



## **Load-Bearing Masonry Creates Durability, Fire Resistance**

### **Case Study: Arlington Elementary School, Arlington, Indiana Prepared by VPS Architecture**

When challenged to replace a century-old elementary school in a community with a small tax base and minimal water service, the use of load-bearing masonry construction allowed the architects to ensure student safety while providing long-term durability in a building that was optimized for contemporary educational needs, yet affordable for local taxpayers.

Arlington is an unincorporated community along U.S. 52 in western Rush County. Since the early part of the 20th century, local students had attended classes in the type of building that was once common throughout Indiana's rural communities.

The antiquated building presented a growing list of headaches for the county's school board. Maintaining it in good working order became more costly with each passing year. The school had been built long before energy costs had become a concern, and opportunities to improve efficiency and comfort were extremely limited. The design of the structure left few opportunities for modernization or ADA compliance. In addition, the commonly held perception that newer school buildings reflect better-quality education impacted the county's economic development efforts and real estate values.

Given the heavily rural tax base and the anti-property tax climate in Indiana, the county's school board carefully considered all of its options before deciding that it was time to replace Arlington and another aging elementary in the community of Milroy with modern K-6 buildings. The district asked VPS Architecture to design the new buildings as cost-effectively as possible.

While the Arlington site was level and easily accessible, it presented challenges for the design team, explained Sarah Schuler, AIA, who led the project for the firm. "The community lacks a source of municipal water with enough pressure to support a fire-suppression system for a building that size," Schuler recalls. In addition, the site was so far from the nearest natural gas pipelines that preliminary estimates for connecting with a gas line were close to \$250,000.

"The building codes are written so that school buildings will ideally have sprinkler systems," she adds, "but the lack of water pressure meant that we had to design a sprinkler-free building. That becomes very complex, because you lose all of the advantages that come with installing sprinkler systems, such as the setbacks that allow for additional square footage."

"Instead, you have to design the building in a way that gives you fire separation between the individual areas of the building. Essentially, you build a series of smaller structures that are all connected to become one building. The code specifies different hour-ratings based upon the types of areas and circumstances. Using load-bearing masonry construction allowed us to achieve our fire rating requirements without sprinklers."

Load-bearing masonry construction also helped the architects ensure the structure's long-term durability in face of Indiana's ever-changing climate. "The school will have to endure four seasons and the freeze-and-thaw cycle," she notes. "The wall construction must be well-insulated and handle vapor transfer correctly while accommodating those cycles and meeting the budget."

The lack of gas service also demanded careful planning, and the VPS Architecture team turned to Tom Durkin of Durkin & Villalta Partners Engineering to identify the most cost-effective HVAC approach. He recommended a two-pipe system using a geothermal well. He estimated the heating costs of the geothermal system at 69 cents per 100 MBTU, compared to \$1.92 for propane and \$2.50 for electricity, and calculated a 12-year payback for the system. Durkin explained that the two-pipe system was less expensive to build and operate, and would be easier to maintain than other options.

“We want the buildings we design to be as sustainable as possible,” explains Schuler. “We know that operating budgets are increasingly important to schools, and geothermal systems usually have a much lower long-term life-cycle cost. We also look for energy efficiencies in the core construction, and incorporate as much natural daylighting as possible in the classroom design to reduce the need for artificial lighting.”

VPS Architecture responded to the district’s needs with a highly functional, very affordable, and strikingly attractive design that made efficient use of both sites and gave the school district substantial flexibility in educational programming. Although the present enrollment at Arlington is 172 students, the 61,220-square-foot structure was designed to house as many as 350 children, giving the school plenty of room for long-term growth.

The single-story plan separates the lower primary grade from the upper classes, with all grade levels sharing amenities in the middle of the building. “It flows very naturally, and by choosing a single-story approach, we were able to address accessibility without the need for an elevator or other accommodations,” said Schuler.

The school’s entry area offers passive security by funneling visitors through the office area, where they can then be admitted into student areas. The common physical education and cafeteria areas are separated from the classroom areas, allowing for secure community use when school is not in session. An elevated platform between the cafeteria and physical education space serves as a stage that permits seating in either room.

Classrooms for first through third grade are located on one side of the shared amenities (which include the administrative area, computer room, media center, group instruction and music room), with grades four through six on the other side. All classrooms have exterior walls, with windows delivering abundant natural lighting.

Arlington Elementary School was completed in August 2010 at a total construction cost of just under \$9.3 million. The structure does incorporate some steel framing, but is primarily constructed with load-bearing concrete block walls, and brick facing on the exterior.

The team used a variety of interior finishes to call attention to individual spaces. “Painted masonry is durable and will stand up to the use that the school is going to see,” says Schuler. “Over time, the masonry can easily be repainted to refresh the appearance or to change colors, which will continue to provide economic advantages.” The Arlington and Milroy buildings are identical, but the interiors use different color schemes to provide separate identity.

Beyond meeting the district’s physical needs for space, Schuler says the design of the new building gives the staff a tremendous amount of flexibility in instructional approaches. “The new school presents the opportunity for dramatic changes in the teaching culture,” she explains. “They now have spaces where they can perform collaborative activities. There’s a computer lab adjacent to the media center, and the stage in the cafeteria and gym. All of these spaces give the staff more flexibility to expand on instructional techniques.”

In addition, the new building provides access to technology that would have been impossible in the previous structure. Recognizing that Arlington Elementary will likely serve the community for decades, the VPS Architecture team designed the load-bearing walls to make technology upgrades easier and less costly. “Even though technology is making things smaller, we sized the conduit runs for electrical and data wiring so that the infrastructure would allow growth,” Schuler notes. “We also laid the groundwork for upgrades to elements such as the security systems. While the school current uses basic security features, we’ve wired the building so that keypads could easily be added in the future.”

“The community had been making the best of what they had,” Schuler reflects, “but now they have a facility that can really advance their teaching. It’s an intuitive design that puts children at ease and helps them identify their environment, gives them the most up-to-date technology, and is durable enough to serve the community for decades to come.”

#### KEY FACTS

Client: Rush County Schools

Architect: VPS Architecture, Inc.

Engineer: Durkin & Villalta Partners Engineering

Construction Manager: NEED

Square footage: 61,220

Construction cost: \$9,270,000

Completion: August 2010

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