

# PROJECT OF THE YEAR

## PDCA 2004 Under \$1,000,000

**Abandoned since the 1980s, the old Charleston High School building was given a second chance as it became part of the Medical University of South Carolina.**

*By Amber N. Billman, Piledriver Editor*

Charleston, South Carolina is a town that celebrates its rich heritage and history. This made the renovation of the old Charleston High School (built in the 1920s) a challenging one. Located adjacent to the main campus of the Medical University of South Carolina (MUSC), the building seemed a natural location for the expansion of the University. However, there was a challenge to preserve the existing brick façade and incorporate it into the new development of a parking garage and additional office building.

The project was selected as the PDCA 2004 Project of the Year (Under \$1,000,000) for the particular challenge faced by the renovation team. PDCA members WPC Inc. and Palmetto Pile Driving, Inc. were part of this team, and faced these challenges head-on.

### Unique Pile Driving Used in the Project

Driven piles for this project were necessary for the renovation and new construction, as well as the existing brick façade support frame of the Charleston High School building. The project was challenging because it involved pile installation within 3 feet of a braced, un-reinforced brick masonry frame,



which is a distinct application for driven piles. “Although the brick façade was braced, the masonry was un-reinforced and old (80 + years old), which made it susceptible to vibrations. In addition, the working area was limited in and around the existing brick façade, posing additional challenges,” says Ed Hajduk, PE, Geotechnical Engineer for WPC Inc. It is also important to mention that the pile driving was located in the heart of Charleston, SC near a working hospital, which necessitated extensive monitoring. Because of the 20+ years of neglect the building suffered, it did not meet the current seismic standards of the SC building code (i.e. IBC 2000). Therefore, the existing structure minus the façade had to be demolished and replaced. Limited construction space, concerns of soil subsidence caused during drilled shaft construction, and quick testing capability of driven piles via dynamic testing led to the selection of driven piles.

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## PDCA PROJECT SPOTLIGHT



Driving) can utilize driven pile foundations as the economical solution for the unique situation of installing a foundation system around a space restricted, vibration sensitive site. J. Harry Robbins, Jr. is president of Palmetto Pile Driving, Inc., and he especially understood the need to get the job done right: “Early on the design team was considering the use of alternatives to driven piles, due to vibration concerns. We knew that driven piles would work, and I wanted very much to be able to prove it. If driven piles on the highly visible project caused vibration problems, it would potentially have had a long-reaching, negative impact on driven piles in Charleston,” he says.

The use of driven steel H piles provided a cost-efficient foundation solution in this setting. Since steel H piles are low displacement, they (combined with pre-augering) produced a minimal amount of vibrations that did not affect the sensitive un-reinforced brick façade. In addition, the ability to easily splice steel H piles allowed long (100+) foot pile to be installed in a restrictive space. The ability to splice piles also allowed for a smaller pile storage area on site, which also assisted the project by allowing other activities to be conducted concurrently with the pile driving. Additionally, the use of driven piles had a beneficial impact on the schedule when compared to other foundation options because of these concurrent activities.

### Equipment Used

An International Construction Equipment (I.C.E.) Model 75 hammer was used to install the production and test piles. A 12-inch diameter auger was used to pre-auger the pile locations to a maximum depth of 40 feet below the ground surface.

The piles were primarily steel HP12 x 53, with lengths ranging from 90 to 105 ft. Also, 12 in OD x 0.219 (wall thickness) steel open-ended pipe (OEP) by 45 feet long were used to support the un-reinforced brick façade.

“Hammer, auger and leads were manufactured by I.C.E. Our crane was a Link-Belt 138H-II crawler crane. Piles were manufactured by Nucor Steel and supplied by Skyline Steel. Forsberg Engineering did the surveying layout of the piles. WPC engineering did the quality control,” Robbins says.

### Working Conditions

The site conditions for the project were restrictive, given that the site was surrounded by existing buildings. “One of these buildings was a working MUSC hospital that maintained regular patient visits and surgeries during the pile driving operations. In addition, an existing interior structure from the old Charleston High School was kept, making access on the interior of the existing brick façade limited as well.

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**Other Project Concerns**

**Safety**

The primary safety issue regarding the pile driving on this project (in addition to standard pile driving safety issues) was the effects of vibrations on the existing brick façade and the concern for subsequent collapse. By monitoring pile vibrations and existing cracks, the team was able to determine the vibrations generated by pile driving did not affect the brick façade.

**Environmental**

Due to the location of the site near existing historical

residential homes and existing MUSC facilities, vibrations were a concern at these locations as well. This concern was addressed by performing a pre-condition survey of the surrounding area and conducting vibration and existing crack monitoring on selected adjacent structures during pile driving.

**Noise**

Given that the project was in a dense urban environment with residents and workers directly adjacent to the site, noise was a concern. However, the method of pile installation selected to limit vibrations (i.e. pre-augering through the

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**“...We knew that driven piles would work, and I wanted very much to be able to prove it...” J. Harry Robbins, Jr., President, Palmetto Pile Driving, Inc.**

upper soils and use of a low hammer stroke) reduced noise generated during pile driving.

### About WPC

“WPC’s geotechnical capabilities, knowledge, and experience allowed us to recommend driven piles as the ideal foundation solution for the project in terms of cost and installation. Our construction services capabilities, knowledge, and experience allowed us to refine our pile design, thereby reducing pile lengths and project cost. In addition, by conducting extensive monitoring in the form of pre-condition surveys and pile/vibration/crack monitoring, we were able to verify that the driven piles did not cause damage to the existing old Charleston High School structures that were to be incorporated into the new development or the adjacent structures,” Hajduk says.

### Quality Control

Quality control for the pile installation consisted of: A pre-condition survey of the existing brick façade and surrounding buildings; a test pile program consisting of dynamic monitoring during pile installation and hammer restrikes, as well as vibration monitoring; pile inspection during installation consisting of monitoring pile blow counts and other information such as hammer stroke; vibration and existing crack monitoring during pile installation; and finally, a review of all available pile data at the end of the project by a registered engineer.

Hajduk attributes teamwork and recognition of the unique attributes of the project as factors to its success. “Teamwork is a successful factor to almost every successful project,” Hajduk adds. ▼

### Project Breakdown

- Work began on the project to renovate and build a parking garage and office building on to the old Charleston High School Building in the Spring of 2004.
- Pile driving was completed Aug. 2, 2004.
- **Owner:** Medical University of South Carolina (MUSC)
- **Architect:** JHS Architecture
- **Structural Engineer:** Mabry Engineering
- **Geotechnical Engineer:** WPC Inc.
- **General Contractor:** Mashburn Construction Company, Inc.
- **Sub-Contractors/Supplier:** Palmetto Pile Driving, Inc. and WPC, Inc.