Berlin High School

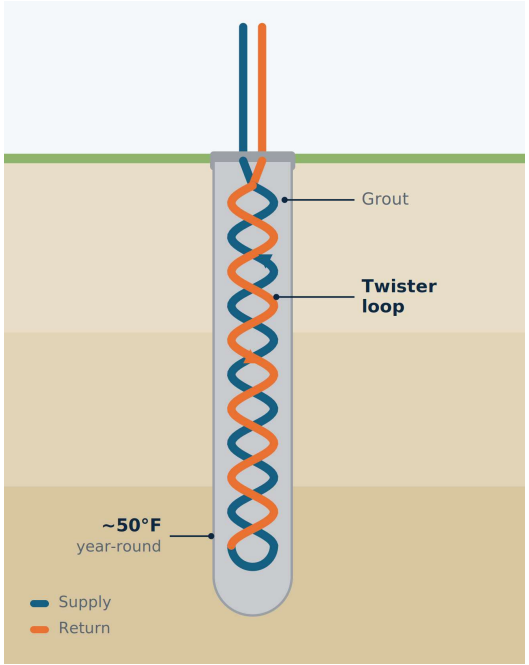
Geothermal conversion considerations

Presentation by: Matt Desmarais, CEM
mattd@energycatalysttech.com
Energycatalysttech.com

ENERGY CATALYST
GROUNDBREAKING CLEAN HEAT

What Is Geothermal?

A geothermal (ground-source) system taps the earth's stored heat to warm and cool a school, offsetting and replacing on-site fuel-oil combustion.



1

Stable Ground Temperature

A few feet down, the earth holds a steady ~50°F all year — a free, renewable energy reservoir.

2

Loops + Heat Pumps

Fluid circulates through buried ground loops; electric heat pumps move that heat into or out of the building.

3

Comfort All Year

One system heats classrooms in winter and cools them in warmer months — with no fuel oil required.

Why Convert from Fuel Oil to Geothermal?

✓ Comfort

Even, quiet heating and cooling in every room — no hot-and-cold zones, with better humidity control and fresh-air ventilation control.

✓ Savings

Berlin purchase fuel at a favorable price, the price equivalent of geothermal is still about 4x lower.

June 2026, #2 fuel oil is $3.2813/gal.
June 2026, geothermal equivalent price per gallon $0.72-$0.85

✓ Environmental Impact

Removes on-site fossil-fuel combustion and its carbon emissions. Cleaner air inside and out, in step with New York’s climate goals.

✓ Redundancy

Multiple heat pumps share the load, so if one needs service the others can make up the difference.

NYSERDA Clean Green Schools Initiative

Our plan: Fund the majority or all the conversion with this New York State grant.

UP TO

100%

of eligible project costs can be covered by the grant

$41M+ already awarded statewide to school decarbonization projects

What it is

A NYSERDA grant funded by New York's 2022 Environmental Bond Act, created to help public schools cut emissions and replace fossil-fuel heating with heat pumps.

Track II – Installation

Directly funds construction projects like a full fuel-oil-to-geothermal conversion.

Our plan

Pursue a Clean Green Schools grant to cover nearly all of the project. Reducing taxpayer burden through cost savings in future years.

Building Aid protected

Receiving the grant does not reduce the district's State Building Aid.

Existing System is Compatible with Geothermal

An initial site walkthrough was performed and a no-cost detailed audit is underway.

