

#ITCon22

Innovation Meets Construction

Advice, Tips, Tricks, and That Was Dumb!
Benjamin Crosby – Yates Construction

 **CONFERENCE**
FOR CONSTRUCTION PROFESSIONALS

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Cool – Christmas 2015



Blowing money – 2016



NBCNEWS.COM
James Eng
Dec. 16, 2015



IMAGE: CHAPPAQUA FIRE DEPARTMENT
MASHABLE.COM
Adario Strange
Jan 21 2016

Half a million hoverboards recalled due to fires, explosions and injuries

Mass recall comes after reports of hoverboard battery packs that exploded or caught fire and caused injuries such as burns to the neck, legs and arms



▲ Hoverboard explodes during a test drive

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Great Investment – October 2019



Things to know – Practical Application

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- 1. Don't try to go cheap
- 2. Check/Get Certification
- 3. Check for quality/history
- 4. Don't overdo it
- 5. Check on progress
- 6. {insert snide remark or catch phrase}

Lean = Not an acronym

AGC CM-Lean = Foundation

Lean Construction Education Program

SHARETHIS



Take the free Lean 101 Course

Optional This optional, free 50 minute eLearning course introduces key CM-Lean concepts

Click on the dots below to learn how to earn your CM-Lean credential

Everyone related to the construction process has an incentive to get the project done faster



Course
Calendar

View upcoming classes!



Supplemental
Courses

Learn More!

Lean

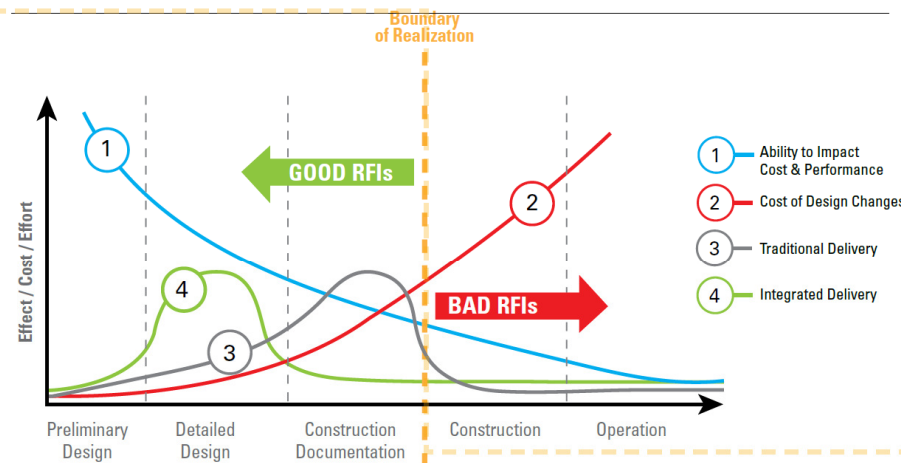
Last Planner System = Better Meetings – Better Schedule



Lean

Lean Design = BIM < iterative design < model review < VDC

The MacLeamy Curve

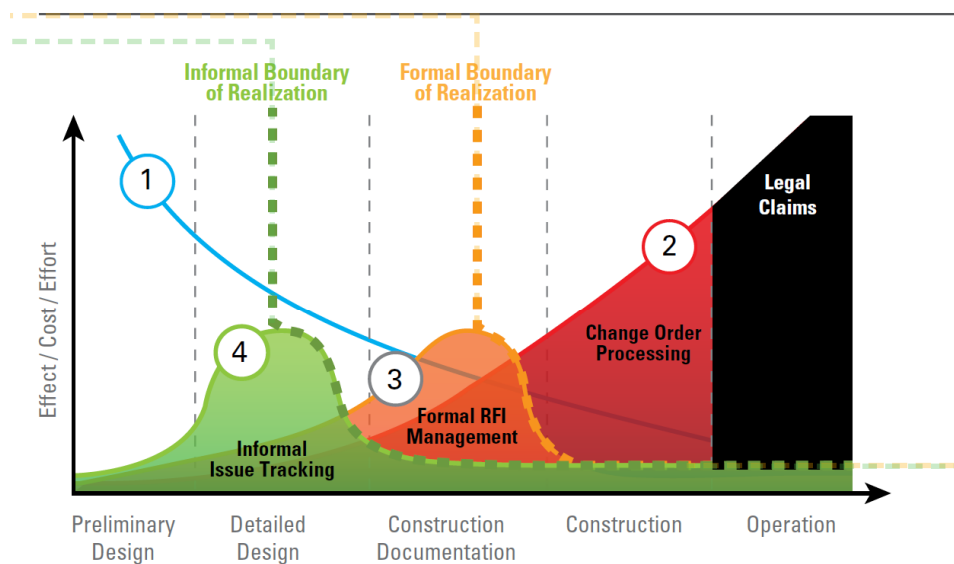


OPEN INTEGRATION SUMMIT 2017 | CONSTRUCTION PROGRESS COALITION

Lean

Problem Solving

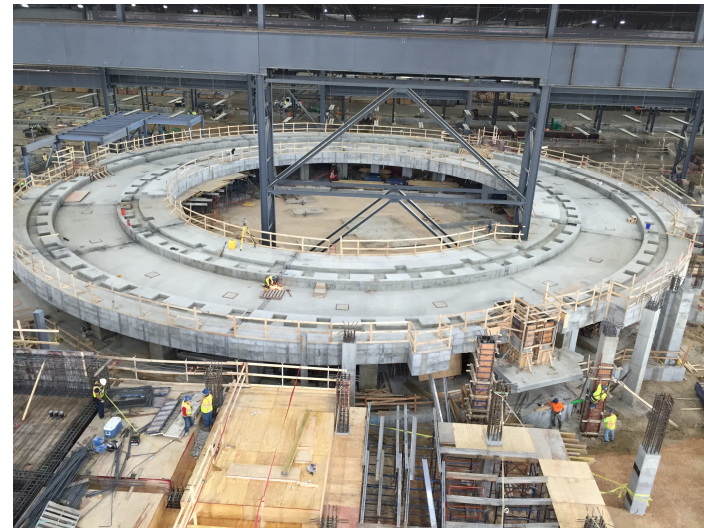
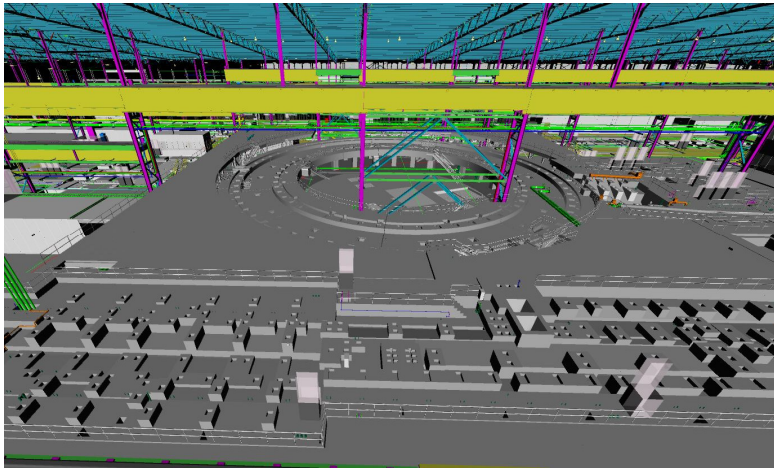
Informal vs. Formal Boundaries



- 1 Ability to Impact Cost & Performance 2 Cost of Design Changes 3 Traditional Delivery 4 Integrated Delivery

Lean

Prefabrication < Manufacturing



Lean

It is a Social Tech – not a Program



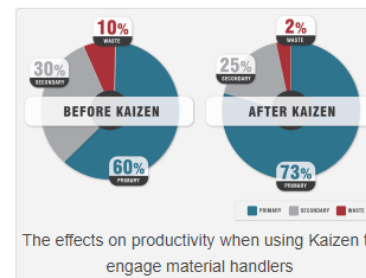
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Making Productivity Gains Through Material Handling and Kaizen

November 27, 2018 by [Derek Buehler](#) under the topic of: [Faith Technologies, Productivity](#)

At **Faith Technologies**, continuous improvement and innovation are at the heart of our work. Through focused, gradual improvements over a nine-year span, Faith has increased primary, or value-added, time from 39 percent to 66 percent. This represents a 69 percent improvement in time spent on what the customer pays us to do, while the construction industry overall has stagnated at 42 percent primary time throughout the same period.



