

RSU 16 HVAC Project development update for the Minot, Elm Street and PCS facilities.

Date: January, 18 2023

EMC, Bennett Engineering and RSU 16 team members has now met onsite several times to determine the scope of work for both locations. Prior to engineering the drawings and generating the scope of work for each location, it is imperative to nail down the exact design and plan. Per our conversations with the Superintendent, after we determine the most logical solution for the RSU, we will need the RSU Facilities Committee to understand and agree upon the updated and final facilities improvement plan for Minot, Elm Street and Poland Community Schools.

Throughout the facility analysis we have reviewed the follow areas of concern:

1. Age and general maintenance of the existing major equipment
2. Code & maintenance issues
3. Energy savings opportunities (VRF & Heat Pump)
4. Classroom environment (Proper Ventilation, temperature and control)
5. Project implementation strategies

Minot Consolidated School - 23 Shaw Hill Rd Minot, ME 04258

- 32,570 Square Foot

Due to the fact that the Minot Consolidated School has only one boiler that is already on its last leg and no ventilation in most of the facility, we've all determined this facility to have the biggest need for immediate infrastructure improvements. During our facility analysis, we discovered that Minot has single phase power that is already very old and at its current capacity, even with the current load on the facility. To convert this facility to VRF or a Heat Pump system, it is most ideal to have three phase power, which happens to be several miles down the road. This will make converting Minot to a VRF or Heat Pump system very difficult and very expensive. Additionally, if VRF is your main source of heat and ventilation, which it would be, this would require at least a 200KW generator to be added to the facility as well. Knowing that converting to a VRF system was the main impetus for design stemming from our last meeting with the RSU facilities committee, we have tried to determine alternate ways to accommodate electrification. We have also done the calculations of the Efficiency Maine incentive program for electrification of heating systems in schools (VRF), which was the primary reason for the committee to consider electrification of the heating plant. Based on the calculations and parameters provided by Efficiency Maine for this program, it appears the incentive that would be applicable for converting the Minot School to VRF or Heat Pump, would be in the neighborhood of \$150,000-\$200,000. Knowing that it would be ~\$300,000 - \$500,000 and an extremely longtime frame for CMP to bring 3 phase power to the facility, alongside ~\$150,000 - \$250,000 for new switch gear to accommodate the new systems, it seems plausible that converting to a VRF or Heat Pump system at Minot would not make sense for the RSU to consider. EMC has also researched lead-times for new Switch gear for upgraded electrical service at the facility, as well as a new generator. While the generator would not have to be in to start school (6-8 months for shipping), the electrical service upgrade would have to be. That said, after our research, it appears the switch gear is ~7-10 months out for shipping. This would obviously not be conducive for a summer project completion date.

With all of the aforementioned data, it is our recommendation that we move to a steam to hot water heating plant with (2) gas-fired condensing boilers, having full redundancy. Additionally, add Energy Recovery Ventilation Units (ERV) to ventilate the unventilated rooms per ASHRAE 62.1 ventilation standards. We would also recommend replacing the ~40 yr. old Air Handler that currently serves the multipurpose room and resides in the janitorial closet adjacent to the kitchen. The new ERV could be mounted outside of the multipurpose room and the old Air Handler will be removed from the current closet, which will provide more space for storage. EMC is also developing the facility Energy Management System scope that will control all of the new heating and ventilation equipment throughout the facility. As discussed, we are designing this scope to be a Niagra based platform, which has proven to be a truly “open” system that does not hold the RSU hostage to a single automation brand or automation service company. Any reputable automation company will have the full capability to install and service Niagra based software and hardware energy management system components. The new systems would require new electrical system components at the school as the current service, as previously mentioned is at its capacity and beyond its useful life. We have checked distributors for timelines on new equipment to make sure this work could all be done this summer, which it appears is likely.

