Gull Lake High School is the district’s first new building in more than 15 years. Its masonry wall system played a major role in meeting several key project goals:

- easy to maintain and durable
- reduce energy use
- create a classically modern and attractive building that is sustainable and will meet the district’s needs for a very long time

Kingscott’s loadbearing masonry wall design with structural precast concrete plank floors was the right fit for the school’s goals. The district was very familiar with this type of structure. The former high school (which is now the middle school), constructed in the 1960s, used loadbearing masonry walls that have proven very durable and easy to maintain. Gull Lake Community Schools was eager to benefit again from this design.

Shrinking Volume and Easy Maintenance

The structural design was very efficient. Using loadbearing concrete masonry unit (CMU) walls with structural precast plank concrete floors allowed the floor-to-floor height to be lowered, reducing the volume of the 230,200 sf, two-story building. Any time the building volume decreases, there is less space to heat and cool, which equates to reduced energy use. The design also eliminated the need for bar joists, allowing engineers to run systems above the ceilings with minimal conflicts, making them easy to access and maintain.

Increased R factor and Loadbearing Capacity

Kingscott’s design standard for loadbearing masonry walls was developed to exceed code requirements and provide owners with a well-insulated building. Beginning in 2002, Michigan school buildings were required to meet the Michigan Building Code which has an energy component calling for a minimum of R-13 for exterior walls (Zone 1). At that time, our design standard totaled 14.5” in width – 8” block, 1.5” rigid insulation, 1” air space and 4” block or brick veneer. We have redesigned our standard to exceed the new requirements with a 16” total width design – 8” CMU, 2” spray polyurethane insulation, 2” air space and 4” block or brick veneer. Our new design standard creates an R factor ranging from R 18.5 to R 20.5. However, at Gull Lake’s new high school, we increased the CMU to 12” to allow the use of precast plank floors, maximize window openings and increase the R factor even more.

Gull Lake High School
Richland, MI

Architect Kingscott Associates, Kalamazoo, MI
Engineer JDH Engineering, Grandville, MI
Construction Manager Miller-Davis Kalamazoo, MI
Mason Contractor Burggrabe Masonry, Belding, MI
Masonry Materials Arriscraft International, Bowerston Shale, Consumers Concrete, MIFCO, Mortar Net, St Marys Cement
Completion Date August 2007
Total Project Budget $34.8 million
Masonry Budget $3.4 million

20” Wall System for R-21

At Gull Lake High School, our design (See Figure 1) totaled 20” in width featuring 12” CMU, 2.5” spray polyurethane insulation, 1.5” air space and 4” brick. This design creates an R factor ranging from R 19 to R 21, greatly exceeding current code minimum. The 12” CMU units are horizontally wire-reinforced every two courses. We specified 2.5” of spray polyurethane foam insulation at an R value of 17.5. Masonry’s surface is porous and has good grab which is ideal for this type of insulation application. We also used a Mortar Net cavity drainage material to keep the air space clean and to reduce thermal bridging.
Keeping the airspace clear also allows any moisture that gets through the veneer to weep out through the bottom of the wall space.

Why the custom design? Certainly there will be an energy efficiency benefit that will save the district operating dollars. The floor, which is a 10" thick precast slab with a 3" topping, sits on 4" of the 12" CMU. Increasing the CMU width to 12" supports the design’s structural precast concrete plank floor and allows large window openings to maximize natural light in the classroom spaces.

Note: Although LEED certification was not a goal for this project, the wall design and construction would contribute toward a LEED goal. It will contribute to reduced energy use, maximized natural light and use of regionally manufactured and recycled-content masonry materials.

More Benefits

In addition to the benefits of energy efficiency, loadbearing and easy maintenance, there are other reasons why masonry was selected for use:

- The Michigan Building Code requires 2-hour and 1-hour fire barriers. Masonry far exceeds this requirement. The 2-hour fire wall’s double-wall design – two free-standing walls that structurally separate the building – also helps designers strategize where to locate the fire walls so they can be used for other purposes. We can use the required fire walls and doors for security and to separate public use areas (theaters, gymnasium, pool, etc.) from the academic areas. This enhances the opportunity for community use of school facilities.

- After this design application, we clearly see the benefits of using the spray insulation. Not only is it an effective insulator, but the ease of application made construction quicker, saving time.

- Masonry walls were ideal to incorporate the structural precast concrete floor plank. This also expedited the construction schedule.

Looking Good

Gull Lake wanted the traditional look of the brick school house – with a modern twist. The combination of face brick and 12” x 24” Arriscraft calcium silicate masonry units were used to create a dressy, modern “brick and stone” appearance. The face brick is a combination of Bowerston Shale’s #40 and Frisco Blend, utility size (4” x 12” modules) with natural colored St. Marys mortar. The modern look is finished off with metal panels at the top of the wall.
From experience, the school district found loadbearing masonry walls durable and easy to maintain. Efficient design reduced overall volume, without eliminating usable space, making it more energy efficient.

Interiors showcase masonry and feature the calcium silicate units along with burnished CMU. Both curved and flat units were used in many areas of the school:

- Burnished block is featured in the cafeteria/commons, media center, main stairway outside the media center, primary entrance and lobby.
- Masonry is used in conjunction with skylights to provide natural light in the media center, stair towers, the main entrance and a specialized science room/greenhouse.
- The owner wanted to create a focal point in the main lobby of the high school. Several possibilities were discussed, but in the end a masonry solution was selected. The school’s logo was created with a combination of Arriscraft limestone finish and rock finish in two different colors. Incorporated into the large lobby wall, visitors are automatically drawn to the logo and the seating area beneath it. This was an excellent choice – we were already working with these materials on the project. This resulted in an economical solution with great impact.
- Arriscraft stone and interior brick are featured in the administrative office.
- CMU is used in all corridors, the walls between classrooms and as full-height walls in the gymnasium.
- CMU is also used in the music room. Walls with solid grouted masonry create a high mass minimizing sound transfer to the surrounding rehearsal room.
- Burgrabbe Masonry, the mason contractor, did an excellent job in putting everything together into a highly durable, energy-efficient and beautiful building.

Our wall design totaled 20” in width featuring 12” CMU, 2.5” spray polyurethane insulation, 1.5” air space and 4” brick. This design creates an R-21, greatly exceeding current code minimum of R-13.

Brendon Pollard, AIA, LEED AP, is a principal and project director with Kingscott Associates, Kalamazoo. With 17 years experience in project management and architectural design, he led Kingscott’s planning and design of Gull Lake Community Schools’ high school, winner of AIA Southwest Michigan Chapter’s 2008 Honor Award. Pollard has a Bachelor of Architecture and a Bachelor of Science, Environmental Design, from Ball State University. He is a member of the American Institute of Architects, AIA Southwest Michigan and serves on Leadership Kalamazoo Advisory Board.

bpollard@kingscott.com
269.381.4880