Lean

1. Hard Bid is usually not the low-cost option.
2. Get your team educated – request certification for others.
3. Request history / results in qualification documents.
4. Don't ask for everything – hit the important parts.
5. Actively participate.
6. Lean is a culture, not a bolt on.

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LOD = Level of Development

<http://bimforum.org/lod/>

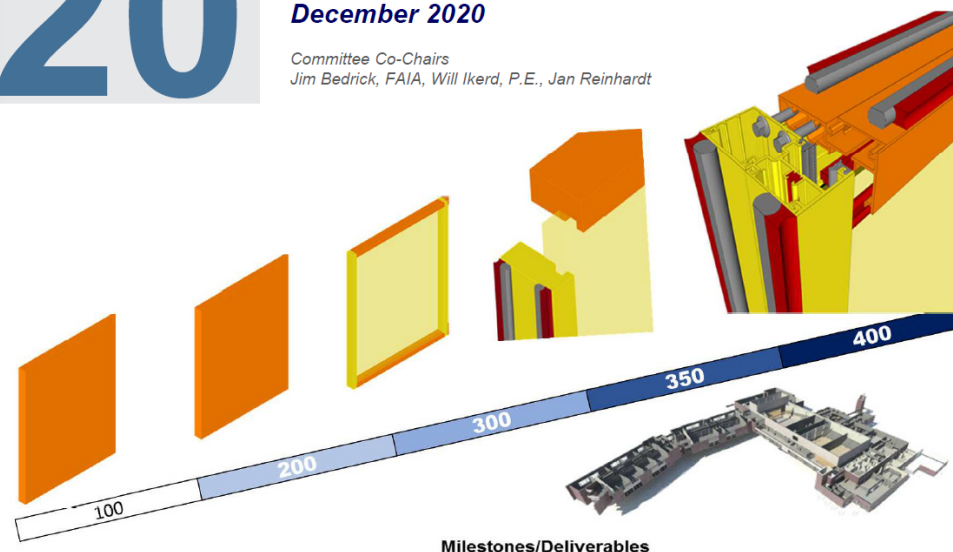
20
20

BIM FORUM LEVEL OF DEVELOPMENT (LOD) SPECIFICATION PART I & COMMENTARY

For Building Information Models and Data

December 2020

Committee Co-Chairs
Jim Bedrick, FAIA, Will Ikerd, P.E., Jan Reinhardt



PARTICIPATING ORGANIZATIONS



The American
Institute
of Architects

AGC of America
THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA
Quality People. Quality Projects.



BIM-M
Building Information Modeling
for Masonry



Precast/Prestressed
PCI Concrete Institute



USIBD
U.S. Institute of
BUILDING DOCUMENTATION

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LOD

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LOD = Level of Development

1. The Specification is free to use.
2. Lots of webinars on how to use it. BIMForum.org
3. LOD 200 and 300 for A/Es – LOD 350 and 400 for Shop Models.
4. Don't ask for 400, 450, 500, 789.
5. Review models frequently (at least monthly).
6. No risk here, just do it.

BIM = Building Information Modeling

AGC CM-BIM = Foundation

Building Information Modeling Education Program

SHARETHIS



Locate your classes

Use the National Course Calendar to find upcoming classes in your area

Click on the dots below to learn how to earn your CM-BIM credential



Building Information Modeling (BIM) is changing the way projects are constructed. Whether you are a prime contractor using BIM across an entire project or a subcontractor impacted by

Meri Woods
Senior Director, Education Advancement
and Credentialing
meri.woods@agc.org
Phone: (703) 837-5366



Course
Calendar

View upcoming classes!

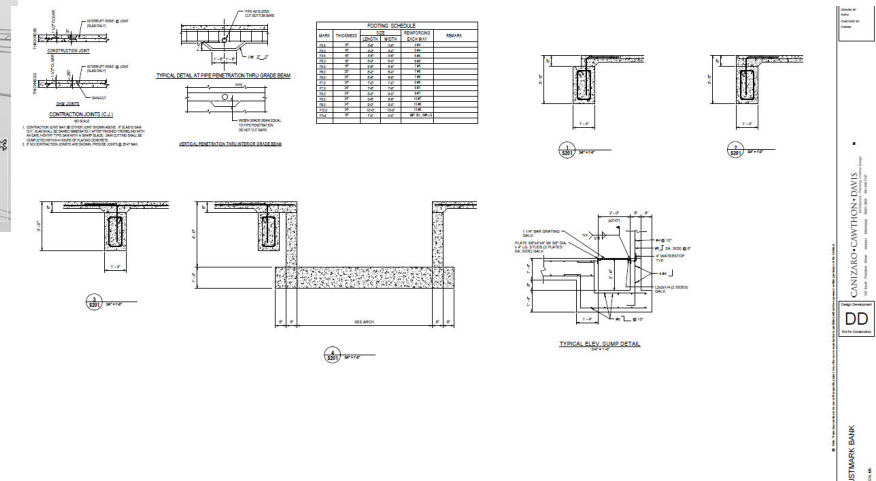
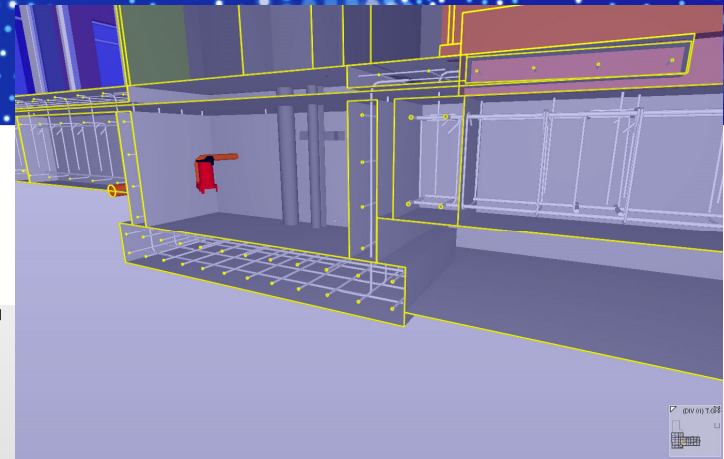
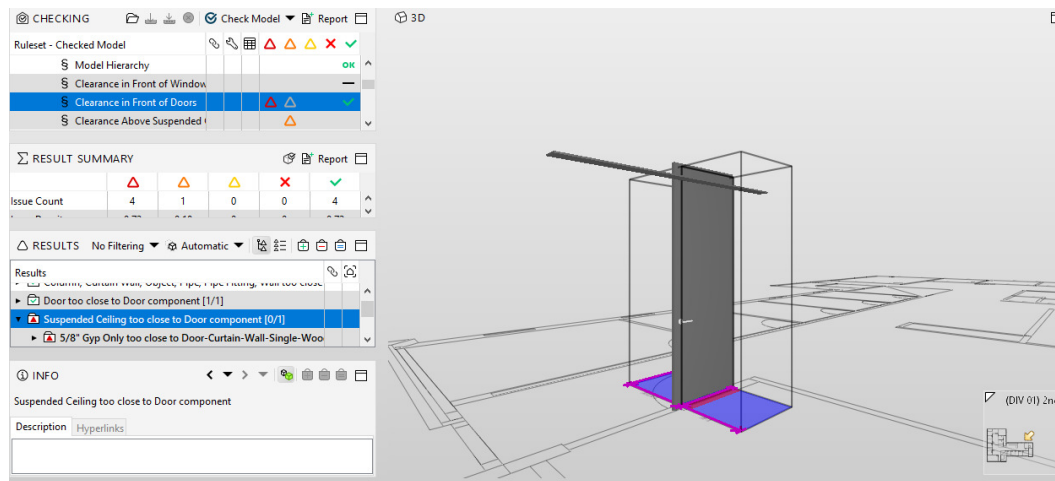


CM-BIM
Exam

Earn Your Credentials!

BIM

What do you use the models for during design?



BIM

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Review model progress regularly (don't waste time on drawings).

