Capron Elementary School

Description	Quantity	Unit Cost (2021)	Total	Estimated Useful Life	Remaining Useful Life	Mechanical Replacement / Upgrade Timeline				
						Year 1	Year 2	Years 3-5	Years 6-10	Years 11-20
Existing / Replacement Equipment										
Boilers (B-1, B-2)	2	- - -	- - -	50	24	- - -	- - -	- - -	- - -	- - -
Boilers (B-3)	1	- - -	- - -	50	24	- - -	- - -	- - -	- - -	- - -
Unit Heater	1	$10,000	**$10,000**	20	0	- - -	- - -	$10,000	- - -	- - -
Classroom Unit Vents	22	$10,000	$220,000	20	0	$220,000	- - -	- - -	- - -	- - -
Fan Coils	2	$5,000	$10,000	?	?	- - -	- - -	$10,000	- - -	- - -
Controls (Existing units)	15	$3,000	$45,000	- - -	- - -	$45,000	- - -	- - -	- - -	- - -
Electrical	1	$30,000	$30,000	- - -	- - -	$30,000	- - -	- - -	- - -	- - -
New Equipment / Systems										
Relief Systems	24	$5,000	$120,000	- - -	- - -	$120,000	- - -	- - -	- - -	- - -
Building Management System	1	$30,000	$30,000	- - -	- - -	- - -	- - -	$30,000	- - -	- - -
Rooftop Units	2	$150,000	$300,000	- - -	- - -	- - -	$300,000	- - -	- - -	- - -
VRF System (Office Areas)	1	$40,000	$40,000	- - -	- - -	- - -	- - -	$40,000	- - -	- - -
Electrical	1	$30,000	$30,000	- - -	- - -	- - -	$15,000	$15,000	- - -	- - -
Window A/C Units				- - -	- - -	- - -	- - -	- - -	- - -	- - -
CUV Condenser Units	22	$5,000	$110,000	- - -	- - -	- - -	- - -	- - -	$110,000	- - -
Total			**$945,000**		**- - -**	**$415,000**	**$315,000**	**$105,000**	**$110,000**	**$0**

Manchester Elementary School

Description	Quantity	Unit Cost (2021)	Total	Estimated Useful Life	Remaining Useful Life	Mechanical Replacement / Upgrade Timeline				
						Year 1	Year 2	Years 3-5	Years 6-10	Years 11-20
Existing / Replacement Equipment										
Boilers (B-1 / B-2)	2	- - -	- - -	50	24	- - -	- - -	- - -	- - -	- - -
Unit Heaters	2	$15,000	$30,000	20	0	- - -	- - -	- - -	$30,000	- - -
AHU (Gymnasium)	1	$60,000	$60,000	40	0	- - -	- - -	$60,000	- - -	- - -
Classroom Unit Vents (CUV-1, CUV-2)	9	$10,000	$90,000	20	0	$90,000	- - -	- - -	- - -	- - -
Classroom Unit Vents (CUV-3)	1	$10,000	$10,000	20	7	- - -	- - -	- - -	$10,000	- - -
Controls (Existing units)	18	$3,000	$54,000	- - -	- - -	$54,000	- - -	- - -	- - -	- - -
Electrical	1	$20,000	$20,000	- - -	- - -	$20,000	- - -	- - -	- - -	- - -
New Equipment / Systems										
Classroom Unit Vents (CUV)	4	$15,000	$60,000	- - -	- - -	- - -	$60,000	- - -	- - -	- - -
Relief Systems	9	$5,000	$45,000	- - -	- - -	$45,000	- - -	- - -	- - -	- - -
Building Management System	1	$20,000	$20,000	- - -	- - -	- - -	$20,000	- - -	- - -	- - -
Office VRF system	1	$40,000	$40,000	- - -	- - -	- - -	- - -	$40,000	- - -	- - -
Condensing Unit (Gymnasium)	1	$40,000	$40,000	- - -	- - -	- - -	- - -	- - -	$40,000	- - -
Electrical	1	$30,000	$30,000	- - -	- - -	$10,000	$10,000	$10,000	- - -	- - -
Window A/C Units					- - -	- - -	- - -	- - -	- - -	- - -
CUV Condenser Units	13	$5,000	$65,000	- - -	- - -	- - -	- - -	- - -	$65,000	- - -
Total			**$564,000**		**- - -**	**$219,000**	**$90,000**	**$110,000**	**$145,000**	**$0**
			(Rounded $1,000)							

