
It’s here!
The IDM!

An overview of ACI 131.1 IDM for Cast-In-Place Concrete

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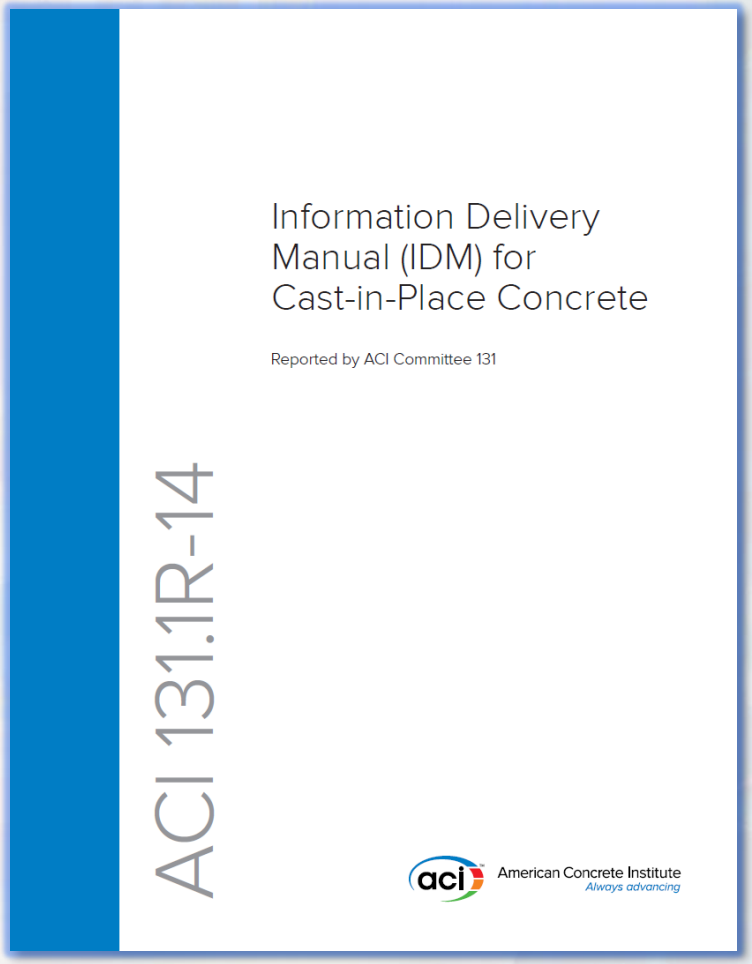
Bentley Systems

Doc Approved!



What is this *eye-dee-em*?

Information **D**elivery **M**anual summarizes our industry

1. Construction Processes
   - Who does what? (both planning and physical activities)
2. **Information flow required by these processes**
   - **Who provides what to who?**

As defined by the people in the trenches (you!)

- Contractors, suppliers, engineers
- (not the software guys)

ISO 29481-1:2010 *Building information modelling – Information delivery manual – Part 1: Methodology and format*

Who provided input?

December 2011 – March 2012

- Concrete Contractors (3)
- Software Vendors (3)
- Rebar Fabricators (3)
- Engineers (1)
- Ready-Mix (1)
- Industry organizations (ACI, CRSI)