A V19 20190708
07/16/2019

compared to

B V18 20190607
06/07/2019

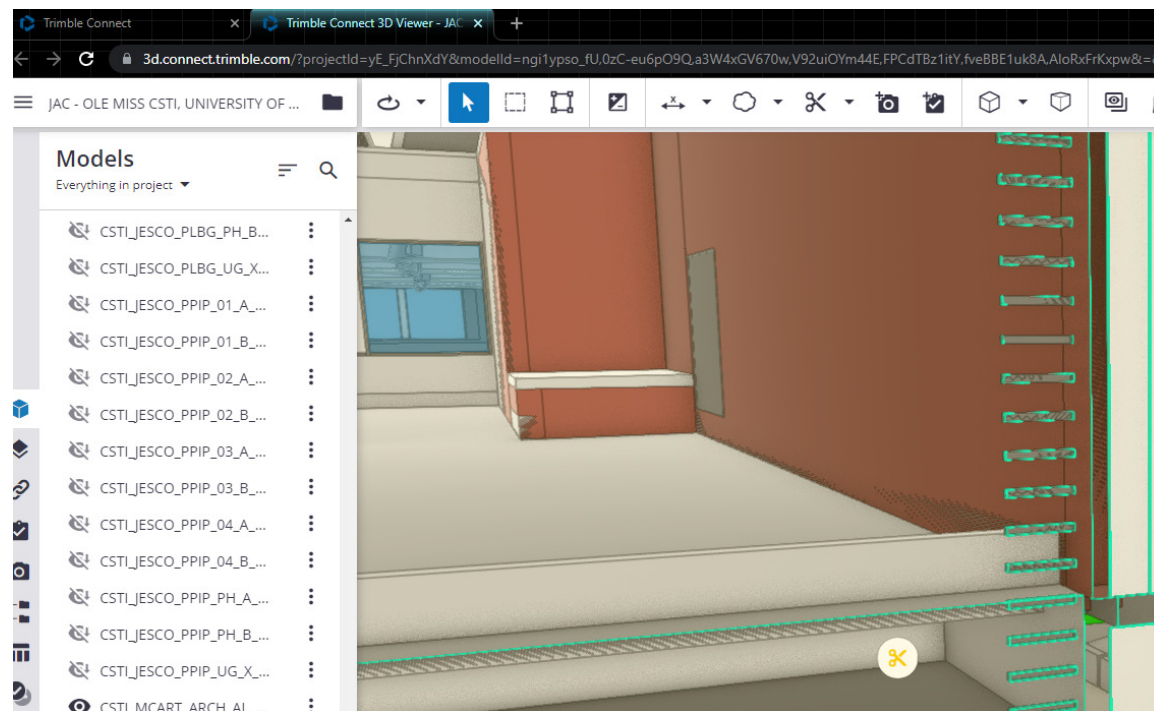
SHOW VARIANCES FOR

☒ Added (75)

Generic Models : #SY - DrapeText_Start : Default	L...	2	0	2.00	EA
Structural Columns	L...	65.75	18.00	47.75	LF
Structural Columns : #CIP - Column - Rectangular : 18x18	L...	29.33	12.00	17.33	LF
Structural Columns : #CIP - Column - Rectangular : 18x36	L...		6.00	(6.00)	LF
Structural Columns : #STL - Column - HSS Rectangular - ...	L...	36.42		36.42	LF
Structural Connections	L...	12	0	12.00	EA
Structural Connections : #CN - Anchor Bolts No Plate : Co...	L...	8	0	8.00	EA
Structural Connections : #CN - Plate - Embed - Horizontal...	L...	2	0	2.00	EA
Structural Connections : #CN - Plate - Embed - Vertical : ...	L...	2	0	2.00	EA
Structural Framing	L...	118.83	73.50	45.33	LF
Structural Framing : #CIP - Framing - Rectangular : BM40	L...	31.08	31.08	0.00	LF
Structural Framing : #STL - Framing - C Shape - 2017v1 ...	L...	11.67	17.75	(6.08)	LF
Structural Framing : #STL - Framing - C Shape - 2017v1 ...	L...	7.25		7.25	LF
Structural Framing : #STL - Framing - L Shape - 2017v1 ...	L...		7.33	(7.33)	LF
Structural Framing : #STL - Framing - W Shape - 2017v1 ...	L...		17.33	(17.33)	LF
Structural Framing : #STL - Framing - W Shape - 2017v1 ...	L...	68.83		68.83	LF
4551445	L...	34.42		34.42	LF

BIM

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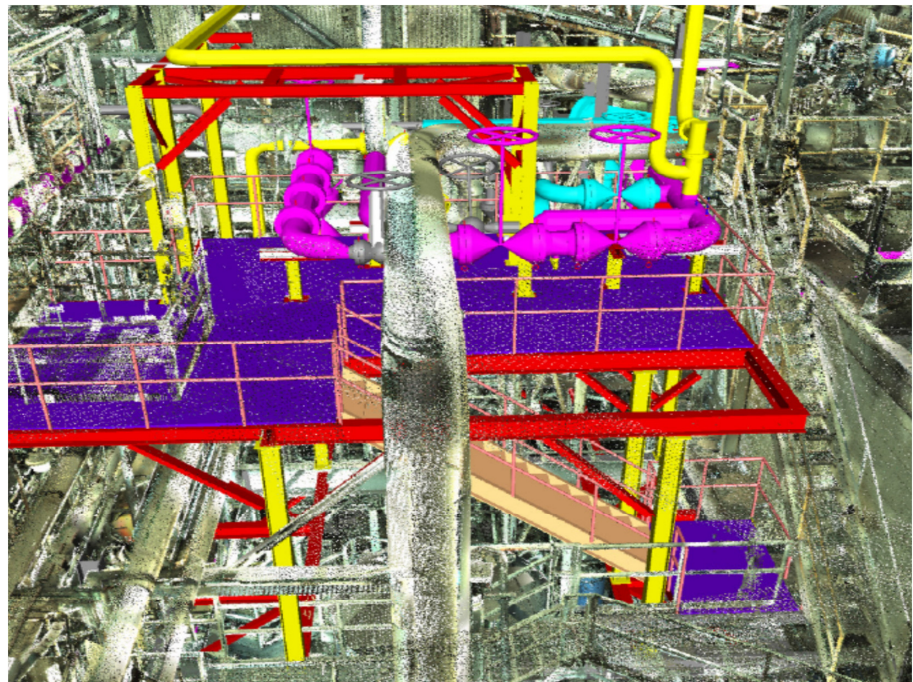
Review model progress regularly
(don't waste time on drawings).

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BIM

Existing facility

= Laser scan.



BIM

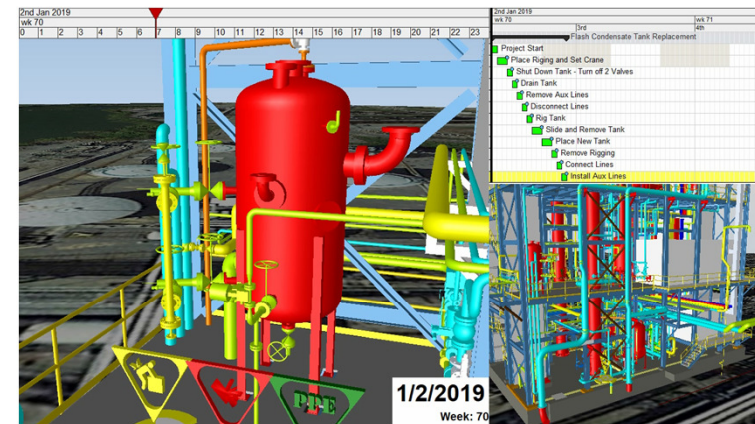
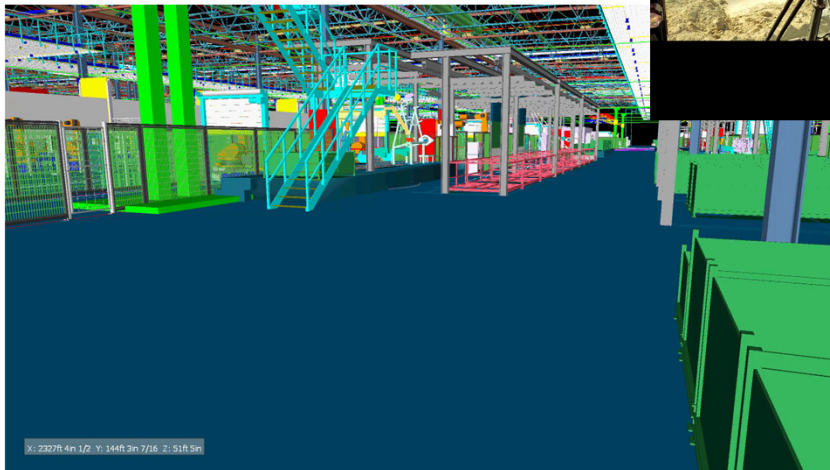
1. Your top 20-25% design firms are doing it right.
2. Do they have a BIM person, or are they practicing 3D Design?
3. How have they used the models (consultants too) in the past?
4. COBie can be a killer, just ask for what is needed.
5. Review the models regularly (scope, alignment, progress).
6. If it cost more, they're doing it wrong.

