☑ Circular references

Analytical / Physical Model Consistency Check

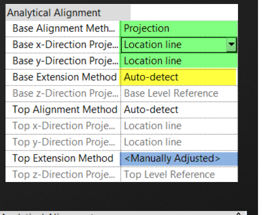
☑ Analytical model connectivity
☑ Analytical model adjusted away from default location
☑ Analytical Beam and Floor overlap check
☑ Possible instability based on release conditions
☑ Analytical model outside physical model
☐ Valid Physical Material Asset

Analytical Model Visibility

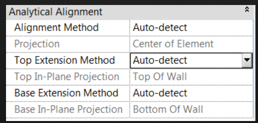
☑ Differentiate ends of linear analytical models

Before Export:
Improve Analytical Model Connectivity

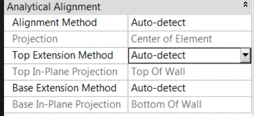
- Analytical Alignment Data Settings
  - Vertical
  - Horizontal
- Beam Settings



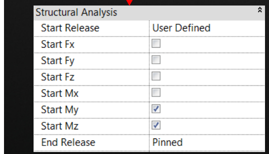
Analytical Alignment	
Base Alignment Meth...	Projection
Base x-Direction Proje...	Location line
Base y-Direction Proje...	Location line
Base Extension Method	Auto-detect
Base z-Direction Proje...	Base Level Reference
Top Alignment Method	Auto-detect
Top x-Direction Proje...	Location line
Top y-Direction Proje...	Location line
Top Extension Method	<Manually Adjusted>
Top z-Direction Proje...	Top Level Reference



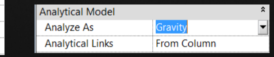
Analytical Alignment	
Alignment Method	Auto-detect
Projection	Center of Element
Top Extension Method	Auto-detect
Top In-Plane Projection	Top Of Wall
Base Extension Method	Auto-detect
Base In-Plane Projection	Bottom Of Wall



Analytical Alignment	
Alignment Method	Auto-detect
Projection	Center of Element
Top Extension Method	Auto-detect
Top In-Plane Projection	Top Of Wall
Base Extension Method	Auto-detect
Base In-Plane Projection	Bottom Of Wall



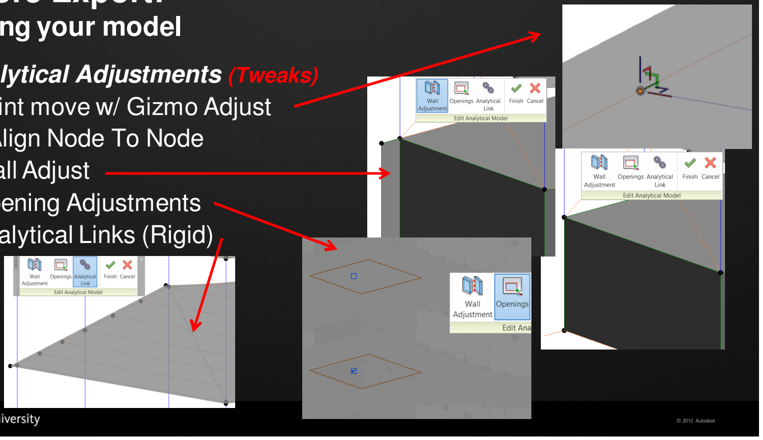
Structural Analysis	
Start Release	User Defined
Start Fx	☐
Start Fy	☐
Start Fz	☐
Start Mx	☐
Start My	☑
Start Mz	☑
End Release	Pinned



Analytical Model	
Analyze As	Gravity
Analytical Links	From Column

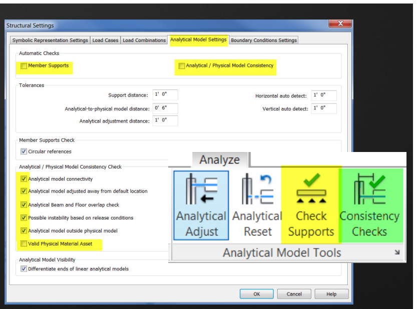
Before Export:
Tuning your model

- ***Analytical Adjustments*** *(Tweaks)*
  - Point move w/ Gizmo Adjust
    - Align Node To Node
  - Wall Adjust
  - Opening Adjustments
  - Analytical Links (Rigid)


Wall Adjustment
Openings
Analytical Link
Finish
Cancel
Edit Analytical Model
Wall Adjustment
Openings
Edit Ana

Before Export:
Run Automatic Checks

- Check Member Supports
- Analytical / Physical Model Consistency Checks



Structural Settings

Symbolic Representation Settings | Load Cases | Load Combinations | Analytical Model Settings | Boundary Conditions Settings

Automatic Checks

☐ Member Supports

☐ Analytical / Physical Model Consistency

Tolerances

Support distance: 1' 0"

Analytical-to-physical model distance: 0' 6"

Analytical adjustment distance: 1' 0"

Horizontal auto detect: 1' 0"

Vertical auto detect: 1' 0"

Member Supports Check

☑ Circular references

Analytical / Physical Model Consistency Check

☑ Analytical model connectivity

☑ Analytical model adjusted away from default location

☑ Analytical Beam and Floor overlap check

☑ Possible instability based on release conditions

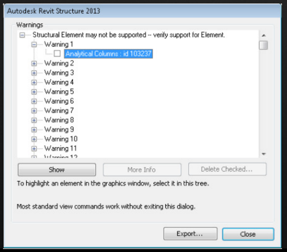
☑ Analytical model outside physical model

☐ Valid Physical Material Asset

Analytical Model Visibility

☑ Differentiate ends of linear analytical models

OK
Cancel
Help
Analyze
Analytical Adjust
Analytical Reset
Check Supports
Consistency Checks
Analytical Model Tools



Autodesk Revit Structure 2013

Warnings

Structural Element may not be supported -- verify support for Element.
- Warning 1
  - ☐ Analytical Columns : id 103237
- Warning 2
- Warning 3
- Warning 4
- Warning 5
- Warning 6
- Warning 7
- Warning 8
- Warning 9
- Warning 10
- Warning 11

Show
More Info
Delete Checked...

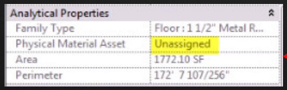
To highlight an element in the graphics window, select it in this tree.

Most standard view commands work without exiting this dialog.

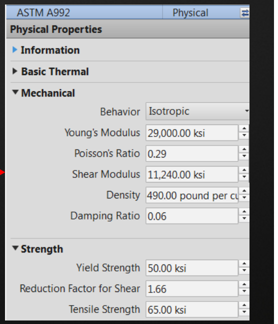
Export...
Close

Before Export:
Run Automatic Checks

- Check Element Properties
  - Model Assets:
    - Mechanical
    - Strength



Analytical Properties	
Family Type	Floor : 1 1/2" Metal R...
Physical Material Asset	Unassigned
Area	1772.10 SF
Perimeter	172' 7 107/256"



