BUILDER: Condition-Based Maintenance for Facilities

Condition-based maintenance can provide prognostic building "health" information for a facility manager to forecast maintenance and repairs.

■ By Nadia Abou-El-Seoud and Claude Matsui

The Army Corps of Engineers (USACE) is working diligently to standardize facilities and infrastructures to support civil and military operations and national security. To accomplish this goal, USACE has established advanced technologies to transform its traditional business practices into proactive, predicative solutions.

Delivering successful facilities and infrastructure to the Army worldwide is one of USACE's primary military construction missions. USACE civilians do not simply design, construct, or renovate buildings; their work has evolved into shaping the sustainment and condition measurement of buildings throughout the Department of Defense (DOD).

Efficiency and cost effectiveness will require a systematic approach to computing facility management formulas for real property assessments, building age, and building components. This approach will ensure that facilities continue to meet their functional requirements and withstand changing dynamics in the years ahead.

Members of the Combat Readiness Support Team (CRST), subject matter experts who primarily focus on the condition-based maintenance (CBM) of ground combat vehicles and aviation systems, believe that CBM can also be used for facilities.

A team of engineers and program managers from the Army Engineering Research and Development Center's Construction Engineering Research Laboratory in Champaign, Ill., created a comprehensive system to assess a building's performance, life expectancy, and necessary repairs, maintenance, and renovations. The tool and process called BUILDER is leading the way in CBM modeling for facilities and infrastructure.

Using CBM for Facilities

CBM is a tool used for combat vehicles and combat aviation systems to optimize maintenance and repair operations. It is a predictive modeling tool used to reduce sustainment costs of materiel end-items. CBM continues to be a top DOD priority because it decreases component failure and support costs and increases unit readiness. The goal is to repair a system when it needs to be repaired versus repairing it after it fails. This capability allows warfighters to perform maintenance or parts replacement before systems fail.

Although CBM is intended to be an integral capability of new weapon systems, existing systems, and legacy systems, BUILDER is essentially a manual operation. It requires technical skills and experience to assess the condition of building components (roofs, walls, and floors) and distribution systems (air conditioning, electrical, and communications). An integrated set of performance metrics for facility and building condition is needed to predict when to reuse, repurpose, or renovate structures instead of building new ones.

BUILDER

BUILDER has revolutionized the way USACE does business. The CRST is coaching, synchronizing, and reinforcing the asset posture assessment that BUILDER can provide as a component of the Installation Status Report and Army Facilities Investment Strategy.

BUILDER was first adopted and used by the Marine Corps, Navy, Air Force, and Defense Logistics Agency. It has since been requested by the Army, Defense Health Agency, Defense Commissary Agency, National Nuclear Security Administration, and the DOD Education Activity, and the list continues to grow.

BUILDER provides project managers, project delivery teams, and facility operations personnel with the information needed to assess change impacts or develop standards to make renovation or repurposing decisions. A comprehensive analysis is conducted to define the condition of the facility using functionality and engineering performance to illustrate its operational life span and maintenance needs.

For each building managed by BUILDER, its "health" information provides the condition index used to predict its life expectancy. Building managers and engineers use this information to qualify and quantify work needed to sustain a structure. The Army intends to use this same information to determine budgetary requirements, conduct value assessments, and identify appropriate facility information for the Office of the Secretary of Defense.

BUILDER data collection provides the engineering details needed

to make facility investment decisions based on actual conditions. As such, it can serve as the blueprint for facility CBM.

Using the information entered by the facility assessors on portable tablets, BUILDER is filled with the required metrics and measurements of all components of a building. The information acts as the foundation for providing a facility's condition so that BUILDER can assess the key components, age, materials, and any additional property data selected by the building manager.

As BUILDER expands to become the system of record for the facility condition index and building condition index for the DOD, the question is what comes next.

BUILDER to Provide CBM

BUILDER is a management tool with limited predictive modeling algorithms. In order to perform as a decision support and investment enabler, the CRST believes BUILDER must evolve into a prognostic tool with more robust predictive modeling capabilities.

Forecasting facility conditions and predicting repairs before failure occurs can save time, money, and manpower. Anticipating repairs also allows the supply chain to have materials or parts on hand before beginning repairs or renovations, thus reducing delays in returning to full operational capability.

Buildings cannot talk, so to make an inanimate infrastructure come to life, a predictive modeling system offers a shortcut to collecting and analyzing data. BUILDER uses robust predictive modeling or simulation instead of manual data collection, analysis, and documentation.

BUILDER can predict the effects of intensive or accelerated use, changing requirements and standards, and the introduction of advanced technologies. The predictive outcome also determines functional relevance and estimated life span of a facility.

Funding is limited, and considering DOD's fiscal constraints, an efficient method to diagnose and treat facility inefficiencies is needed.

The Way Ahead

USACE, using experts from CRST to serve as liaisons for the Army staff, the chief of Engineers, and USACE, has begun drafting ideas with other Department of the Army activities to plan for the uncertainty of future requirements, technology adoption, and stationing needs within a fiscally constrained environment. Their plans include using BUILDER to benefit the Army Facilities Strategy and ensure USACE has the capability to forecast and make sound facility investments.

The Army continues to be "building strong" by expanding what it knows and doing it better. The CRST has coordinated with the DOD and Army logistics communities to assess CBM for years. By adopting CBM lessons learned, performance-oriented methodologies, and modified algorithms, the facilities community can predict change, assess alternatives, and prioritize resources using building systems performance and current condition.

Two engineers and an interior designer conduct an initial assessment on a building whose maintenance will be managed using BUILDER.

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