After more than 130 years, even a stone and brick structure can use a little extra support—especially below ground. When the Cincinnati Center City Development Corporation (3CDC) undertook a revitalization of the historic Cincinnati Music Hall, a geotechnical team with experience evaluating what’s under the ground (subsurface conditions) was needed to recommend efficient design solutions to keep the building standing proudly for the next 100 years.

UNDERSTANDING WHAT LIES BENEATH
Renovation of this National Landmark structure, built in 1878, added weight to existing columns and required new columns to be constructed for building support. Deep excavations inside the building for new mechanical rooms and storage areas below the orchestra pit were also planned.

Our team recommended practical ground modification methods to improve natural soil conditions and create adequate support for these additional loads. Work included using a track-mounted drill rig to obtain new Cone Penetrometer Test (CPT) soundings to supplement archived soil test borings that were performed on site by Terracon in 1968, 1973, 2001, and 2009. CPT soundings extend more than 100 feet underground and define geotechnical engineering properties of soils.

During this testing, the presence of silt pipes—natural, near-vertical vent tubes from ancient earthquake activity—were discovered. Silt pipes have been encountered at other sites in downtown Cincinnati usually ranging from 8 to 36 inches in diameter, 40 to 60 feet deep, and consisting of very loose, fine sand with silt. Silt pipes can cause excessive foundation settlement when located below building footings.

The historic Cincinnati Music Hall, built in 1878, was in need of a partner with expertise in evaluating subsurface conditions and could recommend efficient design solutions.

Terracon performed Cone Penetrometer Testing (CPT) to determine and define geotechnical engineering properties of soil at the site.

Continued on page 2
PRESERVING THE PAST: MUSIC HALL FACTS

1. Designed by Samuel Hanniford as a massive stone and brick Venetian Gothic structure completed in 1878.

2. Located in the historic Over-the-Rhine District in downtown Cincinnati.

3. Home for the Cincinnati Symphony Orchestra, Cincinnati Opera, the annual May Festival Chorus, and the Cincinnati Pops Orchestra and Luminosity.

4. Served as the site of the 1880 Democratic National Convention.

5. The Miami-Erie canal was constructed along present day Central Parkway, along the western edge of the Music Hall.

ACCOMMODATING SET CHANGES

Having a large, open space is important during a performance as different sets need to come on and off the stage quickly. To accomplish this safely, one original column needed to be eliminated which added new load to the remaining columns. Analyses showed this redistribution of load would result in a foundation movement of up to 1.3 inches, which was unacceptable.

To accommodate the need for sets to be moved quickly on and off the stage, our team recommended installing additional uniform support below the original mortared stone footing.

UPGRADING LOADING SUPPORT

To resolve the settlement issue, our team recommended installing additional uniform support below the original mortared stone footing. Both chemical and cement grouts were considered to provide the uniform support. Terracon recommended using chemical grout due to its light weight and the precise set control it allowed.

This design strategy meant the Cincinnati Music Hall’s original stone foundations could be safely reused to support the proposed loading changes of the planned renovation. Using past and current geotechnical research and modern design solutions, Terracon worked with the design team to provide the renovated historic landmark the support it needs for the future.

GEORGE WEBB, P.E., P.G., LEED AP

George is a senior geotechnical engineer in our Cincinnati office. He has served as the geotechnical engineer of record for projects throughout the Midwest, and has provided geotechnical consultation for projects in Taiwan, China, Brazil, Australia, Africa, and the Netherlands.

RECENT ACQUISITIONS BOLSTER REGIONAL CAPABILITIES

Mayes Testing Engineers and ROC Geotechnical Consulting Engineers Join Terracon

MAYES TESTING ENGINEERS, INC.  A TERRACON COMPANY

We have joined forces with Mayes Testing Engineers (Mayes) of Lynnwood, Wash., Tacoma, Wash., and Portland, Ore., and ROC Consulting Engineers, PLLC (ROC) of Rochester, N.Y. These strategic acquisitions bring additional resources, expertise, and capabilities to Terracon and increase our ability to provide clients with responsive and reliable service.

Known for exceptional construction quality assurance services, Mayes has been serving the Pacific Northwest for more than 25 years. All 115 employees join Terracon, adding in-depth welding, concrete, soils, masonry, asphalt, and nondestructive testing to our team. Operating as Mayes Testing Engineers, a Terracon company, it will continue to provide consulting for owners, developers, architects, contractors, and structural engineers.