ASTM A992 Physical

Physical Properties

- Information
- Basic Thermal
- Mechanical

Behavior: Isotropic

Young's Modulus: 29,000.00 ksi

Poisson's Ratio: 0.29

Shear Modulus: 11,240.00 ksi

Density: 490.00 pound per cu

Damping Ratio: 0.06

- Strength

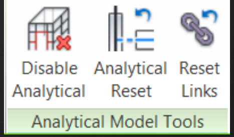
Yield Strength: 50.00 ksi

Reduction Factor for Shear: 1.66

Tensile Strength: 65.00 ksi

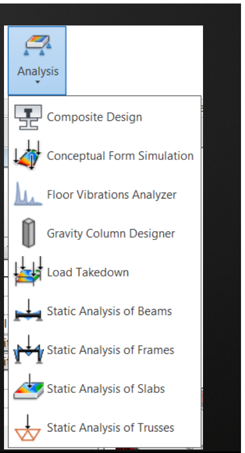
Before Export:
Hope and Pray it works

- ***Ask Revit to Forgive and Forget***
  - ***Disable Analytical Elements***
    - ***Minor Structures***
  - ***Reset the Analytical Models***
  - ***Reset Links***


Disable Analytical
Analytical Reset
Reset Links
Analytical Model Tools

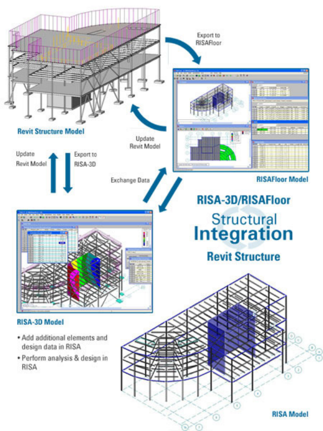
Exporting to Analysis Software

- Options:
  - Many (Risa, Robot, etc.)
  - Inside Revit?


Analysis
Composite Design
Conceptual Form Simulation
Floor Vibrations Analyzer
Gravity Column Designer
Load Takedown
Static Analysis of Beams
Static Analysis of Frames
Static Analysis of Slabs
Static Analysis of Trusses

Risa Revit Link

- Round Trip Workflow
  - Place Structure In Revit
  - Assign Loads & Combinations
  - QA / QC Connectivity
  - Import into Risa
  - Model analysis
  - Change member sizes
  - Export Risa Exchange file Import to Revit
  - QA/QC changes for inconsistencies

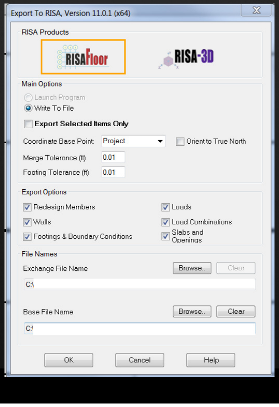

Export to RISAFloor
Revit Structure Model
Update Revit Model
Update Revit Model
Export to RISA-3D
Exchange Data
RISAFloor Model
RISA-3D/RISAFloor
Structural Integration
Revit Structure
RISA-3D Model
• Add additional elements and design data in RISA
• Perform analysis & design in RISA
RISA Model

What is Transferred between Revit & Risa

- Element Properties
  - Risafloor beam and column sizes
  - Number of composite studs
  - Beam Camber
  - Beam end reactions
- Delta transfer if began in Revit
  - Beam Location
  - Material

RisaFloor & Risa-3D, CSC, etc.

- Get Comfortable with Information Exchange
  - Know what comes in
  - Know what goes out
  - 2013 Optimization



Export To RISA, Version 11.0.1 (x64)

RISA Products

Main Options

○ Launch Program
● Write To File

☐ **Export Selected Items Only**

Coordinate Base Point: Project
☐ Orient to True North
Merge Tolerance (ft) 0.01
Footing Tolerance (ft) 0.01

Export Options

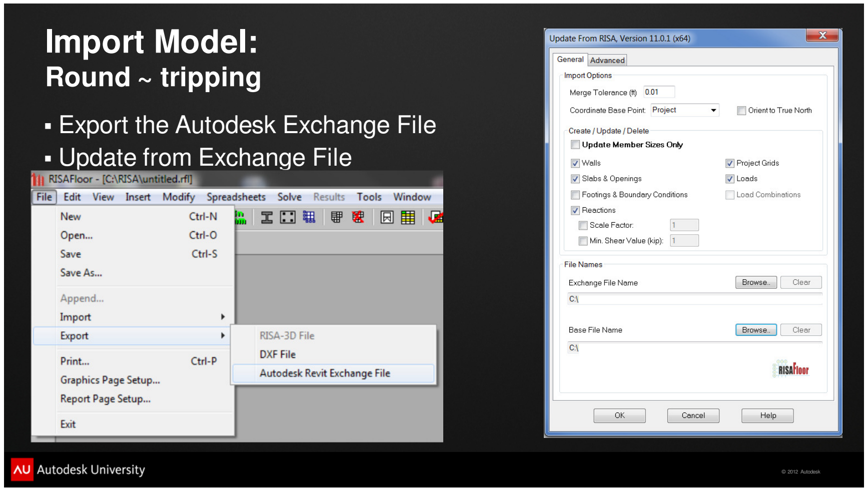
☑ Redesign Members
☑ Loads
☑ Walls
☑ Load Combinations
☑ Footings & Boundary Conditions
☑ Slabs and Openings

File Names

Exchange File Name
C:\

Base File Name
C:\

RISAFloor
RISA-3D
Browse..
Clear
Browse..
Clear
OK
Cancel
Help



Import Model:
Round ~ tripping

- Export the Autodesk Exchange File
- Update from Exchange File

RISAFloor - [C:\RISA\untitled.rfl]
File
Edit
View
Insert
Modify
Spreadsheets
Solve
Results
Tools
Window
New Ctrl-N
Open... Ctrl-O
Save Ctrl-S
Save As...
Append...
Import
Export
Print... Ctrl-P
Graphics Page Setup...
Report Page Setup...
Exit
RISA-3D File
DXF File
Autodesk Revit Exchange File

Update From RISA, Version 11.0.1 (x64)