North Boone Middle School

Description	Quantity	Unit Cost 2021	Total	Estimated Useful Life	Remaining Useful Life	Mechanical Replacement / Upgrade Timeline				
						Year 1	Year 2	Years 3-5	Years 6-10	Years 11-20
Existing / Replacement Equipment										
Boilers (B-1 / B-2)	2	---	---	50	24	---	---	---	---	---
Unit Heaters	2	$10,000	$20,000	20	0	---	---	$20,000	---	---
AHU (Gymnasium)	2	$60,000	$120,000	40	15	---	---	---	---	$120,000
AHU (Tech Room)	1	$60,000	$60,000	20	8	---	---	$60,000	---	---
Condensing Unit (CU-1)	1	$40,000	$40,000	20	8	---	---	---	---	$40,000
Classroom Unit Vents (CUV-1)	26	$10,000	$260,000	20	5	$260,000	---	---	---	---
Classroom Unit Vents (CUV-2) Science	2	$15,000	$30,000	25	12	---	---	---	---	$30,000
Electrical	1	$30,000	$30,000	---	---	$30,000	---	---	---	---
New Equipment / Systems										
Relief Systems	26	$5,000	$130,000	---	---	$130,000	---	---	---	---
Building Management System	1	$30,000	$30,000	---	---	---	---	---	$30,000	---
Office VRF system	1	$40,000	$40,000	---	---	---	---	$40,000	---	---
Rooftop Units (Gymnasium)	2	$160,000	$320,000	---	---	---	---	---	$320,000	---
Controls	1	$30,000	$30,000	---	---	---	$30,000	---	---	---
Electrical	1	$40,000	$40,000	---	---	---	$40,000	---	---	---
Window A/C Units					---	---	---	---	---	---
CUV Condenser Units	28	$5,000	$140,000	---	---	---	---	---	$140,000	---
Total			**$1,290,000**			**$420,000**	**$70,000**	**$120,000**	**$490,000**	**$190,000**

Poplar Grove Elementary School

Description	Quantity	Unit Cost 2021	Total	Estimated Useful Life	Remaining Useful Life	Mechanical Replacement / Upgrade Timeline				
						Year 1	Year 2	Years 3-5	Years 6-10	Years 11-20
Existing / Replacement Equipment										
Boilers (B-1)	1	---	---	50	25	---	---	---	---	---
Boilers (B-2)	1	$90,000	$90,000	20	8	---	---	---	---	$90,000
Boilers (B-3)	1	---	---	40	40	---	---	---	---	---
Classroom Unit Vents (CUV-1)	8	$10,000	$80,000	20	0	$80,000	---	---	---	---
Classroom Unit Vents (CUV-2)	4	$10,000	$40,000	20	8	---	---	---	$40,000	---
RTU's	7	$20,000	$140,000	20	8	---	---	---	$140,000	---
AHU's (Gymnasium)	2	$70,000	$140,000	40	0	---	---	$140,000	---	---
Condensing Units (CU)	3	$5,000	$15,000	20	8	---	---	---	$15,000	---
Building Controls (Existing units)	15	$2,000	$30,000	---	---	$30,000	---	---	---	---
Electrical	1	$10,000	$10,000	---	---	$10,000	---	---	---	---
New Equipment / Systems										
Relief Systems	8	$5,000	$40,000	---	---	$40,000	---	---	---	---
Condensing Unit (Gymnasium)	2	$20,000	$40,000	---	---	---	---	$40,000	---	---
Electrical	1	$10,000	$10,000	---	---	$10,000	---	---	---	---
Window A/C Units					---	---	---	---	---	---
CUV Condenser Units	8	$5,000	$40,000	---	---	---	---	---	$40,000	---
Total			**$675,000**			**$170,000**	**$0**	**$180,000**	**$235,000**	**$90,000**

