TEC SYSTEMS INC.

CASE STUDY

BUILDING AUTOMATION CONTRACTORS

The Museum Of Modern Art

Exceeding Demands For Optimal Environmental Controls

The historic Museum of Modern Art (MoMA), famous for its world-class art collections is making history once again. The museum will reopen in midtown Manhattan on November 20, 2004, to coincide with its seventy-fifth anniversary, after completion of an ambitious $858 million, four year renovation and expansion project. The existing facility was in need of upgrade, expansion and important amenities to accommodate the increasing numbers of visitors to the museum. This is the museum's largest renovation and expansion since it opened in 1929, and in support of this campaign, overseers of the venerable institution enlisted the architectural expertise of Yoshio Taniguchi of Japan.

Says Glenn D. Lowry, director of the museum: "In this superb building realized by Yoshio Taniguchi, the legacy of our founders will resonate with a new audience eager to see and learn about the best in modern and contemporary art. The reconceived building enables us to better articulate our mission in innovative and exciting ways."

Bigger and Better Than Ever

In broad outline, the renovation and expansion will encompass vastly expanded exhibition and program space; a new museum design and book store, restaurant, renovated garden, and extensive additional office space. At completion the museum will include 630,000 square-feet of new and redesigned space, doubling its previous capacity. Two buildings will flank the newly enlarged (twenty times its original size) Abby Aldrich Rockefeller Sculpture Garden: a new Gallery Building will house the main exhibition galleries, and the Museum of Modern Art's first stand-alone Education and Research Center providing five times more space, will offer a dynamically designed space for the Museum's education programs and scholarly resources.

Preserving Collections for Posterity

A major part of the renovation and expansion is the installation of the latest in building automation and environmental control systems. All of the museum's facilities will be fitted with state-of-the-art security, climate control, lighting, and fire detection and suppression systems. A primary goal of MoMA, as of all museums, is to ensure the long-term safety and preservation of its collections. The construction team - led by the international project management and services firm, AMEC - recognized early on that an appreciation of the concept of preventive conservation and the effect of environmental factors is vital for the care of the museum's collections. Objects need one set of conditions while people may need another. Achieving both commands a great deal of planning, which tends to make the overall management of the museum environment a bit difficult since it requires expertise and time. Thus, in accompaniment of Taniguchi's grand design, and for the facilitation of an environment compulsory to conservation and preservation goals, T.E.C. Systems Inc., the region's leading independent building automation systems (BAS) integrator, was retained and charged with the augmentation of the existing building management system (BMS) configuration to include a new scheme to better protect MoMA and its displays from the havoc that can be caused by inadequate environmental controls.

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Project Team

Owner & Developer: The Museum Of Modern Art, NY

Architect: Yoshio Taniguchi, Tokyo, Japan

MEP Engineer: Altieri Sebor Weber, LLC, NY

Construction Manager: AMEC

Key Benefits

The key benefit of this high level of integration in the museum environment is to allow operations staff to see in a single view the impact in an emergency situation. For example in a fire situation the operator can on the one display see the fire alarm zone, and the fire smoke dampers (zones), which are making automatic emergency adjustments. More so, this integration will allow MoMA to maintain critical environments with no downtime and successfully handle miscellaneous service problems. This will also allow museum officials to concentrate on developing exhibitions and educational programs, since the system virtually guarantees smooth operation of the facility.

At completion, the new MoMA will be a comfortable, environmentally efficient, and ultra-modern facility. The expansion and renovation will enable the Museum of Modern Art to welcome ever larger and more diverse visitors, show multiple exhibitions simultaneously, hold large events in its public halls, and install specialized storage for its world-renowned collections of fine and decorative arts.

The Importance of the Museum Environment

The diversity and authenticity of the museum's collections necessitates every type of object to be kept under particular conditions to ensure its long term preservation: an object in a good state can rapidly deteriorate when kept in unsuitable conditions. Environmental factors that can potentially harm collections include: humidity and temperature (particularly fluctuation of these factors), UV radiation, light, and gaseous and particulate pollution. Certain categories of material are especially vulnerable to specific factors, such as some types of natural history specimen which are extremely vulnerable to fluctuations in temperature and levels of humidity, and textiles which are particularly sensitive to light. The monitoring and control of the museum environment therefore forms a key element in effective collection management and one that has implications for planning and resource allocations.