VDC = Virtual Design and Construction

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Virtual Design and Construction > BIM

What do you do with the models?



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VDC

Process for better building

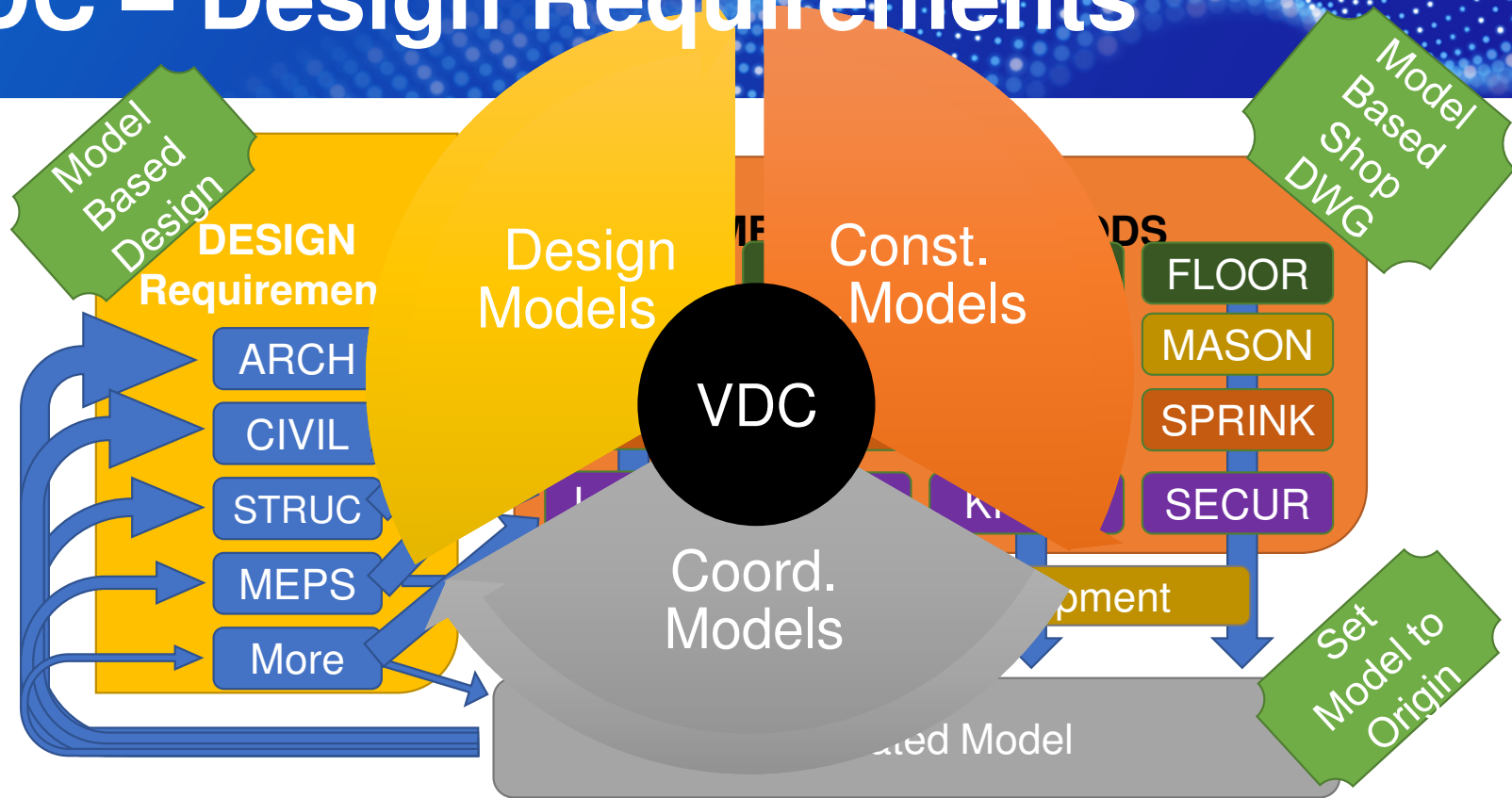


Collaboration



- A key to success is acknowledging and respecting the skillsets of the project team members, from different backgrounds and organizations.

VDC – Design Requirements



```
graph LR; Direction([Direction]) -- "$$" --> Drawings([Drawings]); Drawings --> ShopDrawings([Shop Drawings]); Drawings --> Construction([Construction]); ShopDrawings --> Construction; DesignChanges([Design Changes]) -- "$$" --> AsBuiltDrawings([As-Built Drawings]); Construction -- "$$" --> AsBuiltDrawings; FieldChanges([Field Changes]) -- "$$" --> RedLines([Red Lines]); RedLines -- "$$" --> AsBuiltDrawings;
```

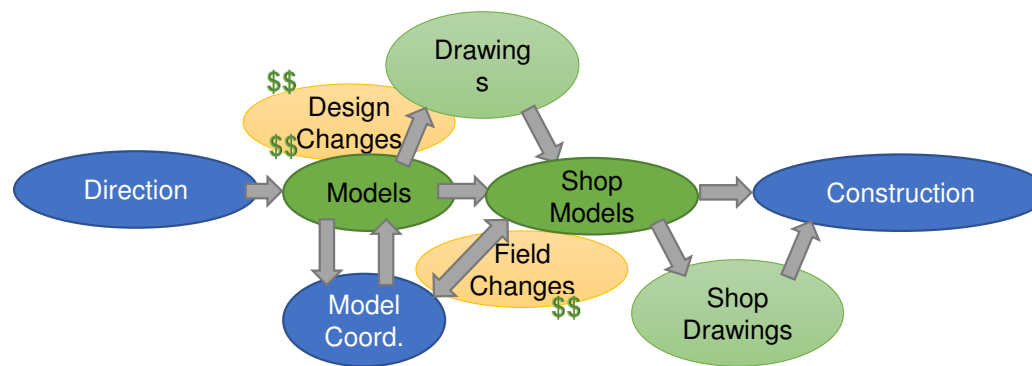
The flowchart illustrates the design and construction process. It begins with 'Direction' leading to 'Drawings' (cost: \$\$). From 'Drawings', the process branches into 'Shop Drawings' and 'Construction'. 'Shop Drawings' also leads to 'Construction'. From 'Construction', the process branches into 'Design Changes' (cost: \$\$), 'Field Changes' (cost: \$\$), and 'Red Lines' (cost: \$\$). 'Design Changes' and 'Field Changes' lead to 'As-Built Drawings' (cost: \$\$). 'Red Lines' also lead to 'As-Built Drawings' (cost: \$).



