Westwood Public Schools

Hanlon-Deerfield
Elementary
School Project

Building Systems
Overview

8 July 2021

Building Systems Overview

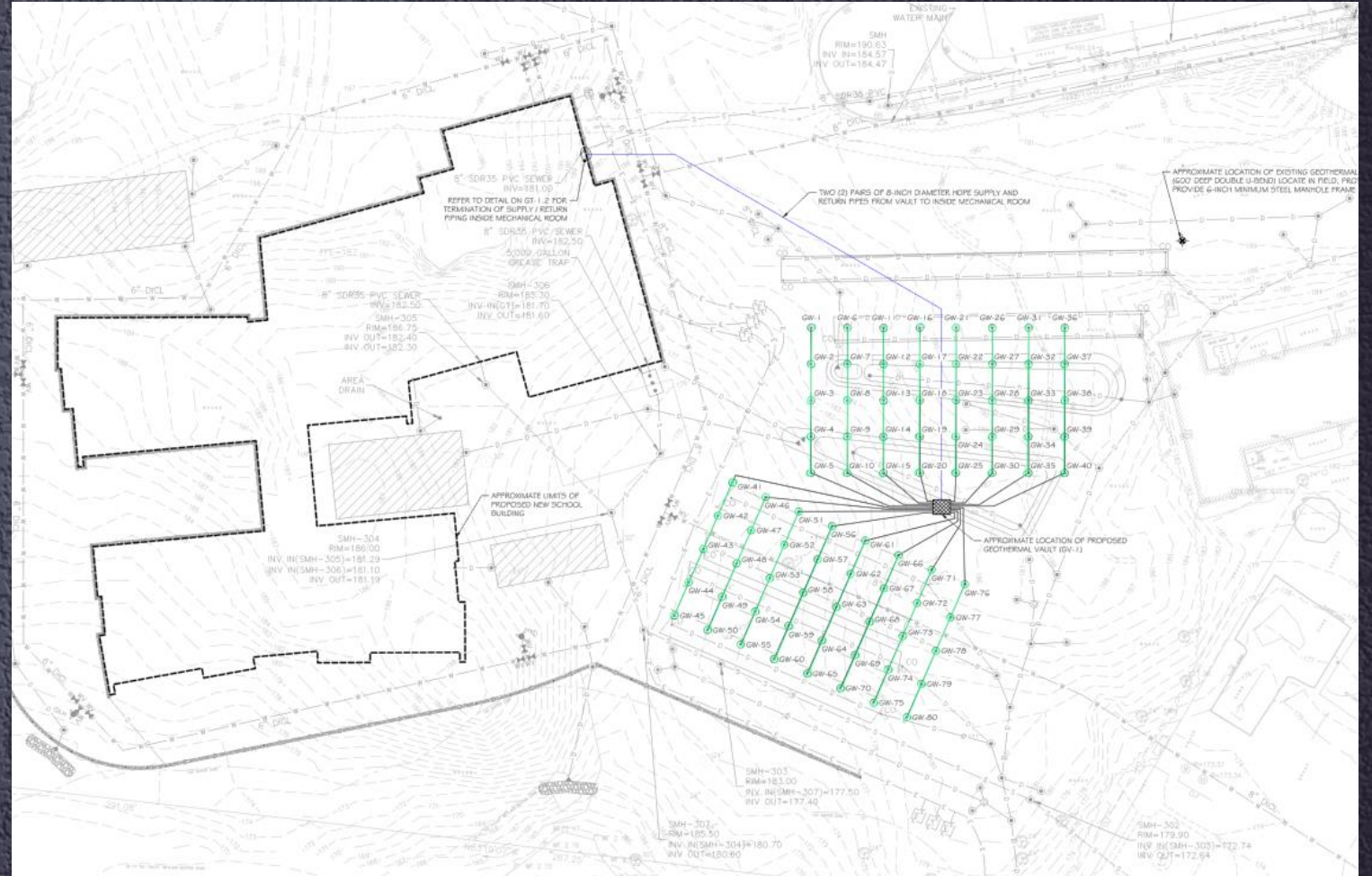▶ AGENDA

