MASONRY EDGE

STATEMENT OF THE PREMIER WALL SYSTEM
A Masonry Advisory Council Publication

THE COLUMBIAN — HIGHEST BRICK TOWER
THE NEW CMU
SPECIFYING BRICK MADE EASY
REINFORCED HOLLOW BRICK MASONRY
DETAILING SHELF ANGLES
DESIGNING MASONRY LINTELS
WORLD OF MASONRY PRODUCT SPOTLIGHT
WORLD'S BEST BRICKLAYER

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BRICK REACH NEW HEIGHTS AT CHICAGO'S COLUMBIAN TOWER

BY JOHN BURCHER, AIA, AND JOHN WINNER, AIA, LEED AP

When thinking about architecture and design firsts in Chicago, the *height* factor has long given this city bragging rights. With the Sears Tower still among the world's top 10 tallest structures, the city rests on some mighty laurels.

The solution DeStefano + Partners brought to the owner and developer of The Columbian — one of the new high-rise residential condo buildings stretching the residential corridor south on Michigan Avenue — proclaims another first: the tallest hand-laid brick cavity wall building in Chicago.

THE DESIGN CHALLENGE

In 1998, Allison Davis of The Davis Group hired us to create the design schematic for The Columbian, a 48-story condominium complex located in the burgeoning South Loop neighborhood across from a vast expanse of park land: Grant Park to the south and Millennium Park (an extension of Grant Park) to the north. The neighborhood's architecture is an eclectic mix of early 19th century Chicago school brick buildings with modern glass and steel elements. We sought to make The Columbian part of Michigan Avenue's street wall, to make it look symmetrical yet as narrow and tall as possible, as if it were a lighthouse symbolizing the community's pinnacle anchoring the end of Grant Park at Roosevelt and Michigan Avenues.

One of our first challenges was the size of the building plot: an unusually narrow lot measuring 100′ long by 171′ wide. In order to soften what would otherwise be a big rectangle in appearance, we designed a series of set back corners, thus reducing the bulk of the building mass. The masonry rhythm blends with this series of set backs with very clean vertical lines. All of the balconies, including those on the corners of the structure, are engaged into the building as opposed to jutting out such that each unit has its own terrace — a big selling feature among urban condominium living. As the renderings demonstrate, each set back terrace has a brick element, followed by a mid-height semi-enclosure railing at the terrace.

Our original design called for a pressure-equalized terracotta rain screen system. Terracotta shares a similar aesthetic to brick and performs well in colder weather. However, we soon learned that local officials had instituted design guidelines recommending brick. We investigated using brick as a part of the exterior wall. Brick-faced precast panels were considered. However, this would have required an additional tower crane and proved cost prohibitive. It was determined that the jobsite laid brick was the more cost effective approach to build, avoiding the additional site crane.

Chicago's Columbian, a 48-story condominium complex, is the tallest hand-laid brick cavity wall building in the city.
[facing page] Two masons at work laying brick and block for cavity wall construction — one story every 2½ days with crew of 32 surrounding the building.

THE COLUMBIAN, CHICAGO

ARCHITECT: DeStefano + Partners, Chicago
GENERAL CONTRACTOR: Walsh Construction, Chicago
STRUCTURAL ENGINEER: CS Associates Inc., Oak Lawn, IL
MASON CONTRACTOR: Ceisel/Garth JV LLC
MASONRY MATERIALS & EQUIPMENT: BMI, Bracing Systems, Dow Chemical, Endicott Brick, Illinois Brick, Lance Construction Supply, Northfield Block

In rethinking our system strategy we were able to properly detail brick while also providing the image of simple columns and tiers throughout the structure, as evidenced by the volumes of masonry and the small ribbons of glass. Many would think the windows are punched, but our masonry strategy allowed the windows to be vertical with vertical piers of brick as the design element.

CHALLENGES BREED SUCCESS

Conventional construction would not expect the use of brick beyond traditional heights with a building of this size. Our solution looked to history.

Located in the Financial District, the 17-story Monadnock Building is one of Chicago's oldest structures. When it was completed in 1893, it was the world's tallest load-bearing office building at 197′. The building is designed in two halves — the north part is a masonry wall-bearing structure thought to be the last skyscraper to employ this method of construction. The south half is an early example of curtain wall construction where the façade doesn't support the building, but is a curtain to keep the elements out of the interior. Its underlying structure is revealed through narrow piers and wide windows.

