PREPARING FOR THE INDUSTRY OF TOMORROW

Applying Technology for Productive Change

“Cool” is a terrible business plan!
The following CE credits are offered for this session:

1.0 AIC CPD Credit | AGC of America has been approved to offer Continuing Professional Development (CPD) credits for qualifying programs by the American Institute of Constructors (AIC).

1.0 SMPS CEU Credit | AGC of America is approved by the Society for Marketing Professional Services (SMPS) to offer SMPS CEUs.

AGC of America is registered with the National Association of State Boards of Accountancy (NASBA) as a sponsor of continuing professional education on the National Registry of CPE Sponsors. This session is designated for 1.2 CPE credits in the field of Information Technology.

1.0 CM-Lean CE Credit | AGC of America recognizes the Annual Convention as qualifying for continuing education hours towards the renewal of AGC’s Certificate of Management-Lean Construction (CM-Lean).

1.0 CM-BIM CE Credit | AGC of America recognizes the Annual Convention as qualifying for continuing education hours towards the renewal of AGC’s Certificate of Management-Building Information Modeling (CM-BIM).
How to earn CE hours for this session

Participants must:
1. Check in with attendance scanner at the door or in the back of the room.
2. Attend at least 95% of the session.
3. Complete the session and post-program evaluation.

Additional instructions will be emailed to attendees requesting CE credits.

For those requesting AIA credits, please provide your AIA number so we can report your attendance. You may contact Jo-Anne Torres, Manager of Professional Development and Continuing Education, at jo-anne.torres@agc.org or (703) 837-5360 for questions.
Learning Objectives

By the end of this session, participants will be able to:

1. Identify types of technology that executives should be tracking.
2. Sort through new technology to find potential improvements.
3. Explore shortlisted technology to begin implementation.
4. Apply change by having people use the technology productively.
Benjamin Crosby
Director of BIM / VDC
Yates Construction
Cool is a terrible business plan!

We want productive Tech!
Cool is a terrible business plan!
Cool – Christmas 2015
Blowing money - 2016

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

Mass recall comes after reports hoverboard battery packs that exploded or caught fire and caused injuries such as burns to the neck, legs and arms.
Great Investment – October 2019
Hoverboard buying and caring tips

- Don’t buy cheap (less than $300) hoverboards; invest in higher-quality brands.
- Look for a model with a UL-certified charger or battery pack.
- Check manufacturer’s warranty before you buy.
- Unplug the hoverboard when it’s completely charged to avoid overcharging.
- Do not leave the hoverboard unattended while it’s charging.
- To avoid all instances of hoverboard self-destruction and personal injury, do not buy a hoverboard.

VALENTINA PALLADINO
Valentina reviews consumer electronics for Ars Technica, testing all kinds of gadgets with a focus on mobile devices and wearables. She has a soft spot for Chromebooks.

TWITTER @valentinapalladino
Things to know – Practical Application

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. Buy a horse to ride

Hoverboard buying and caring tips

- Don’t buy cheap (less than $300) hoverboards; invest in higher-quality brands.
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TWITTER @valentinaiudaa
What do you want to talk about

- Lean
- LOD
- BIM
- VDC
- 4D
- 5D
- IFC
- COBie / 6D
- UAV
- SAM
- RTS
- GPS
- GIS
Lean = Not an acronym

• AGC CM-Lean = Foundation
Lean

• Last Planner System = Better Meetings – Better Schedule
Lean

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

The MacLeamy Curve

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

GOOD RFIs

BAD RFIs

Effect / Cost / Effort

Preliminary Design
Detailed Design
Construction Documentation
Construction
Operation
Lean

- Problem Solving
Lean

• Prefabrication < Manufacturing
Lean

• It is a Social Tech – not a Program
• 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.
LOD = Level of Development

http://bimforum.org/lod/
LOD

LOD 100

LOD 300

LOD 400

LOD 100

LOD 300
LOD = Level of Development

• 1. The Specification is free to use.
• 2. Lots of webinars on how to use it. BIMForum.org
• 3. LOD 100 and 200 and 300 for A/Ess – 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
BIM

• BIM = New way of doing the same thing
BIM

• BIM = New way of doing the same thing
BIM

- BIM = New way of doing the same thing

This work flow costs more, takes longer, and fails.

Are Drawings and Model seen as separate items?
BIM

- BIM = New way of doing the same thing
BIM

- BIM = New way of doing the same thing

This work flow costs more, takes longer, and fails.

Are Drawings the deliverable?
• BIM = New way of doing the same thing

This is the way to do it!

The drawings are a derivative of the model.
BIM = New way of doing the same thing

Graphisoft – BIMx - Demo
BIM

- BIM = New way of doing the same thing

Models is plural!

Arch, Struc, MEPS, Fire, Civil, Kitch, etc..
BIM

• What do you use the model for during design?
• Review model progress regularly (don’t waste time on drawings).
BIM

• Existing facility
  = Laser scan.
• 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 their doing it wrong.
VDC = Virtual Design and Construction

- Virtual Design and Construction > BIM
- What do you do with the models
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

DESIGN

MEANS and METHODS

ARCH
CIVIL
STRUC
MEPS
More

FLOOR
MASSON
SPRINK
SECUR

Owner FFE and Equipment
Const.
Coord.

