

Perot Museum of Nature and Science Building Statistics

Yucheng Lu



IMG 1

Building name: Perot Museum of Nature and Science

Location and site: 2201 N Field St, Dallas, TX 75201

Building Occupant Name: Perot Museum of Nature and Science

Occupancy or function types: Public Museum

Size: 180,000 ft²

Number of stories above grade / total levels: 5

Dates of construction: 05/2010 – 12/2012

Cost Information: not available at this time

Project Delivery Method: Design Assist

Primary project team

Owner:

Perot Museum of Nature and Science | <http://www.perotmuseum.org/>

Project Architect / Architect of record / Interior designer:

Morphosis Architects | <http://www.morphosis.com/>

Lighting Consultant:

Office for Visual Interaction | <http://www.oviinc.com/>

Associate architect / Sustainability Consultant:

Good Fulton & Farrell | <http://www.gff.com/>

Engineer:

Structural: Datum Engineers | <http://www.datumengineers.com/>

Consulting structural engineer: John A. Martin Associates, Inc. | <http://www.johnmartin.com/>

MEP: Buro Happold | <http://www.burohappold.com/>

Civil: URS Corporation | <http://www.urscorp.com/>

General contractor / Construction manager:

Balfour Beatty Construction | <http://www.balfourbeattyus.com/>

Consultant:

Landscape Architecture & Sustainability: Talley Associates | <http://www.talleyassociates.com/>

Acoustical: Jaffe Holden | <http://jaffeholden.com/>

Other:

Cost estimator: Davis Langdon | <http://www.davislangdon.com/global/>

Façade: JA Weir Associates | <http://www.jaweirassociates.com/>

Geotechnical: Terracon Consultants | <http://www.terracon.com/>

Audiovisual/IT: Wrightson, Johnson, Haddon & Williams, Inc (WJHW) | <http://www.wjhw.com/>

Theater: Harvey Marshall Berling Associates (HMBA) | <http://www.hmb-a.com/>

Code: Jim W Sealy Architects | <http://www.google.com/#q=Jim+W+Sealy+Architects>

Specifications: Inspec | <http://www.inspec.com/>

Vertical transportation: Barbre Consulting | <http://barbre.net/>

Technology & BIM: Synthesis | <http://www.syntint.com/>

Water proofing: Apollo BBC | <http://apollobbc.com/>

Accessibility: Access By Design | <http://www.myaccessbydesign.com/>

Security: Jaffe Holden | <http://jaffeholden.com/>

Architectural visualization: Kilograph | <http://kilograph.net/>

Architecture

The site of the building incorporated rock panel and drought-resistant grasses to reflect two of the most typical Texas ecologies: forest and desert. Cubical building mass was built on such a site, demonstrating the coexistence of nature and science. An entry plaza was placed at the intersection of desert and forest ecology, creating a space for gathering and public activities. Part of the landscape was lifted up as the landscape plinth roof of the first floor.

Through the entry plaza visitor will arrive at the ground floor. The sky-lit atrium uses daylight to attract visitor's attention, guiding them going upwards. Series of escalator built around the atrium, with one of the main escalator built on an external cartridge that structurally 'floating in the air'. The escalator will eventually take visitors to an open sky balcony, from which an excellent view of downtown Dallas can be gained. From the balcony visitor can travel downward using stairs to explore galleries on each floor, eventually reach the main lobby on the ground floor.

Major national model code/s

Building Code:

2006 IBC with 2006 Dallas Building Code (DBC) Amendments Ordinance No. 27108 dated 3-26-08.

Electrical Code:

2006 National Electric Code with Dallas City Code Amendments, Chapter 56 including NFPA 70 and ICC Electrical Code.

Elevator Code:

Chapter 30 of 2006 IBC with Dallas Amendments.

Energy Code:

2006 International Energy Conservation Code with Dallas City Code Amendments, Chapter 59.

Fire Code:

2006 International Fire Code with Dallas City Code Amendments, Chapter 16.

Fuel Gas Code:

2006 International Fuel Gas Code with Dallas City Code Amendments, Chapter 60.

Mechanical Code:

2006 International Mechanical Code with Dallas City Code Amendments, Chapter 55.

Plumbing Code:

2006 International Plumbing Code with Dallas City Code Amendments Chapter 54.

Accessibility:

Texas Accessibility Standards (TAS) of the Architectural Barriers Act.

Zoning: Dallas Development Code

Historical requirements of building: N/A

Building Facades

Majority of the façade used precast concrete to create the iconic surface pattern. Combination of curtain / window wall and metal panel are used on the ground floor and exterior escalator to diffuse the sense of enclosure. Supporting system includes rain screen, moisture barrier, exterior insulation finishing system and aluminum composite material contributes greatly to protect the façade system from environmental damage



IMG 2

Roofing

Roofing system of the building consists of three major parts, the landscape roof using Hydrotech Garden Roof technology, tower roof made by modified bitumen and a roof plaza with Carlisle FleeceBack TPO membrane applied on it.