General | Advanced

Import Options

Merge Tolerance (ft) 0.01

Coordinate Base Point: Project

☐ Orient to True North

Create / Update / Delete

☐ **Update Member Sizes Only**

☑ Walls

☑ Project Grids

☑ Slabs & Openings

☑ Loads

☐ Footings & Boundary Conditions

☐ Load Combinations

☑ Reactions

☐ Scale Factor: 1

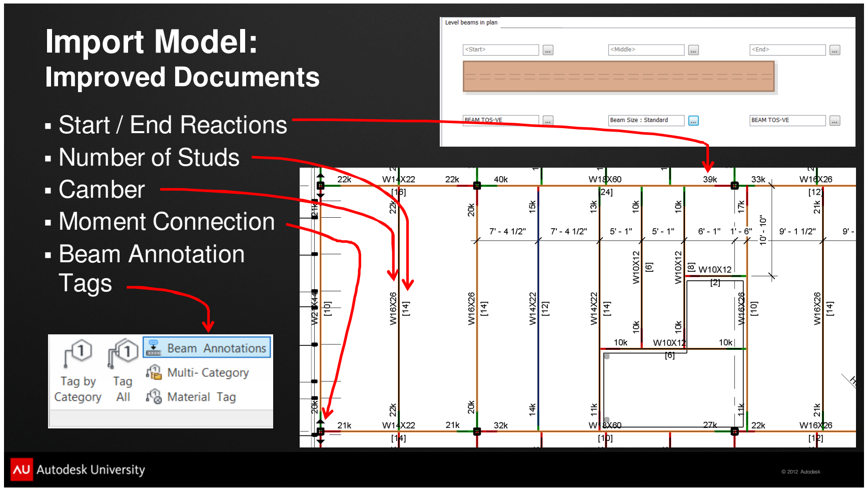
☐ Min. Shear Value (kip): 1

File Names

Exchange File Name C:\

Base File Name C:\

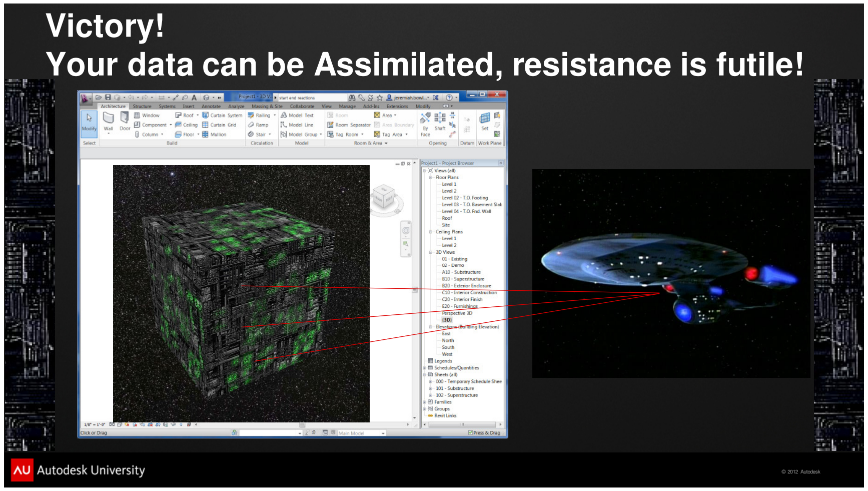
Browse..
Clear
RISAFloor
OK
Cancel
Help



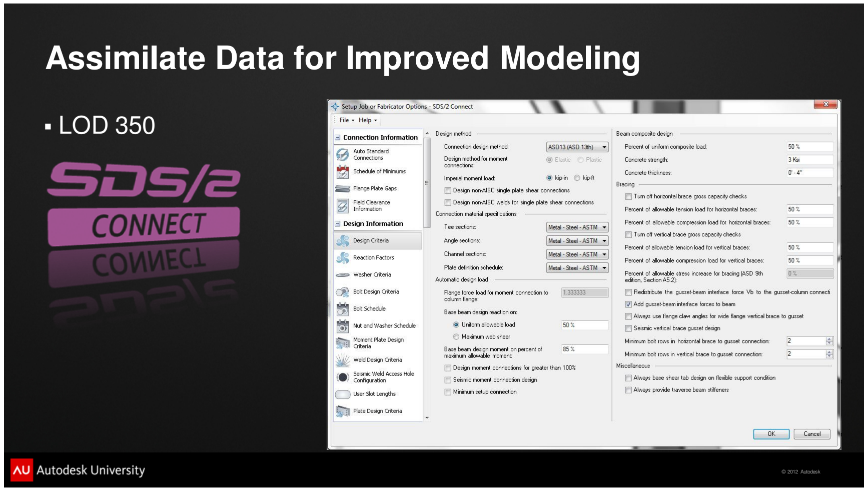
Import Model:
Improved Documents

- Start / End Reactions
- Number of Studs
- Camber
- Moment Connection
- Beam Annotation Tags

Level beams in plan
<Start>
<Middle>
<End>
BEAM TOS-VE
Beam Size : Standard
BEAM TOS-VE
Tag by Category
Tag All
Beam Annotations
Multi- Category
Material Tag
22k
W14X22
[18]
22k
40k
W18X80
[24]
39k
33k
W16X26
[12]
7' - 4 1/2"
5' - 1"
6' - 1"
1' - 6"
9' - 1 1/2"
W10X12
[6]
W10X12
[2]
W16X26
[14]
W14X22
[12]
W18X26
[10]
10k
27k
21k
32k
14k
11k



Victory!
Your data can be Assimilated, resistance is futile!



Assimilate Data for Improved Modeling

- LOD 350

SDS/2
CONNECT

Setup Job or Fabricator Options - SDS/2 Connect

File
Help
Connection Information
Auto Standard Connections
Schedule of Minimums
Flange Plate Gaps
Field Clearance Information
Design Information
Design Criteria
Reaction Factors
Washer Criteria
Bolt Design Criteria
Bolt Schedule
Nut and Washer Schedule
Moment Plate Design Criteria
Weld Design Criteria
Seismic Weld Access Hole Configuration
User Slot Lengths
Plate Design Criteria

Design method

Connection design method: ASD13 (ASD 13th)

Design method for moment connections: ● Elastic ○ Plastic

Imperial moment load: ● kip-in ○ kip-ft

☐ Design non-AISC single plate shear connections

☐ Design non-AISC welds for single plate shear connections

Connection material specifications

Tee sections: Metal - Steel - ASTM

Angle sections: Metal - Steel - ASTM

Channel sections: Metal - Steel - ASTM

Plate definition schedule: Metal - Steel - ASTM

Automatic design load

Flange force load for moment connection to column flange: 1.333333

Base beam design reaction on:

● Uniform allowable load 50 %

○ Maximum web shear

Base beam design moment on percent of maximum allowable moment: 85 %

☐ Design moment connections for greater than 100%

☐ Seismic moment connection design

☐ Minimum setup connection

Beam composite design

Percent of uniform composite load: 50 %

Concrete strength: 3 Ksi

Concrete thickness: 0' - 4"

Bracing

☐ Turn off horizontal brace gross capacity checks

Percent of allowable tension load for horizontal braces: 50 %

Percent of allowable compression load for horizontal braces: 50 %

☐ Turn off vertical brace gross capacity checks

Percent of allowable tension load for vertical braces: 50 %

Percent of allowable compression load for vertical braces: 50 %

Percent of allowable stress increase for bracing (ASD 9th edition, Section A5.2): 0 %

☐ Redistribute the gusset-beam interface force Vb to the gusset-column connecti

☑ Add gusset-beam interface forces to beam

☐ Always use flange claw angles for wide flange vertical brace to gusset

☐ Seismic vertical brace gusset design

Minimum bolt rows in horizontal brace to gusset connection: 2

Minimum bolt rows in vertical brace to gusset connection: 2

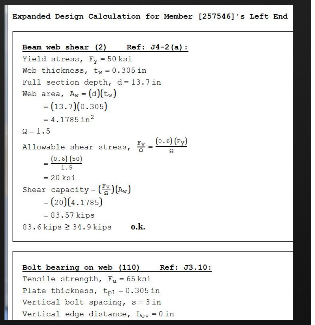
Miscellaneous

☐ Always base shear tab design on flexible support condition

☐ Always provide traverse beam stiffeners

Improved Documentation

- Document Calculations from Analyzed Data.