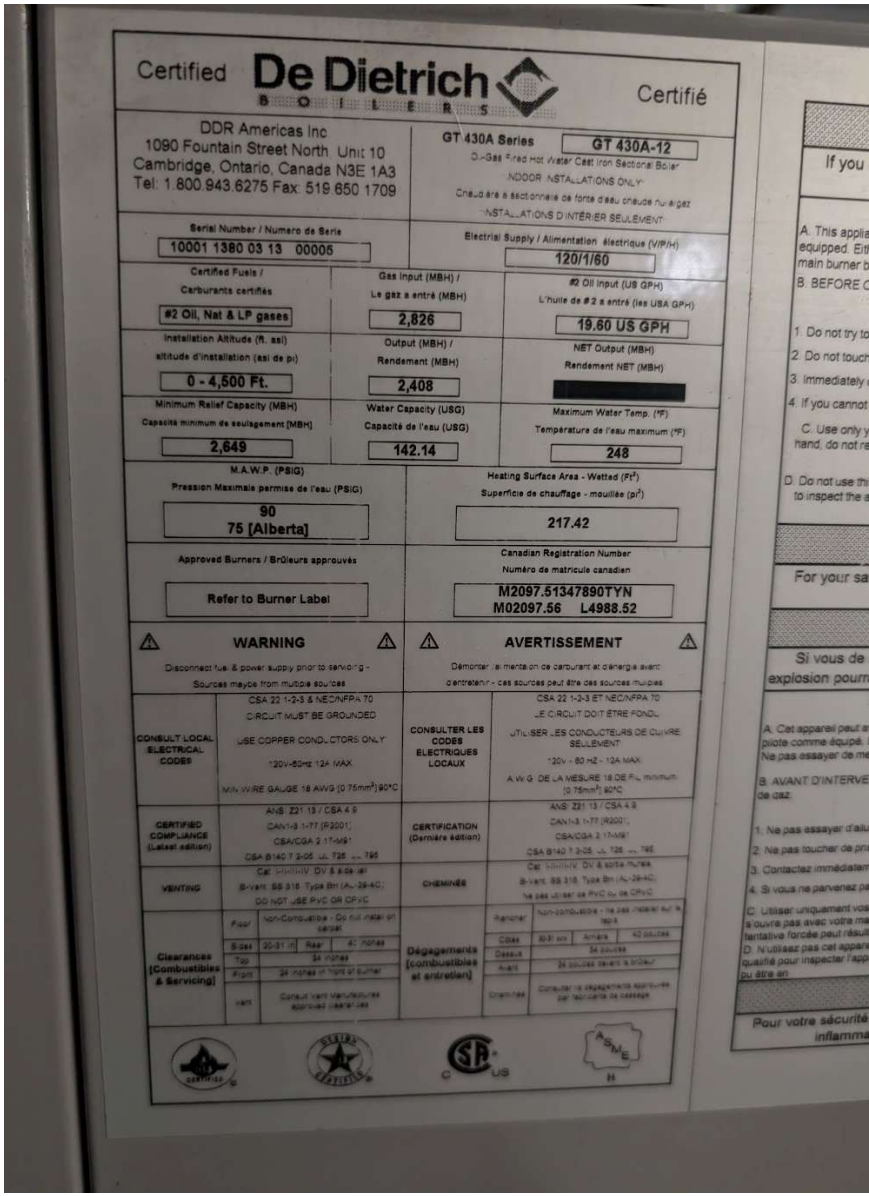
The following slides catalog key pieces of the existing heating infrastructure.

(2) 2019 boilers

Boilers to be left in place for backup.