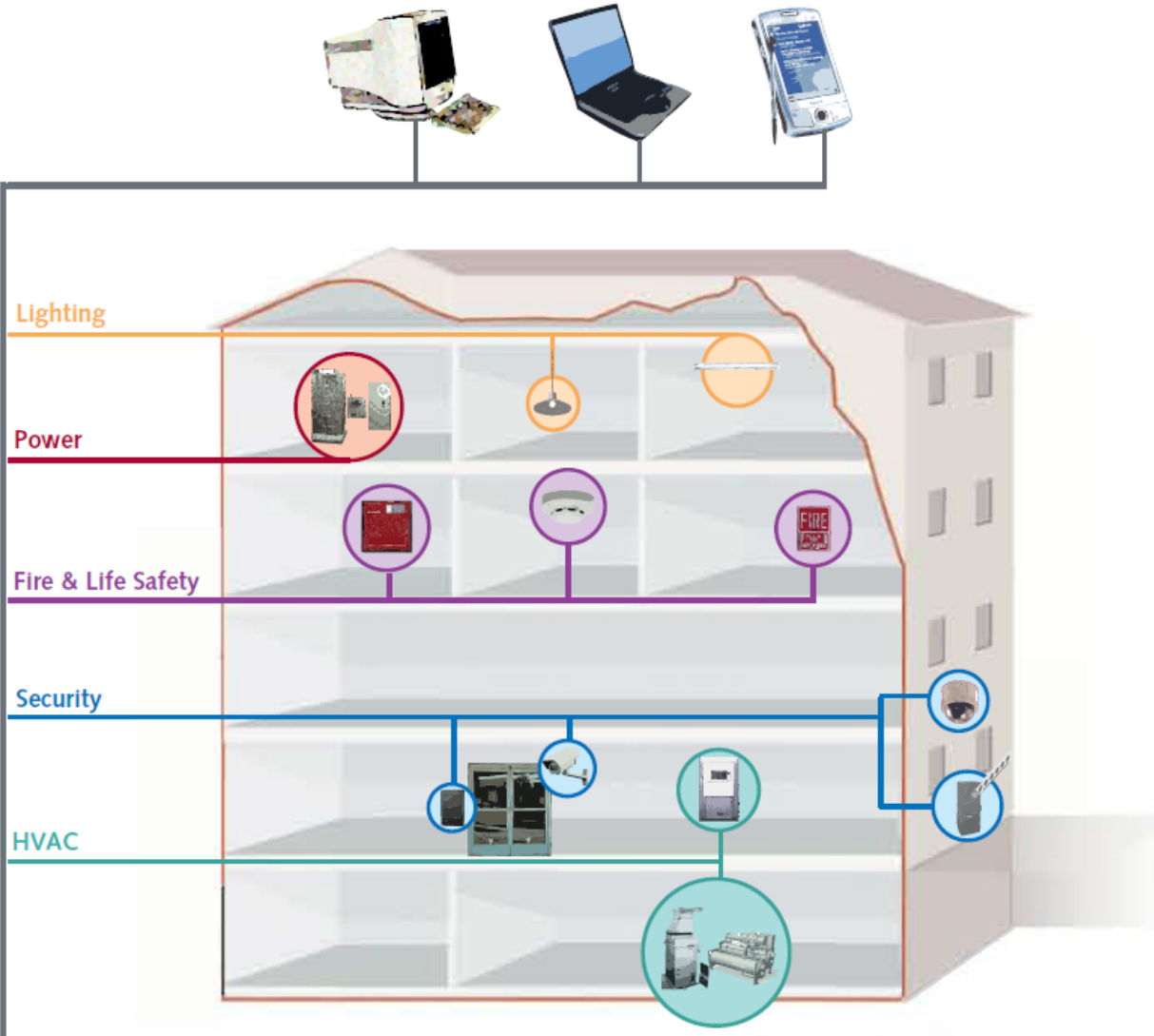
Electronic Leak Detection System is installed on landscape roof and roof plaza which is accessible by visitors.



IMG 3

Sustainable Feature

By integrating Andover Continuum system into the building, occupant of the building are able to control building systems through a simple interface like cell phone.



IMG 4

Viessmann vacuum tube solar collectors is a new technology used in this project, unlike traditional solar collectors where solar energy is directly collected by medium, the vacuum tube collectors first store energy in a vacuum environment and then pass it to liquid mediums, allowing a significant increase in energy efficiency.



IMG 5

Construction

The original contract project delivery method for Perot Museum of Nature and Science was set to be Design-Bid-Building. During the schematic design phase, the client reconsidered the possibility to minimize the construction duration and decided to switch the project delivery method into Design Assist. This decision allowed a construction manager/general contractor to be selected to assist the design team with pricing and other decisions, thus made the design process more efficient. In addition, Guaranteed Maximum Pricing and Early Foundation/Superstructure Package were published after the Design Develop phase, allowing the project to break ground 4 months earlier than the publication of full Construction Document package. All the strategies allowed a 6 month reduction in overall construction duration.