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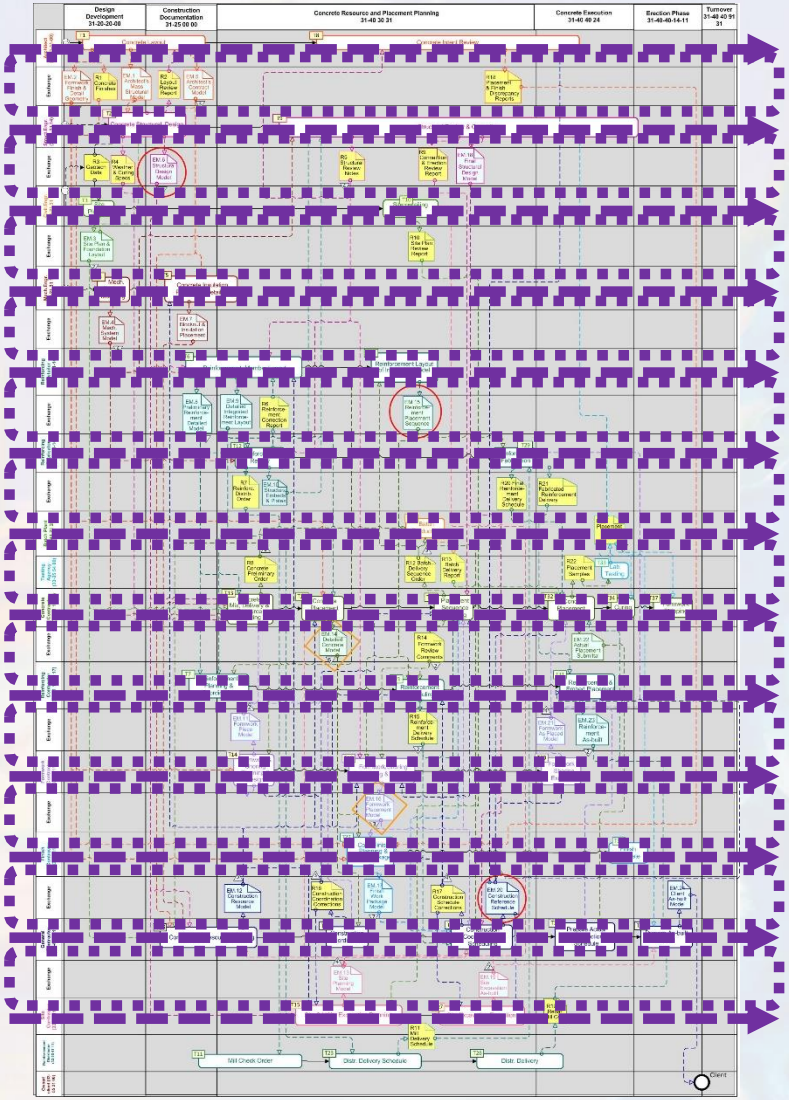
- Bentley Systems