We looked at that building and thought that we could apply 21st century know-how using an age-old approach. The Columbian is a fully insulated cavity wall building with non-loadbearing masonry design that employs the same curtain wall concept of the south portion of the Monadnock Building. This design framework takes the brick out of a structural role and allows it to solely be the exterior wythe of the masonry cavity wall.

The beauty of the system lies in the steel shelf angles. Specifically, this is a veneer building with shelf angles on every floor. In essence, the brick doesn't "know" it is on a 48-story building; each floor doesn't realize that there are other floors above or below it (see *Shelf Angles from a Mason Contractor's Perspective,* page 22). This application is ideal because there is virtually no limit as to how high brick could be laid. The residential portion of the tower begins at the ninth floor. The mason contractor, a joint venture of

Ceisel/Garth, is utilizing a hydraulic mast climbing scaffolding system that is raised as the masonry moves up the building. This system also allows for the floor being constructed to be protected from the elements and heated during the winter months.

At the 43rd floor, however, the structural system changes; no longer are there perimeter columns since the focal point is narrower than the rest of the building. At this point a new scaffolding system will be employed to complete the masonry curtain wall. Unlike many buildings of this nature, there is no exposed or *expressed* concrete framing. This is not the norm in many of the 1960s–80s River North Chicago buildings. We wanted to keep the aesthetic of a well-maintained, classic masonry look inherent of living in a traditional brick row home while still keeping a contemporary feel.

16 single mast units surrounded the building. Bridge units connected the tower units. Outriggers extended platforms into set back corners. System supported a total capacity of 96,000 lb.

Importantly, the added height meant that we had to ensure that the veneer system could accommodate the wind loads. Our wind tunnel tests helped us develop the design of the structural system of the building and its foundations. It also determined what and where the wind loads were located.

At the end of the day, we proved that a 48-story building can be constructed traditionally and cost effectively — one brick at a time.

While directing a busy Interiors Group at DeStefano + Partners, John S. Burcher, AIA, has devoted generous time to orchestrating gala events to raise funds for scholarships and arts education programs. Burcher has over 25 years of professional experience working with major corporations, developers and real estate managers. As an architectural designer, he has been involved with mixed-use, corporate and office projects in the U.S., Europe and Middle East.

With over 18 years of experience in the U.S. and abroad, John R. Winner, AIA, LEED AP, has risen through the ranks since joining DeStefano + Partners in 1994. Technical principle for the Interiors Group, he also provides leadership for other types of new construction and renovation work, ranging from high-rise, multifamily dwellings to airport terminals and corporate headquarters.

Both Burcher and Winner are principals at DeStefano + Partners. 312-836-4321, www.dplusp.com

And They Thought It Couldn't Be Done...

SCAFFOLDING DESIGNED TO MAXIMIZE SCHEDULE EFFICIENCY

BY STEVE WYDERKA

The architects couldn't believe it. Even the general contractor was skeptical. The city of Chicago requested the new 48-story, 507′ high-rise condominium tower anchoring Chicago's new south side residential development be clad in brick, contextual with its neighborhood. But how would that be possible?

Second generation mason contractor Al Ceisel, Ceisel Masonry, Northbrook, IL, knew it could be done. In fact, he had recently bricked a 287′ tall residence hall at Loyola University that served as a template for the Columbian. At Loyola, the residence hall was constructed next to a two-story building. Cantilevered beams were used on the fourth floor to support the scaffold above the adjacent structure. The Columbian is a bit taller, but the scaffolding system is similar.

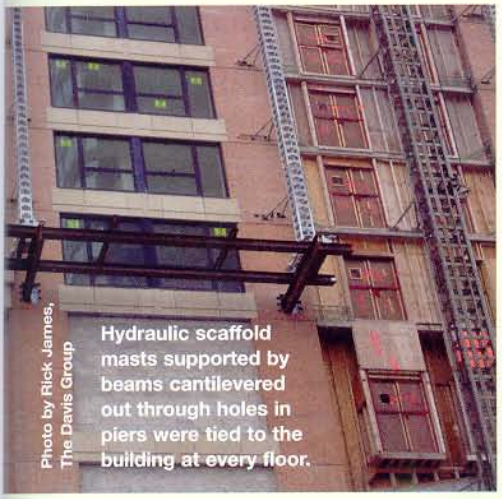

Photo by Rick James, The Davis Group

Hydraulic scaffold masts supported by beams cantilevered out through holes in piers were tied to the building at every floor.

