Developing BIM-Ready Masonry
Deciphering Complexities in Categorizing Myriad Masonry Materials  

Buzzwords There are very few buzzwords in the construction community larger than BIM. Sure we have things like sustainability and transparency, green and resilient, but nothing holds quite the weight that BIM does when it enters a conversation. We may think BIM is a monumental task that only geeks with large computers can understand, but as a community in general, we have a very limited view at this point of what BIM even means.

Building Information Modeling The term BIM has the same anonymity of any acronym: ASTM, EPD, BCS. It paints a concept with a stroke that makes it seem foreign and unreachable for many of us. When we strip that away and refer to this concept as Building Information Modeling, the term takes on some meaning. The idea is designing a building with all the actual information being contained in the model. This model holds all the data needed to do a structural analysis, an architectural rendering, a thermal comparison, a cost breakdown. Theoretically, there is no need to go back to square one with a model every time a new calculation is needed; the same model works for each different analysis.

The key word in that statement is theoretically. The challenge that BIM is facing now is twofold:

- Many models do not transfer information well between analysis programs. A design created in an estimating software program (cost analysis), for instance, cannot be readily imported into an architectural modeling program. Companies have developed workflows to establish the best way for information to be generated throughout their design process, but even with these in place, there are many occasions where changes made later in the design or construction process are not reflected in the model.
- Not all materials are BIM-ready. Information must be available for all materials, both in a single unit state as well as an assembly configuration, for the model to be helpful. Without this data, it would be impossible to run any sort of analysis.

BIM-M The challenge that the masonry industry has taken on is to bring masonry into a BIM-ready state. BIM for Masonry (BIM-M) is the industry initiative for the US and Canada to achieve that goal. There are several working groups focused on various aspects of BIM-M. Material suppliers have been tasked with categorizing what information is needed for masonry to be BIM-ready. There are so many attributes to any product, wrapping your head around everything that encompasses a material may seem daunting. A simple example shows the size of the task needed here.

A Cup of Coffee I started drinking coffee in college. Those late nights and early mornings studying for Dr. Pollock’s steel design course catch up to you quickly. Unfortunately, my morning cup(s) of joe has been one habit I’ve never been able to break. If we look at a cup of coffee as more than just a drink, and instead try and break it down into all its characteristics, we will get a flavor for the material supplier’s BIM-M project.

- Coffee is Black One of the defining characteristics of coffee is its color. But the physical color says much more about the drink than just what it looks like. Black coffee is bitter, it has no additives, and most likely it is brewed differently from a mocha or latte. By drinking black coffee we are getting a basic cup. But there are variations to the level of black a cup of coffee can be. There are light roasts, dark roasts, medium roasts, roasts from specific countries, roasts from specific types of beans and roasts roasted in a particular way. Just by stating a color, we have opened up myriad differences that set one cup of coffee apart from another by factors not taken into account by the word black. It is the same with masonry. In the US, a grey block is typically an 8" x 8" x 16" concrete masonry unit (CMU). There is no added color to make the unit lighter or darker or some other color. Depending on where the materials are sourced, there is a large variation of shades that this block can be. For that matter, there are a large number of configurations into which a simple unit can be manufactured. Face shells can be thicker or thinner. Webs can be removed, reduced...
or enlarged; the unit can have ears or an open end or be fully solid. With both masonry and coffee, a simple statement such as grey or black can deliver a vast array of units (or cups). Any BIM model needs to take these characteristics into account. Having just a grey block included in the model doesn’t cut it.

- Coffee is Special More exactly, there are special types of coffee. I can drink a cup of black coffee, but there are also espresso items such as lattes, mochas, frappachinos and Americanos. Each of those has a subset of characteristics to itself. There are different flavors, production methods, toppings and syrups that can be added or removed to create that perfect, individual drink. It is the same with masonry. We have full-size units, half highs, split face, ground face, fluted, the list goes on. Each drink falls under coffee and each style of CMU falls under masonry.

- Coffee is Tasty Not only is coffee tasty, but it has different tastes. It can be bitter, strong, weak, or full-bodied. The same grounds can produce very different cups just by adding a varied amount of water. A masonry unit is precisely the same; different water content, aggregate type and cement mixes can provide a large variation in strength, absorption or smoothness from the same geometric unit.