On the opposite coast, ROC employees help us better serve our clients throughout the Northeast. Their more than 70 years of combined geotechnical experience and soils testing capabilities further expand our abilities in the commercial, healthcare, energy, and government markets.

We welcome our new employees to Terracon and know bringing talented Mayes and ROC professionals to the team continues our long tradition of creating innovative, cost-effective solutions for a full range of projects from coast to coast.

For more news, please visit terracon.com/news-and-events/
FLOOD CLEANUP:
Disaster Responsiveness Helps History College Reopen After Louisiana Flood

Saint Joseph Abbey and Seminary College suffered a devastating flood which forced the closing of the facility. Our team was able to assemble the equipment and staff resources needed to open several school classrooms safely within two weeks.

On March 11, 2016, floodwaters from the Bogue Falaya River, 60 miles east of Baton Rouge, inundated Saint Joseph Abbey and Seminary College with nearly two feet of water, causing the college to suspend classes. Although no one was hurt, many buildings were damaged, and total losses exceeded $30 million.

Before the administration could authorize reopening the college, more than 40 buildings needed to be assessed for mold and asbestos. Terracon was called in when the college’s consultant could not be responsive to the massive impact. The objective of the college administrators was to get the students and faculty back in their classes with minimal risk to their safety and health.

With the clock ticking on the semester, and the prospect of having to extend or cancel classes, Terracon worked closely with the administration to prioritize the buildings and rooms most critical to the school’s operation. This involved mobilizing resources from several Terracon offices to evaluate each building, some of which were constructed in 1908 and required extra care to preserve their historic features.

RESPONSIVENESS
Terracon was on-site within hours of the original call. Four-person teams inspected the impacted areas, collected samples, and reported results. This inspection and report process typically takes three weeks for a single building. Within two-and-a-half weeks, all 40 buildings had been inspected and the impacted areas were made safe.

CONTINUOUS AIR-QUALITY MONITORING
NorthStar, one of Terracon’s approved disaster recovery contractors, was key to this success by working alongside Terracon to abate the hazards while we continued our evaluation and monitored the ambient air for asbestos and mold to ensure its safety. In order to meet the client’s needs, the air monitoring process entailed using two-person teams working 12-hour days, seven days a week, for approximately one-and-a-half months. The team collected up to 30 air and mold samples each day.

Terracon’s ability to assemble the resources for this project, virtually overnight, provided the response the client needed, while maintaining a high level of quality consulting and ensuring that the team and building occupants were safe. Seminary classes resumed without any classes being cancelled or postponed, while Terracon continues to monitor the air throughout the entire campus.

The ability to quickly respond to our client’s needs sets Terracon apart from its competitors. We were there when others failed, with high quality, reliable, and resourceful services. This was a major accomplishment, and the Louisiana Terracon team is proud of our capacity to meet this client’s needs.

PHILIP BELLAN

Phillip is a senior industrial hygienist in our Baton Rouge office and was the project manager for this project. Phillip has extensive experience in industrial hygiene consulting in commercial, educational, residential, and industrial sectors. Terracon employee-owners from offices in Baton Rouge and New Orleans contributed to the project’s success. The Birmingham, Ala., and Cedar Rapids, Iowa, offices also contributed equipment which allowed Terracon to have a large enough presence to carry out the work successfully.
LABORATORY CERTIFICATIONS:
Why and What Matters?

When you need geotechnical or materials testing conducted for your project, how important is it to you if the laboratory is certified? And, is it important who verifies that data? While in the depths of a construction project, you may not be focused on plaques on a wall or initials behind a name when it comes to relying on quality, reliable test data, but those credentials can make or break your project.

You may be surprised at the number of checks and balances used to verify the quality of Terracon's laboratory and field data. Laboratory certification is a means of determining technical competence, ultimately providing clients with peace of mind knowing Terracon is qualified to produce accurate, reliable, and repeatable test data.

Laboratories generate vast amounts of data obtained from routine construction materials testing related to soils, rock, aggregates, concrete, and asphalt. This data is used to understand the subsurface, confirm construction quality, and facilitate building construction with confidence.

