Designers and block producers alike are expanding masonry’s versatility, potential and wall share. The block industry has come a long way since the days of cinder block. Lightweight, green recyclable concrete masonry units (CMU) with recycled content produced locally, with integral water repellent. Rockface, oversize, block to resemble stone, to resemble brick. Burnished revealing shapes and colors of selected aggregates to create distinctive designer masonry. CMU in neutral, earthy, vibrant, rich, jewel toned or fresh herb integrally pigmented colors. Capacity to produce CMU was mostly developed during the past decade as increased demand required new thinking. New initiatives were implemented at 40 block plants in the Midwest and more than 1600 across the country creating value for the customer.

Masonry is the most reliable, most cost effective solution, most durable and sustainable. And carries with it the most local jobs for both materials producers, as well as bricklayers and laborers. With block plants running lean these past 30 months as construction projects are on hold, we find ourselves with the time and urgency to think outside the box. Training, experimenting, innovating materials, methods and uses are our best chance of seeing the economic downturn through and coming out the other side.

Synergy Creates New Masonry Lintels
One new idea after another. They come faster as we collaborate. Synergy from bringing together people from a variety of disciplines to discuss the best possible solutions stimulates thinking from all.

Paradigm Shift to SmartStructure
In recent years, there has been a paradigm shift away from steel to engineered loadbearing masonry with the cost of steel so unstable, the fabrication time so lengthy
Devising the Plan

Creating the Team

I enlisted professional structural engineers and meeting attendees Walkowicz and Zechmeister to help with the structural design of a masonry lintel that would be user-friendly not only to Dixon Inc, mason contractor on this particular job, but also other mason contractors and other jobs. Walkowicz and Zechmeister, drawing on their vast structural masonry knowledge, helped me to design a one course lintel appropriate for this project. Quality Assurance consultant, former mason contractor and a true masonry artisan, Skip DiGiovanni assembled this first successful creation with a concrete masonry bond beam, masonry adhesive, rebar and grout. I could stand on it, raised into the air, without any cracking. Great strength.

A phone call to inform Bob Henderson, project manager at Dixon, that cost effective masonry lintels could be efficiently delivered to their job site was the next step. In fact, I was able to tell them that we were ready to build the lintels production would be economical and the quality could be improved over on-site construction as materials could be better controlled. By building indoors, we could remove weather from the equation. I recruited mason contractor Dave Muirhead of Muirhead Construction, Milford, MI, to do the assembly. Dixon welcomed the opportunity to sub-contract the work to accomplished professionals, tightening the schedule. Muirhead, with his eye always to best practices, came to the table with the idea of introducing carbon fiber to the block lintels which would carry the stress loads needed. It is an option both stronger and lighter than rebar, conducive to prefabrication. He was able to parlay his past experience with carbon fiber into a new direction. Muirhead enthuses, “Here we are applying lean automotive manufacturing thinking to the construction industry. This indoor lintel prefabrication allows a tighter schedule with no weather constraints. Lintels are being fabricated at the same time that the building is being constructed and delivered with just-in-time precision.”

We benefited from the additional expertise of Todd Jackson of Fortress Stabilization Systems in Dexter, MI, who has been very instrumental in the development of this stage with his extensive knowledge of composite carbon fiber, its superior flexural strength and how it relates to concrete products.

Prefabricated hollow lintels delivered to the site are easy to transport and set. This also gives the mason more flexibility in handling them. Because the carbon fiber is continuous from end to end, they can be easily cut to size. Rebar and grout are field installed. For this particular school, that was a necessity. Grouting had to be both vertical and horizontal, so it wouldn’t have worked to install anything pregrouted. Hollow unit installation is the only way to achieve a monolithic pour, other than building the lintels in place.

While masonry lintels were specified in the plans, the question of whether they were the right choice was raised during a pre-construction meeting where the agenda included a complete review of the masonry elements of two of the new loadbearing masonry elementary schools on Detroit’s near Southwest side. Once attendees Ralph Moxley, AIA, Abdul Brinjikji, PE, and Christopher Hornbeck, AIA, from URS Corp, architect/engineer; Bill Stewart from Brinker Group and Mark Yutzy from Christman Company, construction managers; Elmer Dixon and Mike Harman of Dixon Inc, mason contractor; consulting structural engineer Scott Walkowicz, PE, of the Masonry Coalition of Michigan; executive director Dan Zechmeister, PE, of the Masonry Institute of Michigan; and I, the block producer, had begun the review, the question was raised of whether steel lintels might be quicker to install since there were 120 lintels of varying sizes in the plans.

Never wanting to give up the lintels to steel, I continued to ponder the dilemma and was determined to find a way to resolve the situation expeditiously and economically using block. At National Block, we are continuously experimenting and exploring the possibilities.

Creating the Team

Devising the Plan

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A phone call to inform Bob Henderson, project manager at Dixon, that cost effective masonry lintels could be efficiently delivered to their job site was the next step. In fact, I was able to tell them that we were ready to build the lintels for the school. An assembly line type production would be economical and the quality could be improved over on-site construction as materials could be better controlled. By building indoors, we could remove weather from the equation. I recruited mason contractor Dave Muirhead of Muirhead Construction, Milford, MI, to do the assembly. Dixon welcomed the opportunity to sub-contract the work to accomplished professionals, tightening the schedule. Muirhead, with his eye always to best practices, came to the table with the idea of introducing carbon fiber to the block lintels which would carry the stress loads needed. It is an option both stronger and lighter than rebar, conducive to prefabrication. He was able to parlay his past experience with carbon fiber into a new direction. Muirhead enthuses, “Here we are applying lean automotive manufacturing thinking to the construction industry. This indoor lintel prefabrication allows a tighter schedule with no weather constraints. Lintels are being fabricated at the same time that the building is being constructed and delivered with just-in-time precision.”