▶ Geothermal

▶ HVAC

▶ Electrical

▶ Plumbing and Fire Protection

▶ Technology (Data + Security)
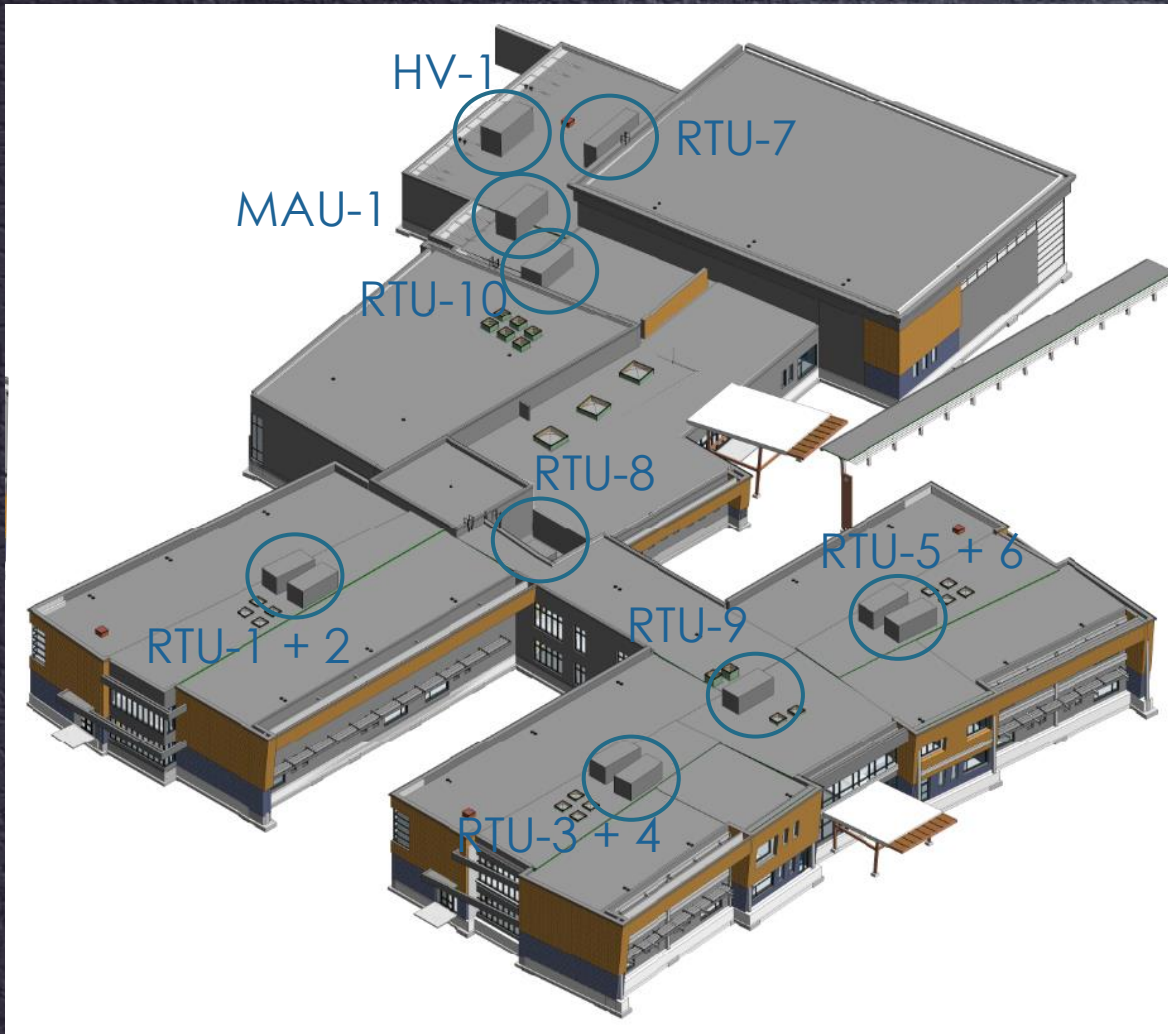
▶ INTENT OF MEETING:

Provide an overview of building systems and an opportunity for questions, feedback and input

Geothermal System

- 80 wells, 600' deep
- Closed-loop, quad-loop
- Below ground, not visible at surface when complete

HVAC System

- Geothermal-Source Heat Recovery Central Plant

- 100% Outdoor Air Rooftop Units

- Displacement Ventilation

- Radiant Heating/Cooling Ceiling Panels

- Dedicated Exhaust systems for Toilets, Janitors Closets, Kilns, Etc.

- Building Management System Control & Monitoring of All HVAC Equipment

- Building Energy Use Metering
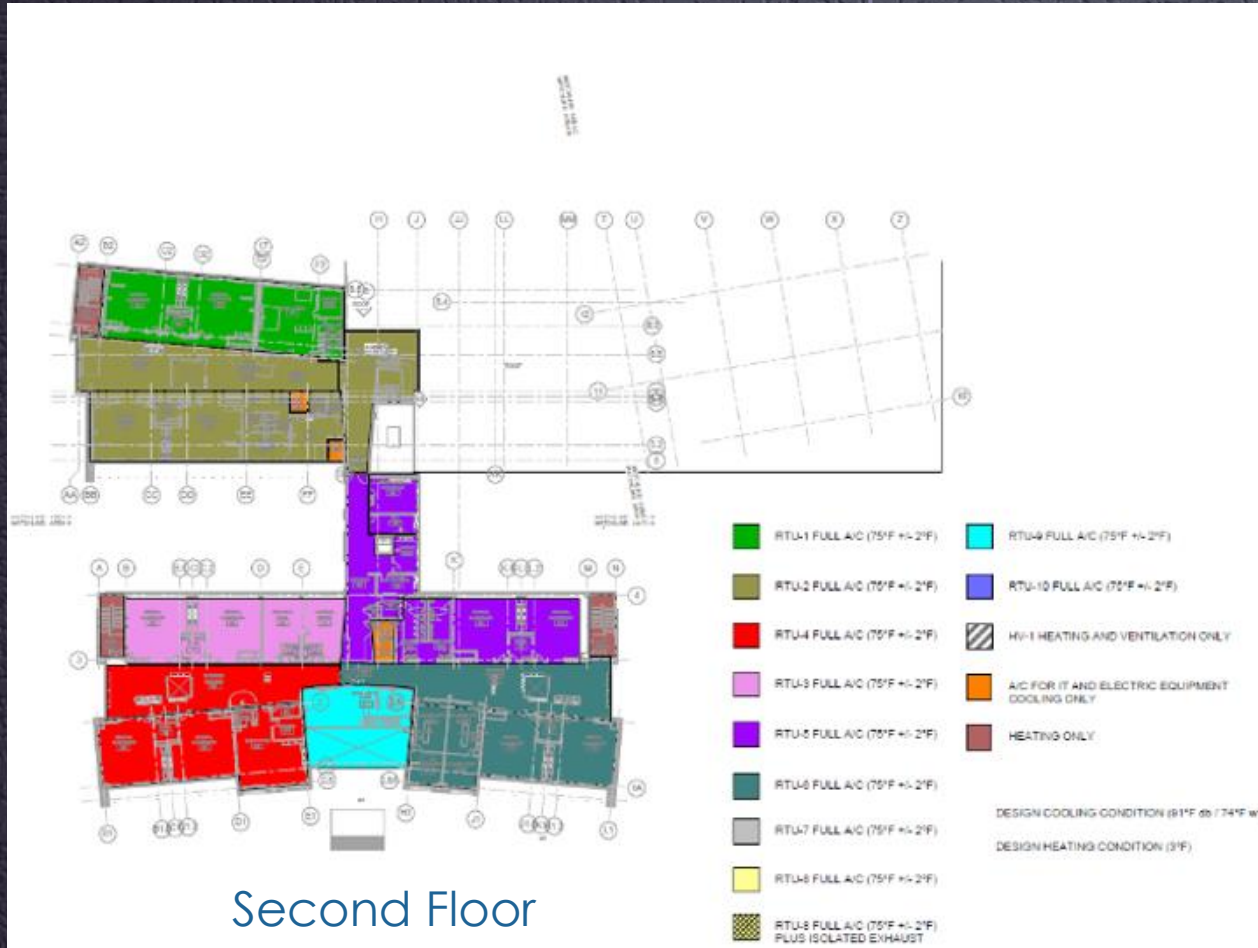
HVAC System
Zones
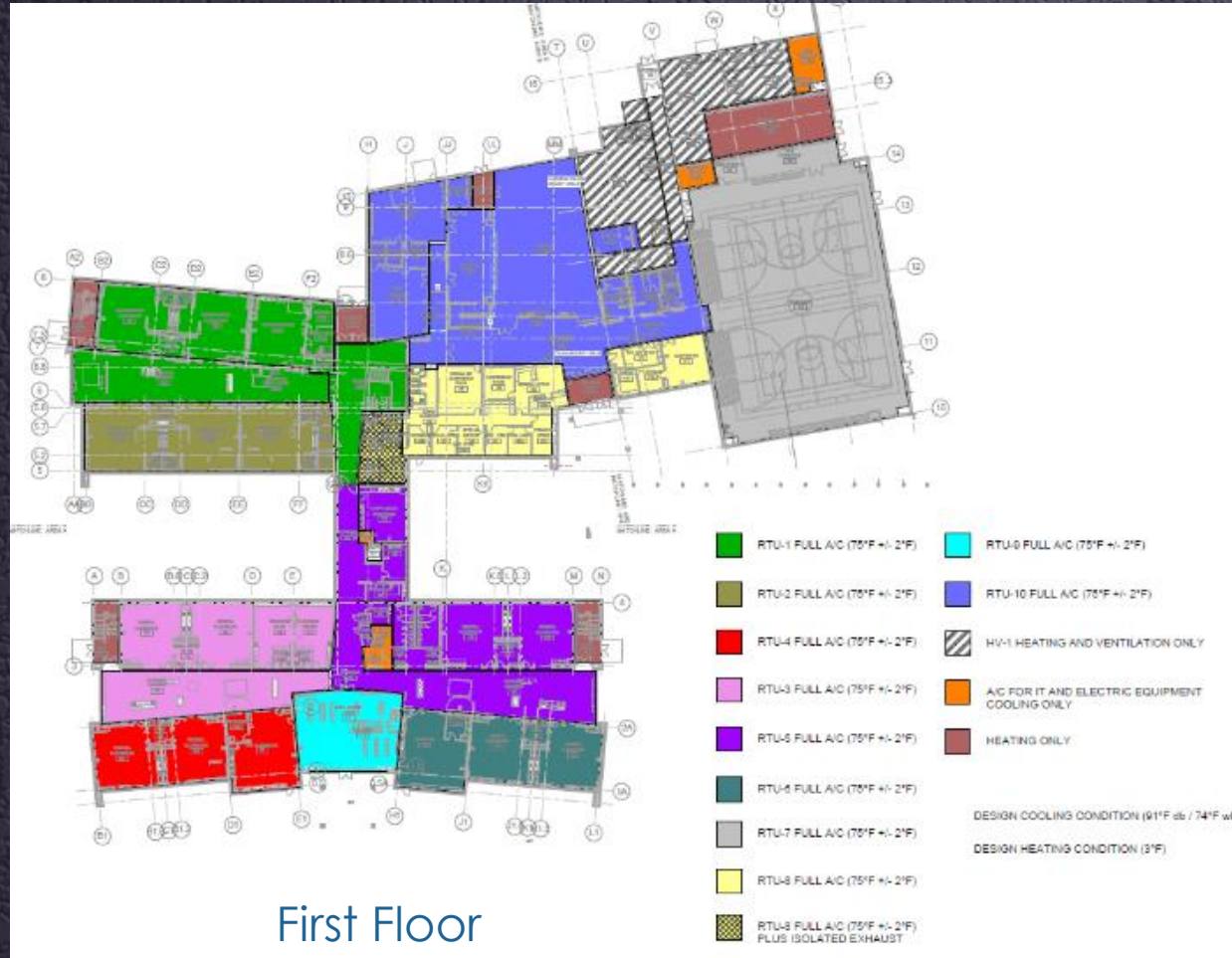
First Floor

