**Minneapolis Public Schools**
Special School District #1

# Air Conditioning Cost Estimating Study Sheridan Spanish Dual Language Magnet


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# APPENDIX

## INTRODUCTION / KEY INFORMATION:

Wold Architects and Engineers was hired May 2021 to develop options with a recommended approach and construction cost estimate to expand the air conditioned area at the Sheridan Spanish Dual Language Magnet. The study also reviewed dehumidification capabilities and outlines additional work necessary to provide active dehumidification control. The study approach included a tour of the building site, review of available building construction documents, and a review of previous ventilation studies. Wold collaborated with the District's facility leadership team to establish criteria and guiding principles for developing options and to determine the recommended approach. Cost estimates are developed to reflect construction bids to be received on January 1, 2022 and includes a semi-annual cost inflation escalation to extend bids to January 1, 2025. .

### Key Information:

- Building Address: **Sheridan Spanish Dual Language Magnet**
  **Minneapolis Public Schools**
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  Minneapolis, MN 55413
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## EXECUTIVE SUMMARY:

Wold Architects and Engineers completed a study to determine the recommended approach and project budget to expand the air-conditioned area at the Sheridan Spanish Dual Language Magnet. The options developed are organized around the priorities established by the District based on the use of each space and by grouping areas within each building geographically as served by common systems. In collaboration with the District, the recommendation was developed to serve the highest priority areas within the overall budget constraints. In addition, the building as a whole was evaluated to determine additional features and systems that are required to provide active dehumidification control.

### Criteria / Guiding Principles:

Initial discussions provided a common understanding of the guiding principles to be used to develop options and a hierarchy of priorities based on the use of each space.

Guiding Principles:

- High quality proven system solutions preferred
- Systems shall be easy to operate and maintain
- A high level of temperature zone control required
- Centralized systems preferred
- Vertical unit ventilators may be an option depending on site factors
- DX or chilled water may be options depending on site factors
- Separate systems to serve administration areas should be considered
- COVID risk mitigation measures to focus on ventilation and filtration
- Window AC unit are not an option. Mini-splits may be is limited applications
- Heating for systems may be steam or hot water depending on site factors
- Systems shall be configured to allow for active dehumidification

Air-conditioning classrooms is the primary goal of this study. Additional spaces may be considered where possible within the overall budget constraints. Options were considered where space adjacencies allow opportunities to economically include additional areas. Gymnasiums are not typically air-conditioned but options were considered where they are central to a building and/or used as gathering spaces. It is not an intended outcome of the study to add ventilation and air conditioning to all spaces where it does not currently exist. The summary diagrams for each building identify the remaining unconditioned areas.

In addition, opportunities within each option were determined to provide added value scope where it is economically feasible to accomplish additional deferred maintenance needs within the scope of the air conditioning project i.e. ceilings, lights, and other room finishes.

**Recommended Scope Summary:**

Classrooms Building Areas #1, #2, #3, and #6 (39,995 Sq Ft): Several of the rooms in Building Areas #2 and #3 are interior complicating the installation of vertical unit ventilators in every room. Because of the configuration of some of these areas, a hybrid approach is recommended as follows:

- Building Area #1 (26,350 Sq Ft): Install a vertical unit ventilator with integral DX cooling in each classroom. Modify the existing steam distribution system to provide heating. The exterior louver will be installed through an existing window opening. The base project includes routing supply ductwork exposed along the exterior wall with registers for horizontal distribution.
- Building Areas #2 and #3 (9,130 Sq Ft): Install a new variable air volume air handling unit in the basement in the same location as the existing unit that serve Building Are #2. Provide a remote DX condensing unit for cooling. Install new insulated supply ductwork and variable air volume boxes with hot water reheat. Install a new steam-to-hot water convertor to provide hot water for VAV reheat when the steam plant is in operation. Remove the existing constant volume unit located on the second floor mechanical room that serves Building Area #3.
- Building Area #6 (4,515 Sq Ft): Replace each of the two constant volume heating only rooftop units with new constant volume single zone units with integral DX cooling. Modify the existing steam distribution system to provide for heating.

For consideration, an added scope option is included for providing a new lay-in ceiling and new LED lighting and controls. A perimeter soffit is included as may be required to accommodate the height of the exterior windows. Included with the ceilings and lights is overhead duct distribution to improve the sound performance and air distribution of the ventilation system.

