

Alternate HVAC Systems Options Memorandum

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and



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Revolution Labs

Alternate HVAC Options

TABLE OF CONTENTS

Project Description..... 3
Mechanical..... 3

Revolution Labs

Alternate HVAC

Systems Options

Project Description

AHA has been asked to provide some general high-level description of the Mechanical systems. Below is a description of the base Mechanical design as well as alternate systems options for the 1040/1050 Waltham Street Lab Core and Shell project.

Mechanical

Base HVAC Design System

Typical lab/office type buildings utilize custom 100% outside air, air handling units with hot, chilled and heat recovery coils to provide the required ventilation for lab spaces. Custom air handling units are paired with custom exhaust air handling units with high plume dilution exhaust fans for once through air. Heating and cooling provided by a centralized chiller plant and boiler plant utilizing centrifugal liquid chillers with cooling towers and high efficiency gas-fire condensing hot water boilers. Heat recovery system to capture lost energy from the exhaust air system and transferred to the supply air to reduce chiller and boiler plant operation. Chilled water and hot water would be piped to the tenant floors for extension to 4 pipe fan coil units to service tenant office areas.

Based on the present market for lab space and the reliability of these types of systems, these systems provide the best overall performance in conditioning large amounts of outside air for lab spaces.

The downside to these systems is the overall size of the equipment. Custom air handling units required large chiller and boiler plants to heat and cool 100% outside air resulting in a significantly large mechanical space required for these systems. Cooling towers will be required outside on the roof for the chiller plant and can consume large amounts of city water and chemical treatment. Traditional run-around heat recovery systems which are commonly used only provide efficiencies around 25-35%.

Alternate Design Option - Konvekta Heat Recovery Pumping System

Konvekta heat recovery system is a highly efficient packaged heat recovery system utilizing cutting edge technology to provides substantial energy savings and best product payback. Konvekta heat recovery systems can produce energy recovery effectiveness upwards of 50-70% utilizing a heat recovery coil specially design by konventa for optimal heat transfer. Konvekta's packaged pump heat recovery systems is a substantial up-grade to traditional run around heat recovery systems.

Konvekta packaged heat recovery systems are a higher upfront cost which is a factor in determining whether to use this system. Lead time on Konvekta coils, which are manufacturer in overseas can also play a factor as well.

Konvekta system is generally 2-4 year payback in this application. It eliminates the hot water coil within the air handling units and reduces overall length of units.

Summary from 7-8-2020 Review meeting: Team agreed to review incorporation of high efficiency heat recovery system (Konvekta) as design progresses.

All-Electrification Option – Water Source Heat Pump Systems for Tenant Office Space

Water source heat pumps operate much like a traditional air source heat pump except that it extracts and dissipates heat by way of water instead of air. Water source heat pumps are the highly energy efficient and utilizes the buildings condenser water system to extract and dissipate the heat.

This system is ideal system to provide heating and cooling to the tenant office space. Does not limit certain area's in the building to be designated to be office space. Utilities required at each floor are capped condenser water lines. Heat pumps and condenser water distribution shall be provided by tenants.

The downside to water source heat pumps is it requires a separate dedicated condenser water loop with some form of heat injection to maintain loop temperature in the winter and required additional pumps, piping, etc. as a day one cost. In addition, there is a higher level of noise associated with water source heat pumps as compared to 4 pipe fan coils due to compressors and fans.

Summary from 7/8/2020 Review meeting: Team agreed to consider use of water source heat pumps as design progresses as possible strategy for minimizing reliance on fossil fuels for office area heating.

All Electrification Option – Variable Refrigerant Flow (VRF) Systems for Tenant Office Space

Variable refrigerant flow (VRF) systems vary the flow of refrigerant to indoor units based on demand. This ability to control the amount of refrigerant that is provided to the indoor fan coil units located throughout a building makes the VRF technology ideal for applications where simultaneously heating and cooling is required.

This type of system is Ideal system to reduce the overall footprint of the mechanical systems in the building. Does not limit certain area's in the building to be designated to be office space. This type of system would be provided by the tenants.

The downside to this type of system is the require roof space that would need to be allocated for the air-cooled condensing units. The limitations on the length of refrigerant piping between the indoor units and the condensing units on the roof. High upfront cost and labor intensive, and it introduces another level of infrastructure in the building. In addition, recent pandemic related scrutiny regarding air filtration has highlighted the limitations of the current available VRF technologies to provide higher levels of filtration.

Summary from 7/8/2020 Review meeting: Team agreed to consider use of VRF fan coils as design progresses as possible strategy for minimizing reliance on fossil fuels for office area heating.

All Electrification Option – Rooftop units with direct expansion cooling and electric heat for tenant office space

Traditional rooftop units with direct expansion cooling and electric heating coil to provide conditioned air to the tenant office space. System would be comprised of a main supply ductwork down to each floor with return air via a return air shaft and return air openings at each floor.

Provides the tenant office space with a variable air volume system utilizing traditional variable air volume terminal units for interior zones and fan-powered terminal units with electric reheat coils on exterior zones.

As we are asked to move toward a reduced carbon footprint, the use of traditional rooftop units with direct expansion cooling and electric heat are being looked at closely to meet the need of all-electrification in buildings. Rooftop units are not ideal for this application as they limit areas of the building to be designated for office space. They also require space on the roof and additional shaft area within the building.

Summary from 7/8/2020 Review meeting: Team agreed that due to the programming limitations this option would impose on tenant layouts, this option would not be considered further.

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