- Zoned areas designed according to
  - building orientation
  - functional use of space
  - after-hours use

- Entire building has A/C with the exception of maintenance and mechanical space, and kitchen

HVAC System
Zones

Second Floor

- Zoned areas designed according to
  - building orientation
  - functional use of space
  - after-hours use

- Entire building has A/C with the exception of maintenance and mechanical space, and kitchen
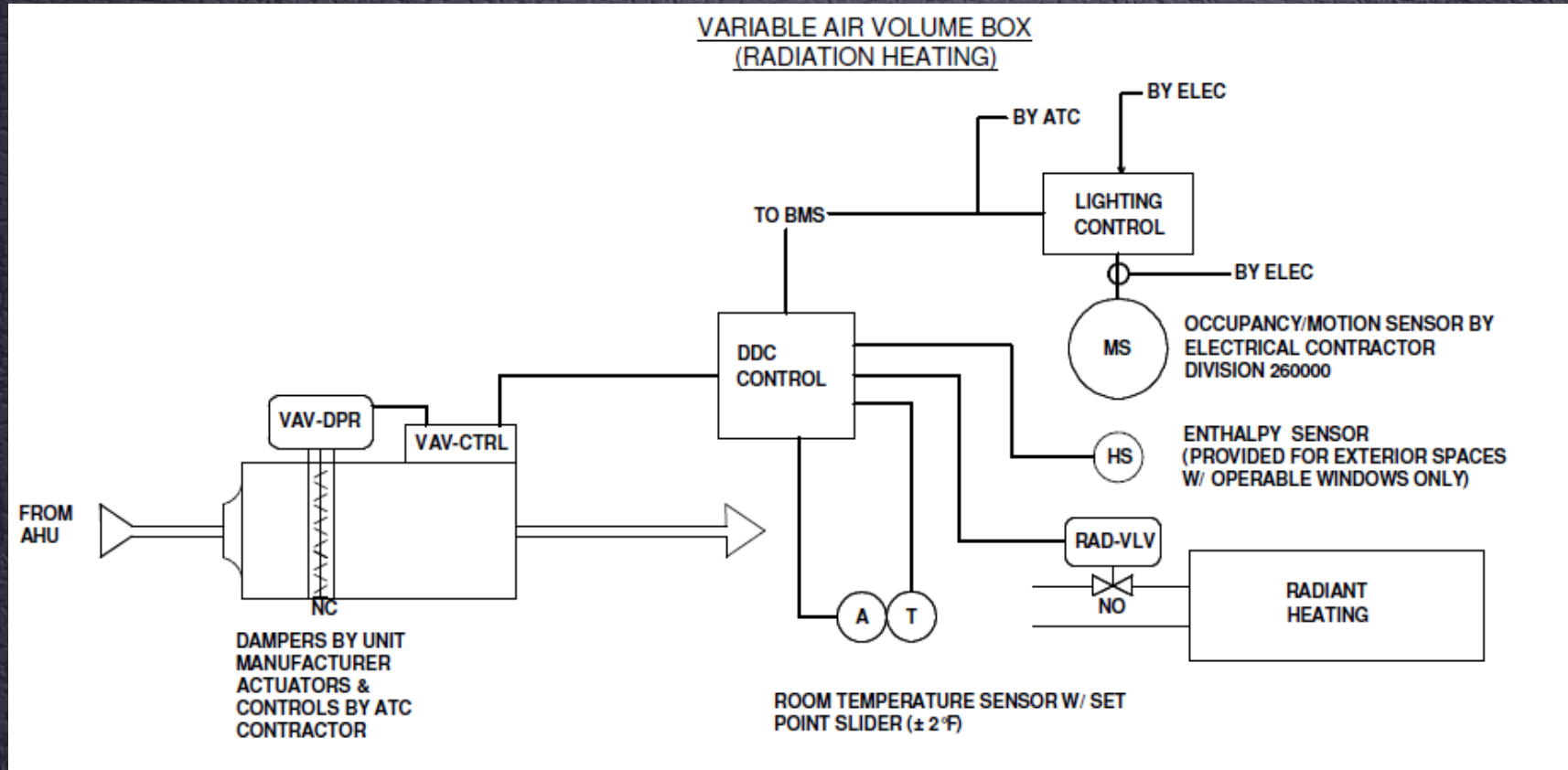
HVAC System
Control Sequence for Typical Variable Air Volume Box (VAV)