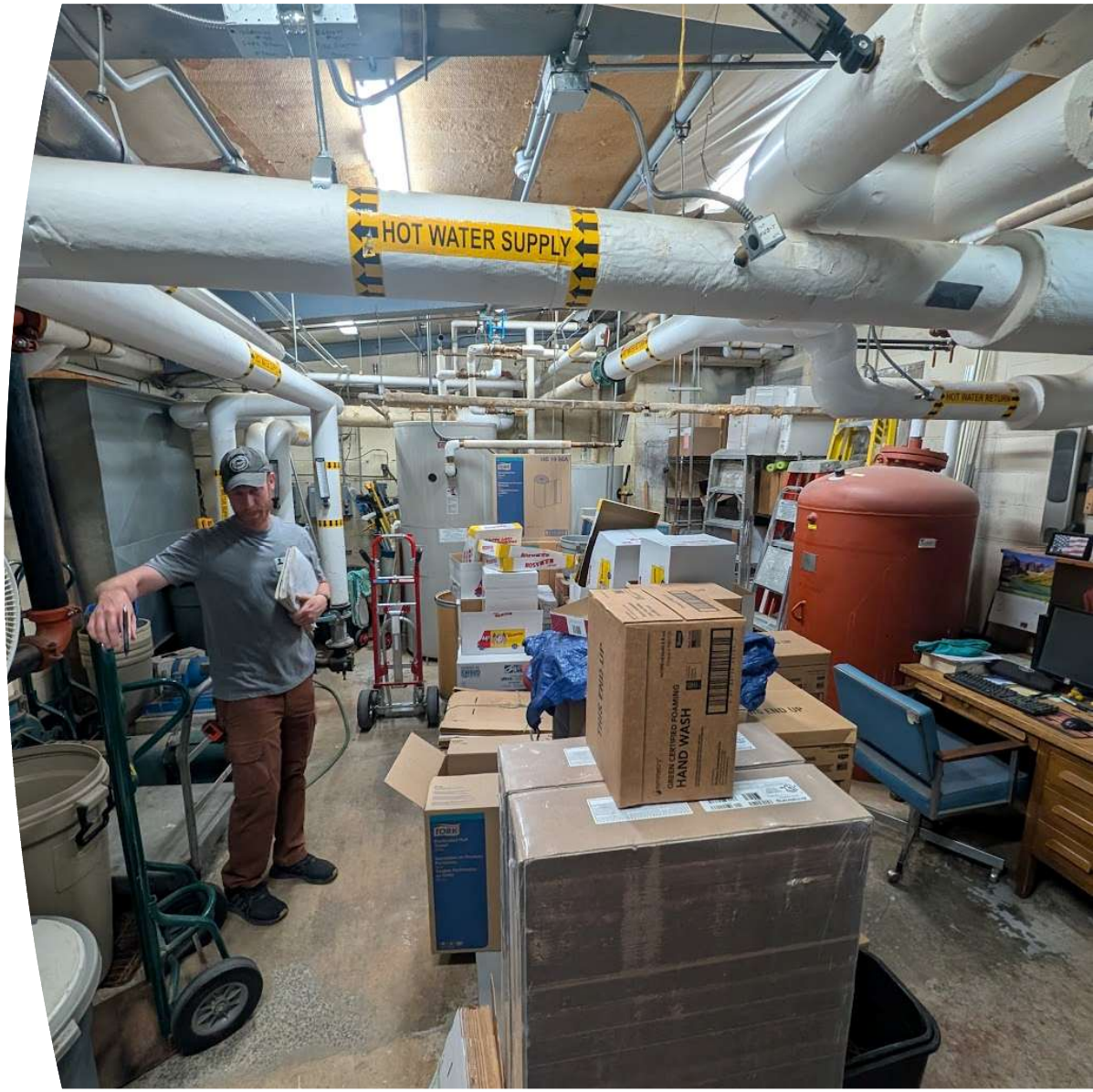
Boiler Capacity: 2.4 MBH

- Per building staff, the two boilers rarely run at the same time.
- With just this information alone, we would estimate a building load of about 2.4-3 MBH.