IDM - Process Map



Our industry – in one chart ☺

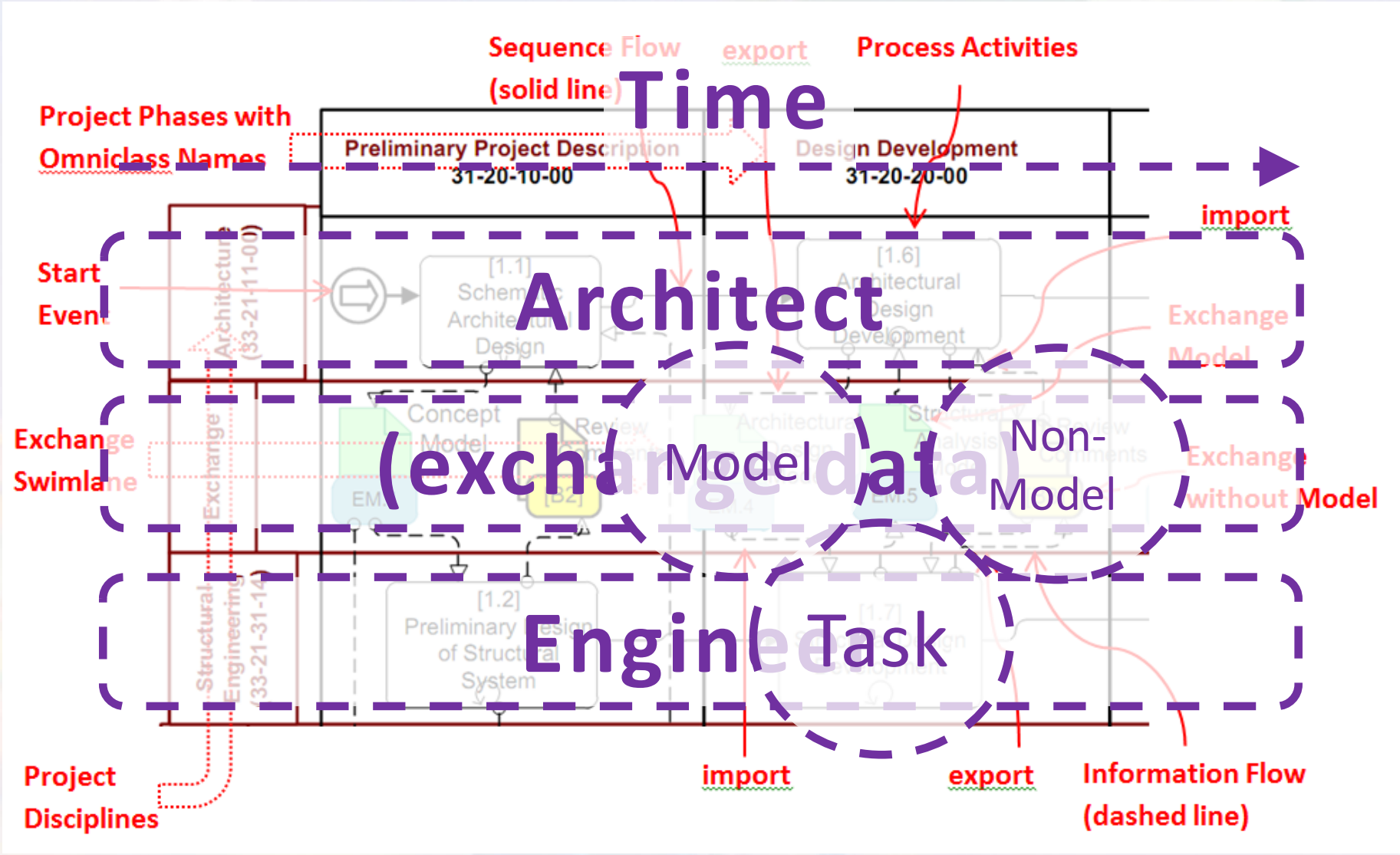
- Simplified & approximated

Time – left-to-right

Each player has a horizontal strip (“swimlane”)

Exchanges noted between players

IDM - Process Map Close-Up



IDM – Tasks ("who does what")

T2—Concrete structural design

Design phase	Design development 31-20-20-00 Construction documentation 31-25 00 00
Discipline	Structural engineer 33-21 31 14
Information obtained from	Receives architect's model and general facility layout and site plan. Also receives site development, including paths and roadways, retaining walls and other site improvements, and geotechnical model or data from site engineer.
Task description	Determines applicable code loading conditions and other structural requirements. Defines and analyzes structural model in sufficient detail to ensure requirements will be met. Model typically includes all member sizes and reinforcing and tendons. Also Includes foundations and retaining walls.

All major tasks summarized:

- When ("Phase")
- Who ("Discipline")
- Input ("Information obtained from")
- Output ("Task description")

IDM - Model Exchanges

EM. 9: Detailed Integrated Reinforcement Layout

Project Stage	Concrete Resource & Placement Planning 31-40 30 31
Exchange Disciplines	**Sender:** Rebar Detailer (33-21-31-14) **Receiver(s):** Structural Engineer (33-21 31 14) Concrete Contractor (33-41 11 14) Reinforcing Contractor (33-41 11 14 17) Reinforcing Fabricator (33-41 11 14) Reinforcement Distributor (33-25 41 11)
Description	**Purpose of exchange:** Integrates placement and reinforcement and tendon layout with both integrated structure and pour sequence. (tendons may be a separate model) **Major elements:** Reinforcement and tendon items to be associated with pours, all embeds and connection plates, and with pour work packets (all concrete related placing activities in schedule). All reinforcing bar, mesh and tendons, properly placed within concrete, with layout of ties, laps and special connections. May be multiple models, not one. **Level of Detail:** Full detail. Special attributes
Software functionality, Export and Import:	**Export:** Reinforced concrete detailing applications, with reinforcing and tendons, plates and embeds fully modeled. **Import:** import reinforcing bar into all applications that need to coordinate with its placement: for formwork, concrete contractor,

Stage (when)

Sender

Receiver(s)

Contents

- Items
- Level of detail

<u>These are the key findings we build off of.</u>

IDM - Non-Model Exchanges

R3—Geotechnical data

Design phase	Design development 31-20-20-00
Discipline from	Geotechnical engineer 33-21-31-11-11
Discipline to	Structural engineer 33-21-31-14 Civil engineer 33-21 31 11
Information transmitted	Provide geotechnical report regarding soil mechanics, moisture flows, and bearing capacities for foundation planning.
Typical formats	Marked-up site plan showing sample test locations and data.