At the Columbian, a system was designed and engineered to support the scaffold off of the ninth floor cantilevered out approximately 10′ allowing pedestrian and vehicle traffic to move on the sidewalk and roadway below.

Rick James, project manager for developer The Davis Group, commented that they and the Columbian LLC knew that outside the box thinking was a must to make this project work. James notes, "It has taken the talent and dedicated effort of literally hundreds of people to make this beautiful structure a reality and a major contributor is the masonry."

The goal was to increase productivity with less labor using a platform that could climb mechanically at a constant pace, offering a safe and comfortable work area, no matter the height. On the Columbian, we employed the single mast system connecting with bridges to surround the perimeter. Sixteen towers supported a total weight of 96,000 lb for men and materials. The single mast system was beneficial in positioning the towers at each pier between windows. There could be no interference with window openings and they could not be used to tie into the building because windows were installed a couple floors below the masons all the way up the tower.

Mast climbing hydraulic scaffolding, developed in the 1990s, is modular in nature allowing it to go as high as we have needed to go, so far. We simply add towers every 5′ to unprecedented heights. Hydro-Mobile engineers run calculations to verify height requirements. Bracing Systems, Carol Stream, IL, began supplying Hydro-Mobile mast climbers in 1999 when we realized how important this could be to masons. We have quickly gained expertise and become specialists in configuring and engineering systems to economically get the jobs done.

SAFETY AND PRODUCTIVITY

Productivity is enhanced with hydraulic mast climbers. When workers are safe and comfortable, and when they are working within an optimum height range with materials within easy reach, they are naturally more productive. Mast climbers provide a 7′ wide work platform with permanently installed toe boards and safety railings protecting workers and keeping them safe. Anchors are installed on a structure capable of withstanding 3000 lb of tension or compression and 1000 lb of shear.

Floors were being poured several stories above the bricklayers. Overhead canopies protect workers from any falling objects. Netting below prevents even a tape measure that slips from someone's hand from becoming a guided missile to anyone below. Permanently installed toe boards prevent accidentally knocking items off platforms. Winter enclosure protects workers from 35 mph winds and cold temperatures.

Schedule is very aggressive. Extensive planning and reliable scaffolding systems ensure the schedule can be met. Concrete workers were scheduled to pour one floor every two days. Masons were chasing them up the tower at the rate of one floor every 2½ days. Masonry was able to increase the speed of the job over any other wall system.

Even though Chicago is a windy city, workers know the scaffolding is engineered and securely tied into the building. The first tie in was at five feet and then every 10′ up the wall.

DESIGN AND ENGINEERING

The building footprint nearly consumed its 100′ x 171′ site along Michigan Avenue. On the southeast corner, we had only 42″ between the building and the sidewalk. The south side allowed a luxurious 9′ to work in. Ceisel indicated what they would need and worked with us to achieve a system that would deliver. Ceisel converted the standard overhead protection to work on single mast towers.

Floors 1–8, encompassing the building's footprint, are the parking structure serving as the base of the residential tower. Easily scaffolded within the tight site, a single mast system of 16 units was used around the perimeter of the building.

Floors 9–43, with their numerous corners, set backs and openings, became a bit more challenging to engineer. Bridge units connected the 16 tower units that hugged the building so masons could walk the perimeter of the building. Outriggers were used to extend platforms into the set back corners. The scaffold for floors 9–43 was built on 40′ long cantilever beams extending 10′ out from the building. The scaffold base was welded onto the beams and shored up on the other side with steel wedged from floor to ceiling.

Floors 44–48, at the top of the tower where the building is set back 6′, will utilize narrow 3′ frame scaffolding — hoisted to the 44th floor and tied into the building on every floor.

Masonry cleaning also becomes much more productive with the mast climbers in place. It is estimated that the cleaners will be able to wash down 10 floors per day. As the towers are disassembled and the ties are removed one floor at a time, the brickwork is completed and the tower proceeds down the wall. It's a very efficient system throughout the process.

Steve Wyderka joined Illinois-based Bracing Systems, Inc. as a scaffolding specialist in 1999. He has worked in the construction equipment industry for 15 years. Wyderka holds a BA in business marketing from the University of Wisconsin and is a member of the Mason Contractors' Association (MCA). derka9@sbcglobal.net, 630-333-5609

RISING TO THE OCCASION

THE FEAT OF 507 FEET OF THE COLUMBIAN

BY ERWIN BERNHARDT

At 507′, The Columbian is the tallest hand-laid brick building in the city of Chicago, adorned with over 450,000 brick.

