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DELIVERING Success

News You Can Use

Terracon

MANAGING HEALTHCARE FACILITY ASSETS EFFECTIVELY IN THE 21ST CENTURY

Healthcare in the 21st century is no longer dispensed only through stand-alone facilities, but more often by a network of healthcare facilities. Healthcare managers are often now juggling the conditions and systems at a variety of healthcare delivery locations.

Asset managers are typically focused on budgets and organizational priorities. Facility managers are typically focused on system maintenance and work orders to manage the day-to-day operations. The key to today's healthcare management is to align the mission of the asset manager with the operations of the facility engineer.

Technology now exists to collect and centralize asset data into a comprehensive management plan by using a Computerized Maintenance Management Software Solution (CMMS). A good place to start, on the journey to centralizing the asset data, is with a Facility Condition Assessment (FCA).

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An effective asset management plan includes:

STEP 1.

Inventory of Assets
Experienced architects and engineers conduct an asset inventory using CMMS software data collection systems, allowing for:

Data Quality and Accuracy

- Standardization of data capture and reporting across a single platform and repository to eliminate waste and redundancy
- Development and verification of credible information and repeatable processes

STEP 2.

Plan for Reporting
Data from the asset inventory is translated into a written FCA for distribution to asset managers and strategic planners, allowing for:

Capital Investment Strategy

- Streamlined planning, forecasting, and prioritizing of capital deployment

STEP 3.

Optimize for CMMS
CMMS systems allow data to be analyzed in a variety of formats in order to:

Monitor, measure, and verify program performance to optimize portfolio

- Improve efficiency of assets to reduce cost and mitigate risk
- Provide a holistic view of assets throughout their lifecycles

Terracon can provide an overall facility condition assessment (pre-purchase due diligence or owned-assets conditions) and deliver comprehensive asset management service.

Asset management, starting with an asset inventory and CMMS, solves this ongoing problem. Facility engineers can manage the day-to-day operations with greater efficiency. Facility asset managers can budget and prioritize effectively, aligning the goals, operations, and budgets of individual sites and a growing network of healthcare facilities.

Terracon recently provided a comprehensive asset inventory of architectural, structural, mechanical, electrical, and plumbing systems for The University Hospital Authority & Trust (UHAT) in Oklahoma City. Terracon provided skilled assessors to inspect more than 1.4 million square feet within eight buildings. The renewal cost for components were computed and identified by year of required renewal. Items considered urgent (endangering life or property, code compliance) were included as an immediate replacement need.

This 21st century asset management solution created a centralized database that UHAT will use to develop maintenance and capital budgets, forecast and plan capital renewal projects, inform capital expenditure decisions, track their deferred maintenance list, and provide much needed inventory data.

Terracon provides comprehensive condition assessment (whether pre-purchase or owned asset) and delivers follow-up asset management programs for healthcare systems and their complex facilities.

CONNECT KEY LEADERS ON ASSETS

Centralized comprehensive asset inventory and management, using ISO 55000, guides asset managers in navigating the challenges of integrating both facility managers and corporate leaders to:

1. Centralize asset management under an asset-centric approach
2. Provide data quality and accuracy
3. Create a capital investment strategy

To learn more about Terracon's healthcare facility capabilities, visit: terracon.com/healthcare

KYLE CHRISTIANSEN, R.A., AIA

Kyle is a senior facilities consultant in Terracon's D.C. Metro North office. He has spent the last 30 years helping building owners in 49 states and six countries manage their assets and plan for the future. In recent years, he has focused on complex facilities and campuses.

PIPELINE GEOHAZARD MANAGEMENT

Identification, Assessment, and Mitigation of Risks

Planning, designing, operating, and managing the integrity of pipelines is a complicated process. When you throw the wide variety of challenges arising from traversing differing terrain and geologic conditions into the mix, it's time to call in the experts.