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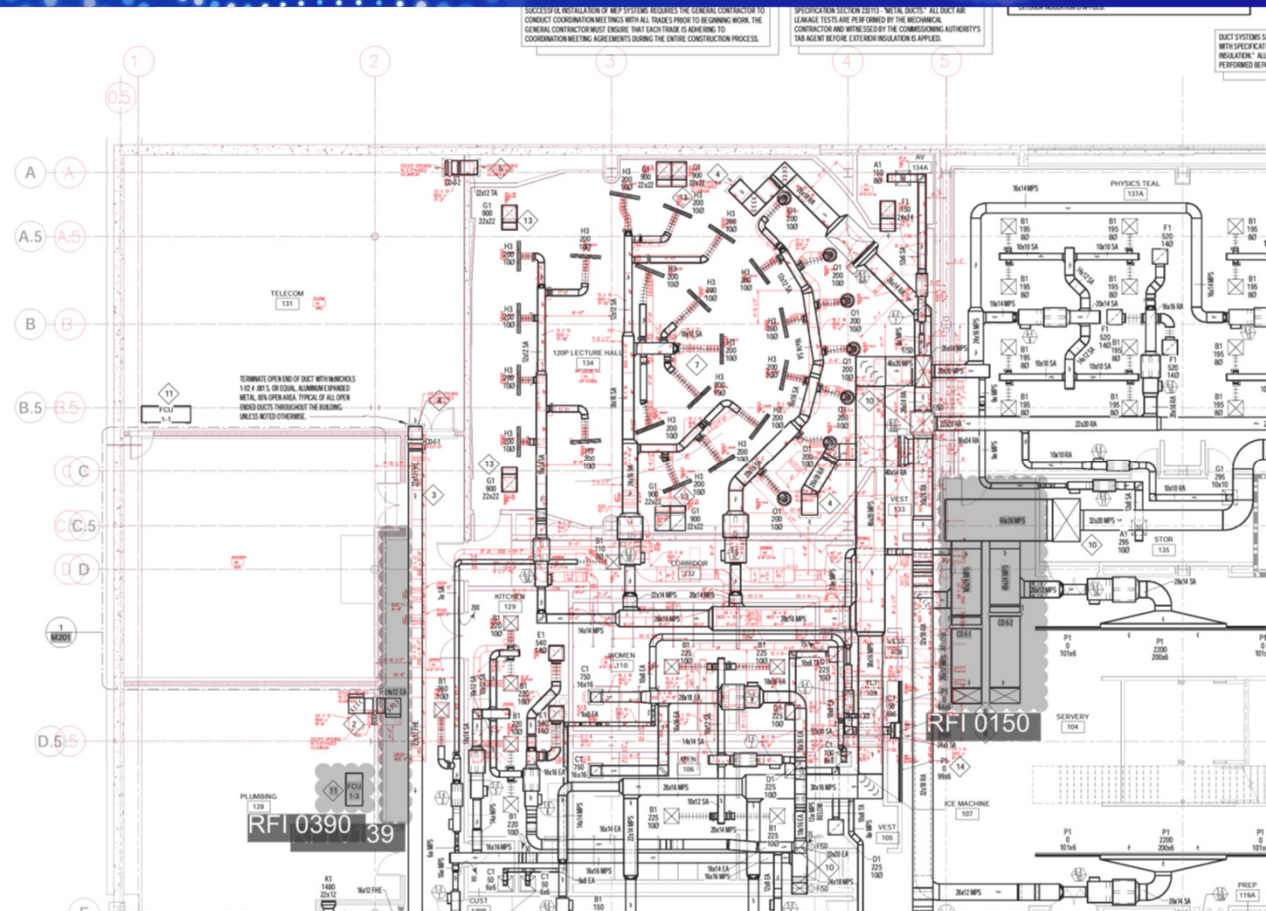
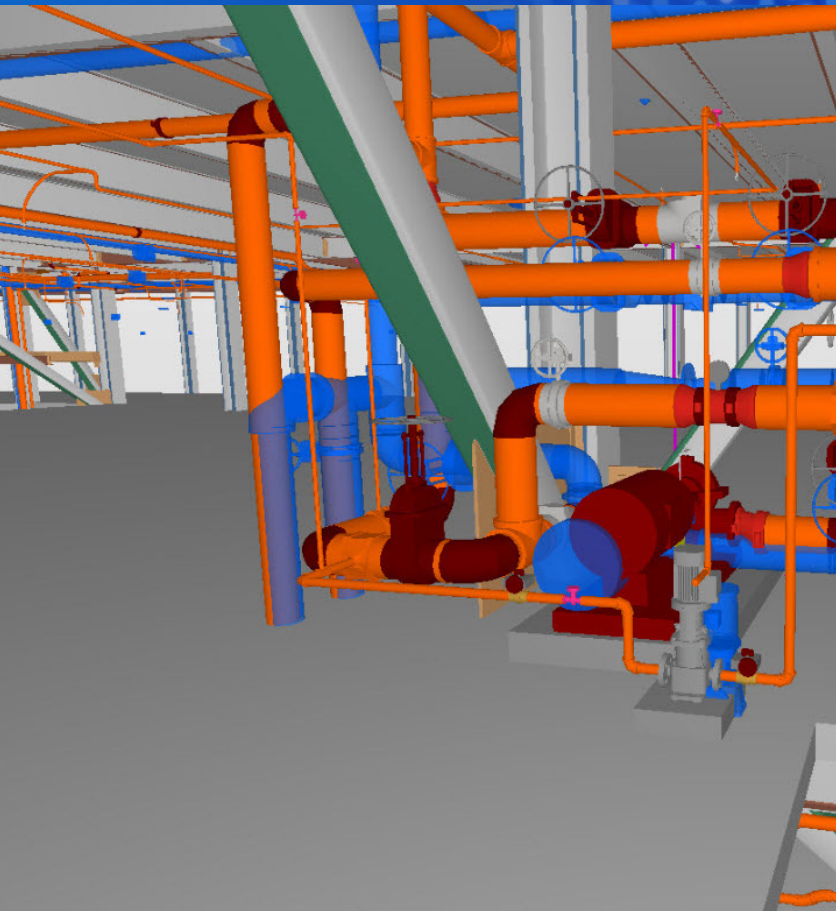
VDC

As-builts (trash) vs Record Models and Fabrication Models



VDC

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VDC

Use a good contract

- Responsibility for accuracy
- Standard of care
- Models need to grow into reliability
- Software defects
- Copywrite and intellectual property
 - Design and Trade models
- Owner use of Models



Consensus Docs: 301
2011 version

VDC

1. Top 20-25% of firms do it right.
2. AGC CM-BIM – Design Team, Contractor, Trades, Owner Reps.
3. If it costs more, they don't know how to do it right.
4. Model all design, shops, coordination, and cut sheets.
5. Weekly coordination and frequent scope, quality, schedule, cost, 6D checks.
6. Don't build or remodel.

4D – Combine 3D models with Time



4D

1. General Contractors Responsibility.
2. Certified 4D Personnel?
3. How do they use it? See past projects, not just Marketing.
4. Not made for detail; work with your typical schedule.
5. Monthly Updates, Revisions, Fragnets, Critical path.
6. Settle for late deliveries and claims.

5D

Check quantities regularly.

