# The Nebraska Capitol HVAC Project

## 2016-2025

**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 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.

## New System Description

The Office of the Capitol Commission hired BVHARCHITECTURE, consulting architects, and consulting engineers, Alvine Associates, to research systems and develop alternatives for the 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

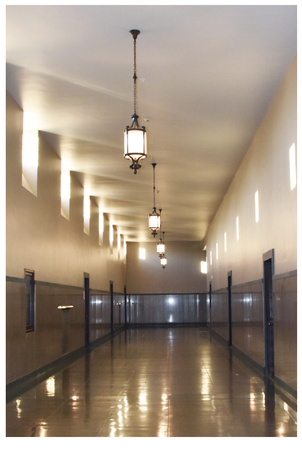
Several additional projects will accompany the HVAC work. Along with the installation of new fan coil units in offices, the original steam radiators in the Capitol at entrances, in corridors and in stairways will be reconditioned and reused. Key to the efficiency and energy savings of the project will be the repair and weather-stripping 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 constructed 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 III Description

Phase III of the HVAC Project involves the northwest quadrant of the Capitol housing offices of the Legislature and the State Treasurer. This quadrant is almost exclusively adaptive use office space. In Phase III the contractors will again install temporary partition walls and protection and then repeat the process of removing all existing HVAC equipment and installing the new refrigerant lines and fan coil units. Windows in the Phase III area will be repaired and fitted with weather-stripping. Corridor lamps will be removed, cleaned and rewired. The first floor corridor ceilings will return to their original height and the lamps return to their original location using new longer chains. The Capitol Tour Office will temporarily move, but tours will continue as scheduled. The West Legislative Chamber is part of the project but will remain available for use during Legislative Sessions. The accessible elevator will remain available for public use, but be within the project area.

*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 useable office space.*

*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, lamps restored to their original length are then re-hung in the project areas. Exposed clerestory windows increase available light and return corridors to original condition. Corridor restoration will continue throughout the first four phases of the project.*



## Project Timeline

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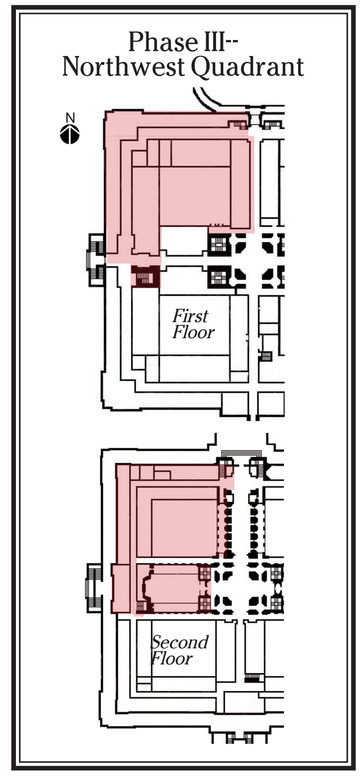
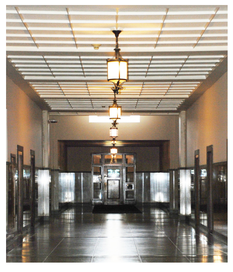
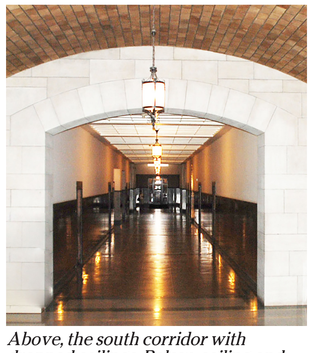
|---|---|---|
| 2016 - 2018 | = | Schematic Design & Design Development<br>Construction Documents<br>Contractor Pre-qualifications<br>Design Bidding |
| 2016 - 2019 | = | Electrical and Generator Connections |
| 2018 - 2019 | = | Well Field Investigation & Construction<br>Phase I--Southwest Quadrant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



*When chilled water from the University of Nebraska was added to the Capitol's HVAC system in a 1960's upgrade, an extensive duct network was installed to move cooled air from air handlers to spaces throughout the building. The ducts were installed across corridors and dropped ceilings added to hide the duct work, left. The current HVAC system upgrade relies on circulating water and refrigerant, not air, for cooling. The demolition of the old duct system and removal of the dropped ceiling in the south corridor uncovered hidden original crown molding. Any ducts needed for fresh air circulation in the new system are being placed above the plaster ceilings or routed through soffits. The original ceiling height and detail in the south corridor was restored during Phase II.*



*Above, the south corridor with dropped ceilings. Below, ceiling and walls restored and ready for paint at the end of Phase II of the project.*

*Left, dropped ceiling panels throughout first floor corridors hid added duct work, above, which hung below original plaster ceilings. The original plaster ceilings were extensively damaged during the 1960's work.*

*Above, ducts were removed or rerouted into soffits. Plaster contractors recreated soffits using wire lath and plaster, and repaired the holes in the ceiling returning the space, left, to its original appearance.*

*The ceiling and walls in the south center corridor, above, were filled with holes left by the 1960's duct work. Holes in the walls were filled by clay wall tile and ceilings repaired with wire lath and plaster.*

*Above, plasterers built up the crown molding detail in layers for stability. The final plaster layer was sculpted, left, to follow the profile of the original molding. The goal was to make the repairs unnoticeable.*