VARIABLE AIR VOLUME BOX
(RADIATION HEATING)

BY ELEC

BY ATC

TO BMS

LIGHTING
CONTROL

BY ELEC

MS

OCCUPANCY/MOTION SENSOR BY
ELECTRICAL CONTRACTOR
DIVISION 260000

DDC
CONTROL

VAV-DPR

VAV-CTRL

HS

ENTHALPY SENSOR
(PROVIDED FOR EXTERIOR SPACES
W/ OPERABLE WINDOWS ONLY)

FROM
AHU

RAD-VLV

RADIANT
HEATING

NO

NC

A   T

DAMPERS BY UNIT
MANUFACTURER
ACTUATORS &
CONTROLS BY ATC
CONTRACTOR

ROOM TEMPERATURE SENSOR W/ SET
POINT SLIDER (± 2°F)

- Occupied
- Unoccupied
- Override
- CO2 Controls
- Standby Mode
- Enthalpy Sensor

HVAC System
Heat Recovery Chiller Plant Control Diagram
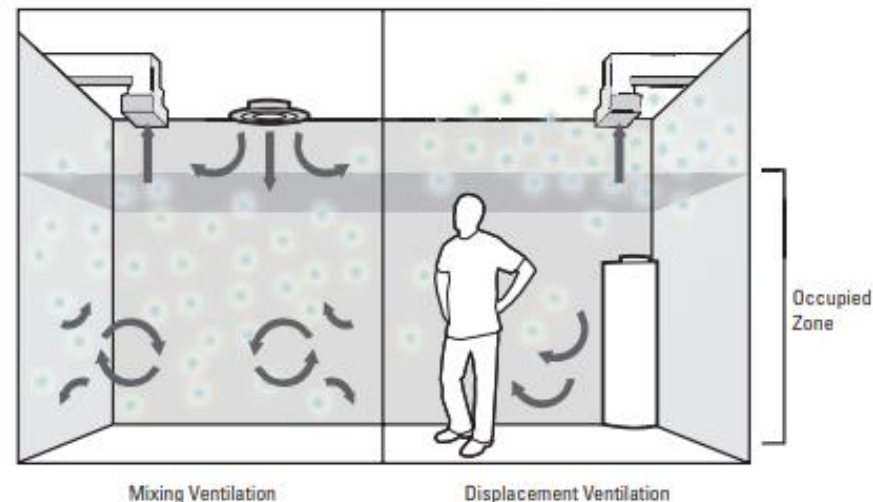
HVAC System
Design for Indoor Air Quality
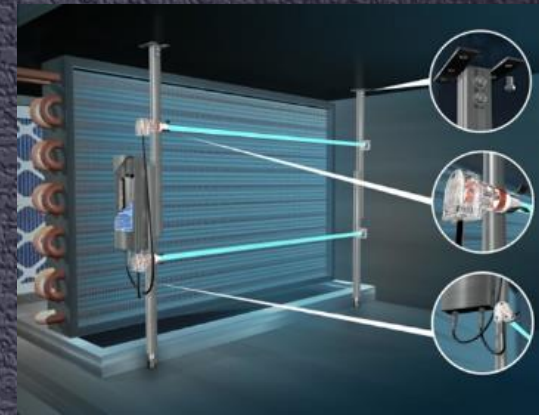
MERV-14 Filtration