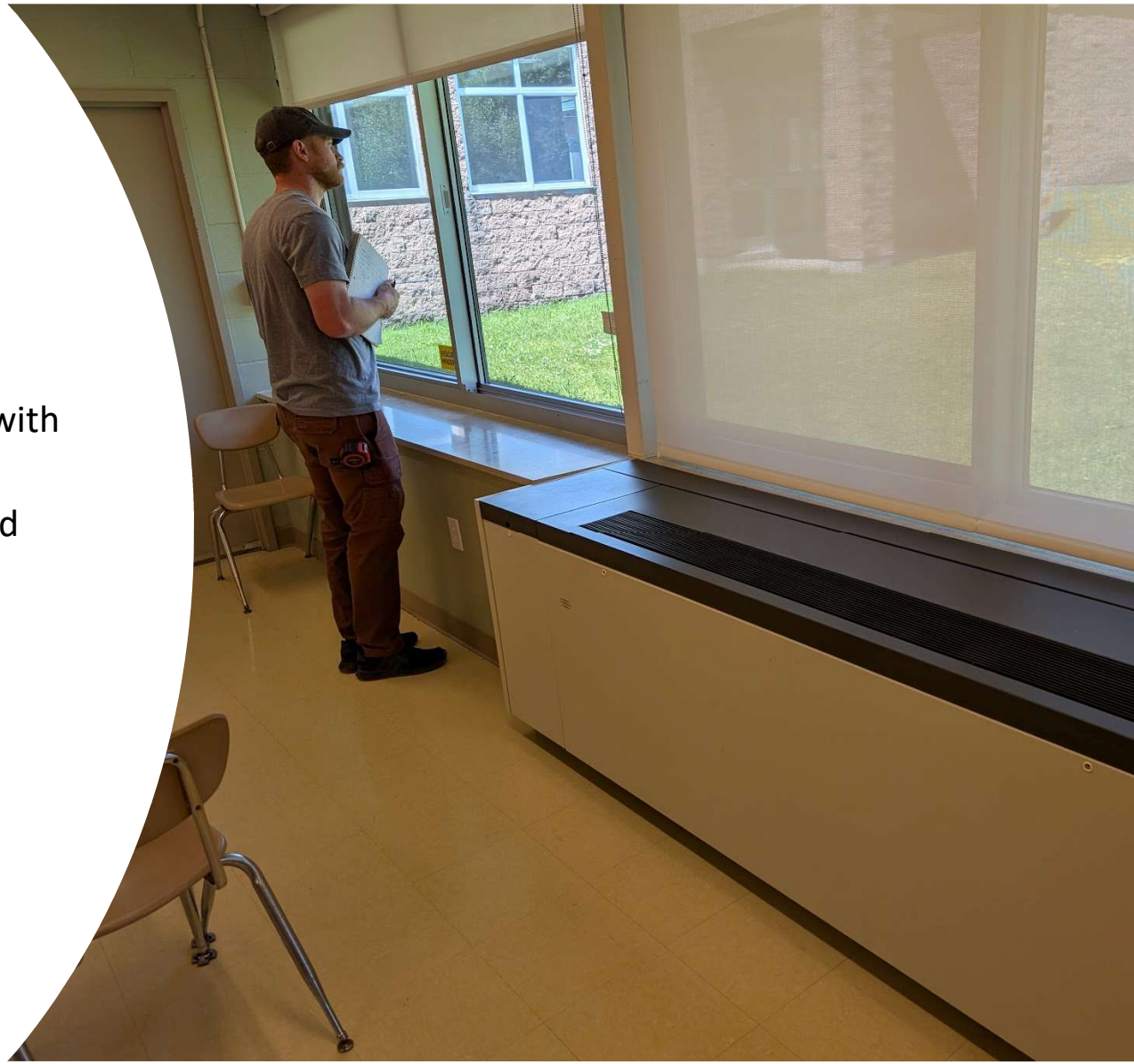
Old Boiler Room

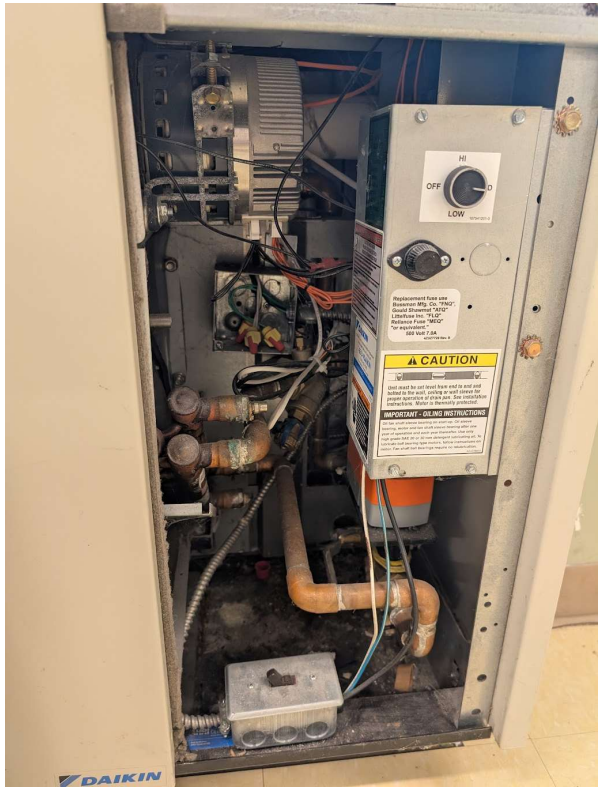
- Presents a good location for up to 8 geothermal heat pumps and potentially a large energy recovery ventilator.