Historically, pipeline integrity management has been dominated by the hunt for and elimination of corrosion with considerable inspection, testing, and maintenance resources dedicated to this issue. Geohazards have flown under the radar due in part to perceived low frequency of occurrence, complicated variety, and because operators and regulators have been unsure how to efficiently predict and prevent them. While the frequency may be low, the consequences, and therefore risks, are generally higher for geohazards.

As this critical infrastructure ages, its strain capacity may diminish due to corrosion and cracking. With worldwide expansion of pipelines within difficult terrain, along with the unpredictable variables created by climate change, the potential exists for failure rates to significantly increase. Proactive intervention has become essential.

Geohazard considerations have become more standard in gas transmission Integrity Management Programs (IMP) within the past 5 to 10 years. Regulators now require that the transmission IMP address geohazards. However, the regulations are not detailed, and operators are highly variable in how they address this threat to pipeline integrity.

Geohazards are natural processes of a geologic, geomorphologic, or hydrogeologic nature that vary regionally based on terrain.

REGIONAL TERRAIN	COMMON GEOHAZARDS
Glaciated Fluvial Permafrost Peatlands and Organic Coastal Karst Mountain Volcanic Desert	**Geotechnical:** Landslides, slope creep, karst, subsidence, mining **Hydrotechnical:** Vertical scour, lateral scour, channel migration, flooding **Erosional:** Headcuts, downcutting, right-of-way backfill, erodible soils **Seismic:** Faults, liquefaction, lateral spreading, tsunami

IDENTIFYING ISSUES

Determining what hazards are present on a job site can take several forms, including visually through field or aerial surveys, remote sensing information, lidar or photogrammetric surveys or analysis of in-line inspection data. Looking at what's visible above ground can point to a number of potential hazards. Our team answered the call when a gas pipeline operator was in need of immediate assistance with a ruptured pipeline. The operator suspected ground movement. After an 80-mile walking survey of the pipeline, our team was able to confirm ground movement, and helped identify other threats along the pipeline alignment.

Terrain-based geohazards along pipelines are ripe for proactive intervention.

ASSESSMENT: ONE-SIZE DOES NOT FIT ALL

Once identified, a non-intrusive, baseline, screening-level assessment should seek to determine the general level of threat, likelihood of failure, and pipeline vulnerability. This should form the basis for planning the next phases of response. If the threat warrants site specific characterization, the importance of subsurface exploration and laboratory testing cannot be underestimated. Before meaningful modeling and analysis can be performed, Terracon must first gather adequate topographic and geotechnical control.

WHAT WE KNOW CAN HELP YOU

Using GIS software for data curation, Terracon has activated vast archive geotechnical data for useful access and compiled variable public datasets. Combined with proprietary GIS geo-processing, Terracon has generated susceptibility mapping for preliminary evaluation which allow us to help our clients. Our network of geo-professionals possesses valuable local knowledge in a wide variety of geologic conditions across the nation. By leveraging our resources, we can expertly gain an expectation of geotechnical conditions before we arrive on-site, thereby efficiently planning resources to identify, assess, and mitigate threats. This gives our clients an edge when it comes to completing their projects through informed pre-planning and design, safe construction, and effective post-construction integrity monitoring.

BENJAMIN W. TAYLOR, P.E.

Benjamin serves as the office manager and department manager for geotechnical services in Terracon's Louisville, Ky., office. Over the past 10 years he has worked with oil and gas operators in support of pipeline integrity management through geohazard threat identification, assessment, and mitigation.

HIDDEN HAZARD IN PLAIN SIGHT

Many School Gym Floors Contain Elemental Mercury

Providing safe and secure community spaces is just one of the reasons our environmental professionals come to work every day. So we were glad to help when, just prior to the start of a new school year, a concerned school district preparing to renovate two older, elementary school gym floors needed assistance to safely remove flooring material.

