The Nebraska Capitol HVAC Project

2016-2026

After two years of planning, the project to replace the 60 year old heating, ventilation, and air conditioning system in the Nebraska State Capitol is in progress. The project is replacing the existing steam and chilled water HVAC system with a closed loop ground source geothermal heating and cooling system. The project is being conducted in five phases and will require the eventual relocation of every office in the building to allow for contractor access.

HVAC History

During the Nebraska State Capitol's 1922-32 construction period, with limited space on site for a power plant, the state took advantage of the University of Nebraska's 1929 construction of a new coal fired power plant and enlarged the system to handle both facilities. The Capitol then relied on steam generated at the University's 14th and U Street power plant and sent through pipes in a tunnel under 14th street to fill radiators located throughout the building. In the 1960's, the decision was made to upgrade the Capitol's system to accommodate chilled water provided by the University's system and cool offices in summer. Most of the original radiators were replaced with induction units which pass air over heated or cooled fan coils. The 1964 units used the original one pipe supply and one pipe return system; the Capitol could be heated or cooled, but not at the same time. The temperature fluctuations of Nebraska's spring and autumn seasons mean elected officials and staff in the Capitol spend some time each year too hot or too cold. By the mid-1990's the aging pipes under 14th Street could no longer carry high pressure steam safely. A natural gas fired steam generation facility was built near the Capitol rather than replace the pipes coming from the University which continued to carry chilled water to the Capitol. The standard life of a HVAC system is 20 - 30 years. Considering the Capitol's system was approaching 60 years of use, the difficulties encountered keeping the system running, and the level of discomfort in the building, the Nebraska Legislature decided in 2014 it was time for a new system.





Above, the 1960's induction units were installed outside the window pockets and took up additional floor space. Below, the new units fit into the window pockets, enlarging usable office space.

New System Description

The Office of the Capitol Commission hired BVH ARCHITECTURE, as consulting architects, and consulting engineers, Alvine Associates, to research systems and develop alternatives for heating and cooling the Capitol. It was determined a closed loop ground source geothermal system was the most energy efficient and cost effective over the long term. Fortunately, the State of Nebraska had just acquired a city block size surface parking lot one block from the Capitol which proved ideal for a geothermal well field. A two year planning and design phase fine-tuned the system and its installation. New fan coil units with the capability for individual office temperature control are being installed in most areas of the Capitol. Depending upon the need, the system will pull heat from or put heat into water circulating in a continuous closed loop from the Capitol to the well field. During the coldest months, the system will be backed up with steam from the state's natural gas steam plant near the Capitol.

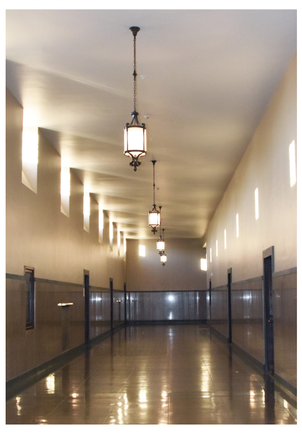
Scope of Work

Several additional projects will accompany the HVAC work. Along with the installation of new fan coil units in offices, the original steam radiators in the Capitol at entrances, in corridors and in stairways will be reconditioned and reused. Key to the efficiency and energy savings of the project will be the repair and weatherstripping of the Capitol's windows. Because the project will require removing staff from every office in the building during the demolition and construction process, the Office of the Capitol Commission will improve the life safety system in the Capitol, installing a new fire alarm/emergency notification system and fire sprinklers where needed. A backup emergency generator has been installed off-site in space shared with the Office of the Chief Information Officer. During well field construction, footings able to accommodate a future parking garage and office building were installed to expand potential use of the well field site in the future.

Phase IV Description

Phase IV of the HVAC Project involves the northeast quadrant of the Capitol housing offices of the executive branch. This quadrant contains adaptive use office space, some still with 1960's finishes, and the Governor's Suite, the most highly finished preservation space in the Capitol. In Phase IV the contractors will again install temporary partition walls and protection, and repeat the process of removing all existing HVAC equipment and installing the new refrigerant lines and fan coil units. Windows in the Phase IV area will be repaired and fitted with weatherstripping. Corridor light fixtures will be removed, cleaned and rewired. The first floor corridor ceilings will return to their original height and the light fixtures return to their original location using new lengthened chains. In addition, damaged finishes in the Governor's Suite will be restored.

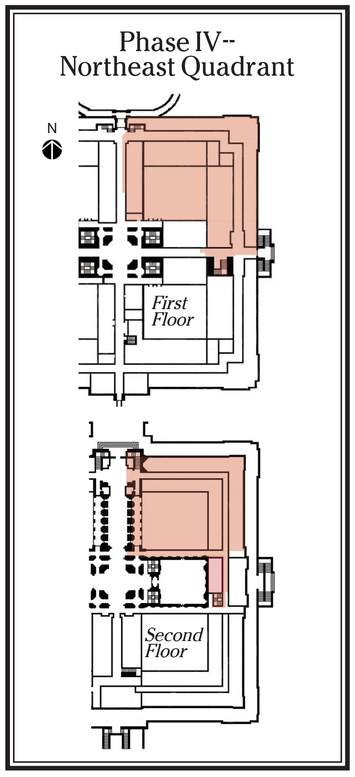




Above: ceilings lowered to hide air ducts added in the 1960's upgrade are being removed in the first floor corridors during the project. Below: light fixtures restored to their original length are then re-hung in the project areas. Exposed clerestory windows increase available light and return corridors to original appearance. Corridor restoration will continue throughout the first four phases of the project.

Project Timeline

2016 - 2018	Schematic Design & Design Development Construction Documents Contractor Pre-qualifications Design Bidding
2016 - 2019	Electrical and Generator Connections
2018 - 2019	Well Field Investigation & Construction Phase I--Southwest Quadrant
2020 - 2021	Phase II--Southeast Quadrant
2021 - 2022	Phase III--Northwest Quadrant
2023 - 2024	**Phase IV--Northeast Quadrant**
2025 - 2026	Phase V--Tower



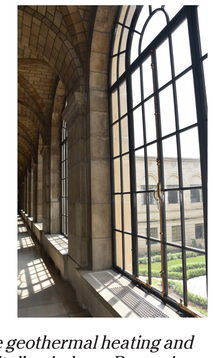




A mechanical room (left) created in the 1950's to house air-conditioning was located above the Governor's Suite. When this mechanical system was new it was a not such a concern to have it above Preservation Space. But, as the system aged and became difficult to repair, pump failure and condensation has caused water to move down into a decorative molded plaster ceiling in the Governor's Suite (right). During the fourth phase of the HVAC project, contractors will remove the old mechanical equipment and the attic space will be vacated and eventually used for storage. While the Governor's Suite is unoccupied during Phase IV, conservators will repair the damaged plaster and restore the ceiling.











One of the keys to the efficiency of the new ground-source geothermal heating and cooling system is repairing and weatherstripping the Capitol's windows. Removing windows, weatherproofing the empty locations (above left and center) and returning the repaired and reglazed second floor windows (above right) requires scaffold installation, closing courtyard access. The steel windows in the Capitol's base have suffered from lack of maintenance for decades. Wind-blown rain and snow infiltrated the window frames and caused grim and rust to accumulate. The damaged frames (above right) made operating the windows difficult. Repaired windows (lower right) with cleaned and repaired bronze hardware are easier to operate and the addition of weatherstripping reduces air infiltration.