Expanded Design Calculation for Member [257546]'s Left End

Beam web shear (2)   Ref: J4-2(a):

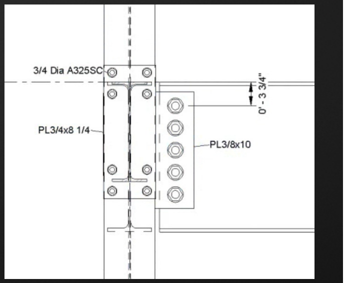
Yield stress, $F_y = 50$ ksi
Web thickness, $t_w = 0.305$ in
Full section depth, $d = 13.7$ in
Web area, $A_w = (d)(t_w)$
$= (13.7)(0.305)$
$= 4.1785\ \text{in}^2$
$\Omega = 1.5$
Allowable shear stress, $\frac{F_v}{\Omega} = \frac{(0.6)(F_y)}{\Omega}$
$= \frac{(0.6)(50)}{1.5}$
$= 20$ ksi
Shear capacity $= \left(\frac{F_v}{\Omega}\right)(A_w)$
$= (20)(4.1785)$
$= 83.57$ kips
83.6 kips ≥ 34.9 kips **o.k.**

Bolt bearing on web (110)   Ref: J3.10:

Tensile strength, $F_u = 65$ ksi
Plate thickness, $t_{pl} = 0.305$ in
Vertical bolt spacing, $s = 3$ in
Vertical edge distance, $L_{ev} = 0$ in

"Tag, your it"

- Improve Tagging

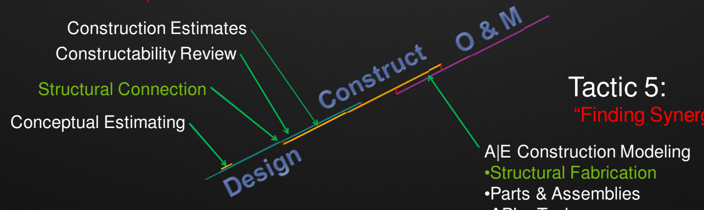

3/4 Dia A325SC
PL3/4x8 1/4
PL3/8x10
0' - 3 3/4"

Additional A|E Analysis Data Strategies

- Improve Engineering & Engineering Technician Workflow
  - Integrated Structural Analysis
  - Engineers modeling
  - QA/QC Model
- Extend BIM use to Construction Engineers
  - Connection Design in Record Model
  - Loads & Design Settings captured in Record Model
  - Temporary Construction Load Analysis

Address Re-work with Pre-work:
Integrated Approach

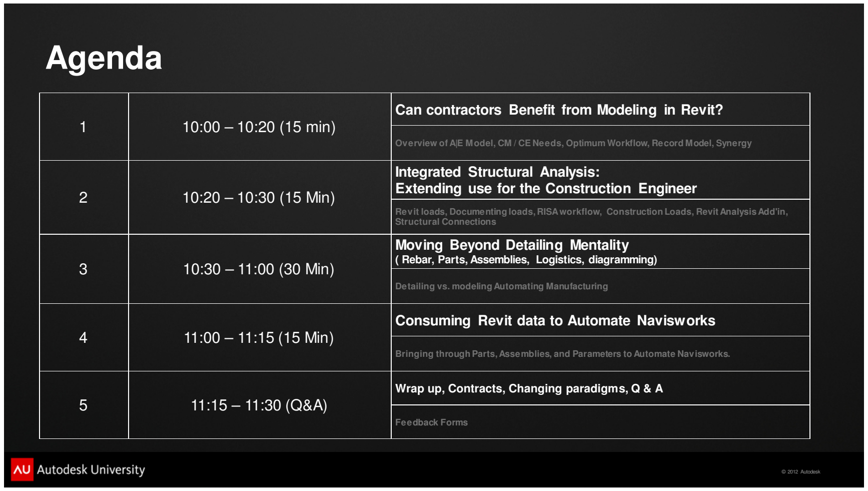
Tactic 3:
"Reduce rework, with Pre-work"


Construction Estimates
Constructability Review
Structural Connection
Conceptual Estimating
Design
Construct
O & M

Tactic 5:
"Finding Synergy"

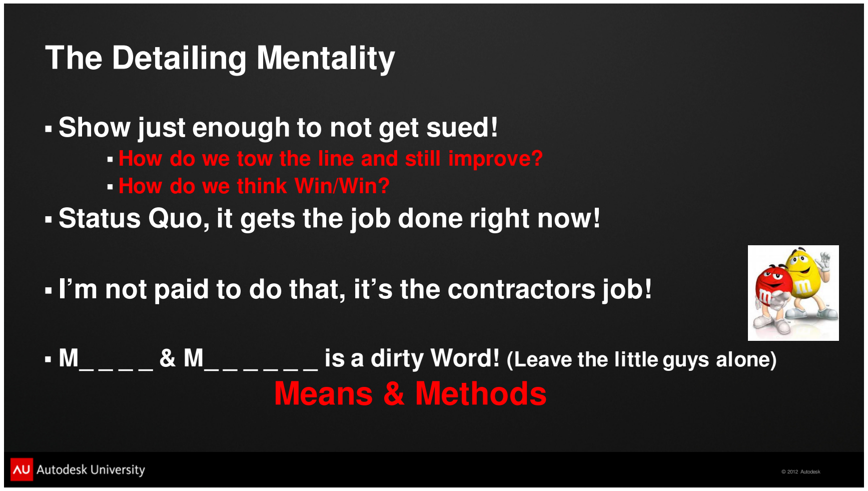
A|E Construction Modeling
- Structural Fabrication
- Parts & Assemblies
- API – Tools
- Enhanced Simulation

Tactic 4:
"Begin with the End in Mind"



Agenda

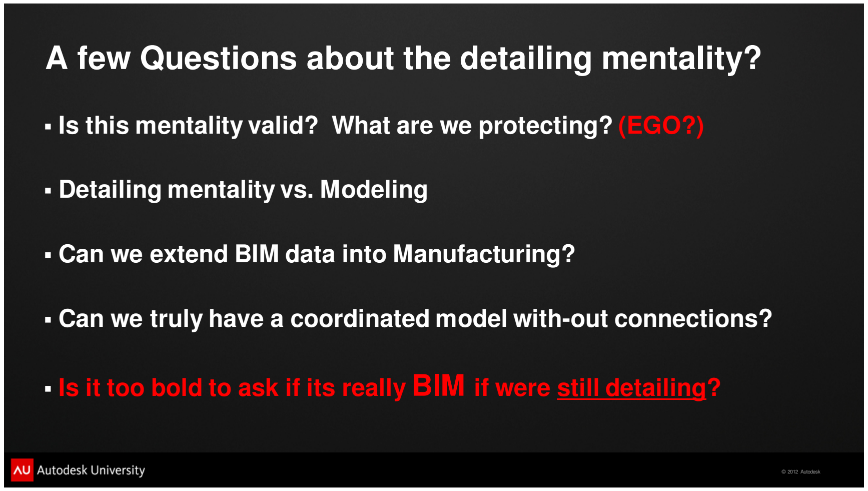
1	10:00 – 10:20 (15 min)	**Can contractors Benefit from Modeling in Revit?** Overview of A|E Model, CM / CE Needs, Optimum Workflow, Record Model, Synergy
2	10:20 – 10:30 (15 Min)	**Integrated Structural Analysis: Extending use for the Construction Engineer** Revit loads, Documenting loads, RISA workflow, Construction Loads, Revit Analysis Add'in, Structural Connections
3	10:30 – 11:00 (30 Min)	**Moving Beyond Detailing Mentality (Rebar, Parts, Assemblies, Logistics, diagramming)** Detailing vs. modeling Automating Manufacturing
4	11:00 – 11:15 (15 Min)	**Consuming Revit data to Automate Navisworks** Bringing through Parts, Assemblies, and Parameters to Automate Navisworks.
5	11:15 – 11:30 (Q&A)	**Wrap up, Contracts, Changing paradigms, Q & A** Feedback Forms