Completes the understanding of the information flow.

Perhaps become incorporated into a model in the future…

What good is all this?

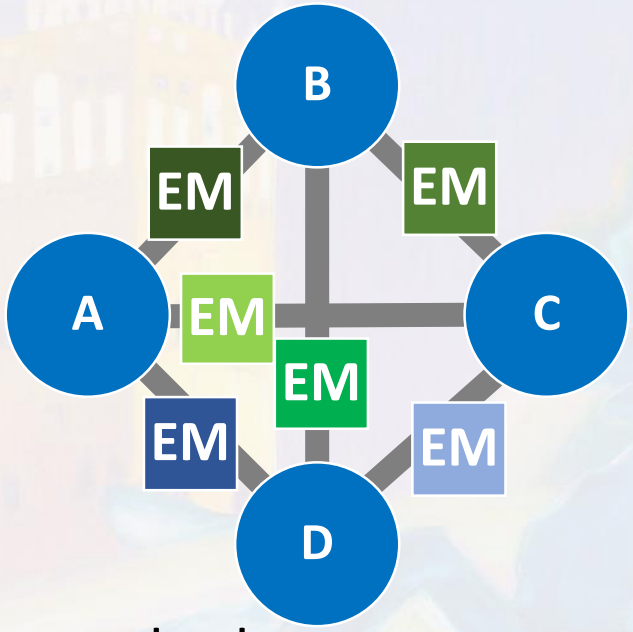
It allows us to define a limited number of **Standard** Exchanges that can be supported by software.

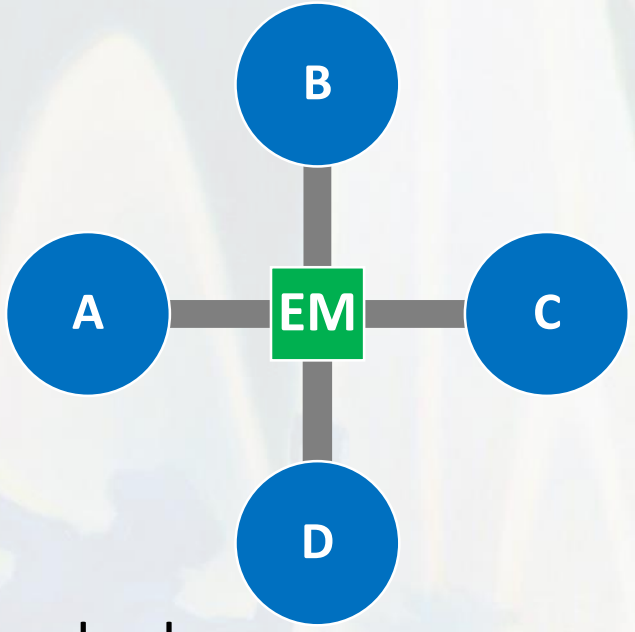
Standard Exchanges have a role that is similar to other standards.

Standard Exchanges foster automation and productivity.

What would our industry be like if we didn't have a standard fc' test?

Standard vs Nonstandard Exchanges





Nonstandard

Positive:

- Potential to optimize per case

Negative:

- Too many cases
- Your case may not be supported

Standard

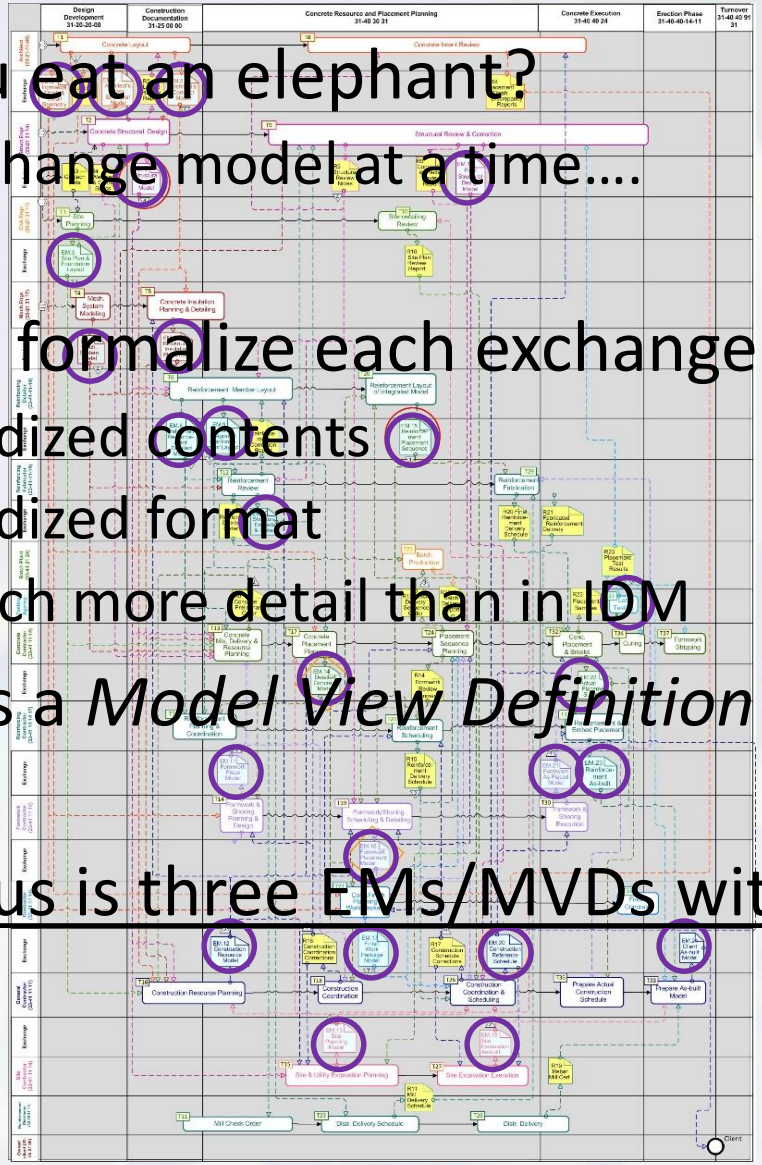
Positive:

- Small number of cases
- Predictability

Negative:

- Least common denominator risk

There are still 24 exchanges…



How do you eat an elephant?

- One exchange model at a time….

We work to formalize each exchange model

- Standardized contents
- Standardized format
- Add much more detail than in IDM

The result is a *Model View Definition* (MVD)

Current focus is three EMs/MVDs with highest value.

EM-6 Structural Design Model

EM.6—Structural design model

Project stage	Construction documentation 31-25-00-00
Exchange disciplines	**Sender:** Structural engineer (33-21 31 14) **Receiver(s):** General contractor (33-41 11 11) Concrete contractor (33-41 11 14) Site contractor (33-41 11 14) Reinforcing detailer (33-41-11-14)
Description	**Purpose:** Report of detail structural design to determine steel reinforcing sections, lap standard details, and special connections. Optionally provide early mill order for reinforcing and early shoring needs. **Major elements**: Reinforced concrete members and reinforcing cross section layouts and spacing requirements; standard details; lap lengths; special connections; concrete strength; steel reinforcing and tendon specifications, including coatings, expansion joints, and post-tensioned tendon placement joints. Includes geophysical data and foundation spatial requirements. **Level of detail:** Sufficient for determining detailing to realize project structural requirements, as defined by structural engineer. **Special attributes:** Reinforcing bar layout for member sections,

As much of design intent as can be put in a model.