A V19 20190708
07/16/2019

compared to

B V18 20190607
06/07/2019

SHOW VARIANCES FOR

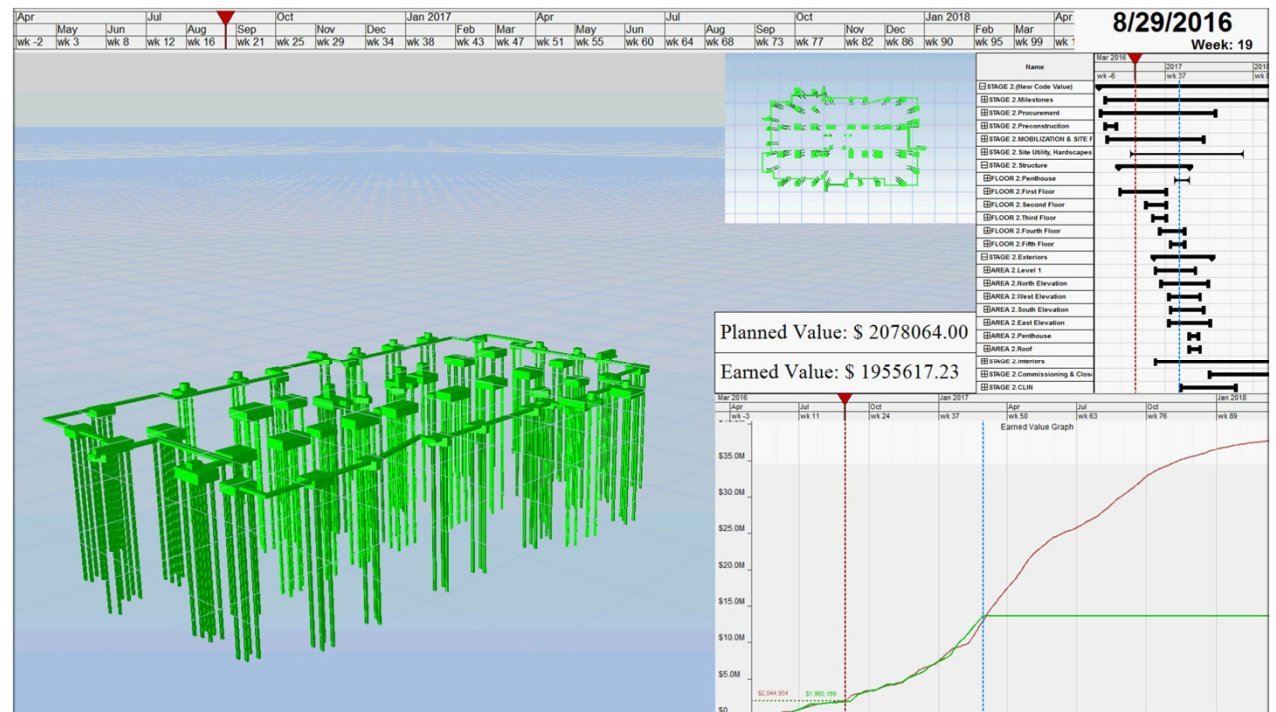
☒ Added (75)

Item	Quantity	Unit	Value
Generic Models : #SY - DrapeText_Start : Default	2	EA	2.00
Structural Columns	65.75	LF	47.75
Structural Columns : #CIP - Column - Rectangular : 18x18	29.33	LF	17.33
Structural Columns : #CIP - Column - Rectangular : 18x36	6.00	LF	(6.00)
Structural Columns : #STL - Column - HSS Rectangular - ...	36.42	LF	36.42
Structural Connections	12	EA	12.00
Structural Connections : #CN - Anchor Bolts No Plate : Co...	8	EA	8.00
Structural Connections : #CN - Plate - Embed - Horizontal...	2	EA	2.00
Structural Connections : #CN - Plate - Embed - Vertical : ...	2	EA	2.00
Structural Framing	118.83	LF	45.33
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Structural Framing : #STL - Framing - C Shape - 2017v1 ...	7.25	LF	7.25
Structural Framing : #STL - Framing - L Shape - 2017v1 ...	7.33	LF	(7.33)
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Structural Framing : #STL - Framing - W Shape - 2017v1 ...	68.83	LF	68.83
4551445	34.42	LF	34.42



5D – Models for Quantities

4D- 5D Combo

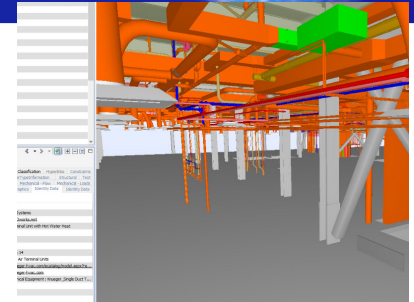


5D

1. Have GC provide access and reports.
2. Check model quantities with traditional quantities/estimating.
3. What is in model and what is not.
4. Don't change design model process for quantities sake.
5. Compare them regularly.
6. Get cost breakdowns as usual, be uninformed.

IFC – Industry Foundation Classes

1. Specify all your model be delivered in IFC format.
2. Use software that is IFC compatible/certified.
3. Be sure your Design team and Contractors have done it before.
4. Ask for the Add/Deduct for using IFC up front.
5. Collect models monthly for review.
6. Hope your current software will still open your record model in 5 years.



COBie = 6D

COBie = Construction Operations

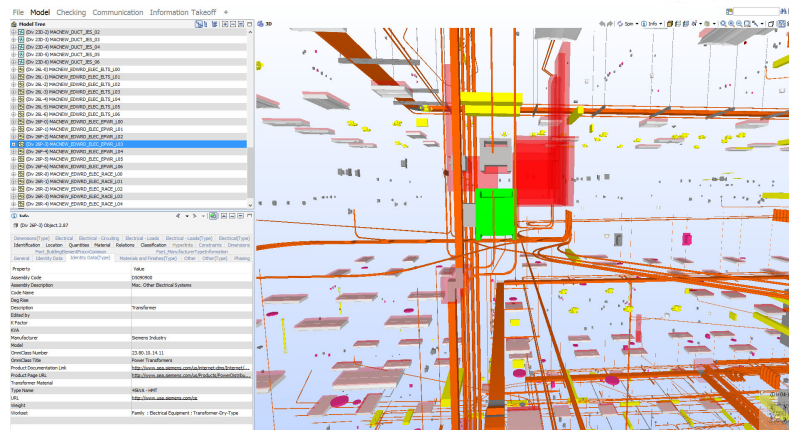
Building information exchange

- The stuff a maintenance crew needs to know
- 6D information

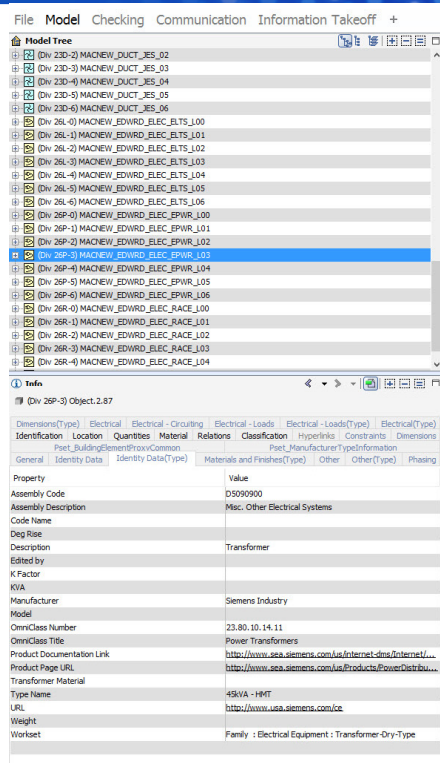
Encapsulated Transformers
.050 - 3.0 KVA Single Phase
3.0 - 15 KVA Three Phase

Benefits

- UL listed designs which comply with applicable ANSI, NEMA, IEEE standards.
- Totally enclosed, non-ventilated, heavy gauge steel enclosure.
- Core and coil completely embedded within a resin compound for quiet, low temperature operation.
- Encapsulation seals out moisture and air.
- UL listed indoor/outdoor enclosure features integral wall mounting brackets.
- Rugged design resists weather, dust, and corrosion.



Use the BIM Forum LOD Specification



Do we want to know the “Model” of this transformer?
It is currently blank.

Do we want “Serial Number” for the transformer?

Do we want to know the “Room” the transformer is in?
Do we want “Room”, “Room Name”, “Room Number”, etc...

What Tab (“General”, “Location”, “Type”) do you want the information on?

Do we want to know the “Manufacturer” for the transformer?
Do we want to know the “Manufacturer” for the concrete?
Do we want to know the “Manufacturer” for the hangers?
Do we want to know the “Manufacturer” for the outlets?

Do we want to know the “Serial Number” for the outlets?

Use the BIM Forum LOD Specification



BIMForum LOD Specification 2018 Part II					
D50 - Electrical					
Baseline	This work is licensed under the Creative Commons Attribution-NonCommercial 4.0 International License				
Additional					
Attribute	Data Type	Units - Imp.	Units - Metric	Option Examples	Commentary
Global Attributes					
Component ID	Text				Part or Equipment Tag
Condition Status	Text			New, Existing, Demolish, Temporary, User Defined	Status of the element, predominately used in renovation or retrofitting projects
Room Number	Text				Room number where component to be /is installed
Room Name	Text				Room name where component to be /is installed
Story Number	Text				Floor or level room is located
Manufacturer Name	Text				The organization that manufactured and/or assembled the item.
Product Name	Text				The manufacturers model name of the product model (or product line)
Model Designation	Text				The manufacturers model number or designator of the product model (or product line)
Target LOD	Text			100, 200, 300, 350, 400	
Current LOD	Text			100, 200, 300, 350, 400	

COBie

1. Your top 20-25% design firms and Trade Contractors are doing it right.
2. Do they have a BIM person, are they practicing 3D Design, will they embed the data?
3. Look at a past COBie/6D model they have produced.
4. Just ask for what is needed.
5. Review the models regularly (scope, alignment, progress).
6. If it cost more, they're doing it wrong.