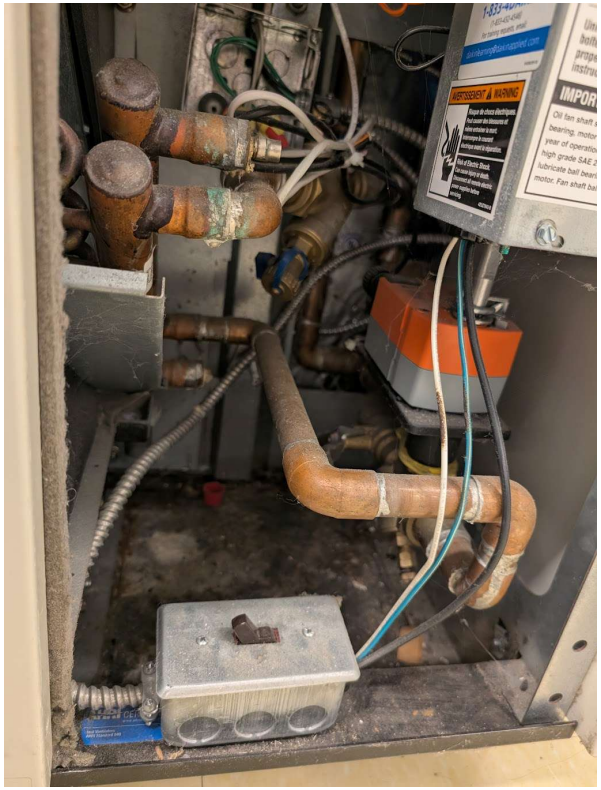


Big Unit Ventilators

- Generously sized, allows for easy reuse with heat pump equipment.
- These currently provide both heating and ventilation, but no cooling.







Modulating hot water valve should control for discharge air temperature.

