NRHS Facilities

NRHS Space Committee

1-22-2015

Mechanical Systems – NRHS

- Expansion Options and Mechanical System Capabilities
  - Water: Well's capacity meets the current building demands and should have sufficient capacity to handle any future expansion / renovation.
    - Well is located within the building and any substantial renovations may require the well be relocated.
  - Septic / Sewer: WWT plant capacity is oversized and sufficient to handle any future expansion / renovation.
  - Electrical: Current service upgrade would be required for any substantial addition. Would need to be assessed for renovations.
  - Gas / Propane: No gas, propane service would need to be upgraded for and science lab renovations.
  - Fire and Sprinkler: Fire panel upgrade required for any future expansion / renovation. Sprinkler pump may need upgrade to handle any increased capacity.
  - Mechanical Systems: Mechanical system design does not seem to have expansion capacity. Additional square-footage would require a dedicated HVAC system or retrofit of existing. Current boilers are approximately 20%-30% redundant.

Building Systems

Facility Description

Building Description

The Nashoba Regional High School is a grade 9 – 12 facility of over 1200 students from Bolton, Lancaster, and Stow, MA. The 195,000 ft^2 building was originally built in 1961, and renovated in 2001. The facility has also recently undergone lighting retrofits and on-going internal energy audits for scheduling and equipment upgrade savings opportunities. The building's envelope is primarily brick with a number of large windows. The windows are a mix of single pane, double pane, and plate glass. The facility is primarily heated by a hot water (HW) closed loop system and cooled by direct expansion (DX) cooling from air-cooled condensing units (ACCUs).

Utilities

Electric Distribution: National Grid
Electric Rate Code: G3A

HVAC

(20) Air Handling Units (AHUs) provide ventilation to the facility's larger spaces. (13) of these AHUs have cooling, between 72 and 553 MBH and (18) of the AHUs provide heating, between 86 and 1171 MBH. Air is supplied from the AHUs between 225 and 9,700 CFM. See Appendix A for more equipment details.

(6) Energy Recovery Units (ERUs) recover heat from exhaust air streams of AHUs 1 – 6 via desiccant wheel. Each ERU is located directly on top of the AHU it serves.

(24) Exhaust Fans, powered by motors between 1/30th and 2 hp, move air at between 150 and 4,550 CFM.

Heating and Hot Water

(2) Weil-McLain Model 1588 hot water (HW) Oil-fired boilers with 4,763 MBH input and 80.2% efficiency provide HW to the facility's heating loop. Each is equipped with a 3 hp burner motor.

(2) HW pumps provide 400 GPM of water with 75 ft head, 68% efficient, to the building's main heating loop. Each is powered by a 15 hp, 92% efficient motor.

(2) Turbopower Domestic Hot Water (DHW) with 399 MBH input capacity provide useful hot water to the facility.

(7) Cabinet Heaters (CHs), powered by between 50 W and 130 W fans, providing between 14.5 and 49.7 MBH of heating to local spaces within the facility.

Cooling

(13) Air-Cooled Condensing Units (ACCUs), mounted on the roof, serve AHUs in the facility. The units' cooling capacities range between 36 and 595 MBH.

Building Automation System (BAS) & Other Controls

Automated Logic, web-based WebCtrl BAS controls AHUs, VAVs, boilers, and loop valves. The system allows for optimal start/stop and HW reset, though these features are rarely used and the controls are often adjusted manually. Trends are kept on many BAS points, including temperature, humidity, air flow, and damper positions. ERUs are not currently in the BAS.

Hot Water Pumps

Domestic Hot Water Heaters

Boilers

Condensing Unit on Roof

Building History

- The original building opened in September of 1961. There was an academic wing built in 1970 that also added a gymnasium and a library area. In 2002 gym space was reconfigured and an auditorium was added, along with administrative offices and a new facade.
  - Some of the building infrastructure was also updated such as the boilers, hot water system, and air handling equipment.