- Coffee has Cousins Many other hot drinks that we consume are not coffee but are of similar stature. There are teas, hot chocolates, apple ciders and (shudder) decaf. In the same way, the masonry industry is not just CMU; we must look to the needs of clay brick, natural stone, manufactured veneer stone and cast stone. Each has specific characteristics that the others do not. Any BIM model needs to take that into account.

Back to BIM-M: Material Supplier Workgroup So what is the point? Something as simple as a cup of coffee—a masonry unit—is incredibly complex. In order to correctly model a structure, it is important to characterize the correct level of detail and complexity for each part of the assembly. The challenge for the Material Supplier Workgroup is to draw the boundaries for what is masonry, and knowing what the necessary data pieces to model masonry are. The group has solved the first conundrum with this simple statement:

A masonry unit is anything laid by a mason as part of a wall assembly.

This broad definition allows the group to consider materials such as veneers, connectors, mortars or grout that may not be normally modeled when looking at a structural masonry wall. These are all important parts of masonry assemblies and greatly affect the constructability, cost analysis, sustainability and more when it comes to BIM modeling.

Answering the second part of that question, what necessary data pieces to model, is a much more challenging task. Basic functions every model needs are geometric shape, structural capacity and thermal efficiency but with more and more advanced digital analysis, this workgroup’s job includes a fair amount of looking into the crystal ball. We must try to piece together what analysis will look like for the next decade and provide that view to software manufacturers who will be implementing this. New design constraints like environmental product declarations (EPDs) or the functional resilience of a structure will eventually be modeled. Knowing what information those classes require is a large part of the coming work.
Determining the Right Data
There is also the challenge of providing too much data. Or, more than providing, requiring too much data. Designers only model a building to a specific level of detail. They know that a particular wall will be comprised of one building material or that openings will be placed in set locations, but rarely will an architect specify the exact wall tie to use on a veneer application or the specific block to act as a backup. These specifics are added later by architects, general contractors, construction managers, engineers or maybe the masons themselves. In order to create a living, breathing model that is envisioned, the industry must consider this challenge and provide solutions. Eventually, the level of detail for a model will include the exact block, brick, tie, grout or mortar that is actually placed in the field. As we get closer to this reality, it becomes important for there to be BIM models for each stock keeping unit (SKU) a producer provides. As with providing too much information when it is not needed, we cannot ask for too much information when it is not practical to give. These are all questions the workgroup is answering.

Compiling everything there is to know about a masonry unit into an accessible database is no laughing matter. Perhaps we already have in place the largest and most important resource. That is the connection with industry professionals nationwide who are providing input and expertise to the initiative. Without these individuals, this project would not even be possible to start. This information is being brought together by a university that has shown excellence in this field for more than 30 years. Georgia Institute of Technology is providing all the academic work to turn the information gathered from industry experts into a functional database. Overseeing the project are Professors Russell Gentry and Chuck Eastman bringing with them a combined 50 years of experience in the BIM world.

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And while these are incredible resources, we also have ideas that make this project simpler. For instance, there is virtually an infinite number of colors in the world that we can see. Does that mean there will be required an infinite number of the same unit all with slightly different colors? No, that is clearly an expectation that is unrealistic. All that is really necessary is that we know the unit has color. Later, we can choose exactly what color that is. We would not need, or want, a list of units with every variable shade of aquamarine. While this may be a slightly absurd example, think about all the variables in all the units in all the applications – considering that not everything will need to be provided at all times is comforting.

**Reaping the Benefit** Bringing masonry into the BIM universe sounds like an incredible task. What is the benefit for all this effort? Simply: market share. More than 71% of commercial and institutional structures built in North America last year required BIM designs. Some of those projects were masonry. However, without the full tools of BIM-M, the industry was selling itself short. Taking these steps toward BIM-M will provide valuable information to all segments of the industry. Things like:

- Accurate and faster cost analysis and take offs for producers and contractors
- Better coordinated job sites and material deliveries for producers and general contractors
- Improved safety provisions and workflows for masons
- Detailed views of complicated areas for contractors
- More advanced modeling techniques for engineers
- Accurate views of a project to help and realize an architect’s vision

These are just some of the important advances BIM-M will bring to masonry. More importantly, BIM is how design will be done for generations to come. If masonry does not have the tools to compete in these arenas, projects will invariably use other building materials. The Material Supplier Workgroup is dedicated to making sure that does not happen. So raise your cup of coffee!

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