

Case Study: Columbia Tower

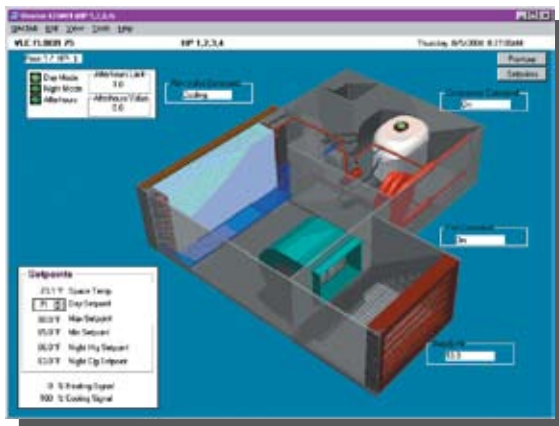
ALERTON®

The Columbia Tower soars above downtown Seattle with 76 stories and a million-and-a-half square feet of space. At 997 feet in height, the Tower is the tallest building in the Pacific Northwest and offers 360° views of the Space Needle, Puget Sound, Mount Rainier and the Northern Cascades. It also hosts one of America's largest direct digital control (DDC) control systems in a commercial office building.

The Columbia Tower took three years and \$200 million to build. When it came time to choose a heating, ventilating and air conditioning (HVAC) solution, the building owner had exacting criteria to meet—specifically, open protocol system that could support such a large installation and a controls contractor who could install the system within an occupied building without disrupting any tenants. He chose ATS Automation (ATS) to provide a BACnet-based Alerton solution.



Seattle's gleaming Columbia Tower, tallest building in the Pacific Northwest, consumes only a fraction more energy than a building two-thirds its size.



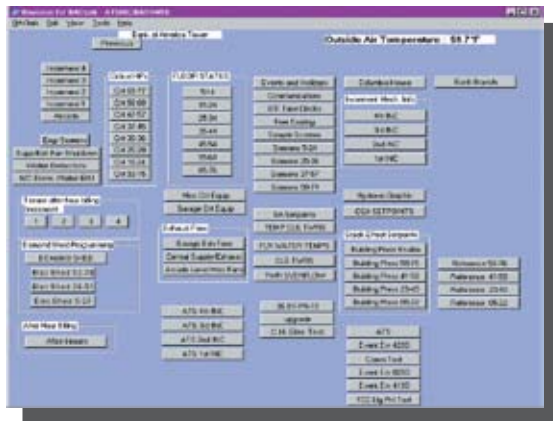
Easy-to-use BACtalk displays vital building information right down the individual devices; in this case, a unitary controller on the 75th floor.

The physical size of the installation within an occupied building was not the only challenge facing ATS. The Columbia Tower is Seattle's biggest commercial power user, not only due to the office and retail space, restaurants, sundries shops, art gallery and observation deck, but also in part to its lighted walkways that operate 24/7. Seattle City Light, the municipal electric utility company, predicted astronomical peak energy demands—equal to the output of a proposed hydroelectric plant. The Tower's BAS had to deliver energy efficiency on top of monitoring and control capabilities from any location.

Due to Tower's height, cold weather causes a substantial stack-effect pressure differential to occur within the envelope of the building. The stack-effect occurs when air escapes through an opening in the upper part of a building and is replaced with outside air that enters through an opening lower down. The problem results in a cooling demand on the upper floors and a heating demand on the lower floors.

ATS installed Alerton's native BACnet DDC controls that integrated all of the Tower's building systems, enabling facilities staff to easily monitor and control energy usage. The Columbia Tower project includes hydronic heat pumps, ventilation fan systems, exhaust fans, boilers, heat exchangers, cooling towers and circulation pumps. ATS also integrated the Tower's fire/life safety systems. Operator workstations—distributed over the Tower's dedicated Ethernet local area network (LAN)—manage all the building's functions through Alerton's native BACnet system, BACtalk®.

To provide the Columbia Tower facilities staff with remote access, ATS established four desktop workstations and four laptop workstations all running BACnet software over the Tower's LAN. Facilities managers can connect to the LAN at any point to monitor and control the entire system. Each computer



BACtalk's load shedding and tenant activity log features enable facilities staff to precisely monitor, adjust, track and bill tenant energy usage.

features a full graphic display package with floor plans and system diagrams.

The BACtalk system monitors kilowatt hours, which enables the Tower's facilities manager to manage energy demands for the entire building at meter inputs. He is able to control energy costs by automatically shedding equipment operation to limit the demand. BACtalk also features a tenant activity log, which lists all after-hours activity for each tenant. The Tower's facilities manager can view and modify the log before billing.

Alerton's Columbia Tower retrofit project used wireless Ethernet technologies during project start-up and commissioning. BACnet's open protocol enabled technicians with laptop computers to access the entire energy management and control system from anywhere in the facility using wireless PC cards and Ethernet transmitters. BACnet-based laptop workstations now connect building staff to the Tower's LAN from any location to oversee and adjust operations. They can view and modify setpoints according to needs—all from a centralized control point.

ATS solved a large part of the stack-effect problem of heating demand by programming a "heatshare" cycle on the Tower's hydronic system. The hydronic system serving the Tower's 2,200 heat pumps comprises four closed increment hydronic loops and one open cooling tower loop. Total capacity of the five loops exceeds 97,000 gallons. Plate exchangers link the increment loops to the cooling tower loop and

increment exchanger pumps provide water flow in the tower loop. To overcome the stack-effect, ATS runs the exchanger pumps with the cooling tower valves in a closed position so the system can recapture the heat energy on the upper floors and substantially reduce boiler operation.

Addressing the stack-effect within the Tower was a required component of the ATS installation. Left unchecked, the pressure differential adversely affects elevator operation, door operation, tenant comfort and energy costs because of condensation build-up and fluctuating temperatures. To combat the effect, ATS provided pressure monitoring on each floor. When the stack-effect is present, the amount of natural exhaust air provided can be deducted from the amount of mechanical exhaust. Measuring the pressure on each floor with respect to the rest of the building allows the system to reduce the amount of mechanical fan energy required to exhaust air. The system maintains the mechanical intake of outside air and assures the integrity of tenant air quality.

With centralized control to monitor energy usage inside the Columbia Tower, the facilities manager can easily and precisely view, track and bill energy usage—for the building and for individual tenants.

Today, the Tower requires about 31,000 megawatt hours (mwhs) of energy each year—still making it the top consumer in the city. But with energy efficient Alerton controls, the Columbia Tower uses only about 3,500 mwhs more than the next top consumer, a building with only two-thirds its square footage.

Project Scope

- 4 BACtalk operator workstations
- 4 laptop workstations
- 41 BTI global controllers
- 650 Alerton VAV/field controllers
- 12,000+ control points
- 2,200 hydronic heat pumps
- 166 ventilation fan systems
- 200 miscellaneous exhaust fans
- 15 boilers
- 15 heat exchangers
- 6 cooling towers with 6 stages each
- 25 circulation pumps