The Detailing Mentality

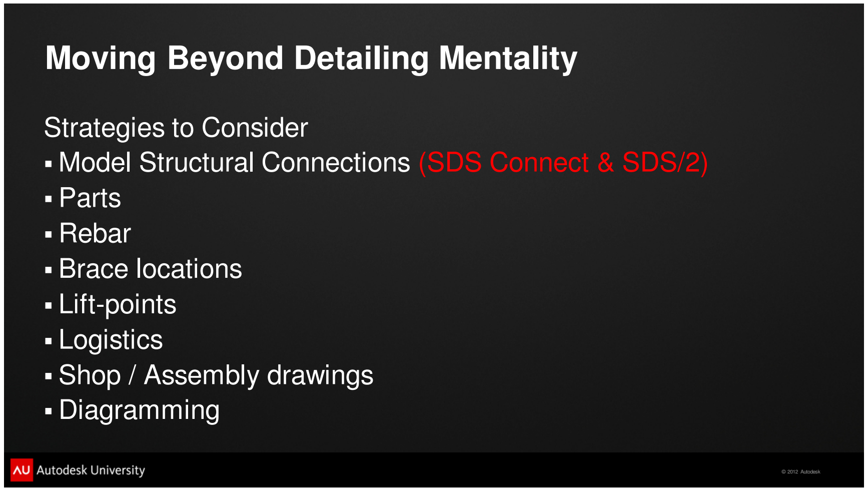
- **Show just enough to not get sued!**
  - **How do we tow the line and still improve?**
  - **How do we think Win/Win?**
- **Status Quo, it gets the job done right now!**
- **I'm not paid to do that, it's the contractors job!**
- **M_ _ _ _ & M_ _ _ _ _ _ _ is a dirty Word!** **(Leave the little guys alone)**

Means & Methods



A few Questions about the detailing mentality?

- **Is this mentality valid? What are we protecting? (EGO?)**
- **Detailing mentality vs. Modeling**
- **Can we extend BIM data into Manufacturing?**
- **Can we truly have a coordinated model with-out connections?**
- **Is it too bold to ask if its really BIM if were still detailing?**



Moving Beyond Detailing Mentality

Strategies to Consider
- Model Structural Connections (SDS Connect & SDS/2)
- Parts
- Rebar
- Brace locations
- Lift-points
- Logistics
- Shop / Assembly drawings
- Diagramming

Transition to Beyond detailing mentality

Beyond Detailing ….
…….The Informed Modeling Mentality

Re-define LOD based on a informed Modeling Mentality

Parts & Assemblies

Rebar Tools

- Why don't Engineers model Rebar?
  Effort vs. Reward {WIIFM - What's in it for me?}

- What value is it for the Contractor?

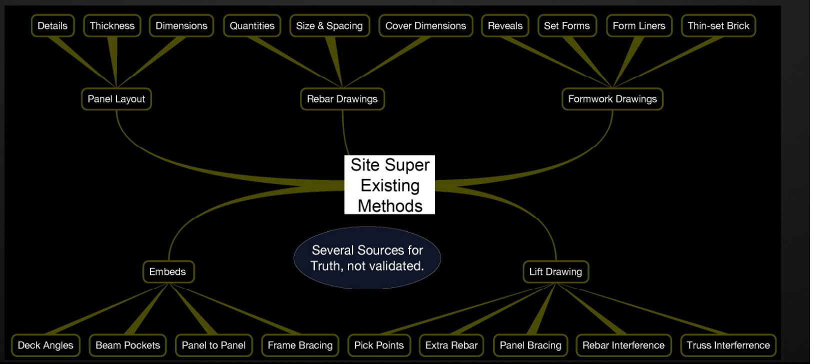
Traditional Construction Challenges

- Fragmented Delivery tools
- Diverse tools
- Separate models / Drawings
- Manual Information exchange
- Communication through RFI
- Interpolation Interpretation????

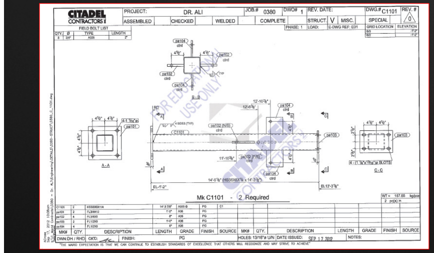
Rework = Waste = Lost Productivity =Lost Profit

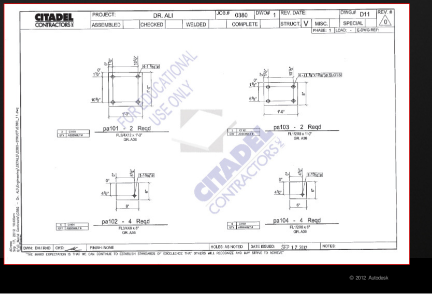
Lean Construction = Reduce rework with Pre-work

Sample Tilt-up / Concrete Lift Drawing Process

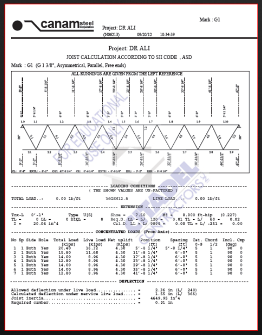

Details
Thickness
Dimensions
Quantities
Size & Spacing
Cover Dimensions
Reveals
Set Forms
Form Liners
Thin-set Brick
Panel Layout
Rebar Drawings
Formwork Drawings
Site Super Existing Methods
Several Sources for Truth, not validated.
Embeds
Lift Drawing
Deck Angles
Beam Pockets
Panel to Panel
Frame Bracing
Pick Points
Extra Rebar
Panel Bracing
Rebar Interference
Truss Interferrence

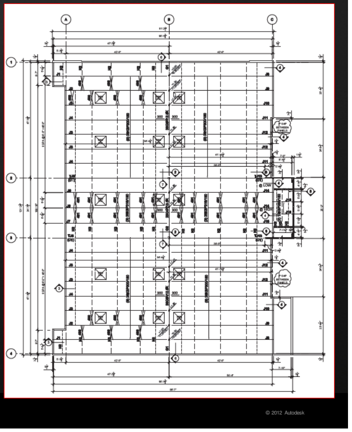
Tilt-up / Pre-cast
Steel Shops


CITADEL CONTRACTORS
PROJECT: DR. ALI
Mk C1101 - 2 Required
FOR EDUCATIONAL USE ONLY

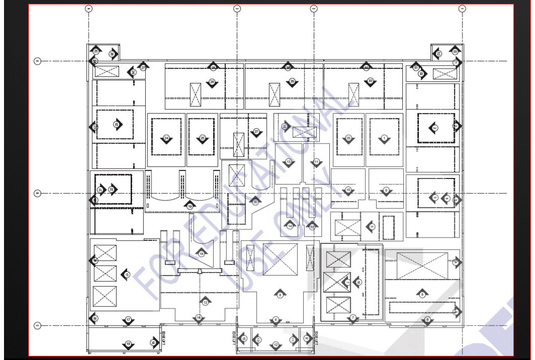

CITADEL CONTRACTORS
PROJECT: DR. ALI
pa101 - 2 Reqd
pa103 - 2 Reqd
pa102 - 4 Reqd
pa104 - 4 Reqd
FOR EDUCATIONAL USE ONLY

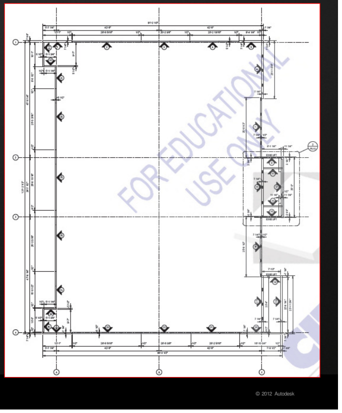
Tilt-up / Pre-cast
Fabrication Drawings / Steel Shops


canam steel
Project: DR ALI
Mark : G1
JOIST CALCULATION ACCORDING TO SJI CODE, ASD