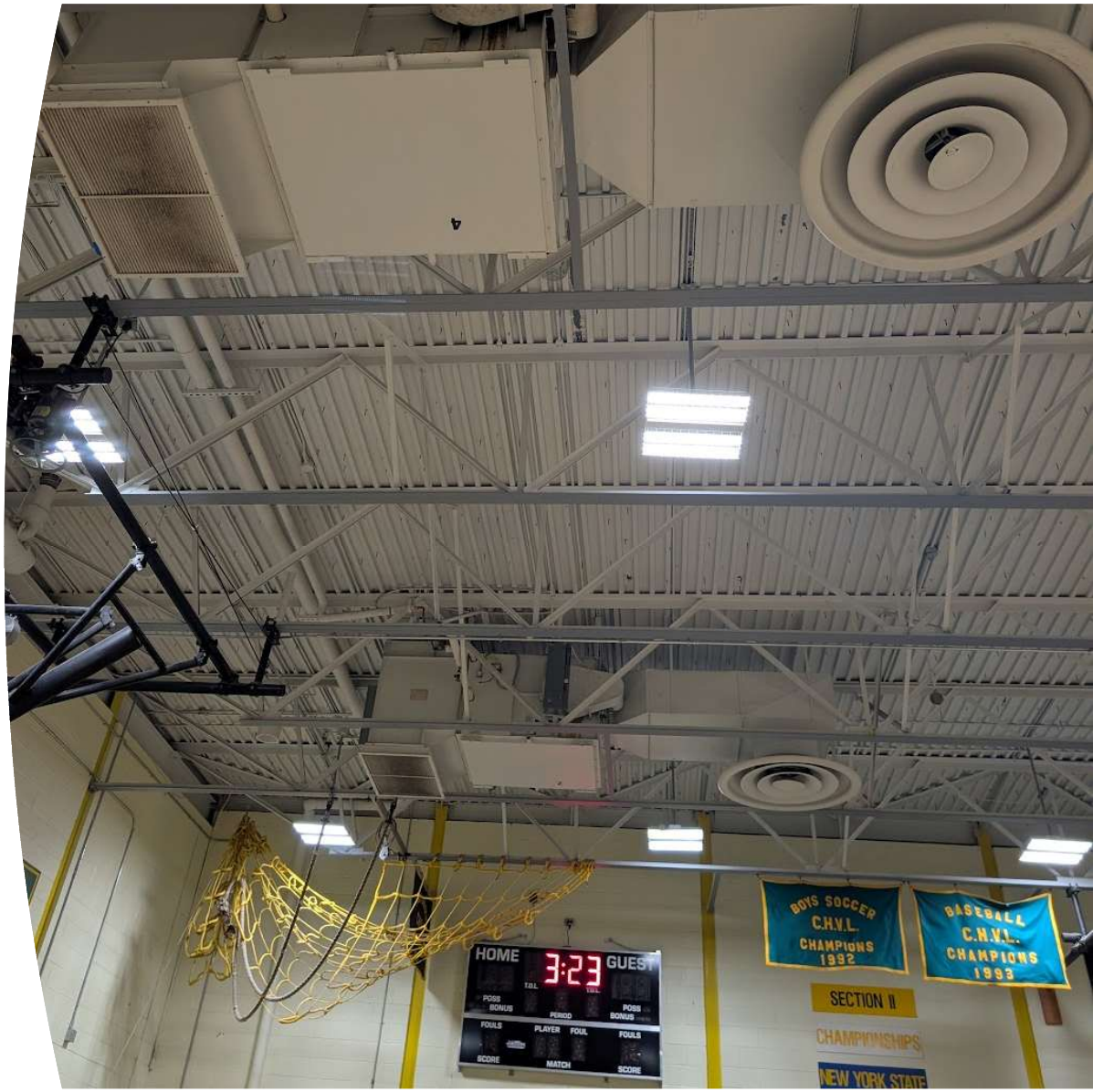
If using lower water temperature, these will automatically compensate, though the discharge air temperature may still be lower.