UV-C Light (Deduct Alternate)

Displacement Ventilation

100% Outdoor Air Delivery

BMS Icon for Switch to Bldg. Flushout Mode

Occupied Zone

Mixing Ventilation   Displacement Ventilation

HVAC System
Design for Redundancy

Rooftop Air Handling Unit Ventilation, Cooling, & Heating Capacity

- Units sized for 100% O.A. but operate as mixed air systems under normal operating condition

- Fan Arrays continue to operate if 1 or some are in fault

- MERV-8 Filters upstream of MERV 14 Filters to extend life of MERV-14's

Primary/ Stand-by Pumping for CHW (Primary & Secondary), HHW, GCW

- Upon a pump or VFD fault/failure, the stand-by pump will be commanded to take over by the BMS

- Pumps are cycled weekly based on duty-time through BMS programming

Modular Heat Recovery Chiller

- Plant designed with 6 modules when only 5 are needed for building load; 1 redundant module.

- Multiple-Module design allows for reduced capacity heating/ cooling operation if 1 or more modules have faulted/ failed.

Electrical System
Power Distribution

- Power Switchgear

- Power Panelboard

- Transient Voltage Surge

  Suppressor (TVSS)

- K-13 Transformer

- KYZ Meter

KYZ Meter
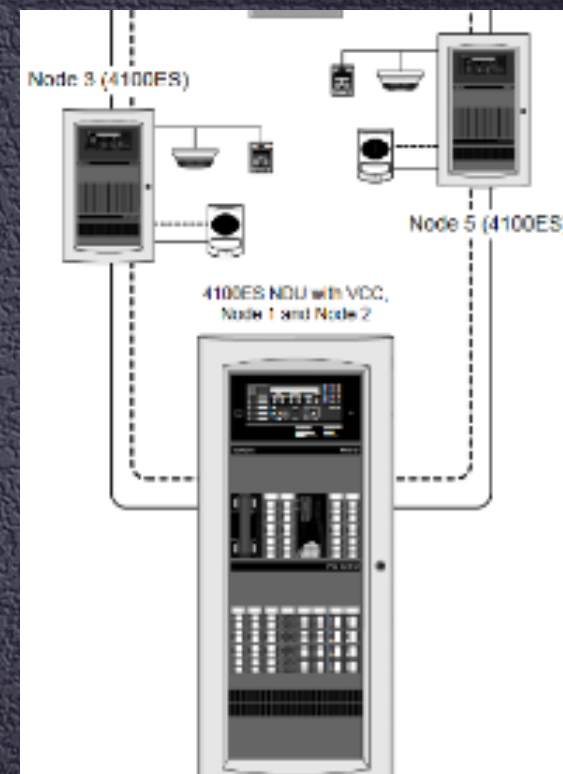
SWITCHBOARD

TVSS

Typical K-13
Transformer

Typical
integrated
TVSS
Panelboard

Electrical System
Addressable Fire Alarm System

- Fire Alarm Control Panel

- Fire Alarm Annunciator

- Pull Station

- Smoke Detector

- Addressable Mass-Notification-Speaker Strobe/Visual "ADA" Compliant Signal

Electrical System
High Efficiency LED Lighting with Occupancy Sensor & Daylight Harvesting

