LIZARDOS

June 21, 2024

Reference: John Jermain Memorial Library
Air Source Heat Pump Chiller Installation
Lizardos Project Number: 10907.00

To Whom it May Concern:

Lizardos Engineering Associates, D.P.C. (Lizardos) has reviewed the questions raised at the recent planning board meeting regarding the design of the air source heat pump chiller installation at John Jermain Memorial Library in Sag Harbor, NY.

Our review and response to the items raised during this meeting are as follows:

1. Regarding closed loop geothermal system feasibility:

   The first phase of the project to evaluate the existing heating, ventilating, and air conditioning (HVAC) systems at the Library included an evaluation of multiple options, including refurbishing/replacing the existing geothermal system. The existing system is an 'open loop' geothermal system, pulling water directly from the ground and utilizing it for cooling/heating within the building. Given the condition of the current geothermal wells, and the short time frame in which they have caused corrosion within the building HVAC equipment, it was deemed not worthwhile to refurbish the existing well system, as the same situation would be likely to reoccur.

   In addition to the 'open loop' system, we evaluated the feasibility of a 'closed loop' geothermal system, which in lieu of pulling water directly from the ground for cooling/heating, water is instead circulated through buried piping, typically in the form of vertical boreholes spaced throughout an open area of ground. As the water does not come into direct contact with the ground, 'closed loop' systems have the benefit of less corrosion than an 'open loop' system, but require significantly more land area to accommodate the borefield.

   Typical 'closed loop' geothermal system sizing is in the range of 200 linear feet of piping per ton of cooling. The John Jermain Memorial Library HVAC system is sized with a peak cooling capacity of 60 tons. As a result, a 'closed loop' geothermal field would require 60x200 = 12,000 linear feet of piping to provide 60 tons of heat rejection. In a vertical configuration, with a typical borehole depth of 500 feet, this would equate to 24 boreholes, spaced out 20 feet on center. In a 6x4 grid, this equates to over 6,000 square feet of space required to install this system. The total square footage of outdoor space on the Library's property is approximately 4,500 square feet, though this includes numerous dry wells and other underground utilities that further reduce the available space for a geothermal system. As such, it was determined after a thorough review that a 'closed loop' geothermal system is not viable on this property.

2. Regarding the feasibility of re-using the existing wells:

   In the early phases of the Library's evaluation of the HVAC system operational issues, P.W. Grosser Consultants, Inc. was hired to provide an evaluation of the existing 'open loop' geothermal system. P.W. Grosser is the most experienced geothermal consulting engineer in the region, and performed a thorough review of the existing system. Their conclusion is that the current wells are clogged with biofilm which is reducing the flow and heat transfer of the ground water. While it is possible to clean this biofilm, that is a very costly and temporary solution, and not suitable for the long term viability of the system. As outlined above, converting to a 'closed loop' system would also not be feasible at this site.

3. Regarding the feasibility of locating the air source heat pump chillers below grade:

   The air source heat pump chillers operate by pulling in air through condenser coils on the sides of the equipment, and discharging this air vertically out of the top of the unit. In order for the system to operate as designed, it is critical that this airflow not be impeded. The air source heat pump chiller manufacturer has published installation guidelines that stipulate the proximity of any walls to the equipment. Additionally, the manufacturer has provided a letter stating that this equipment is not suitable to be installed below grade. Such an installation against the manufacturer's installation instructions is likely to not only result in reduced capacity and operational issues with the system, it is also likely that the manufacturer will not provide a warranty for such an installation.

4. Regarding the alternate unit location next to the courtyard:

   Lizardos has prepared sketches and renderings of the installation on both sides of the building. These renderings have been provided to the planning board for review. Lizardos has concerns that the close proximity of this equipment to the adjacent neighbor on Jefferson Street will result in noise complaints. Additionally, this area results in a direct impact to the Library patrons and the usage of the Library courtyard.

5. Regarding the feasibility of locating the equipment on the roof:

   In the early phases of the design, multiple locations for the air source heat pump chiller were evaluated. The roof of the building was included as a potential location. However, the roof location was deemed to be not feasible due to a number of factors:

   - In order for the equipment to be installed on the roof and maintain the manufacturer's required service clearances, a wall would be required on all sides of the equipment at the edge of the building – effectively creating another floor on top of the existing building. The Library expressed their concerns about the appearance of such an installation.
   - Installation of the equipment on the roof would require additional structural steel dunnage, along with a catwalk around the equipment. This would result in significant additional cost, as well as impact to the Library space below during construction.
   - The current access to the Library roof is via an attic-type pull down ladder on the top floor of the building. The air source heat pump chiller requires periodic maintenance to maintain suitable operation. Performing such maintenance with this limited access to the roof would be difficult, especially if replacement of a motor or other component is

required. This was deemed to be a safety hazard, and was another factor in determining that the roof installation is not feasible.

We hope the above summary clarifies any outstanding questions on this issue. If there are any further questions, please do not hesitate to call me.

Sincerely,
LIZARDOS ENGINEERING ASSOCIATES D.P.C.

Patrick J. Tennant, P.E., CEM, CBCP
Associate Vice President