The museum was designed as a 5 story building with its 'ground level' set to be 20 feet above the street level, which requires the contractor to build a 4.7 acre landscape around the building mass. The contractor's approach is to precede the construction of the building first, building it as a 6 story building from the street level. When the general building envelop is completed, the construction of landscape started to take place along with interior finishes.

Electrical

Electrical power of the museum was supplied through two major switch boards MSB1 and MSB2, both were 480Y/277V, 3 pole switch boards fed through utility with NEMA type 1 enclosure. MSB1's balanced load is 3230A, protected by a 4000A breaker. MSB2's balanced load is 1650A, protected by a 2000A breaker. Other than two switch boards, a 750 KVA generator was also prepared to provide 812 Amps power supply in case of emergency situation. The emergency board is also 480Y/277V, 3 pole switch board with NEMA type 1 enclosure.

Lighting

Exterior spaces like façade and parking lot of the museum were lit by high output Metal Halide floodlights either tree mounted or surface mounted on the landscape plinth. T5 Fluorescent/Compact fluorescent down lights was widely applied in general interior work spaces including classroom and offices due to their excellent energy efficiency and availability. Linear fluorescent luminaire was installed in the lobby/gallery area behind the featured metal mesh. In order to provide concentrated light on exhibition, suspended halogen luminaire was also used in the lobby/gallery area. For special purpose space, especially the theater, LED linear luminaire was applied to create an elegant curvature of accent light. LED luminaires were also used as under bridge, under bench light where small luminaire size was preferred.

Crestron dimming allows light to be controlled through multiple interfaces including local control switch, control touchscreen installed in each space, switch override at the panel board wireless touchscreen devices that connected to the space through internal wi-fi network. Photo sensor and occupancy sensor devices were also installed in the museum to adjust the energy consumption automatically.

Mechanical

Storm water drainage system is the highlight of the museum's mechanical system. When it rains, water reached the roof will be taken through drain piping to the landscape plinth. The plinth was designed to have a specific slope that will direct the water to two major cisterns located at parking lot and North-East corner. Condensing water from the mechanical system will be collected in the same way. Another major waster source being recycled is the irrigation water, which is stored in a separate cistern near North-East cistern. All three cisterns were equipped with basic plumbing and filtration system. Pipe were built between cisterns, allows them to share single advanced filtration system including UV treatment and DYE system as the final treatment before water enter the building. Recycled water will be pumped back to the building for toilet flushing and cooling tower evaporation.

Structural

The primary floor system of the building is concrete slab on metal deck supported by steel frames. The slab is supported by a combination of concrete and steel columns. At the perimeter of the building, series of large V-shaped concrete columns are also designed to distribute load away from building core, especially horizontal loads. The foundation is supported by piles 24" in diameter using mechanical splice.

Fire Protection

Based on 2006 International Building Code (IBC) with City of Dallas Amendments, the museum was classified as type 1-A high rise building. For structural support and interior bearing walls, a 3-hour fire rating is required. 2-hour fire rating is required for roof support, exterior bearing wall, floor construction and emergency power room. Roof construction needs a 1.5-hour fire rating while the building atrium and storage space need a 1-hour fire rating. Any other interior partitions have 0 fire rating.

In order to prevent fire disaster, the building is equipped with a class 1 standpipe system connected to a 2-1/2 inch hose. Automatic sprinkler system covered the entire building with the exception of roof penthouse. Automatic fire alarm system and an emergency voice/alarm communication system are designed as required in DBC (Dallas Building Code) 907.2.1. Smock control system is installed as required in DBC 909, fire command center and fire department connections are designed according to DBC 911, 912.

Transportation

The major transportation is a series of escalators that connects from the ground floor to the uppermost level. The escalators span total of 57 feet in horizontal and lift visitors 110ft higher. The escalator only move upward, in order to get back down, visitors can either take the elevators or stairs. There are four elevators equipped in the atrium. Three regular elevators are 9feet by 9 feet in dimension while the grand elevator is 10 feet by 17 feet. The elevators were equipped with sprinkler and emergency power supply to ensure that they can function as efficient egress means for the 4th floor or above. Two set of stairs are also available in the museum, one is located inside the center atrium while the other one is located on the North-West corner of the building.

Telecommunication

The major telecommunication device in the building is emergency voice/alarm communications systems. The system is supported by secondary power system to guarantee its operation under emergency circumstance. A two-way communication system such as telephone and intercom is also available for a security personal on site to report emergency.

Reference:

1. <http://archrecord.construction.com/projects/portfolio/2013/01/Perot-Museum-of-Nature-and-Science-Morphosis-Architects.asp>
2. <http://archrecord.construction.com/projects/portfolio/2013/01/Perot-Museum-of-Nature-and-Science-Morphosis-Architects.asp>
3. <http://archrecord.construction.com/projects/portfolio/2013/01/Perot-Museum-of-Nature-and-Science-Morphosis-Architects.asp>
4. <http://www.controlservices.com>
5. http://www.viessmann.co.uk/content/dam/internet_uk/literature_new_website