DAKOTA COUNTY
TECHNICAL COLLEGE

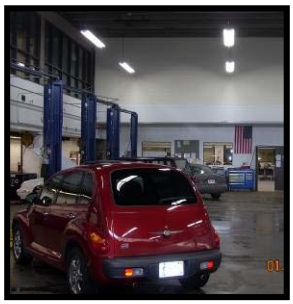
Rosemount, Minnesota

PRE-DESIGN

REPLACEMENT OF AIR HANDLING UNITS 6, 11, 12 & 13







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Prepared by TKDA
Tim Hoseck & Terry Madden
444 Cedar Street - Suite 1500
Saint Paul, MN 55101
p 651.292.4400
timothy.hoseck@tkda.com

TKDA

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PART 1 – PROJECT SUMMARY

SUMMARY STATEMENT

This project will replace the air handling equipment in Pods 6, 11, 12, and 13, which was installed when the original building was constructed in 1971. These systems serve approximately 45,600 square feet of classroom, office, shop, kitchen and commons area spaces. The existing systems do not meet current mechanical and energy codes or current MNSCU standards, and are operating beyond their useful life. Moreover, the campus is unable to provide adequate outdoor ventilation air with the existing air handling units during heating months. The inability to provide code required outdoor ventilation air is due to the existing system design and the inherent heating water coil freeze potential.

New variable air volume air handling systems will be installed to replace the existing constant volume air handling units. These systems will include new central station air handling units, return fans, minimum outdoor air fans, new air distribution systems, variable air volume boxes, and related HVAC piping and general construction work. These new systems will increase occupant comfort, increase ventilation air, and comply with current mechanical and energy codes as well as current MNSCU standards.

New DDC controls will be installed in the new equipment which will be tied back to the existing front end workstation, and will give the school better control and monitoring over these systems.

PROJECT BUDGET SUMMARY (SEE APPENDIX FOR DETAILED BREAKDOWN)

Pod 6	
Construction Cost Estimate (May 2017 Construction Start)	$1,469,398
Design Fee Estimate	$118,000
Total Estimated Cost for Pod 6	**$1,587,398**
Pod 11	
Construction Cost Estimate (May 2018 Construction Start)	$1,338,047
Design Fee Estimate	$107,000
Total Estimated Cost for Pod 11	**$1,445,047**
Pod 12	
Construction Cost Estimate (May 2019 Construction Start)	$1,607,853
Design Fee Estimate	$128,500
Total Estimated Cost for Pod 12	**$1,736,353**
Pod 13	
Construction Cost Estimate (May 2020 Construction Start)	$1,536,904
Design Fee Estimate	$123,000
Total Estimated Cost for Pod 13	**$1,659,904**
Total Estimated Cost for All Pods	$6,428,702

PROJECT SCHEDULE

Three options for design and construction schedule are presented in this Predesign Report. Option 1 calls for air handling system replacement to take place over four summers, with one air handling unit being replaced each summer, starting in Summer 2017 and ending Autumn 2020. Option 2 calls for air handling unit system replacement to take place over two summers, with two air handling units being replaced over Summer 2017 and Summer 2018. Finally, Option 3 calls for all four air handling units to be replaced during Summer 2017. In order to minimize risk of not meeting the substantial completion date and to minimize inflationary costs, (a 3% inflation rate is assumed in these calculations), Option 2 is recommended.

PART 2 – SCOPE

PROJECT BACKGROUND NARRATIVE

The existing air handling equipment located in Pods 6, 11, 12, and 13 was installed when the original building was constructed in 1971. These systems are operating beyond their useful life and do not meet current mechanical and energy codes. These systems utilize constant volume airflow with constant volume duct reheat coils downstream of the air handling units to heat individual spaces. The central station air handling units do not have heating coils. This lack of heating water coils in the central station air handling units has increased the risk of freezing the reheat coils and has caused the owner to reduce outdoor air to the school to prevent the potential of freezing.

The existing air distribution system utilizes interior lined ductwork that poses the risk of microbial growth. Furthermore, the duct distribution system is sized for high airflows that are no longer required, as the building envelope has been improved since the school was originally constructed, allowing duct distribution airflows to decrease.

