



# CASE STUDY



## University of Maryland Shock Trauma Tower

### CARRIER AQUAFORCE® HEAT RECOVERY CHILLER DELIVERS SIGNIFICANT REDUCTION IN ENERGY COSTS

#### HEAT RECOVERY TECHNOLOGY PROVIDES COOLING, HEATING AND DOMESTIC HOT WATER



The University of Maryland Medical Center uses a Carrier AquaForce® 30XW chiller with heat recovery technology to provide cooling, heating and domestic hot water to the loop that serves the Shock Trauma Tower, significantly reducing energy costs for that facility.

#### Project Objectives

The University of Maryland Medical Center (UMMC) in Baltimore has a large campus with several buildings that serve a variety of patient needs, from cancer treatment to pediatric medicine. Administrators planned to add a Shock Trauma Center to provide specialized care for patients who are critically injured or ill, the first integrated trauma center in the nation, to be named after Dr. R. Adams Cowley, the physician who created the concept of the Golden Hour in trauma care. The Shock Trauma Tower could not accommodate rooftop chillers due to its heliport, so the facilities staff sought to expand the capabilities of the campus's existing central plants in order to provide energy efficient cooling, heating and domestic hot water to the Shock Trauma Tower and other buildings on the hydronic loop.

“We have no boilers to serve the Shock Trauma Tower. Heating comes from our heat recovery system and district steam. We anticipate using even more recovered heat as time goes on.”

– John Baldwin,  
Chief Engineer, Facilities Department,  
University of Maryland  
Medical Center

#### Project Solution

Facilities staff at the University of Maryland Medical Center selected three Carrier AquaEdge® 23XRV chillers and one AquaForce® 30XW heat recovery chiller to increase the cooling and heating capacity of their existing physical plant. The new chillers provide cooling, heating and domestic hot water to the Dr. R. Adams Cowley Shock Trauma Critical Care Tower and other buildings on the hydronic loop. The facilities staff—familiar with Carrier quality because of the AquaEdge 19XR chillers already in service at UMMC—selected the AquaEdge chillers and AquaForce® chiller for their energy efficient performance and heat recovery capabilities, and because they can deliver water chilled to a range of temperatures, a requirement when serving multiple structures of different ages and heating, ventilating and air conditioning (HVAC) designs. Thanks in part to its innovative HVAC solution, the University of Maryland Medical Center's Shock Trauma Tower achieved LEED (Leadership in Energy and Environmental Design) Gold certification.



## Synopsis

The University of Maryland Medical Center (UMMC) in Baltimore serves hundreds of thousands of patients a year, with a large campus including multiple buildings that address a variety of patient needs, from cancer treatment to pediatric medicine. UMMC administrators planned to add a Shock Trauma Center to provide specialized care for patients who are critically injured or ill. The resulting facility, the 140,000 ft<sup>2</sup> (13,006.4 m<sup>2</sup>) Dr. R. Adams Cowley Shock Trauma Critical Care Tower, named for the pioneer of trauma medicine, serves more than 8,600 patients a year and is the nation's highest-volume trauma center as well as the first integrated trauma hospital in the nation.

The heating, ventilating and air conditioning (HVAC) design for the Shock Trauma Tower arose from UMMC's green mandate and desire to obtain LEED Gold status for the project, and from conditions specific to the facility. For example, the Shock Trauma Tower could not accommodate rooftop chillers due to its heliport, where critically injured patients arrive by helicopter, so the facilities staff sought instead to expand the capabilities of the medical campus's two existing central plants in order to provide energy efficient cooling, heating and domestic hot water to the Shock Trauma Tower and other buildings on the hydronic loop, which encompasses seven structures at a total of 2,300,000 ft<sup>2</sup> (213,677 m<sup>2</sup>).

To achieve the expansion of heating and cooling capabilities, facilities staff at UMMC selected three Carrier AquaEdge® 23XRV chillers and one AquaForce® 30XW heat recovery chiller. The staff—familiar with Carrier quality and reliability because of the AquaEdge 19XR chillers already in service—selected the additional Carrier chillers for the energy efficient performance provided by their variable frequency drives; for the heat recovery capabilities of the AquaForce unit; and because the chillers can deliver water chilled to a range of temperatures, a requirement when serving multiple structures of different ages and HVAC designs. To maximize efficiency, the UMMC facilities staff operates its chillers in

series during Baltimore's hot, muggy summer weather, while during the winter when both heating and cooling are required simultaneously, the chillers are run in parallel. All UMMC chillers—which use controls from Automated Logic Corporation, a Carrier sister company—are maintained by Carrier Commercial Service.

The AquaForce heat recovery unit works by capturing the heat created during the refrigeration process and repurposing it to hot water, which can then be used for room heating or domestic hot water.

John Baldwin, Chief Engineer, Facilities Department, UMMC, said, "We have no boilers to serve the Shock Trauma Tower. Heating comes from our heat recovery system and district steam. We anticipate using even more recovered heat as time goes on and we automate the process. All chillers produce heat as a byproduct, so there is more to be captured." UMMC notes that heat recovery significantly reduces energy costs over standard boilers.

Keith Schepleng, Market Sales Manager for Carrier, said, "In addition to their heat recovery system, UMMC takes full advantage of the ability of Carrier chillers to produce chilled water in a range of temperatures, serving their low-temperature building as well as those whose HVAC design calls for higher temperature chilled water. UMMC really leverages the flexibility of Carrier chillers to serve their whole campus efficiently. It's no surprise that the facility had added two more AquaEdge® chillers in another location since the Shock Trauma Tower was built." Additionally, staff from the University visited Carrier's award-winning chiller manufacturing facility in Charlotte, North Carolina to observe to observe chiller production and testing.

Thanks in part to its innovative HVAC solution, the University of Maryland Medical Center's Shock Trauma Tower achieved LEED Gold certification.

## Project Summary

**LOCATION:** Baltimore, MD

**PROJECT TYPE:** Expansion of existing system

**BUILDING SIZE:** 140,000 ft<sup>2</sup> (13,006.4 m<sup>2</sup>)

**BUILT:** 2012

**BUILDING USAGE:** Health Care

**OBJECTIVES:** Energy efficiency; use of reclaimed heat; attain LEED Gold

**EQUIPMENT:** 3 Carrier AquaEdge® 23XRV chillers, 1 Carrier AquaForce® 30XW heat recovery chiller

**TOTAL COOLING TONS:** 1,900

**CONTROLS:** 2,804 Automated Logic Corporation controllers with 28,650 physical I/O points monitor or control mechanical applications and specialty systems over approximately 1,000,000 ft<sup>2</sup> (92,903 m<sup>2</sup>)

**MAJOR DECISION DRIVERS:** Carrier equipment efficiency and heat recovery capabilities; ability of Carrier chillers to provide chilled water in the range of 38°F – 43°F (3.3°C – 6.1°C); contribution of Carrier equipment to LEED Gold level performance standards

**UNIQUE FEATURES:** All four Carrier chillers can be used for both chilled water and heat recovery; AquaEdge® chillers run in series in summer and in parallel in winter; recovered heat is used for both space heating and domestic hot water

**INSTALLATION DATE:** 2012

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