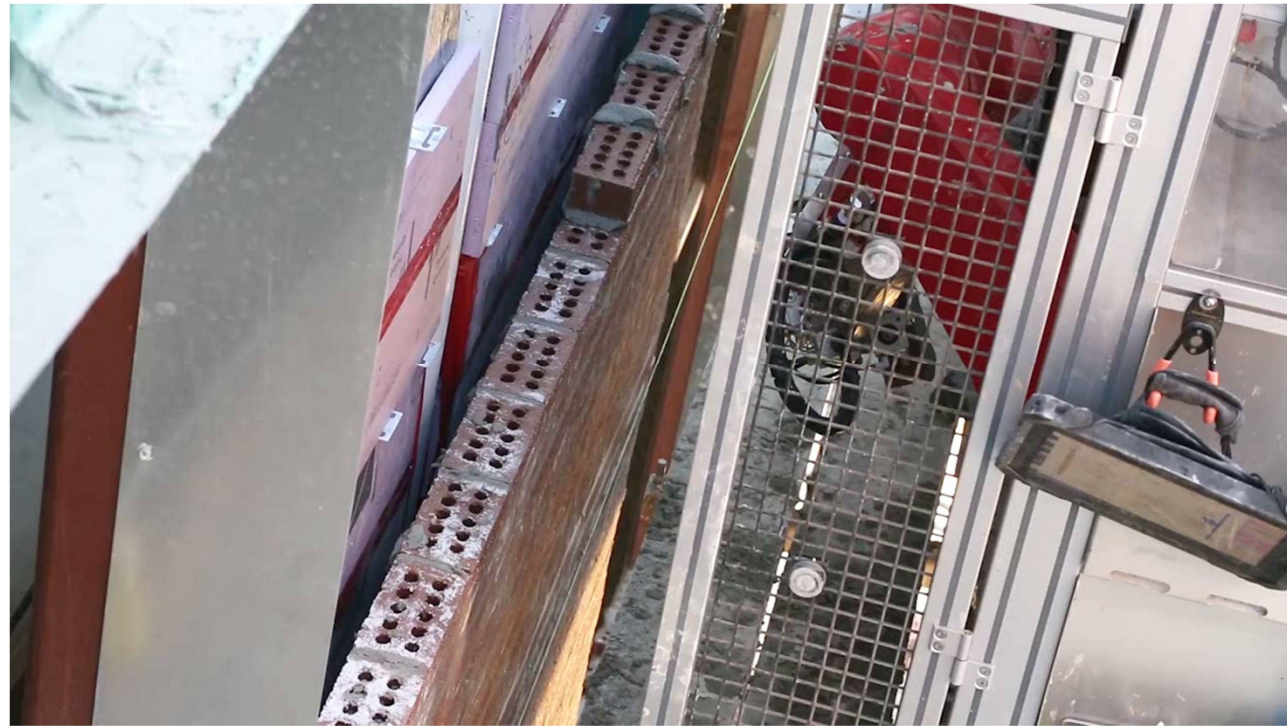
UAV - Drones

1. Get the Drone that meets your needs.
2. Pilot company has to have the FAA certification, registration, and insurance.
3. See results from the model/software.
4. Skip new, go with proven.
5. Stay up to date on laws, uses.
6. Hire a plane for aerals, walk the piles.



SAM – Semi-Automated Mason

Robots are here
More are coming



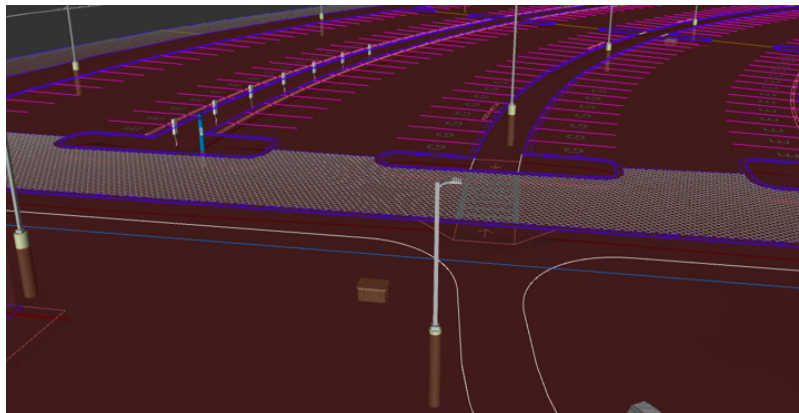
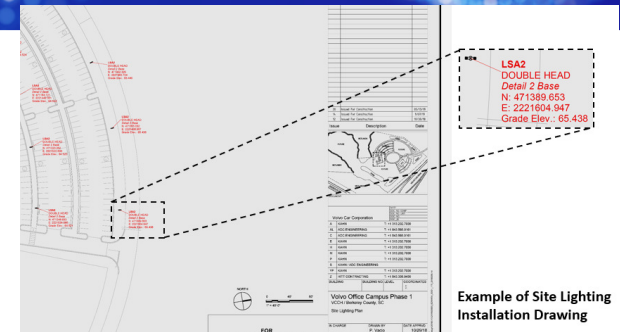
SAM – Semi-Automated Mason

1. Spend the right money; look for repetitive, physical tasks.
2. Have your trades figure it out.
3. Each construction site is different; you will need to figure it out.
4. Don't pay more for it; just expect it to come.
5. Collect daily progress and check the quality.
6. Don't use a robot.