The existing temperature control systems and graphics for the air handling units and associated areas are outdated and provide only minimal controllability and information to the operators. The controls will be updated to allow the school adequate control and monitoring of the new air handling units and associated systems.

PROJECT DESCRIPTION

This project will replace the air handling equipment located in Pods 6, 11, 12, and 13, as well as the associated duct distribution systems and controls. The systems located in/served from Pods 6, 12 & 13 will be replaced with new variable air volume air handling systems which include central station air handling units with heating and cooling water coils, return fans, heat recovery sections, minimum outdoor air fans, variable air volume boxes, and all associated controls.

The system located in/served from Pod 11 will be replaced with a new variable air volume air handling unit designed to deliver 100% outside air. This system is being designed for 100% outside air in anticipation of the campus mechanic and/or future academic programs utilizing this area of the building, and thus will provide the College with future flexibility. The intended use of the POD 11 equipment will be for shop areas only. The POD 11 system air streams shall not be co-mingled with classrooms or offices spaces outside of the shop area and not considered ancillary rooms. Co-mingling of air streams has been a historic issue at the campus. This unit will include a heating water coil only, return fan, variable air volume boxes, a heat recovery section, and all associated controls.

All central station air handling equipment will meet current MNSCU Design Standards, which include insulated double wall panels, air blender sections, primary & secondary air filtration sections, and economizer sections.

Generally, new distribution ductwork and heating water pipes will be routed in approximately the same locations as the existing duct and heating water distribution systems. However, some utility route modifications will be necessary to group similar spaces, as space usage has changed since the original air handling system design. The utility/distribution systems are currently installed above the corridor ceilings that extend from the pods. The ceilings will be removed to facilitate installations of the heating water and duct distribution systems and new lay-in ceilings will be installed. The existing lighting in these corridors will be temporarily removed and re-installed.

The air handling equipment located in Pod 6 currently serves classrooms, part of the cafeteria kitchen, and part of the commons area. The spaces served by Pod 6 are all part of the original building which was built in 1971. This zone is adjacent to the new Student Life area, which is part of the 1977 building addition. The Student Life area is currently receiving insufficient airflow from the air handling unit located in Pod 7. This is

due to the long duct run to serve this area. The Student Life area will now be served by AHU-6 to resolve the airflow issue since the AHU-6 is closer to this area than the air handling unit currently serving this area.

The air handling equipment located in Pod 11 will be designed to accommodate shop spaces. Currently, the air handling equipment located in Pod 11 serves both shop and classroom spaces. In order to separate these zones, the new air handling unit AHU-11 will be designed to be a heating only unit and provide 100% outdoor air and serve only the shop spaces in this area. The classroom and office spaces will need to be served by the new air handling unit that will be installed in Pod 12, which will also have a cooling section and serve only classroom and office spaces.

This change in zoning will require ductwork modifications in the classroom and office areas. Furthermore, ductwork to the office and classroom areas which are currently served by Pod 11 will need to be connected to the Pod 12 system during the Pod 11 construction period.

Fire protection modifications will be necessary in the Pods to facilitate installation of new mechanical equipment as well as to provide adequate coverage around ductwork obstructions. Within the corridors, fire protection branch piping modifications will be required to facilitate installation of air and heating water distribution systems as well as the new lay-in ceiling.

Below is a list of the major equipment/systems, by pod, that will be installed for this project:

Pod 6

System serves approximately 12,700 square feet.

- 17,600 CFM (approx.) central station air handling unit with heating water and cooling water coils
- 8,800 CFM (approx.) minimum outdoor air fan
- 17,600 CFM (approx.) mixed flow return fan with sound attenuator
- (17) VAV boxes with reheat coils
- New supply ductwork system
- New return ductwork system
- New heating water distribution piping
- Variable speed drives
- New DDC controls tied back to existing user workstation
- New exterior wall intake and relief louvers in Pod
- New unit heater in Pod
- New vestibule cabinet unit heater

Pod 11

System serves approximately 7,900 square feet.

- 16,000 CFM (approx.) central station air handling unit with heating water & air to air heat recovery section
- 100% Outdoor air
- (3) zone dampers
- New supply ductwork system
- New heating water distribution piping
- Variable speed drives
- New DDC controls tied back to existing user workstation
- New exterior wall intake and relief louvers in Mechanical Pod
- New unit heater in Mechanical Pod
- New vestibule cabinet unit heater

Pod 12

System serves approximately 18,900 square feet.