Building Automation

Existing BMS is very limited

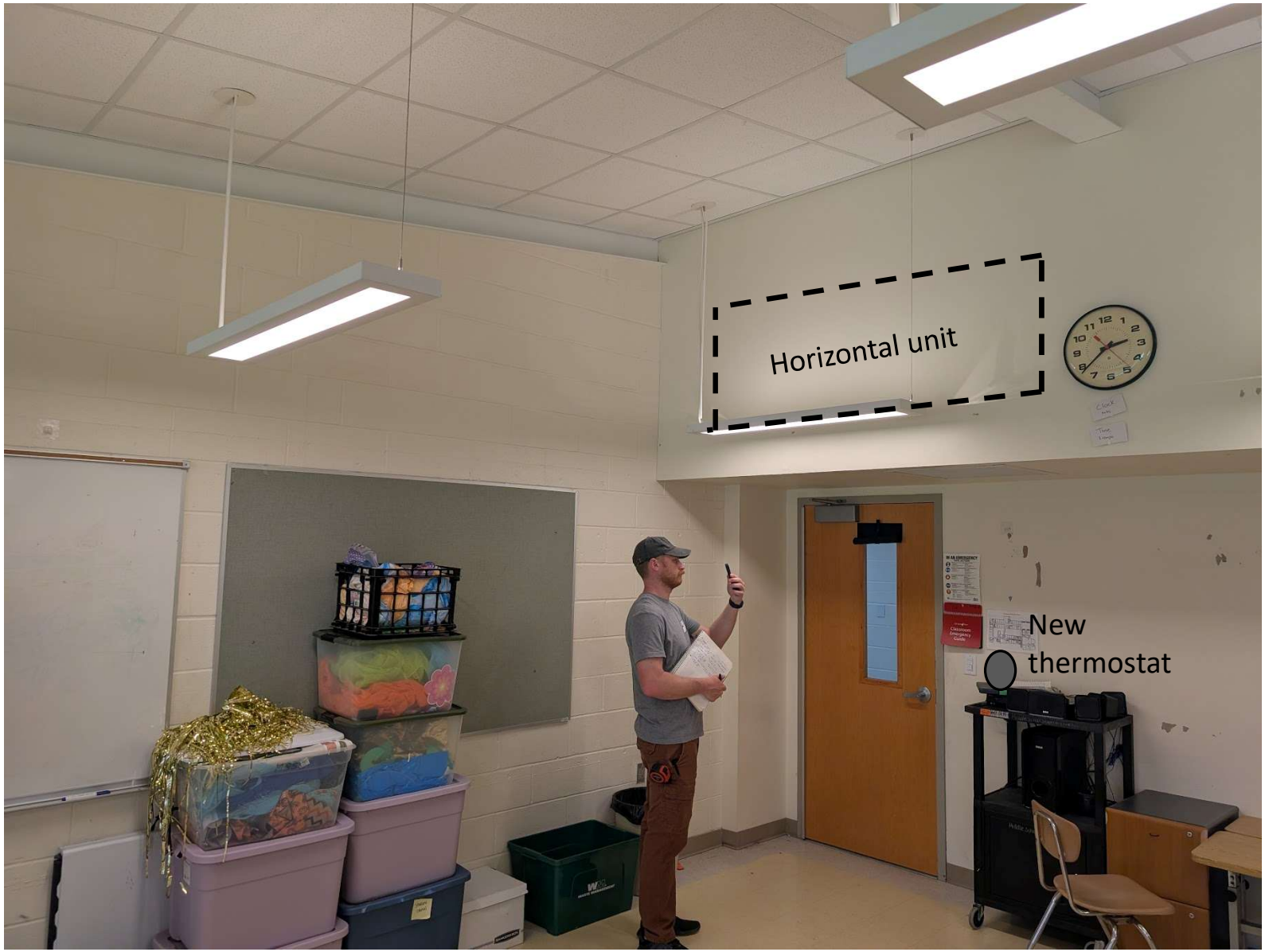
- No remote data collection
- No easy way to analyze data.
- Thermostats require wireless connection and batteries.
- No remote support option.
- Avoid Johnson Controls for maintenance services (per staff).