Model Based Design
Shop DWG
Set Model to Origin

VDC

Design Models
Const. Models
Coord. Models

More

CURT
CEIL
DOORS
FLOOR
MECH
ELEC
PLUMB
SPRINK
STEEL
CONC
JOISTS
MASON
LAND
PARK
KITCH
SECUR
VDC

• As-builds (trash) vs Record Models and Fabrication Models

Design changes are not incorporated into documents until the end. Building with loosely coordinated documents and sometimes uncoordinated changes (RFI’s, Sketches, ASI’s)
VDC

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

This is the way to do it!
All Changes, RFI's, Reroutes, ASI's, are vetted in the models FIRST.
VDC

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

Be more efficient, do it right the first time.
VDC

• Use a good contract
  Responsibility for accuracy
  Standard of care.
  Models have to grow into reliability, (premature reliability).
  Software defects.
  Copywrite and intellectual property
    ◦ Design and Trade models
  Owner use of Models

Set Expectations at Start

Consensus Docs: 301
2011 version
1. Top 20-25% of firms do it right.
2. AGC CM-BIM – Design Team, Contractor, Trades, Owner Reps.
3. If it cost 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

Tue, 19 Feb, 2013
1. Have the GC do it.
2. Does the GC have 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. If it costs more they don’t understand it.
• Check quantities regularly.
5D – Models for Quantities

4D-5D Combos
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.
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 your maintenance crew needs to know
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?
### COBie

- Use the BIM Forum LOD Specification

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<th>Data Type</th>
<th>Units - Imp.</th>
<th>Units - Metric</th>
<th>Option Examples</th>
<th>Commentary</th>
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<td>Part or Equipment Tag</td>
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<td>Room number where component to be/is installed</td>
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<td>Room name where component to be/is installed</td>
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<tr>
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<td>Floor or level room is located</td>
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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 their 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 aerials.
SAM – Semi-Automated Mason

• Robotics 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
Best Practices:
1. Use an actual survey point as (0,0,0) - that has a physical marker
2. Pick a point at the Plan Southwest - All dimensions will be positive
3. Use z= elevation of marker
4. Use State Plane Feet - International Feet will not work

Local Origin point needs to be within 10 Miles, or the software will fail.
Best Practices:
1. Use an actual survey point as (0,0,0) - that has a physical marker
2. Pick a point at the Plan Southwest - All dimensions will be positive
3. Set Local Z=?? to Building Elevation 0’ - Use z = elevation of marker
4. Local models are oriented Plan North - Site rotation noted in state plane coordinates
Local Origin (All Models Except Civil)

N  1,234,567.90
E   678,123.45
Z    185.56
R    85.567
(0,0,185.56)
Local Origin
(All Models Except Civil)

N 1,234,712.90
E 678,333.45
Z 185.56
R 85.567

(0,0,185.56)

Z at 187.76’ matches 0’ on building elevation

N 1,234,567.90
E 678,123.45
Z 185.56
R 85.567

(0,0,185.56)

(210’,145’,187.76)
R 0

R 85.567
Local Origin
(All Models
Except Civil)

BxP:
Distance from Local Origin
to Column Grid D1
X= 210’
Y=145’
At Top of Slab Level G
Z=187.76’
Plan North = Model North

N  1,234,712.90
E      678,333.45
Z     187.76
R     85.567

(0,0,185.56)

(210’,145’,187.76)
Record This Information in the VDC Plan
VDC_03.05_Project_Location_Local_Origin_Point

Check this early (Before Models are “Done”) to make sure they align.

1. All Models should have a marker at the Origin (Base Point, Survey Point).
2. The Model should be the correct distance from this marker so all the models will align.
3. IFC Files are the final model deliverable – the alignment needs to work for IFC Files.
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-builds are any good.
GPS – Global Positioning System

1. Spend the time to get the models in a real location (State Plane).
2. Get licensed surveyor to set control points.
3. Have models embed the control points.
4. Set the foundation, let the trades and GC do the work.
5. Make sure everything aligns.
6. Keep wondering where your utilities are.
GIS – Geographic Information System

1. Spend the time to get the models in a real location (State Plane).
2. Get licensed surveyor to set control points.
3. Have models embed the control points.
4. Set the foundation, let the trades and GC do the work.
5. Make sure everything aligns.
6. Keep wondering where your people are.
“Cool” issues

• Having a tool does not mean it is being used right.
“Cool” issues

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

• Have a good process first.
“Cool” issues

• Fancy / Expensive software does not fix a bad process, it makes it worse.
• Have a good process first.
“Cool” issues

• Make sure you have the personnel to execute that plan.
• Allow for a mistake.
We Want Productive Tech = Profitable

• Plan, Do, Act, Change – Lean your way into a better business.
Applying Technology for Productive Change
Cool is a terrible business plan!

We want productive Tech!
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