Cultural Institutions Working Group
All Hands Meeting

Resilience Planning: From Chronic Threats to Emergency Preparedness
Wharton County Historical Museum, Wharton Texas
Following Hurricane Harvey, August 2017
In 2013, the Pérez Art Museum Miami moved into a cutting-edge facility that was specifically designed to withstand hurricanes. The museum is raised on an elevated platform above the flood plain and features the largest sheets of hurricane-resistant glass in the U.S. Its art storage space is more than 46 feet above sea level, and its signature hanging gardens are reinforced with enough steel to withstand category-five hurricane winds. The museum also features an advanced backup-electricity system with generator systems designed and situated as to be refueled by barge when inaccessible by land.
Dali Art Museum, St. Petersburg FL
Opened in 2011, the new Dali Museum, similar to the Perez, was designed to withstand a Category 5 hurricane. The walls are 18 inch thick steel reinforced concrete. The roof is 12 inch steel reinforced concrete. All of the glass is 1-1/2 inches thick, rated to a Category 3 storm. The breakage-resistant properties of the glass are tested by using a jet engine to fling two-by-fours at the double-layer panels. All artwork and “mission critical” material is located on the 2nd and 3rd floors. Both the concrete block art storage vault on the 2nd floor and the galleries on the 3rd floor can be sealed with interior storm shutters. The data and security systems are located in a sealable concrete block vault as well.
The new Whitney Museum of American Art
99 Gansevort Street NYC   opened 2015
Under construction in October 2012 Hurricane Sandy inundated the Whitney job site with six million gallons of the Hudson River, prompting a substantial redesign and fundraising for an additional $40 million to pay for it.
Cooper Robertson
123 William Street
NYC
SOP

Standard Operating Procedures

Flood Protection
6.1.2 Tasks BSTW team

6.1.2.1 Mechanical / Electrical / Plumbing systems

- Wall penetrations (pipes, vents etc.) open during regular operation of the building, located below 16.5 ft and not protected by a flood gate or barrier must be shut/closed/sealed prior to an expected flood event.
- Operational readiness of the emergency power supply system must be ensured.

1. Emergency Power Supply
   - Schedule a delivery of diesel fuel oil to ensure the fuel oil tank is filled to capacity

2. Pipes / Valves
   - Place MEP systems into “Flood Mode #1” by enabling this mode on the BMS system. “Flood Mode #1” will automatically complete the following:
     a. Valves 1 & 5 on storm pipes will close.
     b. Valves 10 & 11 on inlet to Storm Water Discharge Pumps adjacent to storm tank will open.
     c. Valve 12 on domestic water fill to storm tank will close.
     d. Valve 13 on storm pipe inlet to storm tank will close.
   - Confirm visually that each of the valves above is closed immediately after enabling “Flood Mode #1”. If BMS received an error that a valve did not close, or if during visual inspection it is confirmed that a valve is not closed, the valve may be manually shut using the chain operation located at the floor directly below the valve.

- Location of valves see plan P-100 (by JB&B)
Copper Robertson called on Walz and Krenzer, a Connecticut based engineering firm specializing in watertight enclosures for the maritime industry to design flood barrier systems. The loading dock door pictured is 27 feet long, 14 feet high and weights 15,500 lbs. It can be manually operated by one to two people.
The 500 foot dam system takes approximately 16 to 20 laborers 8 to 10 hours to fully erect.

The entire system is stored next door in the meatpacking building on West Street; storage space is approx. 2,135sq ft.

Initially, it took 5 trailers to transport the system from fabrication site in Long Island City to the Whitney site.
An additional change to the original building design included the rethinking of the building’s emergency energy sources. Instead of the 1,000 gallon fuel oil tank originally planned for the museum, the Whitney’s insurance advisors suggested accommodating the largest tank possible. Therefore, the building has a 4,000 gallon tank which provides as much emergency fuel as possible. This will allow the building’s systems, particularly the pump system, to run for a far greater duration than originally planned. The team did precise calculations to account for numerous flood event scenarios, including the failure of various functions. For example, if the water pumps should fail, it was determined that roughly 14 inches of water may then flood the basement. Therefore, the placement of all electrical equipment was adjusted to sit 14 inches above the finish cellar floor elevation. In cases where this was not possible, a concrete barrier provides perimeter protection.
Museum of Fine Arts, Boston
June 1998, MFA
AOA Decorative
Arts Gallery
Hurricane resistant skylights provide natural daylighting for the gallery space and humidity is controlled using a solar hot water powered dehumidification system.

The solar hot water system also provides domestic hot water.

A cool roof coating on the building and pathways reduce the heat island effect as well as cooling loads.

Landscape irrigation is provided through gray/reclaimed water to reduce potable water usage.

Permeable pavers help absorb stormwater and an underground stormwater filtration system minimizes pollutants that enter into Tampa Bay.

All the concrete for the entire building was flyash or ground granulated blast furnace slag as a replacement for Portland cement, along with 97% recycled steel for the rebar.
Toledo Museum of Art
• 2003 – museum installs four 65 KW gas-powered capstone micro-turbines. Waste heat used to support HVAC heat and domestic hot water
• 2008 – phase one solar installed for 101 KW of renewable energy
• 2010 – phase two solar added 1,500 PV panel 100 KW system
• 2013 – two additional 65 KW micro-turbines added
  parking lot solar canopy takes museum off the grid
TMA GRID POWER CONSUMPTION
Jeongok Prehistory Museum, Korea
Dedicated to the prehistory of the area and human origins, the Jeongok Museum features a high performance double-walled facade to energy efficiently maintain a constant interior climate.
Ningbo History Museum, China

The museum is built from construction rubble by local artisans and craftsmen as a way of honoring and preserving traditional construction methods, history, a sense of place, sustainable use of materials, and the people who will inhabit it.
Museum of Liverpool

The museum features exhibitions on the history of the port town and its influence on the world. Energy efficiency measures include the use of a ‘trigeneration’ system to create heat, electricity and cooling in one integrated process as a way of reducing carbon emissions.
Dedicated to the natural history, flora, fauna, minerals and dinosaurs found in the region, the Utah Natural History Museum is an abstract interpretation of Utah’s landscape. The museum features a green roof, solar system and a copper facade sourced only miles away.