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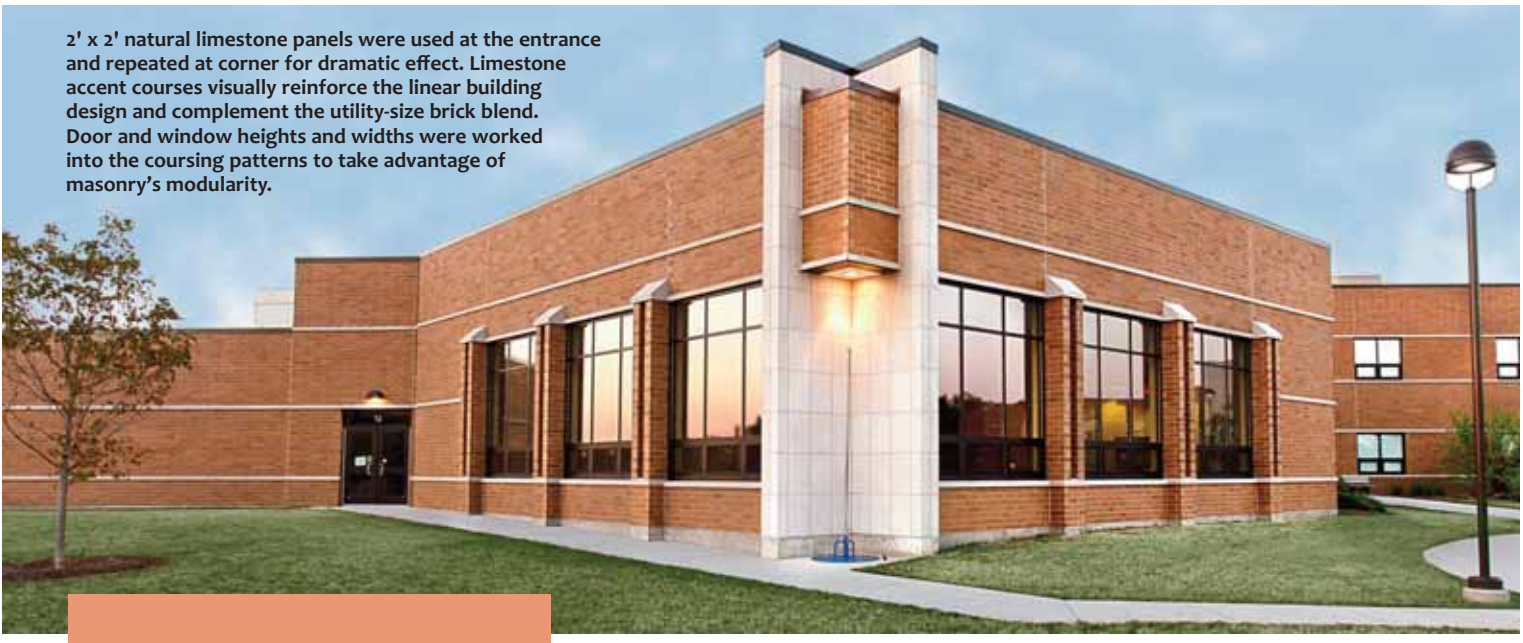

2' x 2' natural limestone panels were used at the entrance and repeated at corner for dramatic effect. Limestone accent courses visually reinforce the linear building design and complement the utility-size brick blend. Door and window heights and widths were worked into the coursing patterns to take advantage of masonry's modularity.

Photos by Daniel Broken, courtesy of Fox and Fox Architects & Engineers

St. Patrick Elementary School
St. Charles IL

Architect **FOX AND FOX ARCHITECTS & ENGINEERS**
Chicago

Structural Engineer **SAMARTANO & COMPANY**
Chicago

MEP Engineer **RL MILLIES & ASSOCIATES**
Munster IN

Masonry Materials | **BIG RIVER INDUSTRIES**
DOW | **MORTAR NET** | **NORTHFIELD**

Project Facts

Total Masonry Budget **$1.925 M**
Construction Cost / Square Feet **$121**
Completion Date **AUGUST 2011**

St. Patrick Elementary

by John Jay Fox, III, LEED AP

Uses Masonry for ALL its Worth

Most Economical Wall System

In 2004, Monsignor Linster of Saint Patrick's Parish in St. Charles IL faced a challenge; the student population was expanding and the elementary school, parish office and rectory buildings were seriously outdated. The decision was made to begin the search for an architect to design a new school building, rectory and office building to be located at the 30 acre site west of downtown where their second church is located.