Heating, Ventilation, and Air Conditioning

The nature of the museum's collections requires operation of the heating, ventilation and air conditioning systems (HVAC) as well as other building systems around the clock without downtime or failure. Specifically, the museum environment is required to maintain a consistent temperature of 72 degrees Fahrenheit, plus or minus two degrees, and relative humidity of 50 percent, plus or minus two percent. Of equal significance is the management of the facility as effectively and efficiently as possible, to conserve budget dollars and allow administrators to concentrate on the presentation and interpretation of MoMA's vast collection of modern contemporary art. Thus, the challenge to T.E.C. Systems was how to design and install a new and truly complementary environmental controls system for equally modern HVAC equipment that would meet temperature and humidity requirements for people as well as buildings and artifact preservation, while taking little or no interior space allowing easy future upgrades and expansions.

The new MoMA features a central mechanical plant serving a network of facility equipment disseminated throughout the museum's association of buildings. The HVAC system is comprised of perimeter induction units and interior variable-air-volume (VAV) boxes (125). In addition, two plate and frame heat exchangers to provide free cooling during winter months for energy conservation. Ancillary components include four two-cell cooling towers as well as Liebert air-conditioning (AC) units. The building's chiller system consists of three York 1000-ton centrifugal chillers with variable speed pumps. The entire museum campus will be heated via steam generation provided by Con Edison. Heating for all fan systems are fed by steam coils; The return air is an open-plenum system located above the ceiling. In sum, fifty-nine air handling units (AHU) will distribute conditioned air throughout the campus buildings. The Gallery Wing will be served by thirty-five of the sixty AHU's, some with preheat. Units feeding directly into the exhibition spaces will be fed minimum outside air from four pre-treatment units (PTU).

System Integration

The diversity of the mechanical equipment demanded a BMS capable of communicating across a multiplicity of communication platforms, including the adaptation of the existing control system into the new design. The system would have to account for environmental monitoring and life safety systems, providing a consistent and positive museum experience. Post consultation with the Mechanical, Electrical and Plumbing Engineer, Altieri Sebor Weber, LLC, T.E.C. Systems resolve a solution to furnish and install a direct digital control (DDC) system, standardized to Honeywell's EXCEL 5000® Building Management System to integrate and regulate the central plant HVAC equipment and other support systems throughout the complex. The EXCEL 5000® system is a core offering of Honeywell's comprehensive building automation technology solutions. Employing a distributive architecture, the system provides a powerful platform for the integration of an indiscriminate amount of products from a diversified group of vendors through a single graphical user interface (GUI) design.

The BMS provides the monitoring and control for all the mechanical and electrical equipment within the museum complex. This includes the air conditioning equipment; electrical distribution monitoring; lighting control. The primary integration in the BMS is the low level integration of the aforementioned equipment, (including the integration of YORK Chillers through a BACnet® connection to the BMS) for monitoring and control, however there is also the high level integration to the life safety systems in order to minimize the danger to building occupants and provide a means of escape. For instance, because the fire alarms needs to interfaced with HVAC controls to shutdown systems (to prevent the spread of fire) or place them in a smoke-control or purge mode, the BMS will also integrate to the FireComm System via a LonWorks® connection. This enables the BMS to have a complete picture of the 1000-plus fire/smoke dampers installed to support the smoke control and emergency egress. In addition, the Tek-Air laboratory airflow control systems (serving the conservation/restoration laboratory) are digitally interfaced to the BMS using ModBus protocol. In sum, the BMS is depended upon for the monitoring of some 9500 points (only 20 percent of which are hard-wired). The BMS also provides a common platform for all Maintenance / Operations activities and provides an excellent source for trouble ticketing, trend analysis, and routine maintenance activities. Access to the BMS is enabled via Honeywell's highly adaptable and scalable SymmetrE™ operator interface architecture. SymmetrE™ is an easy to use, graphics-oriented operator interface, designed to meet the sophisticated comfort, monitoring and control needs of large, demanding facilities. At MoMA, the GUI interface provides global control, serving as a communication link between facility engineers and the 60-plus local control panels designed, fabricated, and installed by T.EC. Systems. The facility is equipped with a single color graphic operator terminal, and a server to allow local capabilities at each control panel.

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