Upper Elementary School

Description	Quantity	Unit Cost 2021	Total	Estimated Useful Life	Remaining Useful Life	Mechanical Replacement / Upgrade Timeline				
						Year 1	Year 2	Years 3-5	Years 6-10	Years 11-20
Existing / Replacement Equipment										
Boilers (B-1 / B-2)	2	$125,000	$250,000	40	15	---	---	---	---	$250,000
AHU (Art Rooms) AHU-1	1	$15,000	$15,000	40	15	---	---	---	---	$15,000
AHU (Gymnasium) (AHU-2)	1	$140,000	$140,000	40	15	---	---	---	---	$140,000
AHU (Classroom Addition) (AHU-4)	1	$100,000	$100,000	40	15	---	---	---	---	$100,000
AHU (Offices) (AHU-5)	1	$65,000	$65,000	40	15	---	---	---	---	$65,000
RTU (Classroom Addition) RTU-1	1	$75,000	$75,000	20	5	---	---	---	$75,000	---
Condensing Units (Art Rooms) (CU-1)	1	$10,000	$10,000	20	0	---	---	$10,000	---	---
Condensing Units (Offices) (CU-2)	1	$80,000	$80,000	20	0	---	---	$80,000	---	---
New Equipment / Systems										
Building Management System	1	$240,000	$240,000	---	---	---	---	---	$240,000	---
Window A/C Units				---	---	---	---	---	---	---
RTU	1	$170,000	$170,000	---	---	---	---	---	$170,000	---
Chiller	1	$330,000	$330,000	---	---	---	---	---	$330,000	---
Coils (4) / Pumps (1) / Piping	1	$120,000	$120,000	---	---	---	---	---	$120,000	---
Electrical	1	$30,000	$30,000	---	---	---	---	---	$30,000	---
Total			**$1,625,000**			**$0**	**$0**	**$90,000**	**$965,000**	**$570,000**

Capron

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July 29, 2021

North Boone CUSD 200
Capron School
Report and Evaluation of HVAC Systems

General System Descriptions

Heating Plant

Heating for the original building is provided by a steam boiler plant located in a lower level mechanical room in the original building. This plant consists of two natural gas fired boilers, is approximately 25 years old and is in good condition. Steam produced by this plant is distributed to terminal equipment by piping located partially in tunnels and in the attic. All piping appears to be in fair condition and is original to the building.

Heating for the 1966 addition is provided by a hot water boiler plant located in a mechanical room on the east side of the building. This plant consists of a single natural gas fired boiler, is approximately 25 years old and is in good condition. Hot water produced by this plant is distributed to terminal equipment by piping located above the ceilings. All piping appears to be in good condition and was installed with the boiler.

Terminal Equipment

Unit ventilators are installed in each classroom. Unit heaters were intended to provide heating and ventilation in the gymnasium, however it does not appear that these systems are operational. Steam unit heaters provide heating in the kitchen, washrooms and in other ancillary spaces. Convectors provide heating in areas such as corridors, and offices. Fan coils have been installed in small classrooms and offices in the addition. All equipment in the original building was installed when the building was constructed. Equipment in the addition was installed approximately 25 years ago. All equipment has exceeded its normal service life.

Ventilation

Mechanical ventilation equipment has been provided for most areas of the building; however, this equipment is not operating correctly and is not supplying the required outside air to each space. The ventilation equipment in the gymnasium and cafeteria is not sized adequately for these spaces. These areas of the building are also not equipped with required relief systems to remove stale air as outside air is introduced into the individual spaces. The offices in the original building are not equipped with mechanical ventilation equipment and rely on operable windows for natural ventilation. Outside air is generally not introduced into these spaces in the winter and summer as opening windows would adversely affect temperatures in these areas.

Cooling
This facility is not equipped with a central air conditioning system. Window units have been installed in most classrooms and offices. Air conditioning has not been provided for the gymnasium and cafeteria. Cooling for the library is provided by a residential style fan coil and associated roof-mounted condensing unit.

Temperature Controls
This facility is equipped with a central pneumatic temperature control system. Most components in this system are no longer operating correctly and have exceeded their normal service life. The pneumatic controls have been removed on some unit ventilators and have been replaced with new standalone electronic controls. A new central digital control system should be installed to increase comfort and to reduce energy consumption.

Electrical
The building is equipped with an 1,200 amp 120/208 volt service located in a mechanical room on the east side of the building. The incoming service has spare capacity for the addition of air conditioning. Replacement of this service is therefore not anticipated.