BEAUTIES OF BRICK

Using hand-laid brick, rather than the initial idea of precast concrete with installed thin brick inserts, is not only a more attractive solution and longer lasting, it is a time-saving one as well. Our crews have been able to set the brick while concrete is being poured nine to 10 floors ahead of us. The concrete was on a two-day pour cycle per floor, while our masons average just slightly more per floor with the brickwork. We were able to set up the scaffolding on the ninth floor while the concrete was being poured on the 15th floor. Work on the Columbian began in October of 2005. We started with the masonry in early April of 2006. The project is scheduled for completion in summer of 2007.

The beauty of the cavity wall construction is its thermal benefit. The Columbian has poured-in-place concrete shear walls, 6″ CMU backup, 1″ high-density polystyrene insulation and modular utility brick veneer.

In addition, the airspace provides a thermal benefit. Inside the CMU wall there is also an insulated barrier with metal studs and then drywall that has a foil back or moisture barrier between the drywall and the living space. So the CMU has insulation both on the exterior side — the cavity — and the interior — the living space. The beauty of the cavity wall construction is its capacity to eliminate moisture. The cavity wall allows moisture that goes through the face brick to drip down to the flashing and out through rope weeps where it cannot do any damage.

WORKING HIGH, WORKING SAFE

Safety is always of paramount importance, but especially so for this job. The entire team attends mandatory weekly safety meetings where we discuss any issues or concerns. We have also taken several special precautions to ensure a safe working environment. Our biggest concern is to make sure everything is secure with the scaffolding. In addition to making sure our men are safe, we have to ensure that no materials fall from the scaffold. Netting under the scaffold in addition to overhead protection above to protect the bricklayers, workers and pedestrians below. We also make sure that all brick are cut on the floor, not on the scaffold. The only materials that go on the scaffold are already-cut brick ready to be laid in place and a shovelful of mortar.

While the extreme heights don't bother the crew, they do present certain challenges.

We are working at heights of more than 500'. Even when the weather seems calm at ground level, conditions are different up there. Winds are consistently at least 25 mph — and there is nothing between this building and Lake Michigan to block them. It's also colder and heat loss is far greater.

TEAMWORK ENSURES PRODUCTIVITY

Materials handling for this job was not unlike what we have done for large-scale projects in the past. There is so much activity here with all of the trades that there are two material hoists (skips) working at all times. For the masonry, we have three or four laborers who work nights to get each floor ready for the next day's work. Stocking two or three days a week, working a day or two ahead of the bricklayers, they set up the brick, block, the mixer and the pre-bagged mortar. This greatly increases productivity since our crews already have what they need on site when they need it.

We're running between 18–22 bricklayers, along with 16–18 laborers plus a few caulkers. Because of its scope, The Columbian benefits from the masonry joint venture of Ceisel and Garth. It's what I like to call a good marriage. The joint venture is going incredibly smoothly. Crews have worked together seamlessly, as a true team. It's hard to tell whose employees are whose. The team has really pulled together. At this point we are finishing up with the very top floors. A small crew will complete the area, which primarily houses the HVAC system.

QUALITY ASSURANCE

Walter A. Laska of Mason Technologies Inc. was hired by general contractor Walsh Construction to perform as their masonry quality assurance expert. Laska first conducted an extensive masonry project document review followed by periodic masonry work-in-progress inspections during which he was able to answer masons' questions, identify and resolve small construction issues and ensure details were installed as indicated in the project documents.

MEGASTRUCTURES FILM CREW DOCUMENTS THE FEAT

Interestingly, at first we weren't even thinking about The Columbian being the tallest masonry building in Chicago. At least not until National Geographic showed up with a film crew. They actually filmed construction for a segment of their program "Mega-Structures" entitled *How it's Built: Brick.* We're very proud to have been part of such a notable project.

Erwin Bernhardt graduated from the Illinois Institute of Technology's Institute of Design in 1973. He has worked in the construction industry since 1978 when he began with Ceisel Masonry, where he is now an estimator and project manager. In addition to The Columbian, Bernhardt has served as manager for such notable projects as Soldier Field and Millennium Park. 847-272-6230, ceiselmasonry@sbcglobal.net