Challenges:

- Structural design isn't really 3D model
- Don't expand engineers' scope (engineer isn't detailer)

EM-15 Detailed Rebar Model

EM.15—Reinforcement placement sequence

Project stage	Concrete resource and placement planning 31-40 30 31
Exchange disciplines	**Sender:** Reinforcing detailer (33-21-31-14) **Receiver(s):** Formwork contractor (33-41 11 14) Reinforcing fabricator (33-41 11 14) Reinforcing contractor (33-41 11 14 17)
Description	**Purpose of exchange:** Coordinate reinforcement and tendon placement with placement sequence and schedule. **Major elements:** All reinforcement and tendon items, embeds, and formwork including formwork for special finishes, blockouts, insulation, to be associated with schedule and placement. **Level of detail:** Complete detail; schedule for formwork and reinforcing elements.
Software functionality: export and import	**Export:** Reinforced concrete detailed model, with definition of placement schedule related to pour sequence. **Import:** Construction coordination model applications able to show both model detailing and sequencing. May be one-way or round trip
Related exchange models	Is elaboration of EM.9

The fully detailed rebar model

Challenges:

- Right granularity (heat #, etc)
- Size vs flexibility
- Nuclear needs vs commercial needs

EM-20 Constr. Schedule Model

EM.20—Construction reference schedule

Project stage	Concrete placement and resource planning 31-40 30 31
Exchange disciplines	**Sender:** General contractor (33-41 11 11) **Receiver(s):** Concrete contractor (33-41 11 14) Finish contractor (33-41 11 14) Structural engineer (33-21 31 14) Reinforcing contractor (33-41 11 14 17) Formwork contractor (33-41 11 14) Site contractor (33-41 11 14)
Description	**Purpose of exchange**: Coordinate layout of all systems for clashes and coordinate schedule of installation, especially with formwork and finishing tasks; optionally a four-dimensional configurator, also used to verify coordination with mechanical systems and architectural intent. **Major elements:** All major systems: structure; mechanical, electrical, and plumbing; and architectural detailing interfacing with concrete work for clash detection and coordination. Concrete placement and discrepancy report. **Level of Detail:** Full detail for concrete finishes and formwork **Special attributes**: Concrete finishing spaces
Software functionality: export and import	**Export:** Concrete detailing application **Import:** Construction management application, supporting detailed spatial coordination and scheduling of all project systems in an integrated building model.
Related Exchange Models	—

Aggregate of the other (detailed) models, plus schedule information.

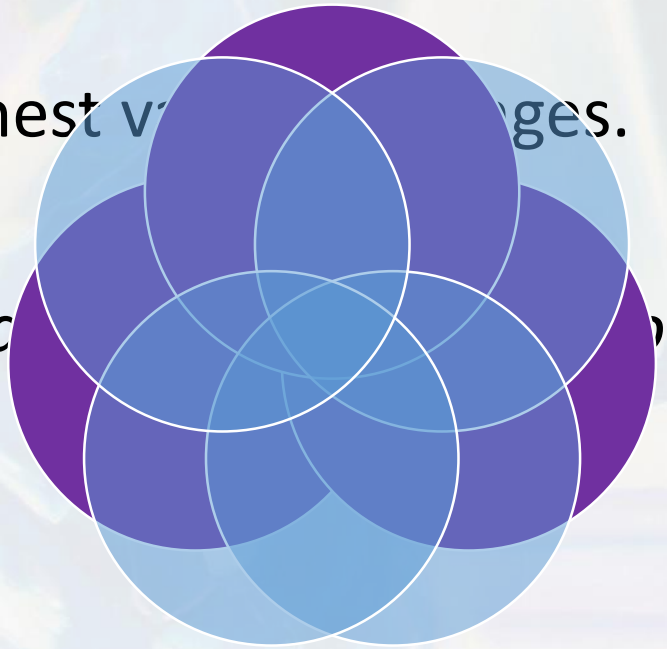
Challenges:

- Pours/breaks
- Finishes
- Formwork/shoring
- Right level of schedule information

Only 3 out of 24 exchanges?!?!

Most of the other exchanges are subsets or supersets of these 3…so the 3 exchanges will probably be used outside of their “official” scope.

These are the highest v ges.



Do you want to wo omething in your software?

What's the current status?