HVAC Replacement Options

Option 1: Direct replacement of existing equipment $755,000 Window Units (Fix what is broken)

All existing unit ventilators and fan coils will be replaced with similar equipment. New relief systems (exhaust fans, etc.) will be installed to ensure proper operation of the new ventilation equipment. Modifications to existing casework and louvers are anticipated to support new equipment. New rooftop units will be installed to serve the gymnasium and cafeteria. The existing steam and hot water boiler plants will remain. New systems will be equipped for future air conditioning with direct expansion (DX) condensing units. Existing window air conditioning units will remain. New controls will be provided for all existing unit heaters and convectors. All new and modified equipment will be connected to a new digital control system. New electrical panels will be installed to support new electrical loads. Branch circuits will be extended from the new panels to all new equipment.

Option 2: Direct replacement, add DX cooling $935,000 ~~Roof top units~~ AC units on ground + roof

This Option replaces all equipment as noted in Option 1 but adds DX condensing units for all new equipment. One condensing unit will be installed for each unit ventilator. These condensing units may be either roof or grade mounted. Structural and roof modifications or concrete pads will be required to support new condensing units. Air conditioning systems will be added to the office areas. Electrical and temperature control modifications will be similar to Option 1.

Option 3: All new systems and equipment $1,430,000

All existing HVAC equipment will be replaced with new. This Option replaces all equipment noted in Option 2 above. In addition, all unit heaters and convectors will be replaced with new similar units compatible with hot water service. The steam boiler plant will be replaced with a new hot water boiler plant. The existing hot water plant will be connected to the new hot water plant and the third boiler will be eliminated. A central roof mounted chiller will provide cooling for the entire facility except the gymnasium and cafeteria. These spaces will be served by rooftop units described above. New heated/chilled piping will extend from the new boiler plant to all areas of the building. This Option will result in a net reduction in natural gas consumption of approximately 15%. Yearly maintenance costs will also be reduced since there will be only one air conditioning unit versus multiple smaller units.

Option 4: New geothermal system – Not considered

The installation of a geothermal system was not considered for this facility since the installation of this type of system would result in a net increase in energy costs.

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July 29, 2021

North Boone CUSD 200
Manchester School
Report and Evaluation of HVAC Systems

General System Descriptions

Heating Plant

Heating for the entire facility is provided by a steam boiler plant located in a lower level mechanical room in the original building. This plant consists of two propane fired boilers, is approximately 25 years old and is in good condition. Steam produced by this plant is distributed to terminal equipment by piping located at the ceiling in the original building and in tunnels in the 1960 addition. All piping appears to be in fair condition and is original to each section of building.

Terminal Equipment

Unit ventilators are installed in each classroom. An air handler provides heating and ventilation in the gymnasium. Steam unit heaters provide heating in the lower level and in other ancillary spaces. Baseboard radiation and convectors provide heating in areas such as corridors, restrooms, offices and the library. All equipment except one unit vent serving the computer lab in the lower level is original and has exceeded its normal service life.

Ventilation

Mechanical ventilation equipment has been provided for most areas of the building; however, this equipment is not operating correctly and is not supplying the required outside air to each space. These areas of the building are also not equipped with required relief systems to remove stale air as outside air is introduced into the individual spaces. The lower level (except the computer lab) and offices are not equipped with mechanical ventilation equipment and rely on operable windows for natural ventilation. Outside air is generally not introduced into these spaces in the winter and summer as opening windows would adversely affect temperatures in these areas.

Cooling

This facility is not equipped with a central air conditioning system. Window units have been installed in most classrooms and offices. Air conditioning has not been provided for the gymnasium.

Temperature Controls

This facility is equipped with a central pneumatic temperature control system. Most components in this system are no longer operating correctly and have exceeded their

normal service life. The pneumatic controls have been removed on some unit ventilators and have been replaced with new standalone electronic controls. A new central digital control system should be installed to increase comfort and to reduce energy consumption.

Electrical

The building is equipped with an 800 amp 120/208 volt service located in the lower level boiler room. The incoming service has spare capacity for the addition of air conditioning. Replacement of this service is therefore not anticipated.