- The site is 47 acres. There are approximately 500 parking spots. There is a waste water treatment plant on site. There is one storage building and a concessions building. Stadium seating was added in 2004 to meet handicap accessibility codes, and a new turf, multi-sport, field and track was built in 2013.

- The building is steel and concrete block construction with a brick facade. The window systems are insulated glass in classrooms and plate glass single pane in hallways and common areas. The roof systems are both PVC (sonofil) and rubber roofing with stone ballast.
- Current envelop issues include roof leaks in the ballast roof areas, lack of insulation in outside walls, heat loss in single pane windows, and settlement in the North West corner of the building.

- Double pane windows where installed in most classroom areas single pane plate glass remains in most common areas.

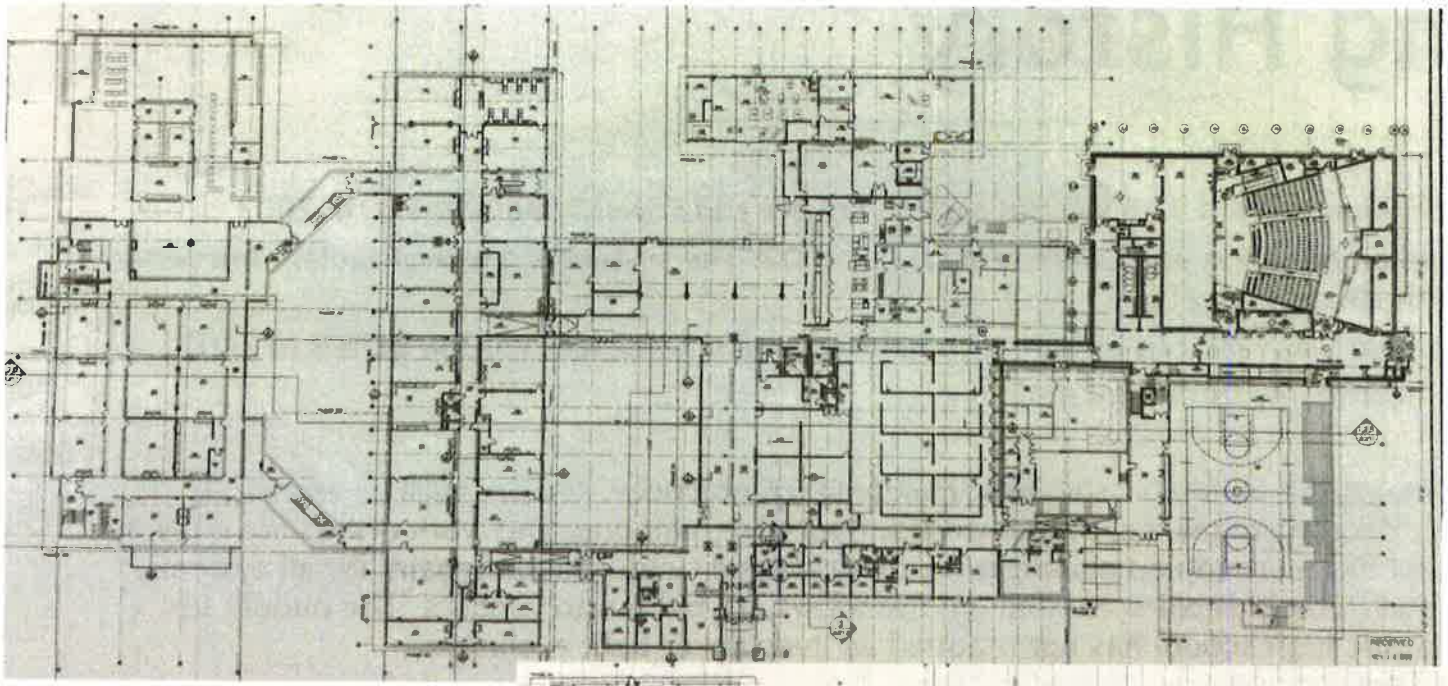
- In general the mechanical systems work well.
  - We do have issues with domestic hot water circulation and frozen pipes.
  - The building automation system is two generations old and eventually needs to be updated which will involve replacing the main controller and all sub-controllers in the building.

