PRESERVING ART
OR WELCOMING VISITORS?
CARRIER, BECAUSE YOU SHOULD NOT HAVE TO CHOOSE

Preserving Cultural Heritage
Carrier solutions based on experience and expertise

Carrier heritage
Since Willis Carrier developed the world’s first modern air conditioning system in 1902, Carrier teams have been designing solutions tailored to each customer’s requirements. Over time, Carrier has been recognized as a pioneer in the design and manufacture of heating, ventilation and air conditioning (HVAC) solutions with sustainable performance, and equally important, for its commitment to first class service.

- The strength of United Technologies Corp. (UTC)
Carrier is part of UTC Building & Industrial Systems, the world’s largest provider of building technologies. Committed to innovation and environmental sustainability, UTC Building & Industrial Systems offers comprehensive solutions including elevator, escalator, fire safety, security, building automation, heating, ventilating, air conditioning and refrigeration systems, and services to make the world a better place to live.
The group’s world-leading brands include Otis, Carrier, Lenel, Edwards, Automated Logic, Kidde, Chubb and Manpco. Carrier recognizes that its customers have a choice and that its performance determines whether they choose Carrier. Carrier focuses on customer satisfaction and continuous improvement. The company continues to innovate in order to offer market-leading products and solutions.

- Preservation of artwork
Across the globe, international tourism is growing at record levels, with more and more people flocking to admire the world’s most celebrated artworks and monuments. Prestigious museums, churches or historic buildings face the dual challenge of giving as many visitors as possible access to the treasures they contain, while safeguarding those treasures themselves. Heat and pollutants like humidity, dust and carbon dioxide generated by the thousands of culture lovers endanger the sights they have come to see. Groundbreaking air management systems that both respect the constraints of historical monuments and ensure the comfort of visitors are therefore a critical part of the solution.

- Simulation capability
Major cultural attractions such as museums or cathedrals require technical solutions to ensure preservation of their spaces, as well as the ability to adjust to changing numbers of visitors. With its advanced computer modeling and simulation capabilities, Carrier is able to analyze and simulate the interior climate to ensure expected performance levels are maintained even when visitor capacity fluctuates.

- Adaptability
Conditions inside buildings change as a result of many factors including the local climate, the time of day and the number of visitors. By using video surveillance cameras linked to auto adaptive Carrier plant system management, Carrier solutions are able to anticipate and adapt operations to maintain the required temperature, humidity and velocity conditions at all times.

- Visitors’ comfort
Culture lovers flock to prestigious monuments or historical buildings to view masterpieces of art or enjoy an opera or a play. Carrier solutions are designed to be virtually unnoticeable and to respect the need for “church-quiet” noise levels. Visitors need to feel comfortable and relaxed to fully enjoy their visits and so expect comfortable temperatures and humidity levels, however they are in lobbies, corridors, stores or restaurants.

- Exceptional reliability
Where the integrity of international masterpieces and the reputation of prestigious heritage sites are at stake, total reliability of air management systems is essential. Carrier solutions are supported by a vast network of service technicians able to offer swift response and expert maintenance. Carrier solutions can ensure real peace of mind by designing backup or fail-safe measures for example a redundancy system with duplicate critical components or functions to increase its reliability.

The AdvanTEC solutions group has access to highly qualified engineers with thermodynamics and efficient building design experience. This group of experts also has deep knowledge of HVAC, fire, building automation and security fundamentals, in addition to industry-leading modeling tools and unique research facilities. One of the key objectives of the group is to design the HVAC systems that meet the energy performance and comfort standards of tomorrow, today.
AdvanTEC offers customers a new approach to HVAC system design. By working directly with customers to understand their specific business and application needs, they are able to develop custom-engineered solutions that address the specific challenges facing that customer and therefore may have worldwide benefits for many others.

© Musei Vaticani, all rights reserved. Photography: Giuliano Del Gatto

PRESERVING CULTURAL HERITAGE

Preserving cultural heritage
Preservation of artwork
- Groundbreaking air management systems that both respect the constraints of historic monuments and ensure the comfort of visitors are therefore a critical part of the solution.

- Air management
Heat and pollutants like humidity, dust and carbon dioxide lead to the deterioration of pigments used in paintings, fabrics, plaster or stone. Carrier solutions can help to ensure and maintain a highly controlled microclimate necessary to protect the works of art, regulating the temperature and humidity levels as well as ensuring optimal airflow quality and velocity.

- Respect for monuments
Spanning the centuries and the globe, the world’s leading monuments are works of art. Carrier solutions not only protect the structure and design of these buildings, but can also integrate seamlessly to respect the aesthetics of spaces where visible equipment may otherwise detract from the overall visitor experience. Carrier can offer customized solutions that address many of the installation constraints inherent to such historic monuments.

- Exceptional reliability
Where the integrity of international masterpieces and the reputation of prestigious heritage sites are at stake, total reliability of air management systems is essential. Carrier solutions are supported by a vast network of service technicians able to offer swift response and expert maintenance. Carrier solutions can ensure real peace of mind by designing backup or fail-safe measures for example a redundancy system with duplicate critical components or functions to increase its reliability.

