Greig Carnevale, estimator at Davenport Masonry, Holt MI, had been working with Art Theusch, BIM planning specialist at The Christman Company in Lansing MI, on the $180 million CoGeneration Plant for the city of Lansing. Here, Theusch worked with Carnevale to determine Davenport’s priorities, their biggest risk and to come up with a strategy to mitigate the trade contractor’s risk. When a building is loadbearing masonry, that structural entity is given precedence over any other subcontractor’s work in engineering planning. Theusch and The Christman Company have been utilizing BIM software for clash detection of more than 50 projects totaling $1.25 billion over the past five years.

Levels of BIM

“Three Dimension Clash Detection is the first level of BIM that coordinates the work of all subcontractors to streamline the construction process,” explains Theusch. “Cost and schedule modules add a more sophisticated level of efficiency. The fourth dimension is time to construct in creating an efficient schedule. The fifth dimension is estimating to quantify with cost. The sixth dimension is facility management logging construction data for the owner’s knowledge and use. Life cycle cost analysis may be determined from this data. Green BIM allows energy usage to be forecast and tracked.” Theusch says Christman is working on developing a customer manual as an asset management program for complete operation of the building to assist property owners and managers in maintaining their assets, control costs, predict failures and allocate budgets. It can be used for capital renewal programs, capital improvements and scheduled maintenance repairs. “The manual will also include product manufacturers for when an addition or repairs in the future would require a match of the brick, architectural block, stone and mortar. A user friendly 3D model would be able to show all the building’s systems and how each relates. This can be a very valuable service to the owner, with the ability to track data for 50 years. Green BIM allows energy usage to be forecast and tracked.”

Think, for a moment, about where this new technology can take the building industry. Proactive attention to eliminate problems, waste, downtime. A most cost effective solution to the building industry to shorten construction schedules, minimize change orders and choreograph the work of all subcontractors.
Image useful for frequent reference in locating CMU openings. In walking the jobsite with the engineer, who was concerned regarding locations of the openings, modular course spacing lined up in the model could be counted to validate that openings were correct with the field installation. The project began before all images were created. This image shows the opening circled did, in fact, clash with the slab on deck and should have been constructed above the slab. It was field corrected.

Isometric view showing again the slab on deck in conflict with the cable tray opening. Modular masonry is easy to validate by counting when drawn to scale. This view shows how the block coursing was going to impact the room slab as well as the location of the bond beams over the doors.

Even though the walls were constructed before this image was created, it shows the opening to the left needed to be moved up to accommodate the purple cable tray already fabricated. The tray was not able to move down as it is resting on the concrete slab (transparent in image) and supported by the brown steel beam. The opening to the right was properly placed. Image 2 is the model from the opposite view of the wall.

Image shows the masonry wall as transparent in order to show vertical rebar spacing as well as openings in the CMU to verify the electrical tray would fit in the exact location of the openings. This image shows conflict with the cable tray exiting the electrical room. This project was fast moving and masonry integrating software is not yet available. Masonry was added through the BIM collaboration software by Theusch.

**Efficiency of Catching Issues** Knowing before construction begins that a change is necessary results in a preplan rather than reacting to changes at a much higher cost. Christman’s internal studies have shown that every dollar invested upfront brings a savings of $3 - $10. It saves on both time and materials. 40% of issues are related to the building enclosure.

Theusch welcomes the day when the mason contractor who has been awarded the contract will come with a BIM model for the masonry to integrate with the total project. “When we can integrate these modules, change orders will be minimized, waste will be minimized, construction will be quicker, costs will go down and all will benefit. Even into the operation of the building, maintenance and potential additions and renovations. All materials, including mortar mix designs, type of sand, location in the quarry from which stone was extracted, etc will be recorded for posterity.”

**How to Proceed** Carnevale knew that in order to keep masonry a strong contender as BIM gains momentum, masonry, as an industry, needed to address BIM. A number of brick and block manufacturers had already categorized products to be selected by architects who were using BIM. But how could the masonry industry come on board?

All it took was a mention from Carnevale to Ed Davenport, owner of Davenport Masonry, and a few connections. Davenport brought the question of how can we proceed to a meeting of the Masonry Institute of Michigan Board. Executive Director Dan Zechmeister suggested he contact engineer David Biggs who had already been consulting with Georgia Institute of Technology regarding a masonry interface for BIM.

