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BUILDING YOUR MUSEUM

It's Electrifying!

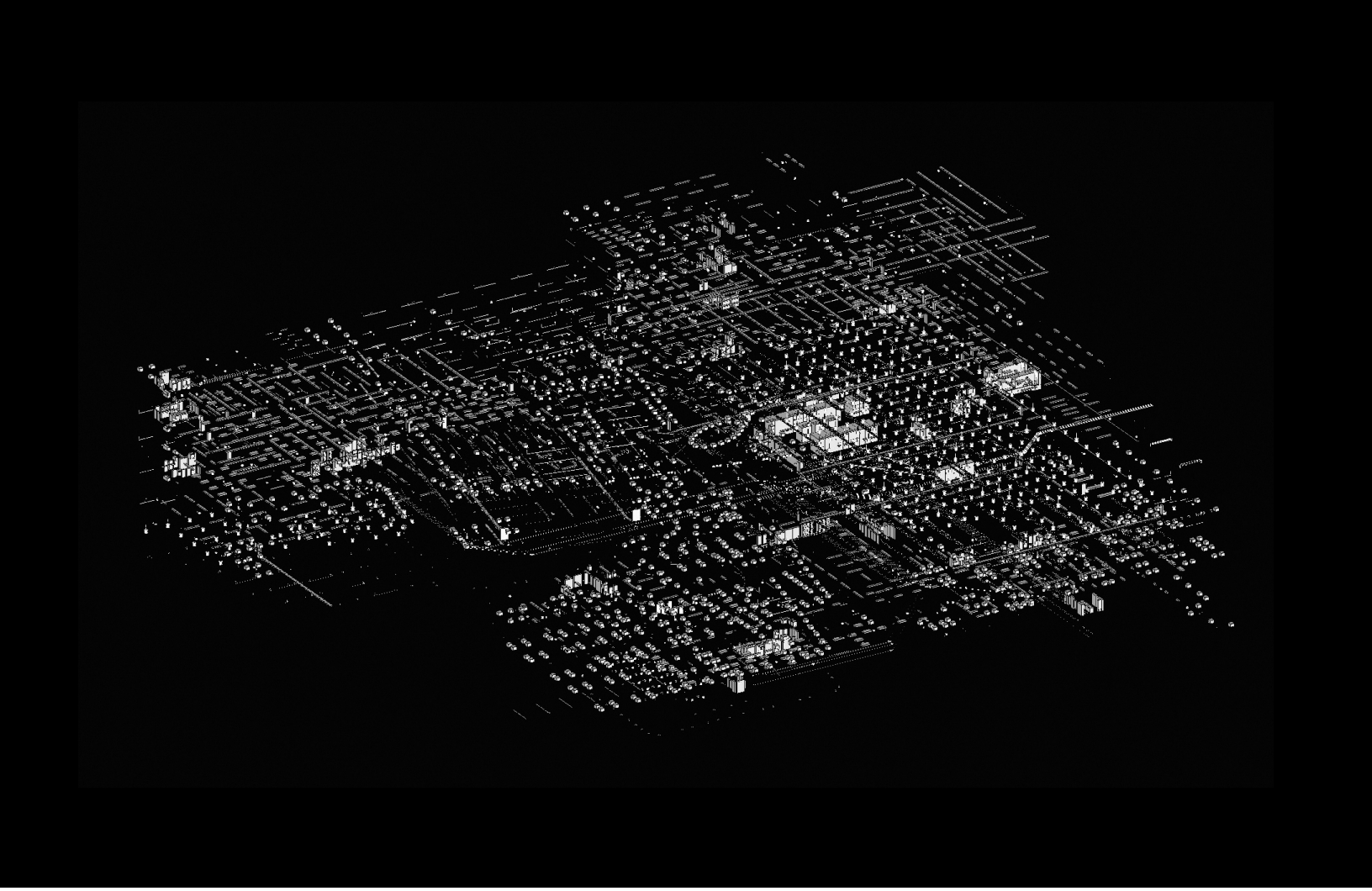
This is third and final installment in a series that showcases the efforts of the structural, mechanical and electrical engineering disciplines, which I have affectionately nicknamed "Earth, Wind and Fire". The focus of this article is on electrical engineering or "fire".

A building's electrical system is akin to the nervous system of your own body. The new Museum building requires a complex and intricate electrical system to keep it functioning at optimal capacity. A complex network of wires (nerves), sub-stations (nodes), relays and breakers work together to distribute the power and signals needed to keep all the critical function of the Museum in working order. The main power (spinal cord) comes into the building at 13,800 volts from two separate Epcor substations. This voltage is 1150 times higher than you'd typically find in your house, where most devices operate at a mere 120 volts. We use transformers to reduce this main voltage down to something that the building systems can use. And use it we do! There are over 20,000 individual electrical devices in the Museum, including light fixtures, power receptacles, data outlets, cameras, card-readers, fire alarms, paging speakers, power panels and transformers. This number doesn't even account for the devices that use the plug-in power, such as computers, printers, and microscopes, etc. Most of the electrical systems remain hidden behind the walls, deliberately designed so that you can't see them—you will only see the functional portions. From layers of conduit piping and cable trays below the basement floor to the custom grid of cable duct-ways within the gallery floors, there's a lot happening that isn't seen, once the concrete is poured and walls are completed.

Sustainable design features of the electrical system include using LED lighting for many areas of the building, utilizing natural light as much as possible in public and non-collection areas, programming lighting controls to turn off electric lighting in areas that are unused, and providing high efficiency transformers. If in the rare event that both substations fail, the Museum building has an emergency diesel generator to supply the critical power needed to service the collections and live cultures while ensuring that our safety and security systems remain on line.

Lighting is the most visible element of the electrical design. It is important to visitors and to the collections. But visitors and collections have very different lighting requirements! For visitors, the lighting is designed to make use of daylight in the lobby to provide a dynamic experience. In galleries, lighting is designed to create dramatic effects to highlight the displays. For the collections, light can be quite damaging, so we employ fixtures that eliminate ultra-violet light and are automatically controlled to turn lights off when there's no-one in the area.

Though I nicknamed this group "Fire," fire is a truly undesirable element in the Museum. The electrical system uses additional sensing through the fire alarm system to detect fires before the sprinklers go off so that Security staff can respond to potential threats before they become significant. Security is another important aspect of Museum operations, both for the safety of people and security of collections. There are cameras throughout the facility to actively monitor what's going on, and there are card-readers and keypads to restrict access into the collections. This is all managed by a sophisticated computer analytics system that assists the Security personnel in monitoring the building.



PHOTOS

FIGURE 1 A network of piping for electrical wires (conduit) is routed inside the concrete floor slabs and walls. The conduit is intended to remain hidden. This requires a great deal of coordination on site by Ledcor and their building trades.

FIGURE 2 Computer model of new Museum building plotting the location of 20,000 built-in electrical devices.