The CMEC and “other” certifications in the chart above are utilized for specialty tests. AASHTO and USACE accreditation are the two more common certifications that we will cover in more detail below.

AASHTO ACCREDITATION

The AASHTO Accreditation Program (AAP) is the largest form of accreditation to recognize the competency of testing. Many of Terracon's specialty laboratories participate in AAP’s voluntary program, satisfying the requirements of AASHTO R18, ASTM E329, ASTM C1077, ASTM D3740, ASTM D3666, and others. This group of quality standards contains criteria for establishing and implementing a quality management system (QMS). The QMS is comprised of organizational structure, staff responsibilities, policies, standard operating procedures, processes, and records required for the laboratory to meet stated quality objectives.

The AAP utilizes laboratory assessments and proficiency sample services provided by the AASHTO Materials Reference Laboratory (AMRL) and the Cement and Concrete Reference Laboratory (CCRL). The AAP inspection process is a comprehensive and stringent process which includes review of quality management systems, personnel training, equipment calibrations, specific test procedures, and standard reporting requirements.

U.S. ARMY CORPS OF ENGINEERS VALIDATION

The U.S. Army Corps of Engineers' Materials Testing Center (MTC) conducts inspection services to validate commercial laboratories conducting materials testing services for the Corps of Engineers. Many of Terracon’s labs are currently validated by the USACE to perform testing related to concrete, soils, asphalt, and aggregates routinely. These materials testing services are provided for a wide array of projects. Similar to the AAP, the MTC has specific requirements which must be met and confirmed before validation is granted and the facility is permitted to perform project-specific materials testing.

INTERNAL VALIDATION

Compliance with the various standards of public agencies and certifying agencies is critical to our profession. Compliance validates the technical competency of our laboratories and quality of our work, thus ensuring proper equipment calibration and maintenance, technical competence of staff and proper report preparation.

Perhaps the most comprehensive laboratory validation program comes from our internal standards. Because Terracon must render professional opinions based upon test results generated by these laboratories, we have developed a national program to validate the quality of the data. As a part of our internal quality protocols, we audit our own laboratories annually and maintain a team of more than a dozen internal auditors dedicated and trained using our quality management program system. Although our audit covers the requirements of the various agencies, our internal program goes above and beyond the boundaries of these agencies. Two Terracon-specific provisions we address are safety and testing laboratories.

Perhaps the most comprehensive laboratory validation program comes from our internal standards. Because Terracon must render professional opinions based upon test results generated by these laboratories, we have developed a national program to validate the quality of the data. As a part of our internal quality protocols, we audit our own laboratories annually and maintain a team of more than a dozen internal auditors dedicated and trained using our quality management program system. Although our audit covers the requirements of the various agencies, our internal program goes above and beyond the boundaries of these agencies. Two Terracon-specific provisions we address are safety and testing laboratories.

Terracon has consistently provided a comprehensive range of laboratory services related to the construction industry for more than 50 years. By combining our national resources with the unique, local area expertise of more than 130 offices, Terracon provides services for thousands of projects each year. We specialize in the sub-fields of soils, concrete, asphalt, aggregates, rock, and a wide array of other construction materials. We deploy the resources of a network of more than 3,500 employees and 120 quality-driven laboratories to work for you.

The next time you receive laboratory testing results from Terracon, you can be confident the timely and reliable data provided was generated using protocols with stringent quality standards. We wouldn't have it any other way.

R. SEAN WILLIAMS

Sean serves as national program manager for Laboratory Services based in our Chattanooga office. He has more than 20 years of materials testing and laboratory management experience, with a focus on initial laboratory start-up, accreditation/validation processes, quality management systems, and laboratory safety.
Owners and developers understand the value of their building investments is only “skin deep.” Without a well-constructed façade and roof, a building’s life expectancy can be greatly reduced and serious problems can result. When Skanska USA Commercial Development Inc. (Skanska) needed a facilities partner during several major business expansions, they found that by establishing a relationship with Building Exterior Solutions (BES), a Terracon company, they have been able to ensure the performance of their buildings goes beyond aesthetics to extend the lives of their facility investments.

The relationship began with the design of Skanska’s new corporate high-rise in Houston. Skanska, a Swedish-based development and construction company with offices worldwide, understood that forming the right team, which included a specialized building enclosure consultant focused on communication, would be paramount to the success of this critical project.