HVAC Replacement Options

Option 1: Direct replacement of existing equipment $290,000

All existing ventilation equipment (unit ventilators and the gym air handler) will be replaced with similar equipment. The existing unit ventilator in the computer lab will remain. New relief systems (exhaust fans, etc.) will be installed to ensure proper operation of new ventilation equipment. Modifications to existing casework and louvers are anticipated to support new equipment. The existing steam boiler plant will remain. New systems will be equipped for future air conditioning with direct expansion (DX) condensing units. Existing window air conditioning units will remain. New controls will be provided for all existing unit heaters, baseboard radiation and convectors. All new and modified equipment will be connected to a new digital control system. New electrical panels will be installed to support new electrical loads. Branch circuits will be extended from the new panels to all new equipment.

Option 2: Direct replacement, add DX cooling $525,000

This Option replaces all equipment as noted in Option 1 but adds DX condensing units for all new equipment. Unit ventilators will be added to all areas in the lower level. One condensing unit will be installed for each unit ventilator and the gym air handler. These condensing units may be either roof or grade mounted. Structural and roof modifications or concrete pads will be required to support new condensing units. Air conditioning systems will be added to the main office area. Electrical and temperature control modifications will be similar to Option 1.

Option 3: All new systems and equipment $1,140,000

All existing HVAC equipment will be replaced with new. This Option replaces all equipment noted in Option 2 above. In addition, all unit heaters, baseboard radiation and convectors will be replaced with new similar units compatible with hot water service. The steam boiler plant will be replaced with a new hot water boiler plant. A central roof mounted chiller will provide cooling for the entire facility. New heated/chilled piping will extend from the new boiler plant to all

areas of the building. This Option will result in a net reduction in propane consumption of approximately 15%. Yearly maintenance costs will also be reduced since there will be only one air conditioning unit versus multiple smaller units.

Option 4: New geothermal system $1,380,000

All equipment noted in Option 3 above will be replaced with new equipment compatible with geothermal heating and cooling. A well field consisting of approximately 50 wells will be installed. The location of this field will need to be coordinated with existing septic system equipment and piping. The installation of this type of system will result in an approximate net yearly energy cost savings of $23,500.

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North Boone CUSD 200
North Boone Middle School
Report and Evaluation of HVAC Systems

General System Descriptions

Heating Plant

Heating for the entire building is provided by a steam boiler plant located on the north side of the original building. This plant consists of two natural gas fired boilers, is approximately 25 years old and is in good condition. Steam produced by this plant is distributed to terminal equipment by piping locate in tunnels at the perimeter of the building. All piping appears to be in fair condition and is original to the building.

Terminal Equipment

Typical classrooms are equipped with finned tube radiation at the outside walls. Unit ventilators have been installed in a few classrooms and in the cafeteria. Two air handlers provide heating and ventilation in the gymnasium. A single air handler provides heating and ventilation in the technology room. Steam unit heaters provide heating in corridors, entrances and in other ancillary spaces. Convectors provide heating in areas such as restrooms and offices. Most equipment in the original building was installed when the building was constructed and has exceeded its normal service life. Unit ventilators in science classrooms were installed in 2008. All other unit ventilators appear to be approximately 25 years old and have reached the end of their normal service life.

Ventilation

Mechanical ventilation equipment has not been provided for most areas of the building. Classrooms and offices rely on operable windows for natural ventilation. Outside air is generally not introduced into these spaces in the winter and summer as opening windows would adversely affect temperatures in these areas. Unit ventilators, where present provide ventilation in classrooms and the cafeteria. The air handlers in the gymnasium and technology room provide mechanical ventilation in these areas.

Cooling

This facility is not equipped with a central air conditioning system. Window units have been installed in most classrooms and offices. Air conditioning has not been provided for the gymnasium and cafeteria. Cooling for the technology area is provided by an air handler mounted above the ceiling and an associated roof-mounted condensing unit.

Temperature Controls

This facility is equipped with a digital temperature control system. The equipment

generally appears to be functioning correctly.

Electrical
The building is equipped with a 1,200 amp 277/480 volt service located in the boiler room. The incoming service has spare capacity for the addition of air conditioning. Replacement of this service is therefore not anticipated.