Daylight/Occupancy Sensor

Low voltage controls

- Dual Technology Occupancy Sensor & Daylight Photosensor

- Lighting Control System

- LPD Target of .4 to .5

- Low light power density (LPD) 40% beyond code

- Lower LPD improves HVAC system efficiency

- Energy reduction by harvesting natural daylight

- 90% reflective ceiling surface for improved light levels

Electrical System
Addressable Lighting Control System

- Occupancy Sensor
- Daylight Sensor
- BMS Integration

- Addressable groups
- Integration to future demand response program

Electrical System

400 KW Natural Gas Generator w/ Sound Attenuated Weatherproof Enclosure

LOAD BREAKDOWN FOR LIFE SAFETY EQUIPMENT

All Exit Signs and Emergency Lighting in the areas listed below are fed by Life Safety Emergency Power:

Corridors
Electrical Rooms
Gymnasium Cafeteria
Media Center
Lobbies
Central Administration Area
Health Suite / Nurse's Office
Toilets
Cafetorium
Data Rooms "Head End" Room & IDF
Closets
Kitchen & Servery
Exterior Building mounted lights over doors required for egress lighting
Where required by code (egress areas)

LOAD BREAKDOWN FOR OPTIONAL STANDBY EQUIPMENT
Equipment listed below are fed by Optional Standby Power:

Boilers, Water Pumps
Door Access Controls, Security System, CCTV
ATC Controls
Strategically located receptacles in the following areas: RED in color:
  Cafeteria
  Kitchen/Servery
  Central Administration
  Electric Rooms and Emergency Electric Rooms, Mechanical Rooms

Electronic faucets and sinks (where applicable)
Heating and ventilation systems required for freeze protection
Cooling unit serving Head End Room & IDF rooms
Unit heater serving water service room
Equipment within the Head End and IDF rooms including
  Paging/Intercom System
  Telephone System
  Network Electronics
  Servers
  Telephone System
  Clock System
  Fire alarm system (full battery backup)
  Refrigeration

Plumbing System

Water faucet and toilet fixtures:

Low flow type: Automatic flush valves

Powered by batteries that are recharged using water

Hands free

Requires changing of batteries after they expire

Plumbing System

Bottle Fill / Water Fountains:

High/Low fountains with bottle fill

Supplemented by individual bottle fill stations

Fire Protection System

Systems being designed:

Wet Sprinkler System throughout

Question on Main IT room:

Wet System

Or

Pre-Action System
 (requires two events to set off sprinkler head. Valve senses heat, smoke or flame to open then fills with water and activates once head element is melted)

Technology Infrastructure Construction Project
Data/Communications

Structured Cabling	Cat 6A voice/data with fiber optic backbone, racks, patch panels
Distributed Communication	Public Address System, Hands Free Call buttons, Synchronized clock system in all academic and admin areas, common spaces, Door Video Intercom/Control
Audio- Visual Systems	A/V for Cafeteria and Gym
	Classroom Speech Reinforcement: *(amplifier, speaker in ceiling with wireless technology at instructional spaces)*
Network Infrastructure	Network Switches, Wireless Access equipment

Technology Infrastructure Construction Project
Security

Integrated Security System

Access Control

Intrusion Detection

Video Surveillance (interior and exterior) with 30-day recorder

Main Entry and Maintenance – Video Intercom with two step access control at main entry

All other exterior doors: electronic card access readers

Access control between public and private areas

Technology Infrastructure Fixtures, Furniture, Equipment
Loose Technology Procurement

Core IT Networking Equipment	Servers, Storage, Firewalls
Telephone and Voicemail	VOIP Telephone system
User IT Equipment	Tablets, Chromebooks, Ipads, laptops Computer carts and lockers
	Copier/Printers/Point of Sale Registers
Instructional Display	Interactive Projectors, flat panels, doc cameras to support instruction
	Portable projectors