Standard AHUs in Gym



Geothermal Retrofit Concept

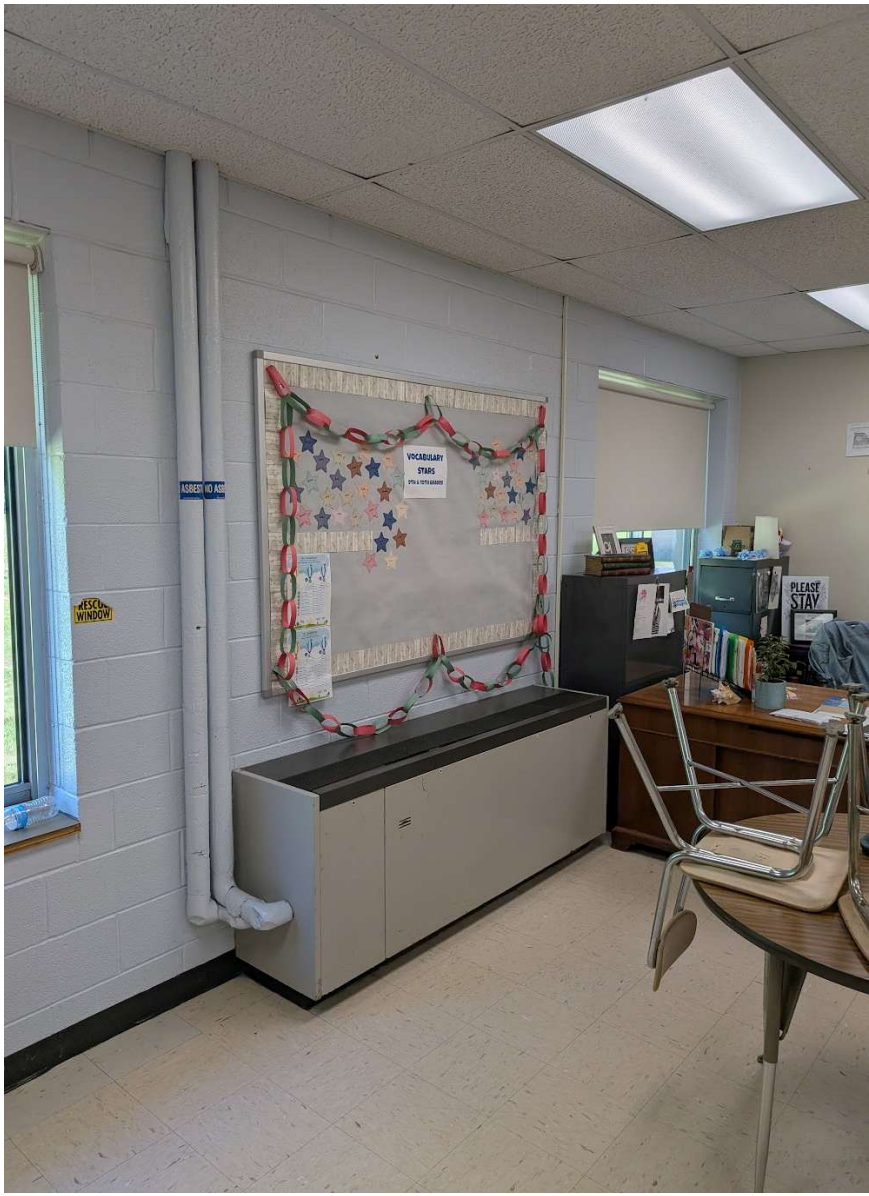
- Reuse all the existing hot water infrastructure. Maintain boiler backup capabilities.
- Support heating and cooling in classrooms with localized horizontal heat pumps that can also make hot water.
- Replace Auditorium and gym AHUs with geothermal units that can produce hot air and high temp hot water. They become a **source not a sink** for building hot water.
- Retrofit exhaust fans to operate as DOAS/ERV style units.
- Upgrade controls: demand control ventilation, remote data, remote support, connected thermostats, phone app.


Horizontal unit
New thermostat

Place units in existing empty space, near classrooms


Tie into existing hot water and duct

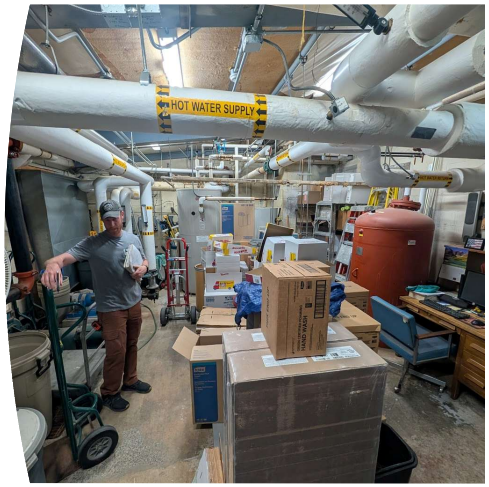
Reuse unit ventilators



Exhaust air for most front classrooms

There are opportunities for overall improved energy efficiency, such as directing exhaust air through an energy recovery ventilator. Reducing energy load can offset geothermal costs.

Boiler room, where several heat pumps could be placed. Good potential location for energy recovery ventilator that can use exhaust air to preheat fresh air to classrooms.



Add heat pumps to Gym

8 existing Air Handling Units (AHUs)

Adding (10) heat pumps could replace the need for existing AHUs

Heat pumps will create high temperature hot water (140-180F) for hot water use.

Gym would now have high efficiency cooling

Replace auditorium AHU with several HPs

1 existing Air Handling Unit (AHU)

Adding several heat pumps could replace the need for existing AHUs

Heat pumps will create high temperature hot water (140-180F) for hot water use.

Auditorium would now have high efficiency cooling