School districts across the nation often install rubberized, polyurethane floors in school gymnasiums. This spongy (cushioned) flooring material is resilient; resisting water damage and absorbing the shock of pounding feet and tumbling bodies, which reduces the chance of injury. However, many of these multi-purpose floors have a dangerous hazard hidden in plain sight. The U.S. Environmental Protection Agency (EPA) reports that certain polyurethane flooring materials installed since 1962 actually contain mercury. The inhalation of mercury vapor can cause damage to the nervous, digestive, and immune systems, as well as lungs and kidneys. Health risks from mercury are greater in younger children or the fetus. Multiple manufacturers produced these floors and marketed to schools as well as industrial plants, hospitals, zoos, and other applications where water-resistant, softer floors would be beneficial.

The polyurethane floors are typically “poured” in place using two chemical resins that form a durable surface. Mercury was added as the catalyst to allow the two resins to react and solidify. The mercury catalyst is not completely bound in the flooring matrix, meaning some floors can emit mercury vapors that are absorbed and then re-emitted by furnishings and equipment such as floor and wall mats, porous fabrics, and even basketballs. As the floors age and deteriorate, mercury vapor release can increase. Mercury vapor emitted by the floors may be at high enough levels to be considered a health hazard. Unfortunately, the floors may also contain unbound mercury that exceeds the EPA's Resource Conservation and Recovery Act (RCRA) limits and can be classified as hazardous waste. Hazardous waste must be removed and disposed of in accordance with federal laws or substantial penalties can be levied against the building owner.

At Terracon, we recommend to our clients with polyurethane floors, a process to collect samples before disposing of them. The samples are submitted for the toxicity characteristic leaching procedure (TCLP) to determine if mercury is present. If the TCLP test for the floors exceeds RCRA standards, the material must be disposed as hazardous waste. Additionally, we recommend air quality sampling be conducted to determine if students and staff are being exposed to mercury vapors in gymnasiums or adjacent areas.

Rubberized, polyurethane gym floors, while resilient, can contain harmful mercury.

In the case above, Terracon determined that the two rubberized gym floors did contain mercury, and that the polymeric floor significantly exceeded the RCRA TCLP threshold. Our lab test indicated that the material must be treated as hazardous waste and abated in a safe manner.

Our team immediately prepared abatement specifications for both school gyms including engineering controls to protect the school’s indoor environments. Abatement of the floors was conducted in negatively pressurized containments by workers trained to handle hazardous materials after a competitive bid process managed by Terracon for the school district. Terracon provided onsite daily consulting and air quality monitoring for mercury within the schools to make sure mercury vapors were not contaminating adjacent indoor areas. After final removal of the floors, Terracon conducted final air clearance sampling before containment structures were allowed to be removed. We also monitored the abatement workers for mercury exposure during the project to ensure OSHA compliance and the workers had the correct respiratory protection. The project was successfully completed just days before the start of the new school year.

The concerned district agreed with our recommendation to test gym floors in 27 other schools. Five more schools were found to have mercury-containing materials, causing additional safety concerns, but there was not enough time to conduct the abatement before the start of the school year. Terracon developed a routine air sampling program to monitor mercury vapor throughout the school year in the five gyms. The air sampling program made sure students and staff were not exposed to mercury at unsafe levels and a plan for future abatement was developed. The floors in these five schools were abated the following summer.

ROBERT GARRISON

Robert is a senior associate and industrial hygiene department manager in Terracon's Dallas-Fort Worth Metro office. He has more than 35 years experience in the field of indoor environmental quality (IEQ), microbial investigation/remediation and industrial hygiene.

BRIDGING THE PAST, PRESENT, AND FUTURE

Helping Two States Come Together

The I-74 Mississippi River Bridge is the key link connecting the Quad Cities of Davenport and Bettendorf, Iowa to Rock Island and Moline, Ill. Consisting of two separate bridges (the westbound completed in 1935 and the eastbound in 1960), this iconic structure is a major connection for travel and commerce in the area. Built for an average daily traffic count of about 48,000, present traffic counts exceed 74,000, causing delays, frequent repairs, and potential structural failure.