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Wall design at Gompers Elementary School, Detroit, inspired the research and development of cost effective prefabricated lintels. 120 openings of varying sizes was a challenge worth conquering. This patent pending process will allow licensing the carbon fiber reinforced prefabrication technology.

Engineering a New Lintel

More than Lintels

To date, we have assembled more than 3,000 lineal feet of this type of CMU prefabricated product. And not just grey block lintels. Architectural burnished pigmented lintels are a beautiful finished product for interior walls. We have even grown this lintel format into a full 20' long by 8' 8" high concrete masonry wall and 24' triangular gable ends attached to parapet walls for delivery to the jobsite.

This innovation has given new and needed promising hope to the masonry industry. Even in its infant stages, one can envision lintels and prefabricated block walls being delivered to construction sites for installation. This will be revolutionary to our industry. Masons will be needed not only to build the walls in a controlled environment, but also any adaptations to the walls installed. The model of one on top of two still prevails. It is the application and the industry that have changed.

Ensuring Integrity

Leading forensic structural engineer, consultant in the development of new masonry products and Great Mind of MasonryEdge/the StoryPole Editorial Advisory Board, David Biggs, PE, of Biggs Consulting, Troy, NY, has also been recruited to participate in this exciting enterprise which will help grow it into a system that can be used from coast to coast. He worked with Bentley in creating a module to design loadbearing masonry and hybrid masonry/steel bearing buildings. A long time advocate of masonry bearing buildings for their structural redundancy from inherent arching action, Biggs, as a member of the Federal Emergency Management Agency’s (FEMA) forensic team, witnessed benefits of a masonry/steel hybrid as he studied the aftermath of Ground Zero, the total destruction of the steel structure World Trade Towers and the much less significant limited destruction of building envelopes protected by masonry infill in structures surrounding.

Biggs' structural expertise will ensure the integrity of the prefabricated products produced. He is able to provide engineering requirements and documentation to support each job. Additionally, Biggs is developing proprietary software to streamline the process and requirements for future demand. Based on the size of the lintel and weight of the block, he can determine how much carbon fiber is necessary, how closely they need to be spaced in place and how many courses can be built on top.

Currently, carbon fiber reinforced polymer is not allowed by Code, so it is being considered a means and methods material. It carries its own weight and will take the place of some or all reinforcement required. We are doing our own testing now and working toward third party testing and achieving Code compliance.

Biggs has been theorizing about and experimenting with the idea of prefabricated masonry beams and panelization for years. He had even applied for grants related to this type of research and design. By assembling the special talents and knowledge that each of us possesses intrinsically, great results happen – like the ability to place a single course hollow masonry lintel with a span of more than 20' into the wall. Cooperation of these talents is imperative for an achievement of this magnitude to transpire.

I cannot help but realize that I was fortunate to be part of a group of many talents discussing the best and most cost effective solution to build and install 120 masonry lintels for one school. Networking with MIM members and others we knew and had worked with allowed knowledgeable individuals to bring their talents together to achieve success in this endeavor.

Embracing Opportunity

Faith, hope and charity are fundamental principles that I live by to help me develop good character. Faith gives us courage and strength to move forward, especially in times like these. Hope is confidence that searches out for the good of us all. Hope is the patience we need to pursue, the good we desire. Hope, in and of itself, is a character builder because it requires us to overcome the obstacles that stand in our way. Charity is a virtue that confirms our love and compassion for one another. This is an industry caring for one another and, most importantly, for one’s neighbor or fellow worker. The opposite of war is not only peace. It is charity.

May you recognize opportunities to help when called upon and may you choose to act on them. It is when we come together and talk and discuss concerns, that the entire industry benefits. In the days when you are not as busy as you would like to be, exercise your mind and think about a better or more cost effective way of accomplishing one procedure you do. Then another. When work picks up, you will find you will be more productive and more competitive. Mason contractors need to encourage GC/CMs to invite them and suppliers to come to the table for pre-construction discussions. They have so much to offer in the design and construction of a higher performance and cost efficient building.

Throughout the Country

This patent pending process will allow licensing the carbon fiber reinforced prefabrication technology: formula for building, quality control program for recordkeeping and testing, and engineering equations to meet requirements. This innovative process will be a beneficial addition to the services and value a block producer and mason contractor can bring to a project. And it brings more local jobs to both the block producer and the mason contractor. Good for the community.

Jim Gendron, vice president, National Block & Ready-Mix, Westland, MI, is Masonry Institute of Michigan president for his ninth term. His vision and dedication to the industry have influenced many changes since he first accepted a board position in 1994. He is one of the Great Minds of the MasonryEdge/the StoryPole Editorial Advisory Board. Active in the industry for more than 20 years, Gendron has initiated and supported many innovations as the concrete and ready-mix industries continue to emerge to meet market demands. Gendron received his BA from Wayne State University. 734.721.4056 j Jim_gendron@nationalblock.com