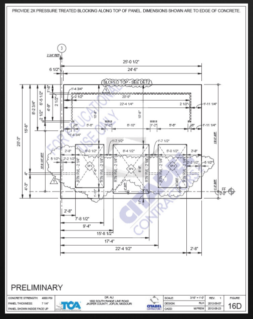


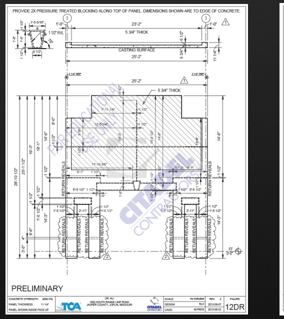
Tilt-up / Pre-cast
Assembly Drawings / Casting Layout

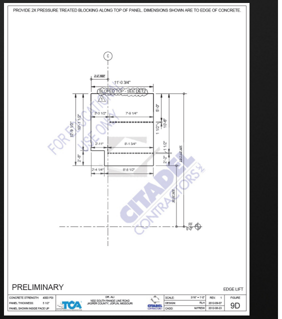

FOR EDUCATIONAL USE ONLY


FOR EDUCATIONAL USE ONLY

Tilt-up / Pre-cast
Lift Drawings / Cut Sheets


PRELIMINARY
TCA
16D


PRELIMINARY
TCA
12DR


PRELIMINARY
TCA
9D

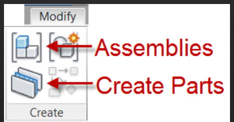
Can Revit do all this?

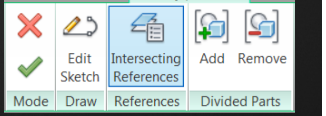
Intro Parts

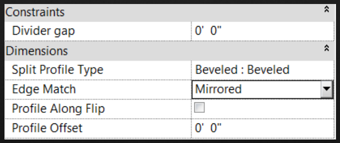
- Reflect construction methods by dividing model into parts.
- Schedule, Tag, Filter and Export Parts for Downstream Construction
- Merge parts with nearby elements for included assembly information.
- Modify or Exclude Parts without affecting the original.
- Parts Automatically update as the design model changes.

Parts Process

- Create Parts
- Divide Parts
  - Sketch Divisions
  - Intersecting References (Grids / Planes)
- Division Profiles
- Schedule Parts (QTO)
  - Part Assemblies


Modify
Assemblies
Create Parts
Create

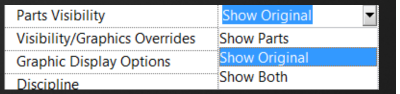

Edit
Sketch
Intersecting
References
Add
Remove
Mode
Draw
References
Divided Parts



Constraints	
Divider gap	0' 0"
Dimensions	
Split Profile Type	Beveled : Beveled
Edge Match	Mirrored
Profile Along Flip	☐
Profile Offset	0' 0"

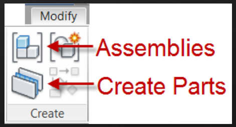
Tips & Tricks

- Create Different Part views
  - Create View templates to automated graphic overrides.
- Create Parts
  - Walls, Floors & Roofs.
- See AU Whitepaper for Detailed Instructions



Parts Visibility	Show Original
Visibility/Graphics Overrides	
Graphic Display Options	
Discipline	

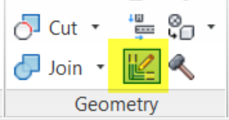
Show Parts
Show Original
Show Both

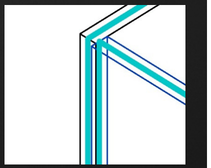

Modify
Assemblies
Create Parts
Create

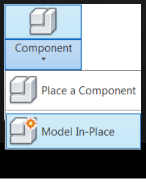
Tips & Tricks

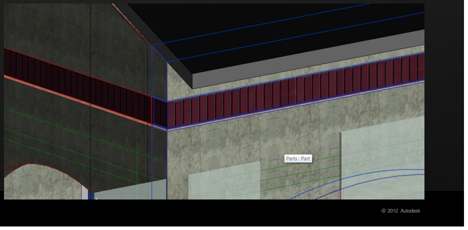
Clean & Prepare Revit Model

- Wall Join
  - Fix wall joins
  - Find disallow join's & fix.
- Hosted Wall Sweeps
  - Host in wall
  - Redraw and break at Part joins
  - Model in Place


Cope
Cut
Join
Geometry



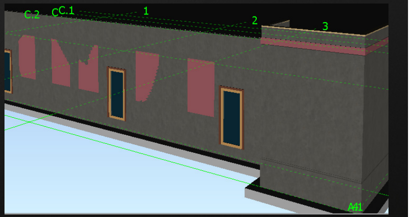

Component
Place a Component
Model In-Place



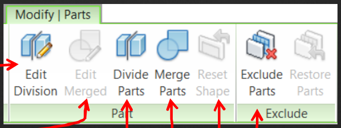
Tips & Tricks

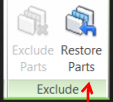
Clean & Prepare Revit Model

- Reveals break with Parts
- Thin-set brick walls join to concrete wall



Modify Parts

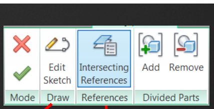

Modify | Parts
Edit Division
Edit Merged
Divide Parts
Merge Parts
Reset Shape
Exclude Parts
Restore Parts
Part
Exclude

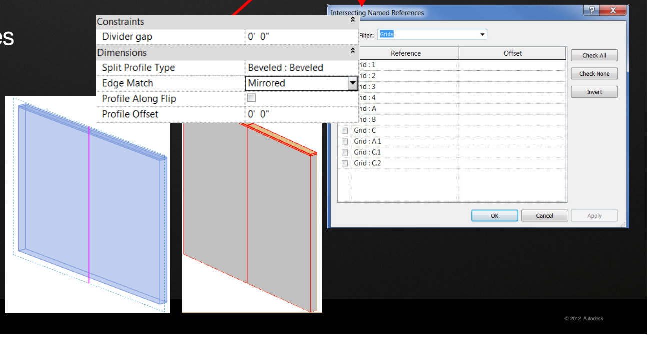

Exclude Parts
Restore Parts
Exclude

- Edit Divisions
- Edit Merged
- Divide Parts
- Merge Parts
- Reset Shape
- Exclude Part (Beam Pockets, voids)
- Restore Parts

Divide Parts

- Divide by intersections
- Sketch Lines
- Division Profiles


Edit Sketch
Intersecting References
Add
Remove
Mode
Draw
References
Divided Parts



Constraints	
Divider gap	0' 0"
Dimensions	
Split Profile Type	Beveled : Beveled
Edge Match	Mirrored
Profile Along Flip	☐
Profile Offset	0' 0"

Intersecting Named References

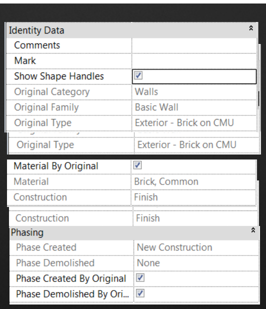
Filter: Grids

Reference	Offset
id : 1	
id : 2	
id : 3	
id : 4	
id : A	
id : B	
☐ Grid : C	
☐ Grid : A.1	
☐ Grid : C.1	
☐ Grid : C.2	

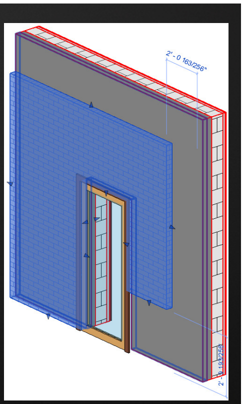
Check All
Check None
Invert
OK
Cancel
Apply

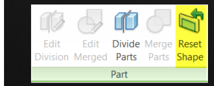
Modify Parts.