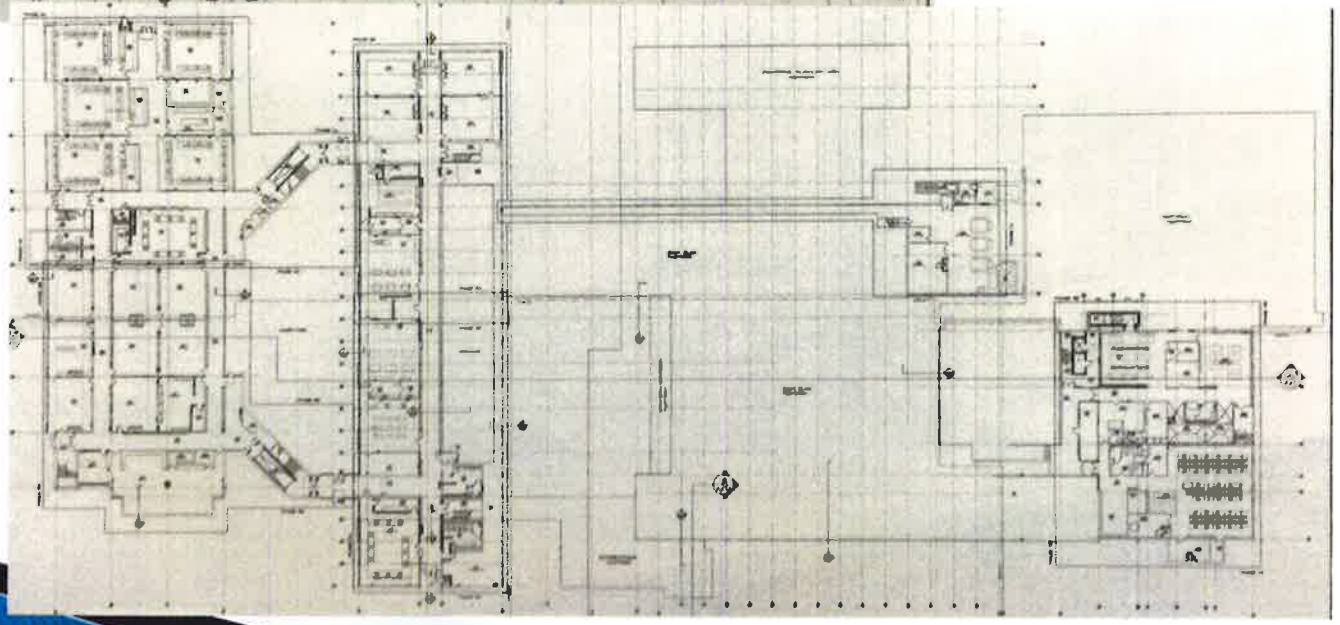
Building History

- Two boilers were replaced with Weil McLean section boilers and Powerflame burners in 2002
- Most roof top and air handling units were replaced in 2002. The system is a mix of radiant hot water and hydro air with DX cooling
- The main switch gear was replaced including transformers and some distribution panels in 2002.
  - The lighting is primarily t5 fluorescent.

- The district maintains the building using best maintenance practices. Repairs such as electrical, plumbing, HVAC, door maintenance, filter changes, floor care, painting, and work orders are done in house. The district has a scheduled maintenance program and funds annual repairs for all systems. Larger projects such as well repairs, roofing, and windows are bid out to vendors. The budget for capital repairs for the high school has not required an override or debt exclusion.