HVAC Replacement Options

Option 1: Direct replacement of existing equipment $420,000

All existing unit ventilators (except science rooms) will be replaced with similar equipment. New unit ventilators will be installed in all classrooms not currently equipped with mechanical ventilation systems. New relief systems (exhaust fans, etc.) will be installed to ensure proper operation of the new ventilation equipment. Modifications to existing casework and louvers are anticipated to support new equipment. The existing steam boiler plant will remain. New systems will be equipped for future air conditioning with direct expansion (DX) condensing units. Existing window air conditioning units will remain. All new equipment will be connected to the existing digital control system. New electrical panels will be installed to support new electrical loads. Branch circuits will be extended from the new panels to all new equipment.

Option 2: Direct replacement, add DX cooling $1,060,000

This Option replaces all equipment as noted in Option 1 but adds DX condensing units for all new equipment. One condensing unit will be installed for each unit ventilator. These condensing units may be either roof or grade mounted. Structural and roof modifications or concrete pads will be required to support new condensing units. Rooftop units will replace the existing gymnasium air handlers. Air conditioning systems will be added to the office areas. Electrical and temperature control modifications will be similar to Option 1.

Option 3: All new systems and equipment $1,820,000

All existing HVAC equipment will be replaced with new. This Option replaces all equipment noted in Option 2 above. In addition, all unit heaters and convectors will be replaced with new similar units compatible with hot water service. The steam boiler plant will be replaced with a new hot water boiler plant. A central roof mounted chiller will provide cooling for the entire facility except the gymnasium. This space will be served by rooftop units described above. New heated/chilled piping will extend from the new boiler plant to all areas of the building. This Option will result in a net reduction in natural gas consumption of approximately 15%. Yearly maintenance costs will also be reduced since there will be only one air conditioning unit versus multiple smaller units.

Option 4: New geothermal system – Not considered

The installation of a geothermal system was not considered for this facility since the installation of this type of system would result in a net increase in energy costs.

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July 29, 2021

North Boone CUSD 200
Poplar Grove School
Report and Evaluation of HVAC Systems

General System Descriptions

Heating Plant

Heating for the west half of the facility is provided by a steam boiler plant located in a lower level mechanical room in the original building. This plant consists of a single natural gas fired boiler, is approximately 25 years old and is in good condition. Steam produced by this plant is distributed to terminal equipment by piping located at the ceiling in the original building and in tunnels in the addition just east of the original building. All piping appears to be in fair condition and is original to each section of building.

Heating for the east half of the facility is provided by a hot water boiler plant located in a mechanical room on the east side of the addition. This plant consists of a two natural gas fired boilers, is approximately 14 years old and is in good condition. Hot water produced by this plant is distributed to terminal equipment by piping located above the ceilings in the addition. All piping appears to be in fair condition and is original to each section of building.

Heating for the three classrooms and library in the center section of the building is provided by natural gas fired rooftop units. These units are approximately 14 years old and are in good condition.

Terminal Equipment

Unit ventilators are installed in each classroom in the west half of the building. Variable air volume (VAV) boxes with hot water reheat coils are installed in the classrooms in the east half of the building. Two air handlers provide heating and ventilation in the gymnasium. Steam unit heaters provide heating in the lower level and in other ancillary spaces. Convectors provide heating in areas such as corridors, offices and entrances. All equipment in the original building is original and has exceeded its normal service life. Equipment in other sections of the building is approximately 14 years old and is in good condition.

Ventilation

Mechanical ventilation equipment has been provided for most areas of the building. Areas of the building served by unit ventilators are not equipped with required relief systems to remove stale air as outside air is introduced into the individual spaces. The

lower level is not equipped with mechanical ventilation equipment and relies on operable windows for natural ventilation. Outside air is generally not introduced into these spaces in the winter and summer as opening windows would adversely affect temperatures in these areas.

Cooling

The west half of this facility is not equipped with a central air conditioning system. Window units have been installed in most classrooms and offices in the original building. Air conditioning has not been provided for the gymnasium. A rooftop unit provides cooling for the main office area. Unit ventilators with direct expansion (DX) condensing units provide cooling for the four classrooms east of the original building.

Cooling for the east half of the building is provided by two VAV rooftop units. Cooled air is distributed to each space through ductwork located above the ceilings. VAV boxes modulate the amount of air delivered to each space to maintain temperatures.

Temperature Controls

This facility is equipped with a combination of pneumatic and digital temperature control systems. Most pneumatic components in this system are no longer operating correctly and have exceeded their normal service life. Newer equipment is equipped with electronic controls and is connected to the digital control system.