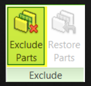
- Shape Handles
  - Parameter constraints
    - Shape Handles
    - Materials
    - Phase Created / Demo
    - Reset Shape
    - Exclude Parts

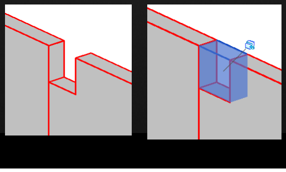


Identity Data	
Comments	
Mark	
Show Shape Handles	☑
Original Category	Walls
Original Family	Basic Wall
Original Type	Exterior - Brick on CMU
Original Type	Exterior - Brick on CMU
Material By Original	☑
Material	Brick, Common
Construction	Finish
Construction	Finish
Phasing	
Phase Created	New Construction
Phase Demolished	None
Phase Created By Original	☑
Phase Demolished By Ori...	☑



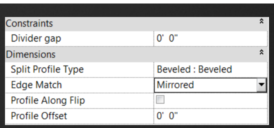

Edit Division
Edit Merged
Divide Parts
Merge Parts
Reset Shape
Part


Exclude Parts
Restore Parts
Exclude

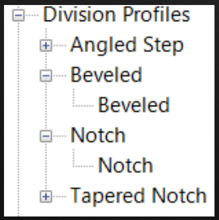


Division Profiles

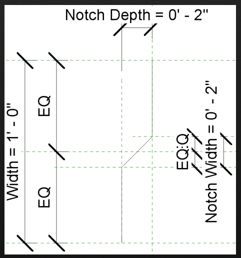
- Define new Profile type
  - Gap (if req'd)
  - Profile

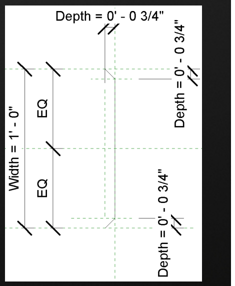


Constraints	
Divider gap	0' 0"
Dimensions	
Split Profile Type	Beveled : Beveled
Edge Match	Mirrored
Profile Along Flip	☐
Profile Offset	0' 0"



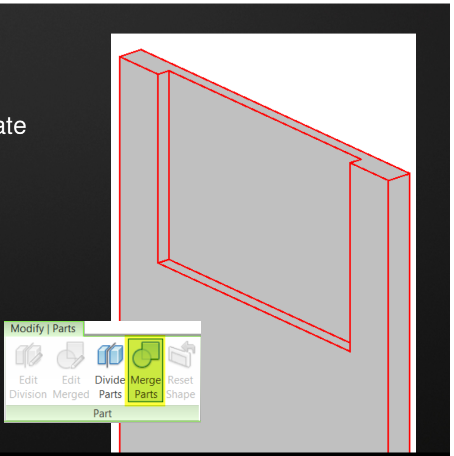
- Division Profiles
  - Angled Step
  - Beveled
    - Beveled
  - Notch
    - Notch
  - Tapered Notch


Notch Depth = 0' - 2"
Width = 1' - 0"
EQ
EQ
EQ
EQ
Notch Width = 0' - 2"


Depth = 0' - 0 3/4"
Width = 1' - 0"
EQ
EQ
Depth = 0' - 0 3/4"
Depth = 0' - 0 3/4"

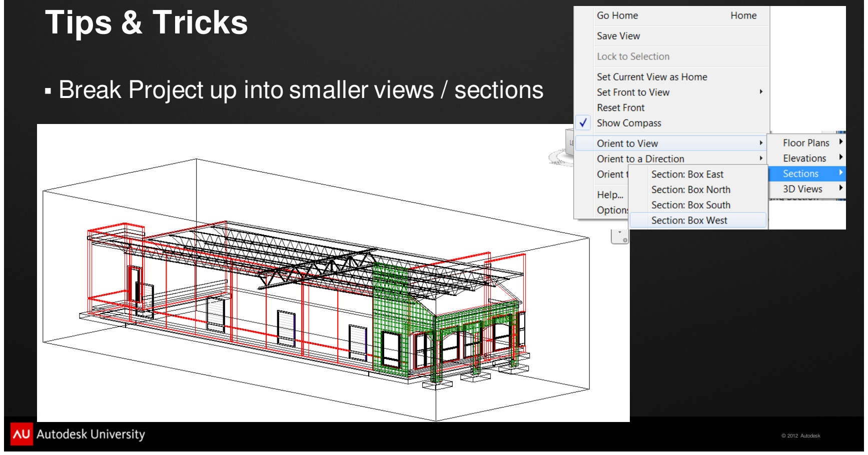
Merge Parts

- Merged Parts join material estimate
- Must be like type material


Modify | Parts
Edit Division
Edit Merged
Divide Parts
Merge Parts
Reset Shape
Part

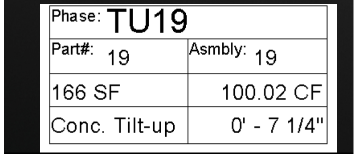
Tips & Tricks

- Break Project up into smaller views / sections

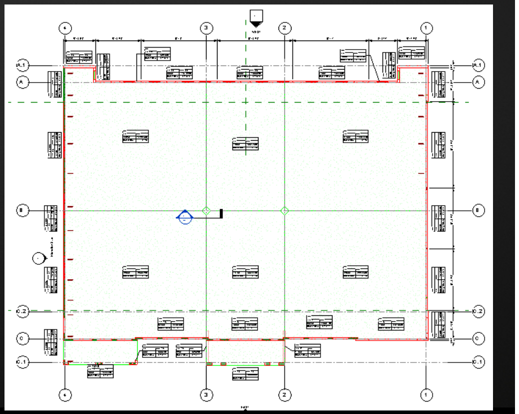

Go Home
Home
Save View
Lock to Selection
Set Current View as Home
Set Front to View
Reset Front
Show Compass
Orient to View
Orient to a Direction
Orient t
Help...
Option
Floor Plans
Elevations
Sections
3D Views
Section: Box East
Section: Box North
Section: Box South
Section: Box West

Tips & Tricks

- Plan views with intelligent part tags.
- Include Project critical information.
- Project Changes are reflected in Navisworks

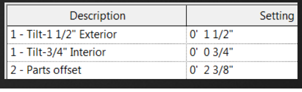


Phase: TU19	
Part#: 19	Asmbly: 19
166 SF	100.02 CF
Conc. Tilt-up	0' - 7 1/4"

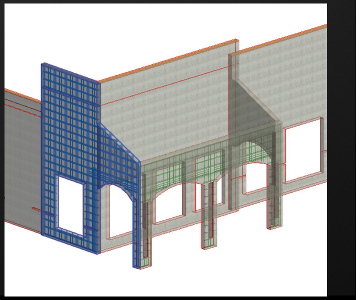


Rebar in Parts Tips

- Establish Specific Cover Settings for Parts
- Create Views isolating Parts & Rebar
- Additional cover settings for Reveals
- Join thin-set brick to concrete walls to void out concrete wall material.

