

Capitol Infrastructure Upgrade Report



Michigan State Capitol Commission

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All Pipes and Wires Will Lead to the New Central Utility Plant

The south end of Capitol Square has been a beehive of activity during the last few weeks as work has begun on various components of the Capitol's new Central Utility Plant (CUP).

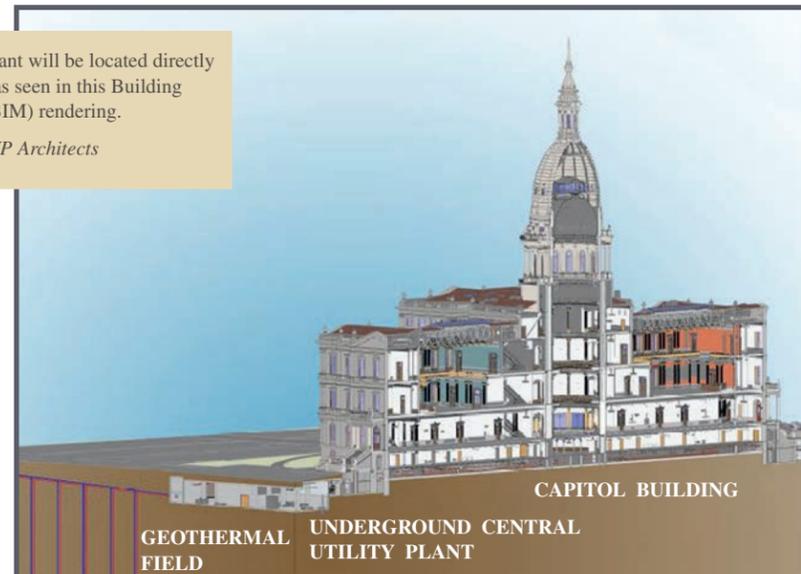
The idea of placing mechanical equipment at the north and south ends of the building dates back to the Capitol's construction in the 1870s, when architect Elijah Myers located boilers under the steps in order to protect the building, and its occupants, from any potential explosions. However, when the local utility began installing steam lines downtown in the early twentieth century, the Capitol quickly abandoned the old system and jumped onboard.

wires, and heating and cooling related equipment. These items were packed in the vaults, and the corridors running under the ground floor, in rather haphazard fashion, creating sometimes potentially dangerous conditions.

The construction of the new CUP will centralize the bulk of the mechanical, electrical, and plumbing equipment, much of which will be replaced and upgraded. Unlike the damp, dim, subbasement, the CUP will be watertight and well-lit. This new environment will provide easier access and safer working conditions for the Capitol's staff, and will help preserve the newly installed equipment.

The Central Utility Plant will be located directly south of the Capitol, as seen in this Building Information Model (BIM) rendering.
Image Courtesy of EYP Architects

The former boiler vaults quickly became a popular place to tuck an increasingly large number of other things. Each technological change in the twentieth century brought more pipes,



Going Green with Geothermal

This October, the Michigan State Capitol is officially going green. As part of the Capitol Infrastructure Upgrade (CIU) project, a new geothermal field will be installed on the west side of Capitol Square. It is projected to be the largest geothermal system at any state capitol.



A 3-D rendering of the west side of Capitol Square showing the new underground geothermal field.
Image Courtesy of Strategic Energy Solutions and EYP Architects

Geothermal systems are, according to the U.S. Department of Energy and the U.S. Environmental Protection Agency, "the most energy-efficient, environmentally clean and cost-effective option available for heating and cooling." Geothermal systems are also self-contained and self-sustaining, providing unparalleled energy security and stability. Following the

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Capitol Infrastructure Upgrade Project Underway

With the passage of the 2017/18 budget, the Michigan State Capitol Commission (MSCC) officially began the Capitol Infrastructure Upgrade (CIU) project, a \$70 million effort to upgrade the failing electrical, mechanical, plumbing, fire suppression, and heating and cooling systems that are critical to the Capitol's operation and preservation. This project, which will touch a multitude of spaces on Capitol Square and in the Capitol building, is expected to last approximately two and a half years.

The MSCC began studying the Capitol's infrastructure problems in early 2016 in response to a growing number of leaks and failures throughout the building and the subbasement. Alarmed, the Commission hired a team of engineers, architects, and systems specialists to analyze the problems, recommend solutions, and create a road map for addressing potentially catastrophic failures before they occur.

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Capitol Infrastructure Upgrade Report

Going Green with Geothermal

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installation of the geothermal system, the Capitol's utility costs are expected to decrease by up to 50%. The system is projected to pay for itself through savings in about seven years.

Geothermal exchange systems use the constant 54-degree temperature of the earth as a heat source in the heating season and as a heat sink for heat rejection in the cooling season. The heat rejected into the ground in the summer can be recaptured to heat the building in the winter. The result is a heating and cooling system that is unmatched in efficiency and environmental impact.