The cost estimate includes a design contingency to cover risks identified that require further investigation. Identified risks include the following:

- Space heating and cooling loads are estimated to determine preliminary equipment selections as a basis for cost estimating. Final heating and cooling loads need to be completed.
- The optimal air-handling unit configuration. A guiding principal is to locate as much of the new equipment inside the existing fan room as possible. Options to optimize the space include combining air-handling zone, determining and alternate outside airflow path, and maybe alternate locations for heat recovery equipment.
- Determining vertical pathways for new ductwork to serve Building Areas#2 and #3. The existing structure poured concrete over clay tile. Options that require removing a concrete joist will require additional structural review.

- Determining pathways for outside and relief air for the system serving Building Areas #2 and #3.
- Integrity and capacity of the existing steam and condensate systems. The basis for cost estimating assumes that necessary piping modifications will be made within each classroom.
- Route and termination of the cooling system condensate drain. An allowance is provided to route the condensate drain from each unit ventilator to a floor drain located in the lower level.
- Modification to perimeter casework and finishes are included only as necessary for the mechanical systems installation.

**Construction Cost Estimate: $ 3,162,000**
**Add for Ceiling and Lights: $ 980,000**

Auditorium Building Areas #4 (10,675 Sq Ft): Install a new constant volume single zone roof mounted air handling unit with integral DX cooling. Route new supply ductwork exposed within the auditorium. To the extent possible, branch ductwork will be t be installed through the existing joist webs to maximize height within the space. Modify the existing steam system to provide heating.

The cost estimate includes a design contingency to cover risks identified that require further investigation. Identified risks include the following:

- Space heating and cooling loads are estimated to determine preliminary equipment selections as a basis for cost estimating. Final heating and cooling loads need to be completed.
- Integrity and capacity of the existing steam and condensate systems. The basis for cost estimating assumes that necessary piping modifications will be made within each classroom.
- Adequacy of the existing structure to support the new rooftop unit. Resolution of this risk requires a specific air handling unit selection and an analysis by a structural engineer.

**Construction Cost Estimate: $ 732,000**

Cafeteria Building Areas #5 (7,925 Sq Ft): Install a new variable air volume air handling unit in the basement in the same location as the existing constant volume unit that serves the cafeteria. Provide a remote DX condensing unit for cooling. Install new insulated supply ductwork and variable air volume boxes with hot water reheat. Install a new steam-to-hot water convertor to provide hot water for VAV reheat when the steam plant is in operation.

For consideration, an added scope option is included for providing a new lay-in ceiling and new LED lighting and controls. A perimeter soffit is included as may be required to accommodate the height of the exterior windows. Included with the ceilings and lights is overhead duct distribution to improve the sound performance and air distribution of the ventilation system.

The cost estimate includes a design contingency to cover risks identified that require further investigation. Identified risks include the following:

- Space heating and cooling loads are estimated to determine preliminary equipment selections as a basis for cost estimating. Final heating and cooling loads need to be completed.
- The optimal new air-handling unit configuration. A guiding principal is to locate as much of the new equipment inside the existing fan room as possible. Options to optimize the space include combining air-handling zone, determining and alternate outside airflow path, and maybe alternate locations for heat recovery equipment.
- Integrity and capacity of the existing steam and condensate systems. The basis for cost estimating assumes that necessary piping modifications will be made within each classroom.
- Adequacy of the existing outside air and relief air pathways to serve the ventilation and relief air for the new systems.

**Construction Cost Estimate: $ 523,000**
**Add for Ceiling and Lights: $ 166,000**

Gymnasium Building Areas #7 (8.415 Sq Ft): Install a new constant volume single zone roof mounted air handling unit with integral DX cooling. Route new supply ductwork exposed within the gymnasium. To the extent possible, branch ductwork will be t be installed through the existing joist webs to maximize height within the space. Modify the existing steam system to provide heating.

The cost estimate includes a design contingency to cover risks identified that require further investigation. Identified risks include the following:

- Space heating and cooling loads are estimated to determine preliminary equipment selections as a basis for cost estimating. Final heating and cooling loads need to be completed.
- Integrity and capacity of the existing steam and condensate systems. The basis for cost estimating assumes that necessary piping modifications will be made within each classroom.
- Adequacy of the existing structure to support the new rooftop unit. Resolution of this risk requires a specific air handling unit selection and an analysis by a structural engineer.