RTS – Robotic Total Station

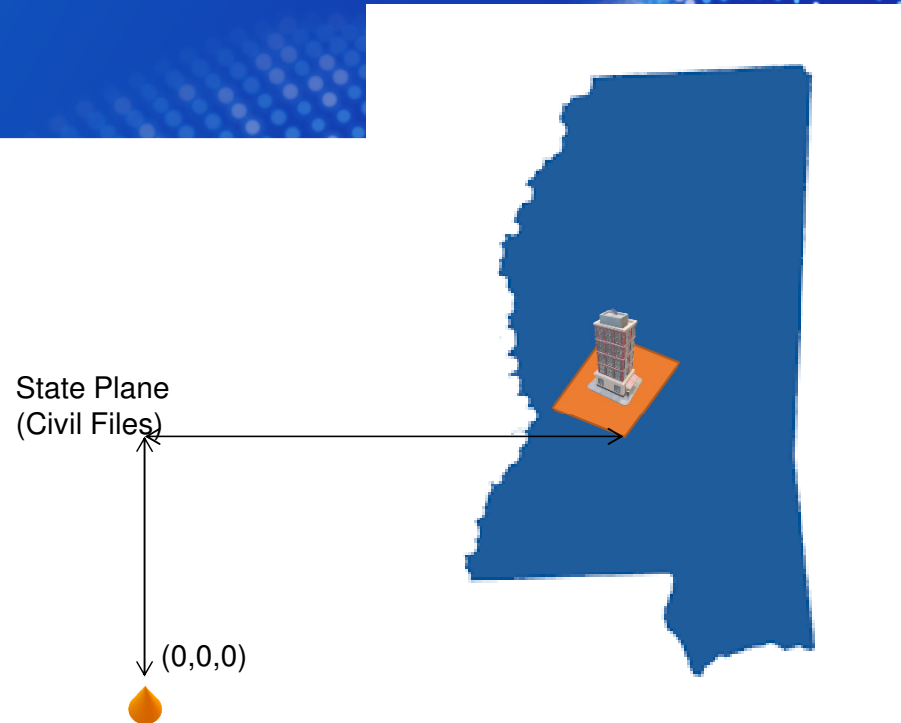
Every layout crew should be using them

- Model based layout

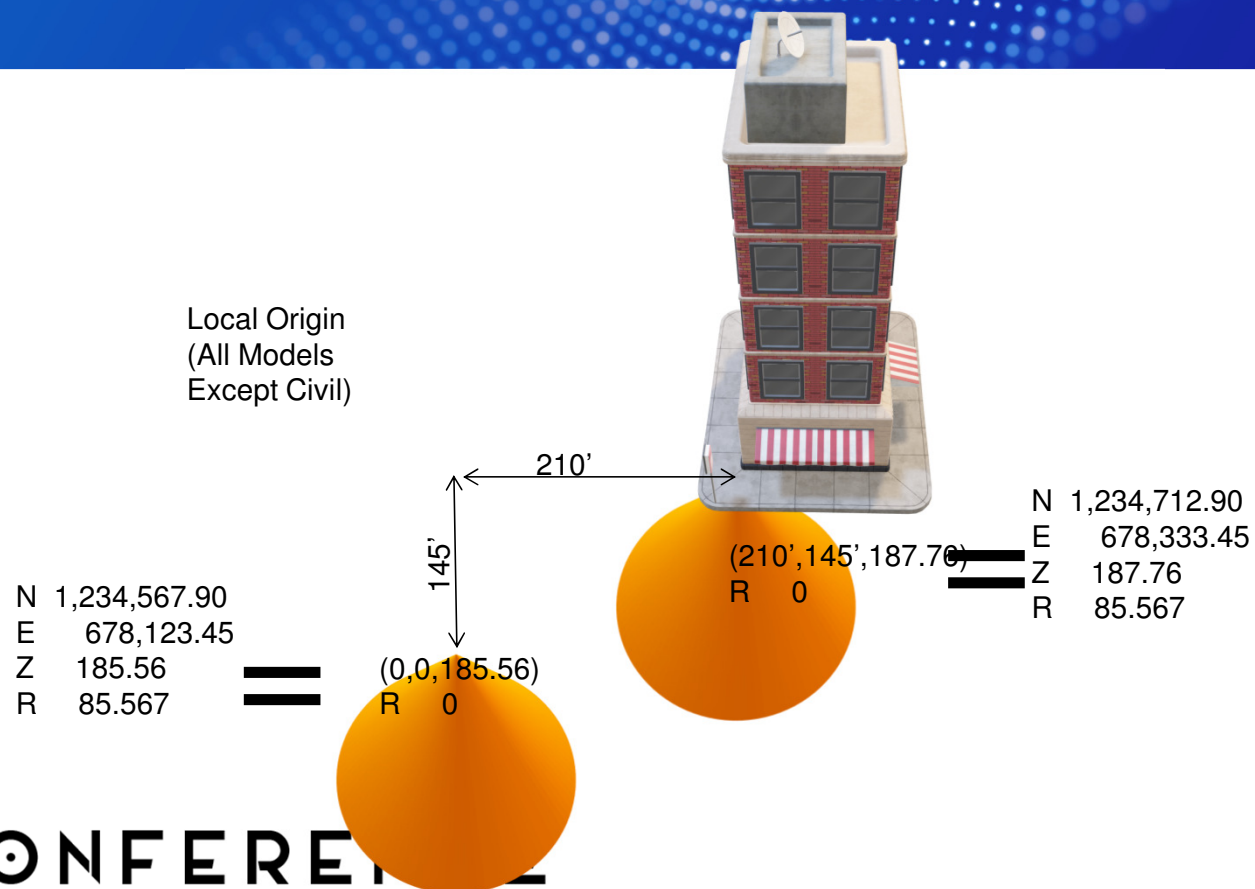


RTS

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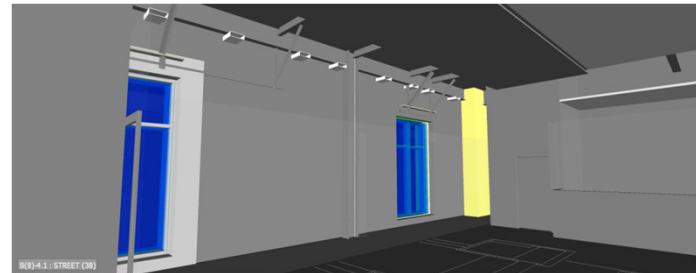


RTS



RTS

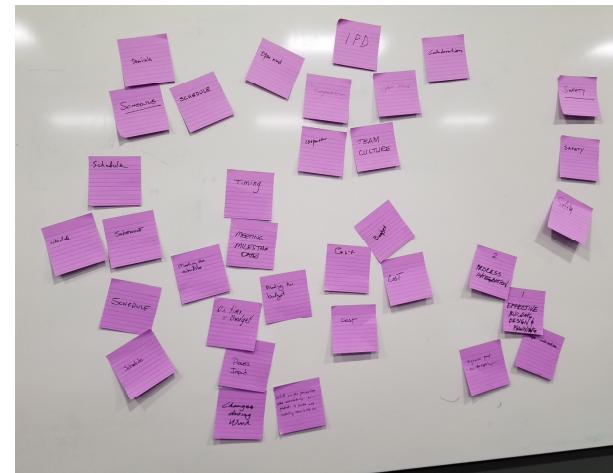
1. Civil and MEP are different machines.
 - A. Get the green laser
 - B. Get embedded photos
2. Get licensed surveyor to set control points.
3. Have models embed the control points.
4. Set the controls, let the trades and GC do the work.
5. Make sure everything aligns.
6. Wondering if your as-builts are any good.



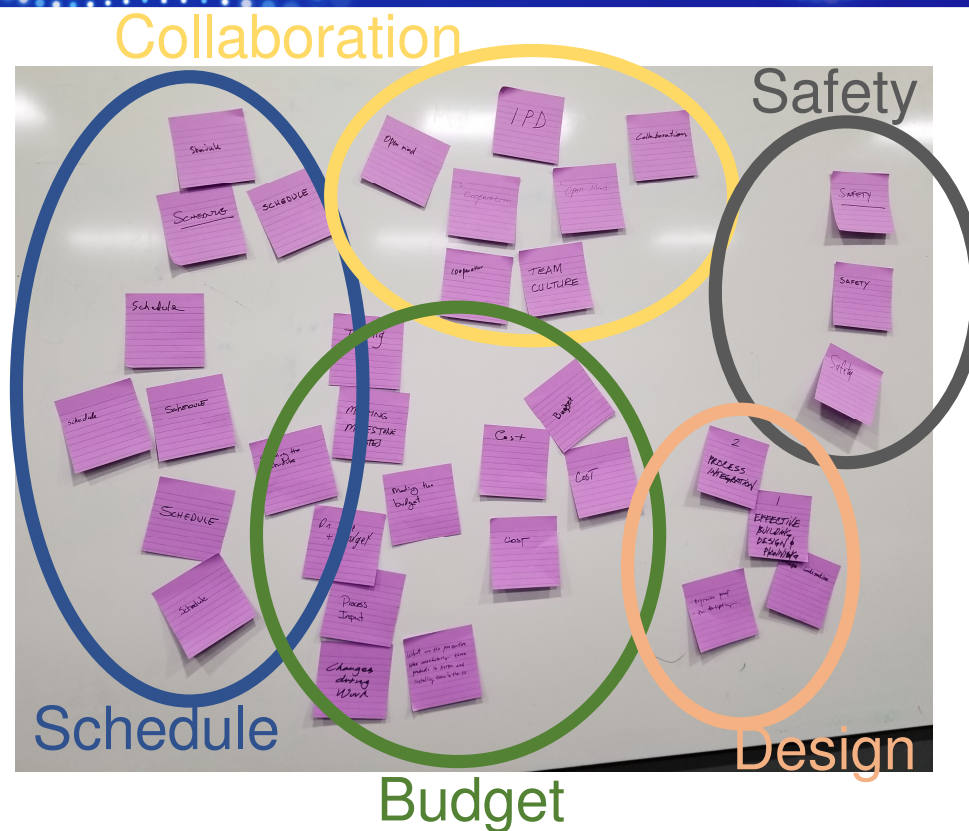
“Cool” issues

Fancy / Expensive software does not fix a bad process; it makes it worse.

Have a good process first.



“Cool” issues



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Cool is a terrible business plan!

Advice, Tips, Tricks, and That Was Dumb!

Benjamin Crosby – Yates Construction

@BIMjamin

www.wgyates.com

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