Meetings between the Fox and Fox Architects and the Parish began in late 2004. Building programs and master plan were developed for office building and parish rectory (constructed in 2008) and new elementary school completed August 2011. The elementary school was designed for 810 students featuring three kindergarten classrooms (30' x 42'), 24 primary classrooms (30' x 30'), computer and science rooms (30' x 42'), learning resource center, band room, full cooking kitchen, dining room, gymnasium with bleacher seating for 450, dual-function stage between gymnasium and dining room, variable volume heating system, playfields, parking and landscaping.

Minimal Change Orders

From the onset, cost containment and minimal change orders were guiding directives in developing the building design. The project was competitively bid, with the four low bidders ranging less than 2% cost difference. Remarkably, change orders were less than 1%, due to careful and thorough planning early in the process.

Sustainable Guidelines

Though the architect had recently completed the first LEED Gold certified fire station in the Chicagoland area, LEED certification was not pursued for this project. However, providing an energy efficient, durable and sustainable school

structure that would integrate aesthetically with the surrounding community was paramount. Face brick, concrete block, limestone, mortar and grout were all sourced and manufactured regionally, within the 500 miles designated in LEED programs. Recycled content was incorporated into products as available. Lightweight CMU, for example, included 32% post-industrial content.

In analyzing their approach to building enclosure and with extensive past school experience with all types of wall construction, masonry was selected for the exterior wall enclosure for its loadbearing capabilities, economy, beauty, durability and energy efficient performance. The 14½" masonry cavity wall is constructed of partially reinforced 8" lightweight CMU, 3¼" cavity with 1¼" air space, 2" foil faced polyisocyanurate insulation with an R-value of 13 and utility face brick tied to 8" CMU with eye and pintel, 2-piece hot dipped galvanized, continuous horizontal joint reinforcing at 16" oc. At the base, continuous thru-wall flashing with stainless steel drip edge runs up the wall 16" and reglet into block joint, all penetrations sealed. 12" mortar net is present at air space with weephole ventilations at 24" oc. Vapor barrier at cavity wall was addressed by providing foam sealer on all insulation bed and head joints, including window and door openings.

72% Above Code The R-value for opaque masonry wall construction was 19.59, exceeding the 2009 International Energy Conservation (IECC) requirement of 11.4 for mass walls in climate zone 5 by 72%. The R-value for roof construction was 31. Envelope thermal values drastically reduced size and cost of HVAC equipment needed. Also, masonry construction, and lightweight CMU with superior fire rating, allowed the school to exceed required hourly fire ratings for exterior walls and corridors for Type II construction, 2009 International Building Code.

Design Plan The school floor plan is U-shaped, featuring three main design elements: central limestone entrance, angular dining and academic wing. This design approach allowed for the incorporation of three distinct elements into the design massing of the building, stressing the horizontal features of the masonry in an economical wall design. The central entrance features 2' x 2' smooth, buff-colored Indiana limestone panels, engraved with the school name and cross. Two limestone and masonry recesses with exterior lighting were provided at the main entrance and angular dining room for church statuary.

A pastel, fine velour utility size brick was selected to enhance visual interest and coordinate with the Fox and Fox Architects recently-designed rectory and parish office buildings and blend with the existing church wall design. Utility 12" face brick, accented by continuous limestone bands running horizontally around building at sill and window heads, substantially reduced quantity and cost of exterior face brick as compared to a standard 8" modular. The mason was given the option to specify both limestone and cast stone for sills, horizontal banding and main entrance. All parties were pleased to include within budget natural limestone on all elevations and stone details.

The second floor structure consists of 5" concrete slab supported by 2" composite steel floor deck. The slab and deck are supported by steel wide flange beams, spaced at 10' oc. Roof structure, of an R31, consists of modified bitumen roof, 5" roofing insulation with R-value of 24, supported by 1½" metal deck, supported by steel bar joists spaced 5' oc. Beams and roof joists are supported by 8" concrete bearing walls at exterior wall and 10" masonry bearing walls at corridors with continuous concrete bond beams at bearing height. In general, the masonry walls are reinforced at 48" oc and grouted at only the reinforced cores. Large openings resulted in heavily loaded piers; fully grouted piers were employed to support these loads.