- Visitors’ comfort
Culture lovers flock to prestigious monuments or historical buildings to view masterpieces of art or enjoy an opera or a play. Carrier solutions are designed to be virtually unnoticeable and to respect the need for “church-quiet” noise levels.

- Visitors’ comfort
Culture lovers flock to prestigious monuments or historical buildings to view masterpieces of art or enjoy an opera or a play. Carrier solutions are designed to be virtually unnoticeable and to respect the need for “church-quiet” noise levels.

- Adaptability
Conditions inside buildings change as a result of many factors including the local climate, the time of day and the number of visitors. By using video surveillance cameras linked to auto adaptive Carrier plant system management, Carrier solutions are able to anticipate and adapt operations to maintain the required temperature, humidity and velocity conditions at all times.

- Exceptional reliability
Where the integrity of international masterpieces and the reputation of prestigious heritage sites are at stake, total reliability of air management systems is essential. Carrier solutions are supported by a vast network of service technicians able to offer swift response and expert maintenance. Carrier solutions can ensure real peace of mind by designing backup or fail-safe measures for example a redundancy system with duplicate critical components or functions to increase its reliability.

- Visitors’ comfort
Culture lovers flock to prestigious monuments or historical buildings to view masterpieces of art or enjoy an opera or a play. Carrier solutions are designed to be virtually unnoticeable and to respect the need for “church-quiet” noise levels.

WELCOMING VISITORS
Anticipate, adapt, enjoy

CONTROL OF THE INTERIOR CLIMATE
RESPECT FOR THE BUILDINGS’ HISTORICAL SIGNIFICANCE
ENHANCED RELIABILITY OF THE SOLUTION

CO2 Mass Fraction
1.100e-003
1.125e-003
1.175e-003
1.000e-003
1.150e-003
1.050e-003
1.025e-003
1.020e-003

Anticipate, adapt, enjoy
Public areas
Entrances, shops and restaurants require individual solutions to address human comfort conditions including temperature and humidity. Carrier offers a wide range of water and air terminal solutions to address these needs.

Administration, conference and meeting areas
Whether for facilities management functions or for the hosting of corporate meetings, comfortable working conditions are key for the productivity and success of the businesses.

Archives and storage areas
The preservation of old manuscripts, books, prints and artwork requires careful control of temperature and humidity.

Art galleries and display areas
These areas frequently feature high ceilings and are therefore high volume areas with high public traffic. The challenges of such areas, in addition to temperature and humidity control, include effective air distribution which ensures visitor comfort and eliminates threats to the preservation of the monuments and arts on display.

STATE-OF-THE-ART SOLUTIONS
Carrier offers innovative and patented solutions for high volume areas, where hydrometric control and specific diffusion are required. Its extensive range of standard and fully customizable solutions ensures quality filters, high efficiency fans and motors, heat recovery systems for energy savings. Carrier's innovative solutions are developed by its research and development center and tested in the integrated laboratory to prove the system's reliability.

CARRIER SOLUTIONS CAPABILITY
The company offers a large range of solutions based on:
- Advanced computer simulation and modeling
- Analysis of building loads, internal air circulation and system performance
- Control of air quality, velocity, temperature and humidity
- Respect for minimal noise
- Reliability
- Low energy consumption
- Rental Systems to keep sites open during installation
- Smooth integration within building architecture.

TALENTED TEAMS FOR EXPERT SOLUTIONS
Today, Carrier's state-of-the-art air management solutions are protecting the world's cultural heritage in some of the most well-known cultural sites across the globe. Such remarkable sites and partners have unique needs and they have selected Carrier for the customized solutions developed by its expert global team of AdvanTEC engineers.

Different solutions for different needs
Carrier's wide product portfolio includes a full range of air- and water-sourced energy efficient liquid chillers, offering cooling capacity from 3 to 5300kW, as well as heat pumps offering heating capacity from 3 to 2000kW. Each solution is specifically designed to reduce energy consumption and CO₂ emissions in line with the needs of all building sizes.

Carrier offers an extensive range of air handling and air treatment solutions that filter, heat and cool to provide fresh air, including heat recovery and control solutions for energy savings. These highly flexible systems can be adapted to meet customers’ needs, whatever their space or budgetary constraints.

While air handling solutions and air distribution grills are ideally suited to large spaces, Carrier also offers a wide range of water terminal solutions to meet the heating, cooling and ventilation needs of smaller spaces such as ticket offices, restaurants, shops and offices.

Alongside its comprehensive product portfolio, Carrier also offers coordinated control and management systems, ensuring optimum operations and performance. From Aquasmart® to WebCTRL®, Carrier HVAC building management systems allow highly efficient control of energy consumption, comfort and zoning, anticipating on system load variations.