Electrical

The building is equipped with an 800 amp 277/480 volt service located in an electrical room on the first floor. The incoming service has spare capacity for the addition of air conditioning. Replacement of this service is therefore not anticipated.

HVAC Replacement Options

Option 1: Direct replacement of existing equipment $300,000

All existing ventilation equipment in the original building and gymnasium will be replaced with similar equipment. New unit ventilators will be added to the lower level. New relief systems (exhaust fans, etc.) will be installed to ensure proper operation of new ventilation equipment. Modifications to existing louvers are anticipated to support new equipment. The existing steam and hot water boiler plants will remain. New systems will be equipped for future air conditioning with direct expansion (DX) condensing units. Existing window air conditioning units will remain. New controls will be provided for all existing unit heaters and convectors currently equipped with pneumatic controls. All new and modified equipment will be connected to a new digital control system. New electrical panels will be installed to support new electrical loads. Branch circuits will be extended from the new panels to all new equipment.

Option 2: Direct replacement, add DX cooling $390,000

This Option replaces all equipment as noted in Option 1 but adds DX condensing units for all new equipment. One condensing unit will be installed for each unit ventilator and the gym air handlers. These condensing units may be either roof or grade mounted. Structural and roof modifications or concrete pads will be required to support new condensing units. Electrical and temperature control modifications will be similar to Option 1.

Option 3: All new systems and equipment – Not Considered

The majority of equipment in this facility is less than 14 years old and is in good condition. Option 2 replaces the remaining older equipment in the building.

Option 4: New geothermal system – Not Considered

The installation of a geothermal system was not considered for this facility since the installation of this type of system would result in a net increase in energy costs.

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North Boone CUSD 200
Upper Elementary School
Report and Evaluation of HVAC Systems

General System Descriptions

Heating Plant

Heating for the entire facility is provided by a hot water boiler plant located in a mezzanine mechanical room in the original building. This plant consists of two natural gas fired boilers, is approximately 27 years old and is in good condition. Hot water produced by this plant is distributed to terminal equipment by piping located above the ceilings. All piping appears to be in good condition and is original to each section of building.

Terminal Equipment

Variable air volume (VAV) boxes are installed in all areas of the building except the gymnasium. Four air handlers provide heating and ventilation for the original building. A rooftop unit provides heating and ventilation for the 2005 addition. Unit heaters provide heating in the entrances and in other ancillary spaces. Baseboard radiation provides heating in restrooms and some classrooms. All equipment original to the section of building that it serves.

Ventilation

Mechanical ventilation equipment has been provided for all areas of the building. The air handlers in the mezzanine mechanical room provide ventilation for all areas of the original building. A rooftop unit provides ventilation for all areas of the 2005 addition.

Cooling

The majority of this facility is not equipped with a central air conditioning system. Window units have been installed in some classrooms. The air handlers serving the office and art room are equipped with direct expansion (DX) condensing units. The condensing units are in good condition, but are near the end of their normal service life.

Temperature Controls

This facility is equipped with a central pneumatic temperature control system. Most pneumatic components in this system are currently operating correctly, but are near the end of their normal service life.

Electrical

The building is equipped with a 1,200 amp 120/208 volt service located in a mechanical

room on the first floor. The incoming service has spare capacity for the addition of air conditioning. Replacement of this service is therefore not anticipated.

HVAC Replacement Options

Option 1: Replacement of existing condensing units, upgrade controls $330,000

The two existing condensing units will be replaced with new similar units. The existing coils in the air handlers and the associated piping will be replaced to be compatible with newer refrigerants. All existing pneumatic controls will be replaced with new digital controls. Existing window air conditioning units will remain.

Option 2: Installation of new chiller and rooftop unit $890,000

The two existing condensing units will be removed and the existing hot water coils in the air handlers will be replaced with coils equipped for heating and cooling service. The existing rooftop unit for the addition will be replaced with a new similar unit with DX cooling. The temperature controls will be upgraded as with Option 1.

Option 3: All new systems and equipment – Not Considered

All equipment in this facility is less than 20 years old and is in good condition. Full replacement is not anticipated at this time.

Option 4: New geothermal system – Not Considered

The installation of a geothermal system was not considered for this facility since the installation of this type of system would result in a net increase in energy costs.