The Capitol's system will be comprised of 224 boreholes, measuring 500 feet deep. Every bore will contain a closed loop of piping, through which a solution of water and environmentally-friendly glycol will constantly circulate. The earth will either warm or cool the solution, which will then move into heat pumps (or heater/chillers), that will generate hot or cold water. This water will then be circulated to air handling units throughout the building.

Work on the geothermal system will progress at intervals throughout the CIU project. The first step, which includes the installation of the bores, looped piping, and grout, is expected to take about five months.

First, a rig will bore a hole into the earth. Immediately following this action, a looped pipe will be installed into the hole and grouted into place. This process will be repeated throughout the field, until all of the boreholes are complete.

Both the looped piping and the grout are important components of the system. Each loop is made up of two pieces of HDPE (high density polyethylene) piping fused together in the factory. The pipes contain no seams, so there is no place for the solution to leak. The expected lifespan of the piping, which has been used by natural gas companies for decades, is anywhere from 50 to 100 years. The grout secures the piping, protects the surrounding earth and aquifer from the threat of contamination, and improves the thermo-exchange conductivity rate.

At first, the location of each bore will be visibly marked by a 1 ¼" pipe (sometimes called a pigtail) sticking out of the ground. Once the bore field is complete, workers will dig a series of horizontal trenches in which straight header



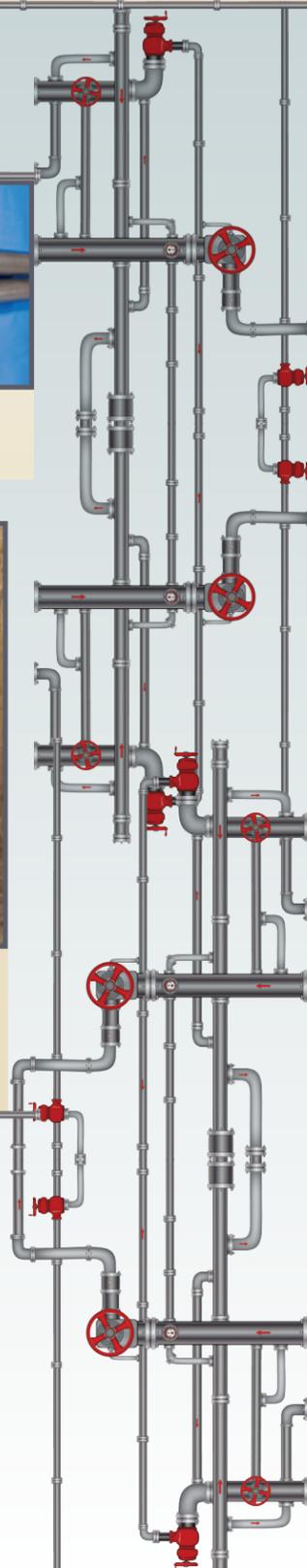
A loop of fused HDPE piping.

Image Courtesy of David Marvin



The two ends of each loop will tie into a header pipe, seen here. Once everything is securely connected, the trenches will be backfilled, hiding all of the piping underground.

Image Courtesy of Strategic Energy Solutions



pipes will be placed. At this time the pigtails will be cut, and the individual loops will be tied to the header pipe, which will, in turn, be connected to a central manifold pipe that will run into the new Central Utility Plant (CUP). After all of the piping is installed the trenches will be filled in with dirt, and the entire system will be hidden about five feet below ground.

Once this installation work is finished, the field will lie dormant while other components of the CIU, including the construction of the new CUP, are executed. When the CUP is complete, and the proper equipment has been installed and linked to the manifold pipe, the system will go live.

Any project this complex requires a knowledgeable team. Happily, the MSCC has a great group of local partners including the Department of Environmental Quality, the Tri-County Regional Planning Commission, the Groundwater Management Board, the Ingham County Health Department, and the Lansing Board of Water and Light. Together these partners are making sure that the project is executed in a safe, efficient manner, so Lansing's underground resources, including the aquifer, will be protected every step of the way. Several members of the team will continue to be involved in monitoring the system in the future.

Capitol Infrastructure...

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Fixing these problems — which include things like corroded electrical boxes, leaking pipes, heating and cooling units that are simultaneously blowing warm and cold air, and improper wiring — won't be easy. While some of the equipment is carefully concealed in hidden mechanical rooms, many projects will touch the Capitol's most important and historic spaces, including the Senate and House Chambers, legislative offices, and even the dome.

By the end of the project, the Capitol will have an all new heating and cooling system, and the bulk of the building's mechanical equipment will be relocated to a new underground Central Utility Plant (CUP). Leaking sprinkler heads will be fixed, and corroded electrical boxes and wiring will be replaced.

When it's all done, we will rest secure in the knowledge that our beautiful, 138-year-old building — and the people who work in and visit the Capitol everyday — are safe from the threat of a major system failure.

Crawl through the sub-basement and see the Capitol's failing infrastructure yourself in a video at www.capitol.michigan.gov/restoration.

Have questions about an MSCC project?

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Want to learn more about Capitol tours, events, or history?

Visit www.capitol.michigan.gov