Wide beam spacing helped increase floor mass and dampen floor vibrations. Additionally, masonry walls helped keep floor vibration controlled by eliminating floor girders within support system. At library, design load of 150 p/sf was utilized. Beam spans of over 40', coupled with wide beam spacing, resulted in high beam reactions at the beam, supporting the live load. These reactions were distributed to masonry wall via steel grillage beams rather than flat bearing plates to keep the stresses in the masonry within allowable limits. Control joints were placed 30' oc and corresponded to the classroom wall design, which had two window openings per classroom with a building expansion joint running through building, separating school classrooms from athletic and dining wings.

Modularity Door head heights were 7'-4" to block and brick coursing, taking advantage of masonry's modularity and aiding mason productivity by reducing the need for field-cutting units to fit irregular spacing. Window heights and widths were also worked to block and brick coursing. Second floor elevation was set at block coursing of 13'-4", allowing 9'-6" classroom ceilings with ample room for MEP systems and structure. Roof joists pitch 12" down at ¼"/ ft or 1 ½" concrete block courses to roof drains. Saddles between drains slopes water to 8'-0" x 8'-0" roof sumps and drains.

BIM In developing drawings, a BIM modeling system was used to generate and manage building data from design through construction and increase productivity and efficiency, providing intricate details about building space, relationship and geographic information, quantities and properties of building components. BIM technology allowed us to control entire building process with exacting precision. By doing so, we virtually walked the client through the building before ground was even broken for construction. It is not just about the technology; we still have to have the idea and that's what really makes the difference. This project is a testament to creative thinking combined with the latest technology. Change orders for the project were less than 1%.

Construction Schedule

After competitively bidding the project, ground breaking for school building was mid-June, 2010. A heavy machinery operator's strike delayed construction for six weeks until September. Because of the CMU loadbearing structure, the contractor was able to begin laying the structural block in mid-September and close up the 89,000 sf building and complete the roof by mid-December. Quick 12-week enclosure minimized the need for winter protection conditions. Finishing work continued during winter months of 2011. Exterior face brick and stone entrance were completed in the spring and the building had substantial completion July 1, with school opening August 2011.

Using loadbearing capabilities of masonry allowed the architect to save substantial costs over steel post and beam construction. Additionally, the architect can point to many firm-designed masonry school structures that are over 60 years old, remain stunning, aesthetically relevant and continue to operate efficiently. Beauty, durability and timeless appeal of masonry are obvious benefits. Just as attractive are the enormous cost savings that allowed the owners to completely furnish the school building and provide IT equipment throughout. Each classroom has eight computer/data outlets and high definition television connected to a centrally located computer room where students have access to internet, video instructions and cable programs. Total project costs including furniture, cabling, site utilities, kitchen equipment, lockers, window shades, bleachers and building construction is an unheard of $131/sf.

Using Masonry Through the firm's lifetime of capitalizing on masonry's benefits, handed down from generation to generation, masonry has been used extensively. Fox and Fox Architects know the ins and outs of masonry's intricacies. We were able to take advantage of so many inherent attributes, including the economics of loadbearing enclosure and

Insulated masonry cavity wall was the system chosen for aesthetics, cost and thermal efficiency. The wall system allowed for a smaller HVAC system to be used, while also providing loadbearing capacity, sound and vibration dampening and increased fire rating.

partition walls, high performance insulated masonry cavity wall exceeding code for fire rating and R-value. Mason productivity increased with lightweight block, oversize brick and modular masonry units. Comprehensive planning and responsible quoting ensured the best quality products were used following principles of green building promoting a sustainable, long-lasting, high performing building.

John Jay Fox, III, LEED AP, is president and principal of Fox and Fox Architects, Chicago. Founded in 1919, the firm has made notable contributions to architecture in the Midwest, including schools, churches, country clubs, municipal buildings and even the Papal platform for the visit by Pope John Paul II in Grant Park, Chicago.

Fox is a registered architect in Illinois, Indiana, Michigan, Louisiana and Arizona. He has served on the boards of the Illinois Architect-Engineer Council and Illinois Society of Architects. He earned his Bachelor of Architecture from the University of Notre Dame.

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