



Ragdale, Lake Forest, Illinois

Architectural Consulting Engineers (ACE) was the mechanical engineering consultant for a Historic Structures Report (HSR) and restoration project for the historic Ragdale House in Lake Forest, Illinois. Ragdale was the country summer home designed and built in 1897 by Howard Van Doren Shaw for his personal family use. The home was modernized and added onto throughout the years and was developed into an artist's community in 1976 by Shaw's granddaughter, Alice Judson Hayes. It was eventually donated to the City of Lake Forest in 1986, while the Ragdale Foundation continues to operate the building and grounds as an artist retreat. The Ragdale house is used as a residence for a rotating group of artists who stay in the guest suites and use the balance of the spaces for their home-away-from-home experience including a residential kitchen, living and dining room, porches and the beautiful grounds – all of which help promote a quiet and peaceful atmosphere while they are in residence.

As part of the HSR, ACE prepared a feasibility study that reviewed different HVAC systems that might be installed in the house to improve guest comfort and reduce the building's overall energy use. The study showed that a geothermal system had the best overall life cycle cost and the Ragdale Foundation selected that system to move forward with once the full restoration project moved ahead. In addition to the new HVAC system, the building had an obsolete electrical distribution system and a plumbing system that presented many maintenance problems for guests and staff. The restoration project improved the building envelope by renovating the existing windows to reduce infiltration and added wall and attic insulation to reduce thermal losses through the building walls and roof. By improving the envelope first we were able to design a smaller, less costly HVAC system than would have been possible if the improvements had not been completed. Another wonderful feature of the geothermal system on this site is the elimination of any exterior equipment. This building sits on beautiful grounds so there is not really any suitable location to place an exterior condensing unit that wouldn't present a visual or aesthetic barrier to fully enjoying the grounds.

The final project included a full electrical service upgrade and new electrical distribution system to eliminate the obsolete components, an extensive plumbing system renovation that largely replaced the aging plumbing pipes, a full wet pipe fire sprinkler system, and a new zoned geothermal heat pump system. This system is made up of four units serving the variety of spaces throughout the building. Each of the five guest suites has individual thermostatic control as does the care taker apartment, kitchen, sun room and general first floor living space. The loop field is circulated with a variable volume pumping system, there is an energy recovery ventilation system that captures energy from the exhaust in the building and preheats the replacement fresh air, and the heat pump system helps to provide low cost domestic hot water.