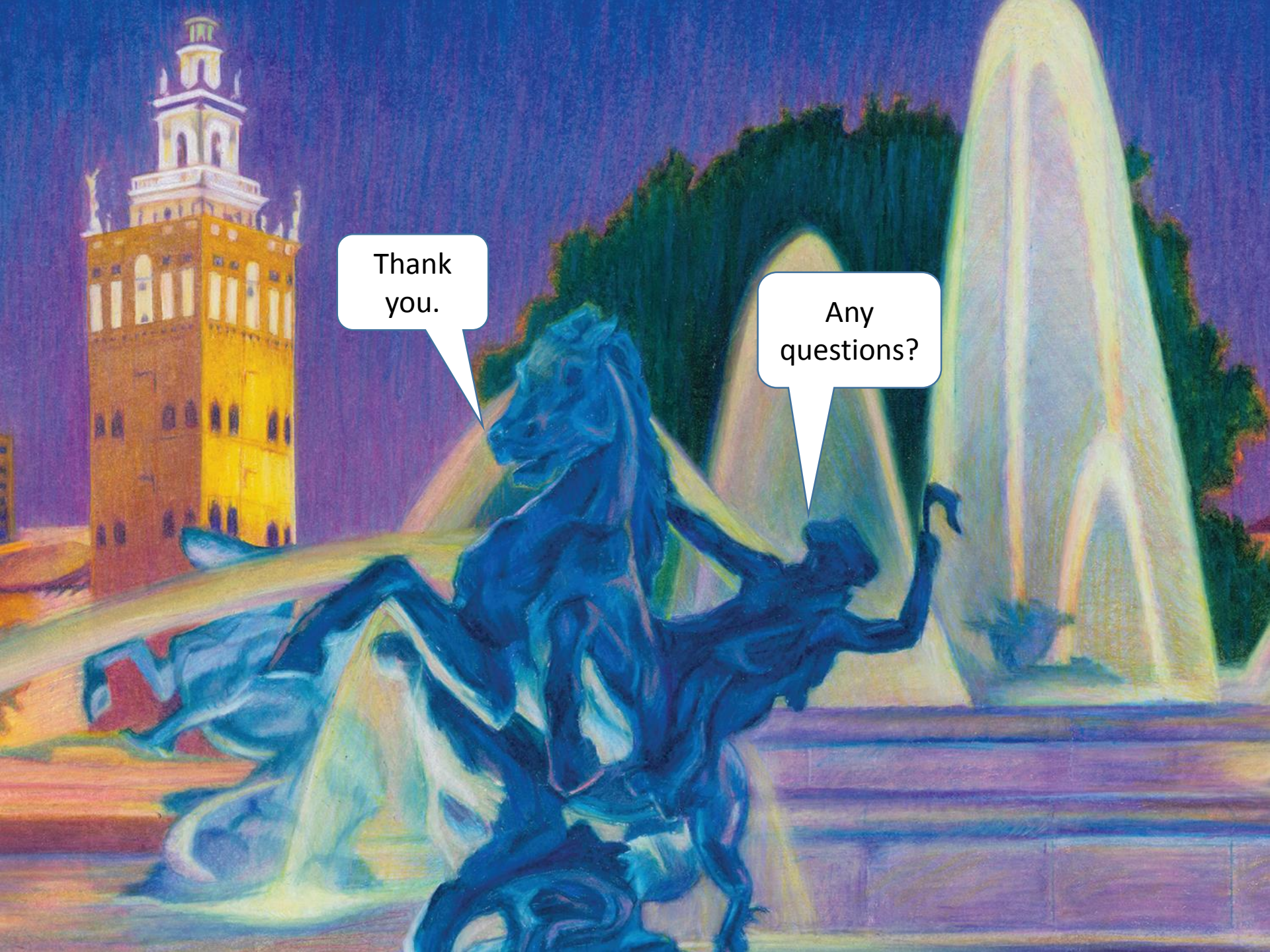
IDM is out the door… Buy Now!

MVD work is underway:

- Software vendors
- Engineers
- Concrete Contractors
- EPCs
- Rebar fabricators
- Ready-mix industry
- Formwork vendor
- Consultant (Chuck Eastman)

MVDs - Easy or difficult?

- Moderate where IFC already contains the concepts we need
- Difficult when we need to invent new concepts
- buildingSMART has its own approval bureaucracy
- **Start balloting MVDs in the fall**


Thank you.
Any questions?