



“It was a eureka moment.”

# Sage

SOLVED

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FOR SEVEN YEARS the beauty and peace of Sage Chapel has been held behind locked doors, but soon the sounds of worship and song will fill its space again. After years of probing and analysis, the mysterious structural problems that caused NMH to close Sage in 2003 have been solved. Through high-tech sleuthing, engineers discovered a small, 100-year-old construction error that caused the roof

to separate from the walls along the nave. Those engineers have designed a restoration plan and repairs are under way to bring the chapel back to its former glory.

THE JOURNEY BEGAN in late 2002 when a Northfield building inspector attending a wedding in the chapel noticed a small gap between an interior roof support—or truss—and the wall. By the time NMH solicited bids for the repair in early 2003, the gap had tripled in size. Contractors recommended closing the chapel immediately and installing supportive staging until structural engineers could determine the cause of the movement and make the repairs.

The staging quickly stabilized the structure, but the cause of the movement was elusive. Five engineering firms inspected the chapel and came back with divergent perspectives, proposals, and costs. “You didn’t know which peg to hang your hat on,” recalls Stan Pitchko, former NMH director of facilities and a project manager at the time. “As each firm made a presentation, it was difficult to determine which was the correct one. It paralyzed the process.”

At opposite extremes, one said a simple tightening and recentering of the bolts in the roof trusses would be sufficient. The other held that the roof had to be removed and rebuilt, costing millions in repair. As to why the damage had appeared nearly 100 years after construction, some attributed it to a possible earth tremor. Others suggested the school could have been negligent in its care of the building. Still others proposed that the original design might have been flawed. John Wathne, a historic preservation engineer, didn’t buy those explanations. “We work on about 260 historic structures a year, some designed by Shepley Bulfinch (the Boston architecture firm that was practicing as Shepley, Rutan, and Coolidge when it designed Sage Chapel). We’re very familiar with their work. It’s always detailed and well built.” Design failure made no sense to Wathne, so he decided to search for answers electronically.

Using the original design and construction documents of the chapel, he created a three-dimensional computer model of the roof trusses (the dark wood supports on the ceiling and walls of Sage). He tested all of the stresses and established that the design was sound. Then with engineers from his company, Structures North Consulting Engineers, while up in the staging and taking measurements, Wathne began to play “what if.” By introducing errors into the model, he could see what kind of long-term damage might result. One error produced exactly the damage he was seeing in the chapel—the absence of a small support block in a pocket for the trusses right where they meet the wall and the top of the buttresses. The block, about the size of a book, was in the design drawings. Wathne chipped a hole in the wall near one of the trusses. The block was missing.

By this time NMH had consolidated on the Mount Hermon campus, and the school’s energies and resources were directed there. Sage remained a priority, but it was stable, and the ongoing marketing process suggested that a new owner might consider the chapel a luxury. Given the circumstances, the school elected to monitor the situation and delay repairs.

During winter 2009, negotiations with a potential buyer included NMH repairing Sage as part of the sale, and so Wathne returned to campus, this time with new equipment that could provide irrefutable evidence to support his diagnosis.

He bored small holes beside each truss. Using an articulating videoscope—a camera on a bendable arm—he examined the base of each hammer truss, those large, blunt supports that jut out from the interior walls. In every case where roof damage is evident, Wathne’s camera revealed an empty pocket.

“It was a eureka moment,” says Trina Learned, director of NMH plant facilities, who was there with Joe Ribeiro ’54, former chief financial officer for the school and part of the marketing team for the campus, and Devin Lockley, assistant director for facilities and project management.

“For this engineer to think this way was fascinating,” says Learned. “Without that deductive train of thought, we wouldn’t have figured it out.”

Apparently, during construction, workers simply overlooked some of the blocks, which provide a continuous transfer of the load from the roof to the buttresses and then to the ground. About two-thirds of the trusses lack the supporting blocks. Without them, the load from the roof lands inappropriately on the walls, which over time have bowed outward at the top and separated from the roof.

Wathne’s solution is first to relieve the weight on the walls by lifting the trusses with cables, then filling the empty

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pockets with grout, and then restoring the trusses to their original position. The buttresses will be disassembled, reinforced with steel rods, and restored by a stonemason. In the end, Learned says, the repairs will be invisible to anyone coming into the chapel.

There’s plenty of joy associated with the understanding and resolution of the problems with Sage. The chapel has been the spiritual home and focal point of the Northfield campus since its dedication in 1909. “It’s a magnificent building,” says Les Miller, a real estate analyst for the new owner, Hobby Lobby. He says restoring Sage is one of their top priorities, and the work should be finished sometime this fall. Miller also says Hobby Lobby and the C. S. Lewis Foundation intend to provide time for NMH alumni to visit and be in the chapel—welcome words for all NMH alumni. ❖