The states of Iowa and Illinois engaged partners to rebuild the bridge, and the project became a top transportation priority for the area. Terracon was chosen to play an instrumental role in the $1.2 billion project, which began construction in 2017.

Various stages of construction for the concrete substructures and foundations for the I-74 bridge project, including deep foundations, footings, columns, and pier caps. In the background are the substructures for the new bridge arches.

EXPERTISE IS KEY FOR IMPROVED STRUCTURE

Proficiency in all parts of the multi-faceted design—geotechnical work, state-of-the-art materials testing and project specifications—is how Terracon contributes to a finished bridge that will provide safe, smooth travel for millions of residents and businesses in the coming years.

Terracon is also working to address other issues, including: vibration monitoring to prevent damage to existing sewer lines, concrete quality control, and pull testing for guard rail anchor bolts to provide structural safety—all while the current bridge is operable. This project also includes the construction and testing of viaducts connecting the bridge to downtown areas in both states.

With structures so large in nature, one of the most important aspects of the project is the concrete thermal control monitoring, which is Terracon's main role in the project. Thermal control of the concrete in these large structures is key to prevent thermal cracking during construction. Temperature sensors with leads as short as 4 feet and as long as 100 feet are installed in all footings, columns, arches, and crossbeams (above and below the water) to record the temperature of the concrete 24 hours a day, 365 days per year. The readings are then monitored by the Terracon team, which check the temperatures remotely every four hours to verify they are within the project specifications. Concrete temperatures cannot exceed 160°F, and the differential temperatures between the core and outside faces of the structure cannot differ by more than 20 to 50°F depending upon the time after the pour is complete. Once the core temperatures are within 50 degrees of the average air temperature for the previous seven days, monitoring is complete, and the forms can be removed.

Temperature sensors are connected to the yellow remote radios (tied to the scaffolding in the upper left of the photo) that sends readings to the team.

MANAGING SAFETY IN A HIGH-RISK ENVIRONMENT

Safety is always Terracon's top priority. With the I-74 bridge project, the job site presents unique challenges. The condition of the Mississippi River—the second largest river connected to the second largest drainage system in North America—makes it an ever-changing job site. Distinctive considerations like materials transport via both the water and land, high river levels, extreme heights of the 150-foot columns and acute weather situations require specific experience and diligence. With an office in Bettendorf, Terracon's local material technicians, project managers, and field engineers understand these distinct conditions, and can be equipped with additional resources from our national network if needed.

To learn more about this project, visit: terracon.com/i74-bridge/

TONY JAEGER, P.E.

Tony is the materials department manager in our Bettendorf, Iowa office. He has over 14 years of experience in overseeing and managing construction projects in Iowa, Illinois, and Wisconsin and is a past president of the local ASCE chapter.

Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

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More Than 150 Offices Nationwide

2019 *ENR* RANKINGS REFLECT CONTINUED EXCELLENCE

Terracon has continued our pattern of growth and market presence expansion as evidenced in *Engineering News-Record's (ENR)* annual listings of The Top 500 Design Firms and Sourcebook rankings.

ENR conducts surveys of the construction industry's key segments and ranks companies engaged in general contracting, specialty contracting, engineering, architecture, and environmental services, among other specialties.

ENR ranked Terracon #1 in **Asbestos/Lead Abatement** for the seventh consecutive year.

Significant upward movement for Terracon in the **Top Design Firms** regional listings includes rising to #10 in Intermountain, #11 in Southwest, #35 in California, and #38 in MidAtlantic. Terracon was listed for the first time for the New York Region, debuting at #60.

For more information about our awards, visit:
terracon.com/news-and-events/

Terracon also continues to shine in these national rankings:

- **Top 500 Design Firms:** #24
- **Top 100 Pure Designers:** #10
- **Telecommunications:** #17
- **Retail:** #16
- **Commercial Offices:** #8
- **Transportation:** #35
- **Power:** #26

Terracon

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