**IFMA CONFERENCE PROCEEDINGS PAPER**
**Dane Taival – High Performance Buildings: Achieving Superior Performance for Life**

New buildings are now being designed to provide optimal performance in such dimensions as energy and water efficiency, environmental impact, operational reliability, and occupant health and welfare. Meanwhile, owners and operators of existing buildings are using new technologies and practices to turn their older facilities into high performance buildings. Adopting high performance building outcomes can reduce energy and operating expenses by 30 to 50 percent over the course of a building's typical 50-75 year life cycle and also create a safe comfortable environment where employees can thrive and productivity can soar.

Resource efficiency and environmental impact are often the first things that come to mind upon hearing the term high performance building. Of course these dimensions of performance are critically important and often provide the initial justification for choosing "green" energy-efficient and water-efficient options during the design and construction phase, even in cases where these choices result in slightly higher building costs.

But as our thinking has evolved, the definition of "high performance" has expanded beyond the realm of energy efficiency and environmental stewardship. Today's high performance buildings are being designed, constructed, operated and maintained in a way that contributes to organizational and occupant effectiveness.

## WHAT IS A HIGH PERFORMANCE BUILDING

A high performance building outcome links building "performance" to the bottom line and organizational objectives, and reduces lifecycle costs so organizations can invest in other priorities.

High performance buildings are created using a highly effective methodology that combines financial, operating and energy analysis with specialized service offerings and available financing. They use design and operating standards that are created, measured and continually validated to deliver desired business outcomes for owners. High performance building outcomes meet specific standards for energy and water use, system reliability and uptime, environmental compliance, occupant comfort and safety, and other success factors.

Operating costs typically account for 60 to 85 percent of the building lifecycle costs compared to only 5 to 10 percent for design and construction costs. High performance buildings reduce overall lifecycle costs so companies can invest in other priorities and make buildings "assets" instead of "expenses". By looking at buildings as assets, financial leaders can communicate its value to the people the building serves (environment, comfort, safety), value to customers and the community (competence, environmental responsibility), and its value to the bottom line (cost savings, avoidance, ROI).

A study conducted by The Economist Intelligence Unit for Ingersoll Rand among CEOs found that 49 percent of respondents said energy efficiency programs have improved their company's bottom line in the last three years. The vast majority of survey respondents (82 percent) pointed to cost savings as the biggest benefit of energy efficiency investment and 69 percent cited it as the number one driver.

All building owners are faced with determining how to continually do “more with less” as building operating staffs have decreased by an average of 30 to 75 percent over the past 10 years in most commercial and institutional buildings. The financial decision-making burden shifts away from simple payback economics to projected lifecycle ROI due to energy cost volatility and other economically-driven factors. Results of adopting a high performance building approach include reduced operating costs, higher occupant productivity and enhanced asset value. Meanwhile, owners and occupants of high performance buildings enjoy superior energy, economic, comfort and environmental performance.

Moreover, high performance buildings also improve occupant productivity and performance. Research into the connection between employee absenteeism and moving into new high performance green office buildings showed that overall productivity improvements of 2.6 percent with workers working an additional 38.98 work hours per occupant per year.

According to the USGBC, high performance buildings are 20 to 50 percent more energy efficient than conventional buildings and “the best sustainable designs are not just environmentally responsible. They produce buildings where employees can thrive and productivity can soar. We call these high performance green buildings.” Developments in technology and applications are helping to meet the escalating demand for better and more cost-effective buildings.

The first step in implementing a high performance building outcome is to identify and quantify mission-critical factors. These are factors essential to the core functions of the work done inside a building. It is also necessary to conduct a critical building systems audit. This requires an assembled energy management team to gather relevant data and make comparisons. The data includes current levels of performance for key building systems, obtaining three to five years of actual energy cost data and then using that data to first estimate the annual cost of planned and unplanned maintenance and then compare actual costs against industry averages and best-in-class performance.

When making decisions about investing in a high performance building, it is important to consider all of the benefits of HPBs including increases in human and organizational performance as well as increases to property values and brand and reputation. Instead of developing a new high performance building, some building managers will instead choose to re-commission the building by improving already existing systems such as air handling systems, chilled water systems and heating systems. A disciplined re-commissioning project typically yields 10 to 20 percent energy savings.

**TRANE HIGH PERFOMANCE BUILDINGS APPROACH**

Trane helps organizations achieve financial, sustainability and productivity goals in high performance buildings by developing concrete strategies that customers can define and implement and that Trane can deliver and measure. Trane’s approach for delivering ROI is focused on six key areas: understanding the customer’s mission; conducting a critical systems audit and facility assessment; providing performance improvement recommendations; implementing improvements; providing continuous systems monitoring; periodic audits and ongoing assessment; and delivering measurement and evaluation.

To help customers realize their mission, Trane utilizes a comprehensive High Performance Building approach. This customer-centered process begins by conducting a building improvement survey which analyzes gaps between a building's current and optimum energy performance. The process makes performance improvements, validates system performance within set standards, provides period energy audits and identifies improvements. Upgrades to control systems with intelligent technology, that uses analytics to improve efficiency and self-sufficiency and continuously monitors and analyzes data against operating benchmarks are often key to the process

Trane provides a new level of technology-enabled services to help building owners and operators achieve and maintain optimum building performance at all stages of the process. Trane leverages technology to create a whole-building, total-lifecycle, knowledge-based approach to establishing and maintaining performance standards. At the design stage, technologies are available to help building design and management teams achieve the highest possible efficiency. Energy modeling and analysis tools provide comprehensive and accurate analyses of energy and economic impacts of building features.

Engineers use computer simulation software to develop virtual models that are a powerful tool that can be used to analyze building performance. The software examines the various zones and systems to simulate the building's energy consumption patterns. It then creates a total picture of the building's energy use, including how energy consumption breaks down by fuel type, task, and building component. It is best to use modeling early in the design process. This allows the high-performance building team to prioritize investments in efficiency strategies that will have the greatest impact on the building's energy use. Many high-performance building teams incorporate renewable energy technologies into the design phase to reduce utility dependency and environmental impact. Benefits include greater stability in power supply, and often government incentives to help fund renewable applications.

**CONCLUSION**

The most effective service and maintenance outcomes are holistic, technology-enabled and knowledge-based, with a focus that extends well beyond the preventive maintenance and task-oriented strategies of an earlier time. Service offerings that support the full range of a high performance building's operations use robust and proven processes, computer modeling, diagnostic testing, predictive technologies and other state-of-the-art techniques.