BREAKING the MOLD

Johnson Creek School District's new monolithic dome school is turning heads

Shelby Anderson


Image courtesy of TeamTSP.com

In 2012, the Johnson Creek School District Sites and Facilities Committee listened to a presentation from an architect on dome schools. Located in southeastern Wisconsin, the district of about 740 students was in dire need of a new middle/high school facility and was exploring options. However, the idea of a school housed in a series of domes seemed a little far-fetched.

"At first, we kind of looked at each other, rolled our eyes and said we would give this gentleman 15 minutes to present and then move on to 'normal' school board business," remembers Rick Kaltenberg, school board president and member of the Sites and Facilities Committee. "An hour and a half later, we knew we had to investigate more."

Shortly after that meeting, Superintendent Michael Garvey, Kaltenberg and a team of school board members and administrators visited Grand Meadow Public Schools in Minnesota. At that time, the school was the only dome school in the Midwest. It is comprised of five interconnected domes. Garvey said when he first saw the buildings from the outside, he wasn't impressed.

"When we drove up, it looked a little small; I thought it would be damp and dark inside," Garvey said. "But once we were in the school, it was the complete opposite. It was bright, open and there was a lot of space."

Buying In

Intrigued by the idea of a school made of interconnected, monolithic domes, the Johnson Creek School Board sent out bids for a dome school project and selected TSP, a design firm based in the Midwest that also designed the Grand Meadow School.

In February 2013, the school board voted to go to referendum to build a dome school. They didn't have much time to educate the public — the community voted on the referendum a couple months later in April. This proved to be an insufficient amount of time to talk to the community about the district's plans. The referendum failed; it was the district's fourth failed building referendum.

Despite the failed referendum, the school district was in desperate need of a new facility. Among other issues, the old high school was too small and didn't even have a cafeteria — high school students had to use several portable classrooms and walk to the nearby elementary school for lunch.

Benefits of a Dome School

According to Thomas Kincaid, a Wisconsin architect, dome schools check off all the boxes that school leaders and community members look for in a school. Dome schools are energy-efficient, low-maintenance, safe, provide flexible learning spaces, have good indoor air quality, and are less expensive to build than traditional brick and mortar schools. They also don't take as long to build — about three months, compared to about eight months for a traditional school.

"Monolithic, thin-shell concrete construction utilizes the least amount of materials to enclose the largest amount of space at a minimum cost in the least amount of time," Kincaid said.

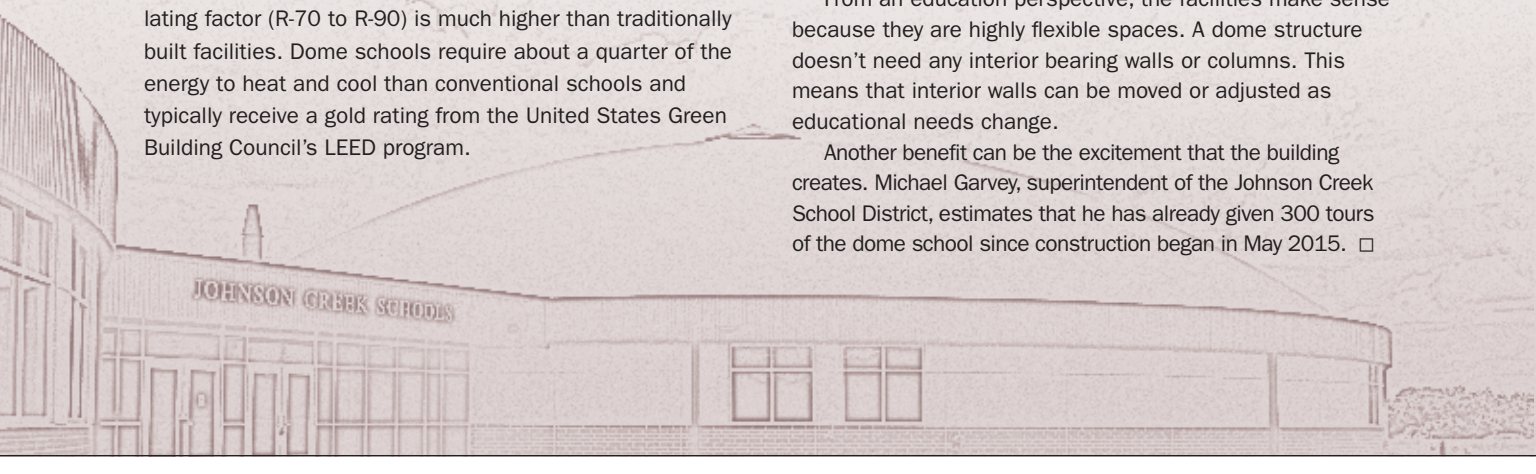
The dome's energy efficiency comes, in part, from the building's construction. The dome is built out of a single concrete shell. There are no joints or gaps that can be difficult to insulate. The concrete dome structure's insulating factor (R-70 to R-90) is much higher than traditionally built facilities. Dome schools require about a quarter of the energy to heat and cool than conventional schools and typically receive a gold rating from the United States Green Building Council's LEED program.

One of the biggest reasons that the Johnson Creek School District decided to build a dome school was cost. Dome schools cost less to build than a conventionally built school. The initial cost of a dome school is $120 to $140 per square foot, compared to $158 to more than $250 per square foot for a conventionally built school.

Dome structures are rare in Wisconsin but are more common in Oklahoma and other states hit hard by tornadoes because of their ability to withstand strong winds. Concrete thin-shell domes can resist tornado winds up to 300-400 miles per hour. Additionally, concrete dome structures are essentially fireproof as concrete will not support a flame. It is not surprising that dome schools exceed all strength and safety requirements of FEMA. Many of the 150 domed schools around the nation received FEMA grants in the past two years. If a community has a dome structure, it is often designated the community's storm shelter.