Main & Lower Floors – NRHS

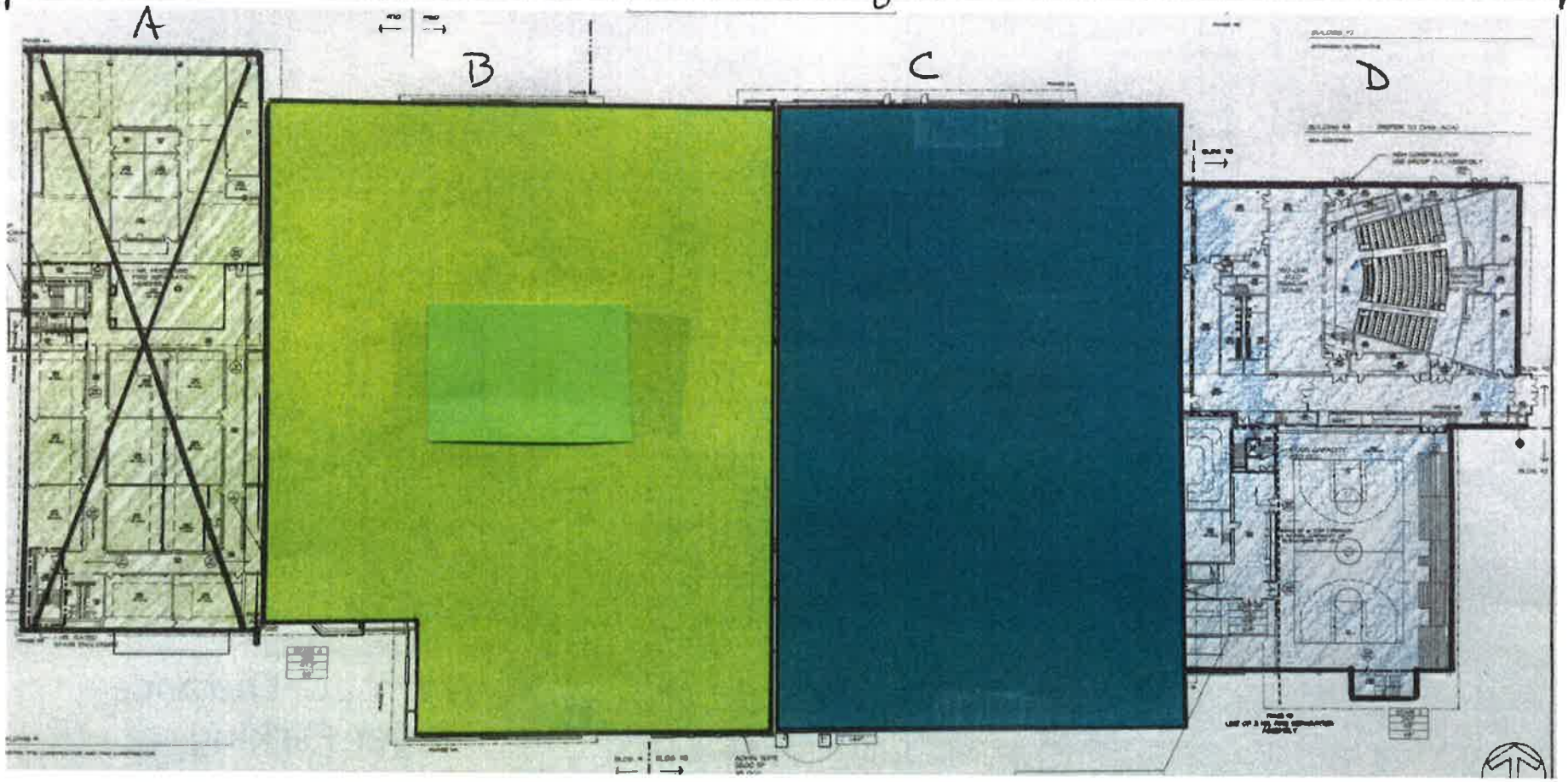




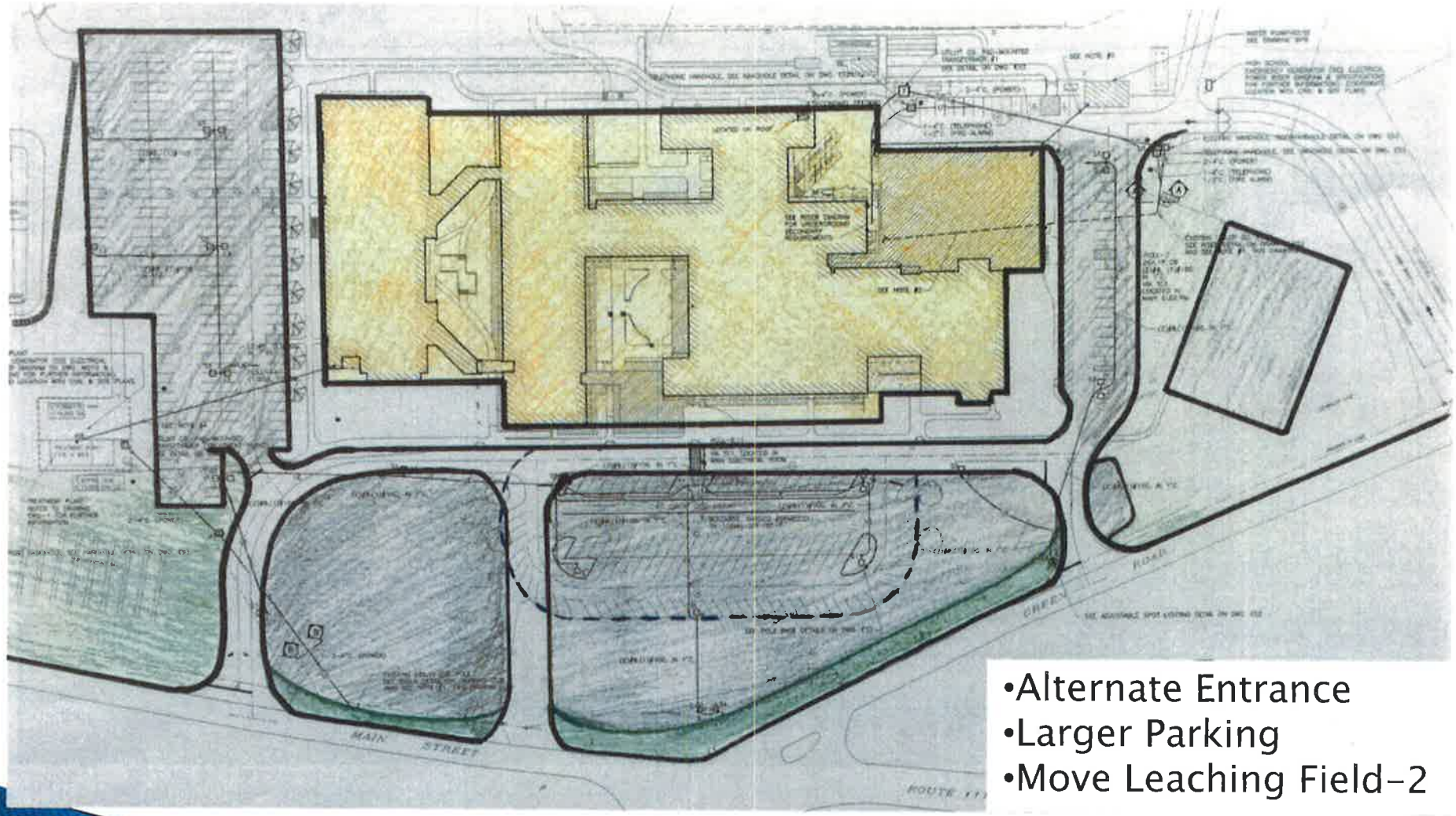
Interior – NRHS

168,000 sq ft
- 272,000 sq ft (MSBA)
2 story (Blue/Green)
312,800+

320,000 sq. ft



Exterior - NRHS



- Alternate Entrance
- Larger Parking
- Move Leaching Field-2

Satellite - NRHS