COOLING & HEATING PRODUCTION
Ventilation & Air Handling Solutions
Water Terminals & Air Diffusion Solutions
System Control Solutions

Carrier offers an extensive range of air handling and air treatment solutions that filter, heat and cool to provide fresh air, including heat recovery and control solutions for energy savings. These highly flexible systems can be adapted to meet customers’ needs, whatever their space or budgetary constraints.

While air handling solutions and air distribution grills are ideally suited to large spaces, Carrier also offers a wide range of water terminal solutions to meet the heating, cooling and ventilation needs of smaller spaces such as ticket offices, restaurants, shops and offices.

Alongside its comprehensive product portfolio, Carrier also offers coordinated control and management systems, ensuring optimum operations and performance. From Aquasmart® to WebCTRL®, Carrier HVAC building management systems allow highly efficient control of energy consumption, comfort and zoning, anticipating on system load variations.
Specific solutions for the protection of art

Carrier’s portfolio of HVAC products and services ensures optimum conditions in worldwide heritage sites, both for the masterpieces they house and for the visitors that come to admire them.

Sistine Chapel (Vatican City State)

■ The challenge

Since their completion more than 500 years ago, Michelangelo’s Sistine Chapel paintings have become one of the most celebrated masterpieces of our time. The awe-inspiring frescoes attract as many as 20,000 visitors a day. The heat, dust, sweat and carbon dioxide they bring in can potentially damage the chapel’s historic artwork. In 2010, the museum’s curators examined the condition of the frescoes and they sounded an urgent alarm: the Sistine Chapel is dying! That was when I contacted Carrier to design a solution that would protect the frescoes from further contamination and allow the Vatican to keep the chapel open to the public.

Professor Antonio Paolucci,
Director of the Vatican Museums

■ The solution

Working with the Vatican to design a system to preserve the frescoes of the Sistine Chapel was a noble undertaking, and one that also came with many challenges. It was critical to understand how the presence of thousands of visitors affected the chapel’s air quality, temperature, and humidity. For that, we used modern simulation tools and state-of-the-art technology to collect data, simulate airflows, and model the chapel’s interior atmosphere. The system also had to be invisible to the public, respect “church-quiet” sound levels, and provide airflow capacity for up to 2,000 visitors in the chapel at one time. The two-year system development phase was a process of innovation and discovery, during which we had to invent solutions. Once we understood the parameters of the challenge, we were able to develop a unique and innovative system that would maintain optimal atmospheric conditions in the chapel at all times.

Didier Da Costa,
President, Carrier HVAC Europe

■ Carrier solutions protect:

Museums and art galleries, cathedrals and churches, theatres and concert halls, libraries and archives, historic buildings and heritage hotels, auditoriums and conference rooms.

Rijksmuseum (Amsterdam, Netherlands)

Carrier’s climate control system maintains the correct humidity and temperature levels required to preserve Rembrandt’s world-famous painting ‘Night Watch’.

MACBA (Barcelona, Spain)

The Barcelona Museum of Contemporary Art’s cutting edge art program has relied on Carrier for nearly 20 years.

Bibliotheca Alexandrina (Alexandria, Egypt)

Carrier engineers implemented a climate control system to safeguard the collections while providing air comfort for visitors.

MuCEM (Marseille, France)

Carrier’s expertise in seawater heating and cooling systems helps the national Museum of European and Mediterranean Civilisations to meet its environmental goals for an energy-efficient, sustainable solution.

Haleplibahce Museum Complex (Sanliurfa, Turkey)

Carrier designed an environmentally responsible system with high energy efficiency to meet all of the museum’s requirements.

Preserving the artwork of the Sistine Chapel: a masterpiece of technology by Carrier. Discover the story of this extraordinary project on www.youtube.com/UTCBIS
Carrier Service beyond your expectations

To continuously keep visitors comfortable while preserving the world’s cultural heritage, turn to Carrier Service experts and to our 110 years of experience.

Carrier supports you with a total commitment to first class service.

- **Adaptability**
  Museums, like all heritage sites, promote culture, communication and entertainment for the enjoyment of culture lovers. Exhibits change, spaces evolve and special events are added to museum calendar. Carrier Service offering is tailored to:
  - Preventive maintenance programs to keep the system operating continuously at peak level for each dedicated zone
  - Rental Systems to support your events and refurbishment projects. Carrier delivers a complete package of temporary air-conditioning solutions from design, through installation to decommissioning.

- **Peace of mind**
  A properly functioning system is critical to the preservation of artworks. Carrier’s expert technicians can therefore be relied on to take action, quickly, supported by:
  - Comprehensive and efficient maintenance
  - Proximity of the Carrier organization allowing rapid on-site intervention
  - Original manufacturer parts availability
  - Continuous internal training.

- **Sustainability**
  Cost-efficient HVAC systems are critical to balancing the constraints of your budget with the imperatives of protecting masterpieces and providing comfortable conditions for visitors. Carrier designs specific solutions to ensure:
  - Energy efficiency and regulation guidance
  - Energy optimization based on Carrier algorithms.

Present in more than 60 countries

24/7 on-site availability

More than 110 years of experience