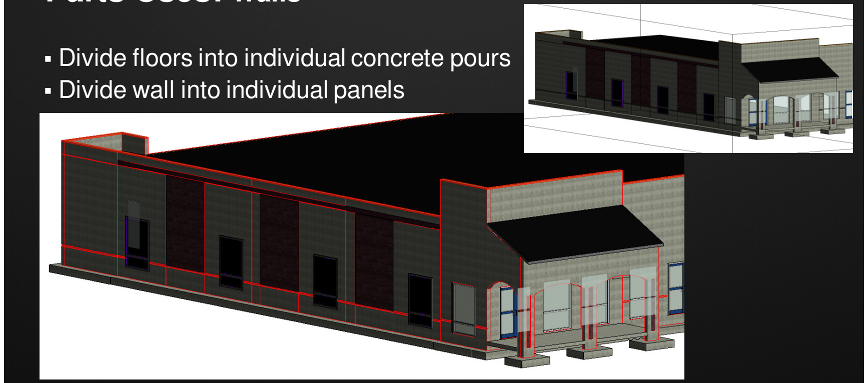


Description	Setting
1 - Tilt-1 1/2" Exterior	0' 1 1/2"
1 - Tilt-3/4" Interior	0' 0 3/4"
2 - Parts offset	0' 2 3/8"



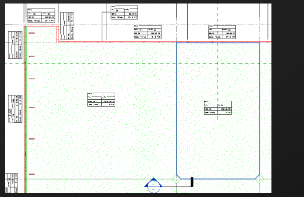
Parts Uses: Walls

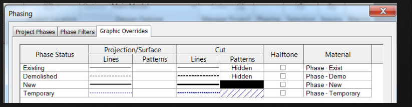
- Divide floors into individual concrete pours
- Divide wall into individual panels



Parts Uses: Floors (Flat with no Shape Edits)

- Divide floors into individual concrete pours
- Additional Detail Sheets, elevations, etc., Shop Drawings
  - Model Forms as Temporary Phase (built and demolished in same phase)
  - Rebar location
  - Specify project coordinates and show on plans.





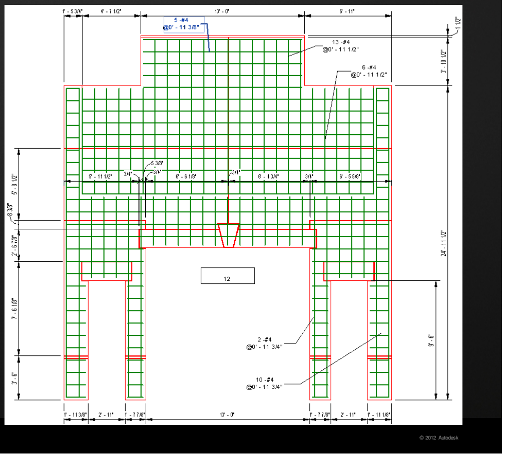
Phasing

Phase Status	Projection/Surface		Cut		Halftone	Material
	Lines	Patterns	Lines	Patterns		
Existing	———		———	Hidden	☐	Phase - Exist
Demolished	- - - - -		- - - - -	Hidden	☐	Phase - Demo
New	━━━		━━━	■	☐	Phase - New
Temporary	········		········	▨	☐	Phase - Temporary

Assemblies

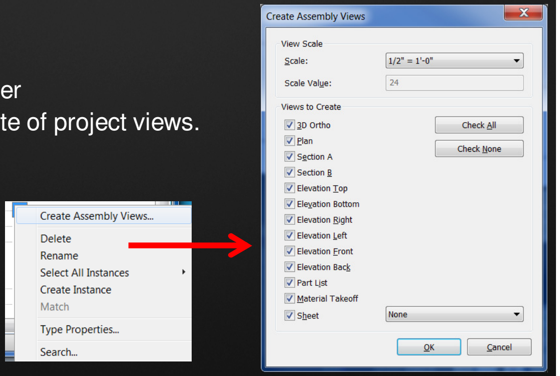
- Combine Several objects into assemblies
  - Manipulate elements as a single unit
  - Each assembly is a separate assembly type
  - Place instances of assemblies
  - Changes are tracked as the model changes
  - Consume parts, parameters, associate to parts.
- Using Assemblies
  - Edited, tagged, schedules, and filtered
  - Generate sheet and assembly views
  - Shop Drawings, clarity drawings, slab plans, form layouts.
  - Grouping like type objects

Assembly Views



Assembly Views

- Separate Views
- Found in Project Browser
- Can be detailed separate of project views.
- Automated creation
- Automatic Placement


Create Assembly Views...
Delete
Rename
Select All Instances
Create Instance
Match
Type Properties...
Search...
Check All
Check None
OK
Cancel

Create Assembly Views

View Scale

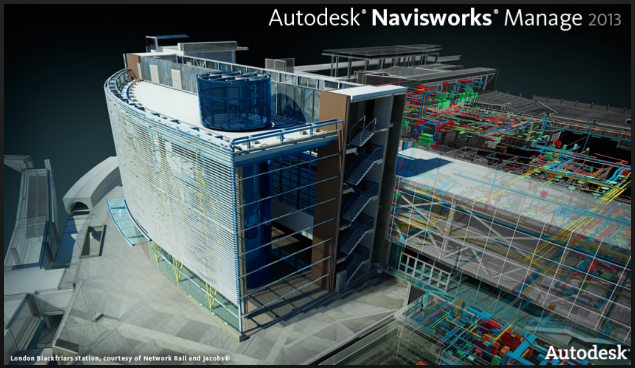
Scale: 1/2" = 1'-0"

Scale Value: 24

Views to Create

- ☑ 3D Ortho
- ☑ Plan
- ☑ Section A
- ☑ Section B
- ☑ Elevation Top
- ☑ Elevation Bottom
- ☑ Elevation Right
- ☑ Elevation Left
- ☑ Elevation Front
- ☑ Elevation Back
- ☑ Part List
- ☑ Material Takeoff
- ☑ Sheet: None

Consuming Revit Data to Automate Navisworks


Autodesk® Navisworks® Manage 2013
London Blackfriars station, courtesy of Network Rail and Jacobs®
Autodesk

Innovators don’t see obstacles, just opportunities

- Narrative: When working as a Technical expert I always heard the statement “were going to wait for the tool to be more complete until we leverage these functions”. The problem with this statement is that it doesn’t
- What not to do:
- Just enough to start….

Perception, Potentials, & Realities

- Plan Delivery and Installation of more complex Revit elements.
- Rebar does not split when parts are divide walls
  - IDAT Pre-cast Tools will divide walls based on formulas (no rebar edits however)
- Hosted sweeps split separately from wall materials
- Wall Sweeps don’t split (Can’t Create Parts unless nested)
- Wall Reveals do split ☺
- Individual bar picking when adding to assemblies(Common Segments)
  - API tools to fix these?
- NO Start & End Division Gaps for wall transitions?
- Rebar not dynamic to wall edits as parts are.

Say what? Where to start?

- Evaluate your existing process, players and team structures.
  - Are Integrated teams an option.
- Create a value map for each strategy.
- As a BIM thought leader…. Innovate

Modeling Considerations

- When Should BIM be used?
- LOD’s – What Should Be modeled?
- Where is the balance of Effort / Reward?
- Where is productivity lost?
- What are the clients end deliverables? (Record model, As-built, COBie?)

Modeling Considerations continued

- Should we re-invent the wheel 3 different times?
- Does the designer / A|E team have all the information?
- Does the Fabricator have all the information?
- What obstacles face our collaborative world of information exchange?
- Do any synergies exist?

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