



## Steam to Hydronic Conversion Feasibility Study

Campbell Cassetta Architects, PC has teamed with Energia Engineering, PC and have completed a Feasibility Study Survey for Floral Park - Bellerose Union Free School District (UFSD).

The purpose of this study is to set forth a plan which considers various options for the modernization of the aging steam heating infrastructure and the addition of centralized cooling to the facilities.

## Facility Description

### Floral Park – Bellerose Elementary School



Floral Park - Bellerose School was constructed in 1929 with additions added in 1973, 1992 and 2021. It is a 3-story building with approximate area of 144,000 SF and caters to grades Pre-K through 6.

**Heating Systems:** The building is heated by two cast iron sectional Steam boilers (convertible to Hot Water) with approx. 3,600 MBH capacity manufactured by HB Smith. Both boilers are dual fuel, capable of burning either number 2 Fuel oil or natural gas. A portion of the steam from the boilers flow to steam to hot water heat exchangers, and the hot water is distributed to multiple different terminal devices primarily including Unit Ventilators, Fin Tube Radiators, Cabinet Unit Heaters, and Packaged Rooftop Units.

**Cooling Systems:** The building is selectively cooled with Packaged Rooftop Units, Variant Refrigerant Flow Heat Pumps, and standard condensers. In addition, many of the classrooms have window AC units for cooling, but the majority of the building does not have centralized cooling.

### John Lewis Childs Elementary School



John Lewis Childs Elementary School was constructed in 1921 with additions in 1925, 1973, 1992 and 2021. It is a 3-story building with approximate area of 119,000 SF and caters to grades preK-6.

**Heating Systems:** The building is heated by two cast iron Steam boilers (convertible to Hot Water) with approx. 3,600 MBH capacity manufactured by Weil McLain. Both boilers are dual fuel, capable of burning either number 2 Fuel oil or natural gas. A portion of the steam from the boilers flow to steam to hot water heat exchangers, and the hot water is distributed to multiple different terminal devices primarily including Unit Ventilators, Fin Tube Radiators, Cabinet Unit Heaters, and Packaged Rooftop Units.

**Cooling Systems:** The building is partially cooled with Packaged Rooftop Units, Variant Refrigerant Flow Heat Pumps, and standard condensers. In addition, many of the classrooms have window AC units for cooling.



## Recommended: Steam to Hot Water Conversion

Due to the location and size of these schools, modern day hot water systems are long lasting, reliable and will significantly decrease energy and maintenance costs throughout the district. The amount of energy required to convert water to steam is extensive, far less efficient than hot water condensing boilers, and many of the required accessories needed for steam systems are failing throughout the schools, particularly the piping.

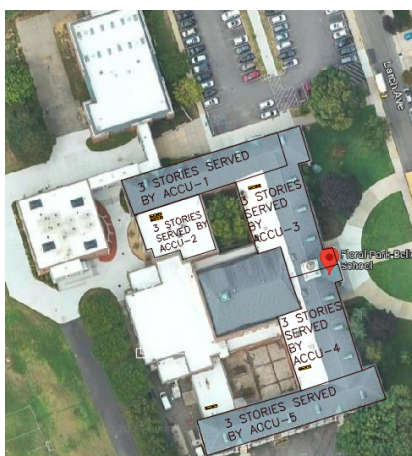
Modern hot water heating systems offer several significant advantages over the antiquated steam heating systems currently in operation in these facilities:

1. Energy Efficiency: Hot water heating systems are significantly more energy-efficient than steam systems.
2. Even Heat Distribution: Hot water systems provide more consistent and even heating throughout a building, eliminating temperature fluctuations, and overheating of spaces that are common with steam systems.
3. Lower Maintenance: Hot water systems require significantly less maintenance than steam systems which are prone to issues like steam leaks, failing steam traps and condensate return problems.
4. Reduced Noise: Hot water systems are quieter than steam systems, as they don't have the hissing and banging associated with steam distribution.
5. Safer Operation: Steam systems can pose safety hazards due to the high pressure and temperatures that they are required to operate with.

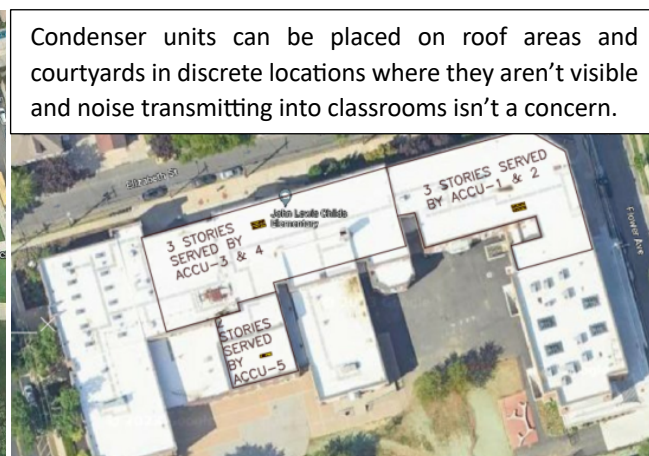
## Recommended: VRF Condensers – Add Cooling / Supplemental Heating



Adding a Variable Refrigerant Flow (VRF) heat pump system would be a significant upgrade in comfort and energy efficiency. The heat pump system would supply cooling and humidity control along with supplemental heating to all the classrooms and would eliminate the need to install a centralized chiller plant to provide cooling through the new hydronic system being used for primary building heat.



Floral Park - Bellerose School

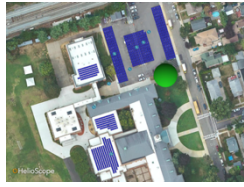


John Lewis Childs Elementary School



## Not Recommended: Solar PV Systems

### Floral Park – Bellerose School



Following a Helioscope analysis of the building, while avoiding unsuitable roof areas reveals that an installation of rooftop and carport solar could potentially be accommodated at this location of approx. 214 kWdc. Even when NYSED building aid is considered, the payback on the system would be more than 32 years and is therefore not recommended.

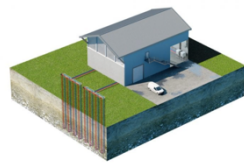
### John Lewis Child Elementary School



Following a Helioscope analysis of the building, while avoiding suspect roof areas, obstructions and NYS Fire Code requirements reveals that only a very small area is feasible, around 48.1 kWdc could be installed on a roof. Based on the small size of the system and upfront costs to install it, Solar PV is not recommended at this time.

## Not Recommended: Geothermal Heating and Cooling

### Floral Park – Bellerose School



The building would require a well field of approximately 202 vertical wells @400 ft depth. This would require a field area nearing 1 acres in size and add approximately \$2M to the capital costs. The system would increase the operation costs of the building as compared with a modern hydronic system in excess of \$500k over its 25-year life span given the high cost of electric utilities and is therefore not recommended.

### John Lewis Child Elementary School

The building would require a well field of approximately 106 vertical wells @400 ft depth. This would require a field area nearing 1/2 acre in size and add approximately \$1.2M to the capital costs. The system would increase the operation costs of the building as compared with a modern hydronic system in excess of \$95k over its 25-year life span given the high cost of electric utilities and is therefore not recommended.

## Not Recommended: Central Chiller Plant



While this is technically feasible as an option only for the Floral Park – Bellerose School, the additional costs, long term maintenance requirements, aesthetics and noise considerations associated with implementing a 400+Ton chiller at these schools make this solution undesirable and less effective than implementing the VRF cooling solution.