UPHOLDING OPERATIONAL PHILOSOPHY

Located adjacent to one of Houston’s most congested highways, this building project required unique considerations including sound transmission and increased potential for glass replacement. The project was unique in that a custom unitized curtain wall design was to be provided as the full façade for the building, which was more complicated than standard manufactured systems.

Our team integrated Skanska’s philosophy of operational efficiency and environmentally responsible construction and development. Based on this approach, the team recommended design and construction strategies in order to eventually achieve LEED® Platinum certification. Reaching this level of energy performance required specialized design expertise and coordination of the building enclosure with mechanical and electrical systems. Working with Skanska’s project team (architect, general contractor, and curtain wall manufacturer) to meet their design goals was a collaborative partnership which ensured the project quality assurance and quality control, schedule, and budget were met.

DEMONSTRATING EXPERTISE DURING EXPANSION

Skanska continued its business expansion with the first phase of West Memorial Place, a 12-story Class A commercial office building and adjacent parking garage located in the Houston Energy Corridor. As with their previous corporate high-rise, the distinctive project required a custom unitized curtain wall which BES designed with structurally glazed granite panels within the wall system. This tower also achieved LEED® Platinum certification.

Today, BES’s work on Phase II – West Memorial Place is nearing completion. Phase II includes the addition of a 14-story Class A office building and parking garage on the existing project site, more than doubling the lease space for the development.

Throughout construction, Skanska trusted BES to oversee pre-construction testing, site observations, meeting coordination, and field testing to make sure the building enclosure performed efficiently.

SERVING AS A TRUSTED PARTNER

During the design phase on each of these high-profile, complex projects, BES provided the expertise to confirm the appropriateness of the systems specified, make sure that proper considerations were included, and coordinate the integration and requirements of the building enclosure components.

Throughout construction, Skanska trusted BES to oversee pre-construction testing, site observations, meeting coordination, and field testing to ensure the efficient performance of the building enclosure. Our focus on helping clients find success in their facility projects enables us to make valuable life-extending recommendations and foster long-term service relationships.

ABOUT BES

Since 2008, BES has served as a leader in providing building enclosure services for a variety of markets including commercial, medical, education, and multifamily industries in Texas and throughout the U.S. BES joined Terracon in 2016. For both the design and construction of new buildings, and maintaining and restoring existing ones, we are committed to achieving a fully integrated and well-performing building enclosure to support clients’ overall development goals.

AMY PEEVEY, R.E., REWC, RRO, CDT

Amy is a principal at Building Exterior Solutions (BES), a Terracon company. Her experience includes the investigation, evaluation, analysis, repair design, and construction monitoring/administration for building envelope and building structural problems.
COMMUNITY INVOLVEMENT

Terracon Foundation Supports Society of Women Engineers

The Terracon Foundation is a philanthropic initiative created with a goal to reach out and become a real part of the lives of our employees and communities. Terracon employees apply for foundation grants to support organizations and universities they are passionate about in their communities. Once a year, the foundation offers a national partner grant to provide support to organizations with a national scope.

Catherine Rocky, national accounts manager based in our Wichita office, championed this year’s $50,000 national partner grant for the Society of Women Engineers (SWE). As a not-for-profit educational and service organization, SWE empowers women to succeed and advance in the field of engineering, and to be recognized for their life-changing contributions.

The national partner grant supports SWE’s Collegiate Leadership Program, which prepares female engineering and technology students to gain employment within the engineering sector and become leaders in their fields. It also funds more than 70 trainings for chapters, webinars, and for as many as 120 collegiate members who have been recognized as future leaders to attend WE16, SWE’s annual conference. societyofwomenengineers.swe.org

For more information, visit terracon.com/foundation

Catherine Rocky (right) and Heather Rogers of our Wichita office (left) present Cindy Hoover (center). SWE, a check for $50,000. Catherine has been engaged with SWE since college, joining as a way to connect with other fellow female engineers-in-training. She has served in several organizations related to the Wichita area and is currently a member of the WE16 Regional committee.

CONTACT US:
To provide feedback, change your address, or remove a name from the mailing list, email the editor at successeditor@terracom.com.