- 19,200 CFM (approx.) central station air handling unit with heating water and cooling water coils.
- 7,100 CFM (approx.) minimum outdoor air fan
- 19,200 CFM (approx.) mixed flow return fan with sound attenuator
- (18) VAV boxes with reheat coils
- New supply ductwork system
- New return ductwork system
- New heating water distribution piping
- Variable speed drives
- New DDC controls tied back to existing user workstation
- New exterior wall intake and relief louvers in Mechanical Pod
- New unit heater in Mechanical Pod
- New vestibule cabinet unit heater

Pod 13

System serves approximately 14,250 square feet.

- 15,000 CFM (approx.) central station air handling unit with heating water and cooling water coils.
- 6,000 CFM (approx.) minimum outdoor air fan
- 15,000 CFM (approx.) mixed flow return fan with sound attenuator
- (15) VAV boxes with reheat coils
- New supply ductwork system
- New return ductwork system
- New heating water distribution piping
- Variable speed drives
- New DDC controls tied back to existing user workstation
- New exterior wall intake and relief louvers in Mechanical Pod
- New unit heater in Mechanical Pod
- New vestibule cabinet unit heater

SUSTAINABILITY/ENERGY STATUTES

New HVAC systems incorporating premium efficiency motors, setback temperature controls, and variable volume operation will be installed to replace the existing HVAC systems. These new HVAC systems will reduce energy consumption and energy costs while increasing comfort of students, faculty, and staff. These improvements are due to the new HVAC systems being appropriately sized for the improved building envelope and meeting the current Minnesota Energy Code. The current Energy Code requires all air handling systems with cooling capacities above 54,000 btu/hr to be equipped with air economizers that provide up to 100% of the design supply air quantity as outdoor air for cooling. This will be an energy saving improvement as the existing systems do not have economizer controls. Code also requires heating and cooling systems over 10,000 CFM to be equipped with optimum start controls. This control algorithm is a function of the difference between space temperature and occupied setpoint and the amount of time prior to scheduled occupancy. This will increase the comfort of the students, faculty, and staff. Finally, the Minnesota Energy Code requires many air handling units that are designed to provide more than 30% ventilation air to be equipped with a form of energy recovery. Most of these units will be required to have heat recovery, which will provide further energy savings.

In addition to the air handling unit specific upgrades, other initiatives employed to increase system efficiency and occupant comfort include:

- Use of low VOC sealants and adhesives.
- Building Management and demand based ventilation system with occupancy sensors.
- M&E Commissioning.

ALTERNATIVE ENERGY ANALYSIS

Per Minnesota Statute 16B.326, a study for the application of geothermal and solar thermal systems does not apply as the central cooling and heating plants are not being replaced. This predesign only addresses the air handling systems in these four mechanical pods. Furthermore, per Minnesota Statute 16B.32, a study to determine the feasibility of installing a system to provide 2% Solar or Wind energy for the building does not apply as this project does not renovate 50% or more of the building, nor does this project involve new construction.

PART 3 – SCHEDULE

SCHEDULE OPTIONS

Construction will take place during the summer months to minimize the disruption to students. There are a few different schedule options to complete this work. For comparison purposes, Option 1 has been used as the base option.

Option 1 – Four Construction Phases

Under this option, one mechanical pod would be replaced each summer over the course of four years, starting Summer 2017. This option causes the least disruption to the campus and creates the least amount of risk to the campus in terms of on-time construction completion. This proposed project schedule can be seen below in Figure 1.