**Uniting the Masonry Industry** BIM-M will be a major force in unifying the masonry industry, historically segmented. Now an executive committee has been established with representatives from the various segments, all with a common interest to pool their financial resources to move the industry forward. Jeff Buczkiewicz, president/CEO, Ed Davenport and Greig Carnevale of Mason Contractors Association of America (MCAA), Tyler Witthuhn, National Concrete Masonry Association (NCMA) Dave Sovinski, national director of industry development of the International Masonry Institute (IMI), James Boland, president of the International Union of Bricklayers and Allied Craftworkers (IUBAC), Darrell McMillian and Dan Zechmeister, The Masonry Society, Jeff Elder, technical chairman and past president of Western
States Clay Products Association (WSCPA) are financially sponsoring the national Building Information Modeling for Masonry (BIM-M) initiative in order to include masonry materials and systems into BIM software for the architecture, engineering and construction industries. Theusch is advisor. Numerous affiliated groups have joined in with their support – Autodesk, Block USA, Brick Industry Association, Concrete Masonry Association of California and Nevada, Davenport Masonry, DVA Architects, E&S Masonry Corp, Front Studio Architects, HOK, IMS Masonry, Interstate Brick, Jollay Masonry, KFF Consulting Engineers, Lafarge North America, Masonry Institute of America, Masonry Institute of Michigan, Masonry Institute of St Louis, Oldcastle, Perkins + Will, Portland Cement Association, Pruitt Eberly Stone, Pyramid Masonry, Reed Construction Data, Seedoff Masonry, Southern Illinois University - Edwardsville, Target Corp, Tradesmen’s Software, University of Florida, Western States Clay Products Association.

Every dollar invested upfront brings a savings of $3 - $10. It saves on both time and materials.

“The industry-wide involvement in BIM-M is an indication of the professionalism and commitment of the masonry industry to a leadership position within the entire construction industry,” confirms Buczkiewicz. “MCAA plans to participate through every phase of this worthwhile project.”

“All members of the building community are going to benefit from the inclusion of masonry into BIM software,” stresses Biggs. “Building owners will have more advanced tools for understanding total cost of building ownership and upkeep, architects and engineers will have better design and communication tools, and the masons and other trades on the construction site will experience improved scheduling, safety, and site logistics.” Gentry explains that BIM-M will create smoother workflows and collaboration across all disciplines.

According to Zechmeister, “Masonry’s greatest strength is its biggest challenge in relation to BIM. Designers love the flexibility of masonry, its endless colors, sizes, special shapes and textures. Infinite options make the simplicity of a drop down menu a bit daunting.”

Simple Systems will be created as menu items for designers to select a wall system loaded with intrinsic added value and performance capabilities. Using masonry will become simpler through BIM-M. For example, designers will be able select a cost effective, high performance loadbearing cavity wall system to reach an R-value of choice, complete with sound isolation, fire ratings of up to 4 hours meeting or exceeding code, durability and inherent arching action for structural redundancy. Or, a single wythe insulated (or not), oversize, lightweight integrally pigmented CMU to make a dramatic design statement, while at the same time saving money on production and time in the schedule. Or myriad other selections, all with valuable benefits the designer may not even be aware of. Masonry will become more productive. Prefab masonry walls or parts of walls will add to that productivity.

Getting Involved Workgroups with an emphasis on Architectural Modeling, Structural Modeling, Construction Management, Construction Activities and Material Suppliers will be established to look at masonry BIM from all angles. “We encourage other members of the industry to join a workgroup at this critical first phase,” said Bob Thomas, president NCMA. “When there is an opportunity to make it easier, faster and more cost effective for our members’ products to be used, you can bet we’re going to want to be involved from square one.” Contact Russell Gentry at russell.gentry@coa.gatech.edu for information on joining a workgroup.

At press time, nearly 100 industry leaders have already signed on to participate in one of these workgroups. The networking which will take place will be incredible in moving this industry forward. “Never before have we had such an opportunity to gain a synergistic effect from working together,” smiles Davenport. Carnevale, Davenport, Zechmeister, Biggs and so many others are quite excited about how the entire industry will benefit.

The first phase of the National BIM for Masonry Initiative is expected to wrap in early 2013 and will deliver a roadmap for bringing masonry into BIM. This roadmap is expected to include specific project plans for standardizing masonry unit databases, developing automated 3D layout of structures with all types of masonry (structural and veneer) and integrating BIM systems with structural analysis systems and all types of supply chain applications. How exciting!