

# 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 has begun. The project will replace the existing hot water and chilled water system with a closed loop ground source geothermal heating and cooling system. The project will be 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 continue 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 consulting architects BVHARCHITECTURE and consulting engineers Alvine Associates to research systems and develop alternatives for 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 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 will be 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 will be 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 will be installed to expand the future potential use of the well field site.

### Phase I Description

During Phase I of the HVAC Project the contractor will move into a shop in the Capitol's basement and develop a work schedule with the numerous subcontractors. At the well field site bounded by 17th, 18th, K and L Streets 225 wells 670' deep will be drilled and piping installed. Underground directional boring will bring the pipes carrying the recirculating water to the northeast side of the Capitol via K Street. A backup generator will be installed off-site. Inside the Capitol, contractors will install temporary partition walls for safety and security in the work area. Contractors will remove all existing HVAC equipment in the southwest quadrant of the Capitol, and install the new fan coil units and refrigerant lines. All windows in the Phase I area will be removed, repaired and reinstalled with weather-stripping. All corridor lamps will be removed and the suspended corridor ceilings demolished. The plaster corridor ceilings will be restored to their original height and corridor lamps replaced in their original configuration using new longer chains.



Originally, steam radiators in the tower were located at the columns between the ribbon windows, above, and in the base of the Capitol in the window pockets.



The 1960's HVAC upgrade placed the new induction units along the tower columns, above. These units changed the appearance of the windows and office space.



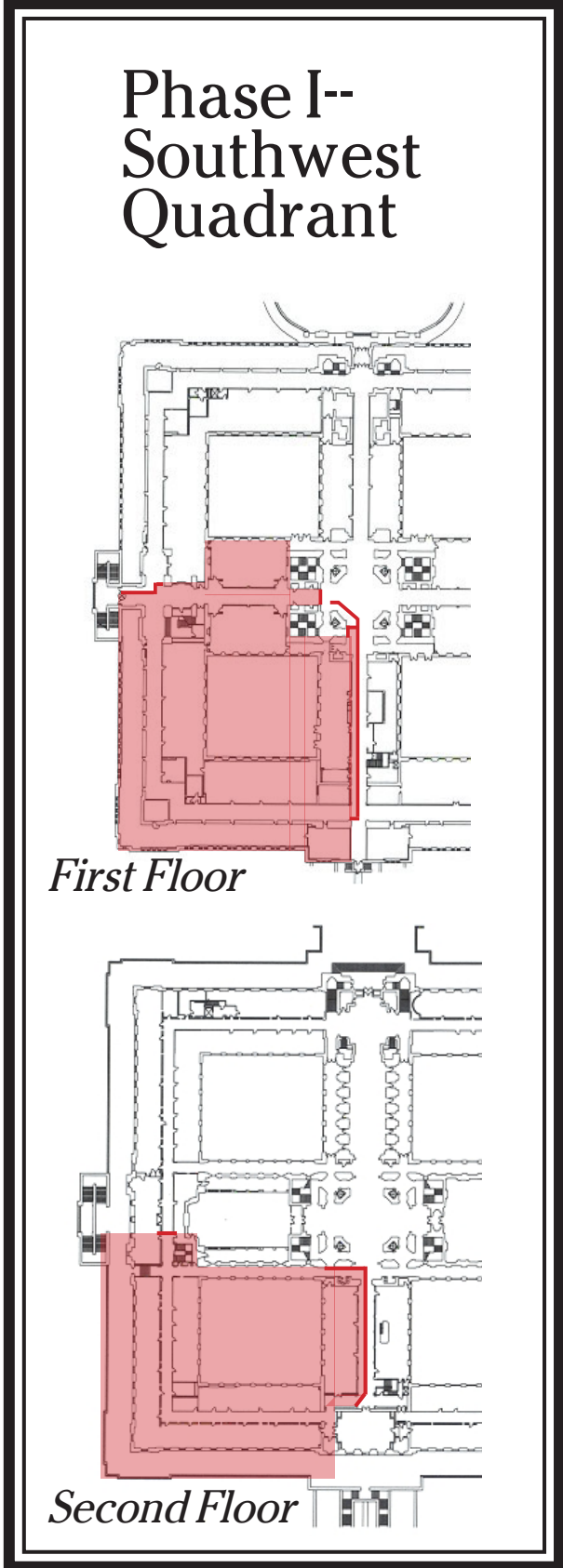
The 1960's induction units were placed outside the window pockets and moved into office floor space. The window pockets filled in with sheet metal shelves.



The current project will remove the induction units and install variable temperature fan coils in original locations, on columns in the tower, above, and window pockets in the base.

### 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
- 2024 - 2025 — Phase V--Tower



Original radiators still in service will be reconditioned and reused.



The original painted ducts will be reused in the new system once the 1964 galvanized ducts are removed.



The steam supply system will continue to operate until the final phase when new steam equipment will be installed.



Placing the well field under a state-owned surface parking lot saved money. Test well drilling, below, provided valuable information for the design of the new system.



Window repair and weather-stripping are key to energy efficiency and cost savings.



Left, drop ceilings and hidden 1960's ducts will be removed from first floor corridors during the project. Lamps will be restored to their original length, right, and hung at the proper height from restored plaster ceilings. Perimeter clerestory windows will be fully exposed increasing available light.