From an education perspective, the facilities make sense because they are highly flexible spaces. A dome structure doesn't need any interior bearing walls or columns. This means that interior walls can be moved or adjusted as educational needs change.

Another benefit can be the excitement that the building creates. Michael Garvey, superintendent of the Johnson Creek School District, estimates that he has already given 300 tours of the dome school since construction began in May 2015. □



Although the district had experienced four failed referendums, Kaltenberg said it wasn't necessarily because the community was unsupportive of education.

"With multiple failed referendums, the misconception was that the community was saying no to any new facility and no to education, when in fact they were just telling us to get the right facility," Kaltenberg said.

The school board voted to put the referendum question to the community again in the spring of 2014. This time, the district had time to engage the community about what a dome school would mean for the district. In addition, a team of parents formed a 'Yes' committee and went door to door educating community members about the proposed dome school.

Domes are uncommon in the Midwest but they are becoming more popular in the Southwest and Northwest. Domes have also been used in Oklahoma's Tornado Alley — because of the design of a dome, it can withstand strong winds and severe weather.

After four unsuccessful referendums in Johnson Creek, the fifth one passed successfully and the school district broke ground on what was to be the first dome school in the state. Given the non-conventional structure of the building, the construction process was also unique. Like the Grand Meadow School, the Johnson Creek Middle/High School is made of five, interconnected domes. The domes were built by inflating a specially designed thermoplastic membrane into the dome shape. Once it was inflated, it was reinforced with rebar and sprayed concrete was applied. The self-supporting domes are about 8 to 10 inches thick.

The number of contractors that build dome structures is rather small. The school district selected South Industries, which is based out of Idaho and one of the pioneering construction firms specializing in monolithic domes. The company only brought six people to construct the dome and hired local help, including two recent Johnson Creek graduates. During the entire building process, all trade teams (electrical, plumbing, etc.), were onsite, which helped the project move along and it

Take a Tour
of Johnson Creek's Dome School

If you are going to the State Education Convention in January, you may want to consider stopping by Johnson Creek to participate in a tour of the new school. Superintendent Michael Garvey will be leading tours on **Tuesday, Jan. 17 between 8 am and 2 pm and Friday, Jan. 20 between 12 and 3 pm.**

Tours can also be scheduled by contacting the district directly at 920-541-4800.
The new Johnson Creek Middle/High School is located at 455 Aztalan Street in Johnson Creek.

also ensured that wiring and pipes were placed correctly according to plans.

Dome Advantages

There are many benefits of a dome school, but for Kaltenberg and the Johnson Creek community, the big selling point was cost.

"The upfront cost of building the domes was 20 to 30 percent lower than a conventional building with the same square footage," Kaltenberg said. "That's a significant dollar amount in our small district."

The district should benefit from long-term cost savings as well. The design and construction of the domes is such that heating and cooling costs can be better controlled and are very efficient. In fact, the district considered installing a geothermal system in the new school but found that because the heating and cooling costs would be so minimal that the up-front costs of installing a geothermal system wasn't worth it. It would have taken more than 100 years to see the return on the investment.

Additionally, the domes are very flexible. Since they don't require interior walls to support the roof, walls can be moved around as needed.

"That means that when education evolves to whatever it will evolve to over the next 100 years, we can redesign and remodel to fit those needs without worrying about what walls can and can't be moved," Kaltenberg said.

The finished school houses the district's middle and high school students. The five domes provide 109,000 square feet and divide up into rather traditional classroom spaces. The difference is the high ceiling of the dome. The five domes house the middle school academic wing, the high school academic wing, a large gym, and vocational classrooms. There is also a "cafetorium" — a cafeteria fitted with a large, professional stage for school productions and other events.

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A Proud Community

During the building process, Garvey gave tours to anyone who was interested, but the community got the first real look at the new school during open house the night before the start of the school year. Garvey noted that typically before the start of the school year some freshmen and their parents attend the open house to get a feel for the school. But when the district held the open house for the new dome school, everyone showed up.

"It was incredible," Garvey said. "The school was absolutely full. We had more than 1,000 people here that night."

Garvey said feedback from students and staff has been positive. "Students and staff are upbeat," he said. "It has been an incredible change. School spirit has never been higher."

One outcome of the new school has been the renewed school spirit not only from students but also community members. When the school was built, the referendum didn't include funding for new athletic fields. That is being raised by the same parent group that served as the referendum 'Yes' committee. The committee needs to raise $2.5 million to fund the athletic fields. So far, community support has exceeded expectations and the district plans on having the new football field ready for fall 2017.

The school is new and some of the unique characteristics present their own charms. For instance, acoustics are quite different. Because of the design of the school, the administrative offices inadvertently gets sound from the band room piped in through the HVAC system. These are relatively minor issues that Garvey said the school will be able to fix.

Overall, school leaders at Johnson Creek recommended that interested school districts consider a dome school.

"Every district is different and dome schools have a niche — very large schools may find that it doesn't fit well," Kaltenberg said. "Plus, it's not conventional so if you are considering it, you have to understand that you need to educate from the ground up … But if you want a solution that provides a safe environment with upfront cost savings and long-term savings then, yes, I would recommend considering it."

The Johnson Creek Middle/High School is still very new, students and staff just moved in at the beginning of the school year. However, the district is committed to the new school. The site on which the domes were built is very large and the school is zoned to build four more domes if needed.

"With our history, we are going to be in this building a long time," Garvey said. ■

Shelby Anderson is editor of Wisconsin School News.