	Date Completed	2016				2017				2018				2019				2020			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PREDESIGN																					
Predesign - Submit May 2016	May 2016																				
MnSCU Scoring	Jun. 2016																				
Legislative Review	Jul. 2016																				
DESIGN																					
A/E Selection	Jul. 2016																				
Construction Document Production - Pod 6	Jan. 2017																				
Review of Pod 6 CDs	Jan 2017																				
Construction Document Production - Pod 11	Dec. 2017																				
Review of Pod 11 CDs	Jan. 2018																				
Construction Document Production - Pod 12	Dec. 2018																				
Review of Pod 12 CDs	Jan. 2019																				
Construction Document Production - Pod 13	Dec. 2019																				
Review of Pod 13 CDs	Jan. 2020																				
CONSTRUCTION																					
Pod 6 & Associated Areas																					
Bidding	Mar. 2017																				
Contract Award	Apr. 2017																				
Construction	Aug. 2017																				
Substantial Completion	Aug. 2017																				
Closeout	Oct. 2017																				
Pod 11 Areas & Associated Areas																					
Bidding	Feb. 2018																				
Contract Award	Mar. 2018																				
Construction	Aug. 2018																				
Substantial Completion	Aug. 2018																				
Closeout	Oct. 2018																				
Pod 12 Areas & Associated Areas																					
Bidding	Feb. 2019																				
Contract Award	Mar. 2019																				
Construction	Aug. 2019																				
Substantial Completion	Aug. 2019																				
Closeout	Oct. 2019																				
Pod 13 Areas & Associated Areas																					
Bidding	Feb. 2020																				
Contract Award	Mar. 2020																				
Construction	Aug. 2020																				
Substantial Completion	Aug. 2020																				
Closeout	Oct. 2020																				

Figure 1 - Project Schedule Option 1 – Four Construction Phases

Option 2 – Two Construction Phases

Under this option, two mechanical pods would be replaced in Summer 2017 and the remaining mechanical pods would be replaced during Summer 2018. This option creates more disruption to the school than Option 1 and increases the risk of not meeting the scheduled substantial completion date. However, this option allows for quicker installation of energy efficient/code compliant units and could potentially save approximately $50,000 in inflationary costs, (assuming Pods 11 and 12 are constructed in 2018 at an inflation rate of 3%). This proposed project schedule can be seen below in Figure 2.

	Date Completed	2016				2017				2018			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PREDESIGN													
Predesign - Submit May 2016	May 2016												
MnSCU Scoring	Jun. 2016												
Legislative Review	Jul. 2016												
DESIGN													
A/E Selection	Jul. 2016												
Construction Document Production - Pods 6 & 13	Jan. 2017												
Review of Pods 6 & 13 CDs	Jan 2017												
Construction Document Production - Pods 11 & 12	Dec. 2017												
Review of Pods 11 & 12 CDs	Jan. 2018												
CONSTRUCTION													
Pods 6 & 13 & Associated Areas													
Bidding	Mar. 2017												
Contract Award	Apr. 2017												
Construction	Aug. 2017												
Substantial Completion	Aug. 2017												
Closeout	Oct. 2017												
Pods 11 & 12 & Associated Areas													
Bidding	Feb. 2018												
Contract Award	Mar. 2018												
Construction	Aug. 2018												
Substantial Completion	Aug. 2018												
Closeout	Oct. 2018												

Figure 2 - Project Schedule Option 2 – Two Construction Phases

Option 3 – One Construction Phase

Under this option, all four mechanical pods would be replaced in one summer. This option creates the most disruption to the school and carries the highest risk of not meeting the scheduled substantial completion date. Similar to Option 2, this option allows for quicker installation of energy efficient/code compliant units, and could also potentially save approximately $250,000 in inflationary costs, (assuming an inflation rate of 3%). This proposed project schedule can be seen below in Figure 3.

	Date Completed	2016 Q1	2016 Q2	2016 Q3	2016 Q4	2017 Q1	2017 Q2	2017 Q3	2017 Q4
PREDESIGN									
Predesign - Submit May 2016	May 2016								
MnSCU Scoring	Jun. 2016								
Legislative Review	Jul. 2016								
DESIGN									
A/E Selection	Jul. 2016								
Construction Document Production - Pods 6 , 11, 12 & 13	Jan. 2017								
Review of Pods 6 , 11, 12 & 13 CDs	Jan 2017								
CONSTRUCTION									
Pods 6, 11, 12 & 13 Associated Areas									
Bidding	Mar. 2017								
Contract Award	Apr. 2017								
Construction	Aug. 2017								
Substantial Completion	Aug. 2017								
Closeout	Oct. 2017								

Figure 3 - Project Schedule Option 3 – One Construction Phase

Figure 4 - Example of Existing Mechanical Pod

Figure 5 - Example of New Mechanical Pod