Elm Street School - 129 Elm St, Mechanic Falls, ME 04256

- 56,200 Sq Ft

Working off of the Minot School data, Elm Street currently has three phase power, two boilers, a generator and currently enough electrical capacity. While the Elm Street HVAC infrastructure as a whole has clearly reached its useful life, it may be in the best interest of the RSU to consider addressing the improvements made to this school the following summer. As you all experienced in our walkthrough, the existing boiler room temperature is extremely hot, this is due in part to some un-insulated steam piping, but mostly to steam trap leaks in the building, which kick back to the boiler room. The extreme temperature in the boiler room can be felt in the adjoining rooms, as well. Due to the fact that the current steam system is not operating correctly, live steam is blowing off into the condensate receiver tank and through the tank vent to the outside, this is a huge cost of energy, thus a priority on the list of measures to address. Most maintained steam traps last a maximum of 3-5 years and then would need to be replaced or re-built. We are currently making provisions to get a steam and air-leak study done ASAP. Once we have this data back, we can create a bid specification for qualified contractors to provide pricing to address the current issues with the steam system, so you can make it through the year without disruption. We do not believe the steam trap and system repairs will be an insurmountable cost, so that the RSU is spending money only to remove the new steam system components the following year. Additionally, as you noticed in the entryway of the boiler room, the combustion air situation for the boiler room is less than ideal. The issue is magnified due to the steam leaks but should be re-designed per code requirements, with combustion air supply fans and relief ducting. This would all be addressed during the boiler room conversion. As of now, it appears the current facilities personnel manually switch over boilers to limit overheating. Naturally, this is not an optimal way to address this issue.

By addressing the severe overheating now, this will buy us the necessary time to get the right system designed for the RSU that allows for long lead-times on equipment and more importantly, puts the RSU in a good position for the next 30 years. Ultimately, if the incentives and savings make sense for the RSU to move in the direction of a VRF or Heat Pump system, electrical service at the facility will have to be upgraded and a larger generator will have to be installed. It is our thought, that this may make sense, as the Efficiency Maine incentives could be large enough to pay for the larger amperage for facility electrical service and a larger generator to accommodate the new HVAC equipment. Having the time to develop this plan for the RSU will be the most important element to the equation.

Poland Community School - 1250 Main St, Poland, ME 04274

- 71,300 Sq Ft

Again, working off from the aforementioned data at Minot and Elm Street, we categorize the Poland Community School as a summer of 2024 project as well. PCS has redundancy in the boiler plant and ventilation in almost all areas of the facility. While PCS has all of these necessary infrastructure components in place, it is most certainly at the end of its useful life and should be addressed for a capital plan for HVAC replacement. Because most of the ventilation at PCS is Unit Ventilators, the RSU may consider a phased approach to the infrastructure, especially if the decision is to stay the course of electrification. In similar nature to Elm Street, PCS has 3 phase power, which may prove likely to support the notion of electrification of the heating system.

Current HVAC Infrastructure: (expected life based off from ASHRAE standards)

BOILERS					
LOCATION	MANUFACTURER/MODEL #	TYPE	FUEL	AGE	EXPECTED LIFE
Elm Street School	Smith 28HE-S-5	Steam	Oil	7	25
Elm Street School	Smith 28A-S-5	Steam	Oil	22	25
Elm Street School	New Yorker	Water	Oil	5	25
Poland Community	Burnham EW.40.0.1F	Water	Oil	25	25
Poland Community	Burnham EW.40.0.1F	Water	Oil	25	25
Minot Consolidated	Smith 28HE-S-7	Steam	Oil	9	25

DOMESTIC WATER HEATERS				
LOCATION	QUANTITY	FUEL	AGE	EXPECTED LIFE
Elm Street School	1	Indirect hot water	5	15
Poland Community School	1	Oil	24	12
Minot Consolidated School	1	Oil	5	12

AIR HANDLING UNITS				
LOCATION	QUANTITY	CFM/AREA SERVED	AGE	EXPECTED LIFE
Elm Street School	1 or 2	Gym	41	20-25
Poland Community School	3	2600, 6000, 6000	33	20-25
Poland Community School	1	640	20	20-25
Minot Consolidated School	1	Gym	32	20-25

UNIT VENTILATORS				
LOCATION	QUANTITY	CFM	AGE	EXPECTED LIFE
Elm Street School (1954)	14	unknown	68	25
Poland Community School (1990)	18	1000	32	25
Poland Community School (1990)	1	750	32	25
Poland Community School (2002)	10	750	21	25

TEMPERATURE CONTROLS/AUTOMATION				
LOCATION	TYPE	MANUFACTURER	AGE	EXPECTED LIFE
Elm Street School	Pneumatic	Honeywell	38	20
Poland Community School	Elect/Electronic	Honeywell	42	16
Minot Consolidated School	Elect/Electronic	Barber-Coleman	32	16