**Construction Cost Estimate: $ 273,000**
**Add for De-stratification Fans $ 42,000**

## EXISTING BUILDING INFORMATION

The original building was constructed in 1932. A gymnasium addition was added in 1967. The original project typically ventilated the classrooms with unit ventilators. Spaces other than the classrooms are typically ventilated by central air handling systems installed in interior mechanical rooms.

There is not a centralized cooling plant. A portion of the original classroom unit ventilators were replaced in 2008 with vertical unit ventilators with integral cooling. Window AC units or mini-split units serve a portion of the rest of the building.

The building is heated with two large dual fuel fire tube steam boilers.

A complete summary of the existing building systems is shown graphically in Appendix A.

### Building Area Summary:

| Year | Area (sq. ft.) |
|---|---|
| 1932 | 109,980 |
| 1967 | 16,306 |
| **Total** | **126,286** |

## AIR CONDITIONING OPTIONS SUMMARY

The Primary driver of the overall project scope and budget is the decision about the air delivery method. The size of the equipment and the configuration within the building affects the work scope of multiple trades to provide pathways for ductwork and piping and to restore building finishes. With each air delivery method, there are multiple options to provide cooling and multiple options to provide heating which typically are part of the overall building central heating and cooling plant strategy. There are long-term benefits to the overall maintenance and operation of the facility to consider the heating and cooling approach for each air delivery option within the overall plan for the central heating and cooling plants that serve the building.

The range of air delivery options presented in this summary are narrowed to those that fit the District's criteria that includes centralizing systems to the extent possible to minimize regular and periodic maintenance. These options typically include vertical unit ventilators, variable air volume central air handling, and dedicated outside air displacement systems. The full range of options are discussed in more detail in the "Air Conditioning Options Detail" section of this report.

In addition to the first cost, the attributes of each system also have an effect on the quality of the learning environment and the on-going operational costs related to energy efficiency and the requirements for regular and periodic maintenance. As an aid for discussion, each of the air delivery options presented are rated relative to each other in terms of good, better, best in each of these performance categories as follows.

| Attribute | Vertical Unit Vents | Central VAV | DOAS / Displacement |
|---|---|---|---|
| Environment Quality | Good | Better | Best |
| Energy Efficiency | Good | Better | Best |
| Maintenance | Good | Better | Best |

A summary of the cost range for viable options for each of the air delivery methods is as follows. The options prioritize adding cooling to the classrooms and are summarized in total to cover all of the currently unconditioned classrooms in the building. Other areas that may include gymnasiums, auditoriums or other common areas are listed separately. All cost are presented as construction costs.

Vertical Unit Ventilators:

Install a vertical unit ventilator along the perimeter of each classroom. The work will include installing a new exterior louver through either a window or cutting a louver through the exterior wall. The range of costs includes is defined by the following approach to heating and cooling. Several of the rooms in Building Areas #2 and #3 are interior which complicate the addition of vertical unit ventilators. Consideration should be given to providing a hybrid approach that may be a combination of vertical unit ventilators and central systems to serve the interior classrooms.

Low Cost Option: Integral DX, Modify existing hot water system

Medium Cost Option: Air-cooled chiller, Modify existing steam

High Cost Option: Air-cooled chiller, Steam to HW convertor

| Vertical Unit Ventilators | | | | | |
|---|---|---|---|---|---|
| **Building Area** | **Serves** | **Area SF** | **Construction Budget** | | |
| | | | **Low** | **Medium** | **High** |
| #1 | Classrooms | 26,350 | | | |
| #2 | Band / Music | 6,750 | | | |
| #3 | Blackbox | 2,380 | | | |
| #6 | Art | 4,515 | | | |
| **Total** | | **39,995** | **$1,885,000** | **$2,593,000** | **$3,779,000** |

Central Variable Air Volume:

Install a variable central air handling system in each of the building areas. Install a new air-handling unit in the location of the existing. Replace the existing ductwork with new insulated ductwork along the same pathways.

Low Cost Option: Remote DX, Modify existing Steam System, cooling only VAV's

Medium Cost Option: Remote DX, Steam to HW convertor

High Cost Option: Air-cooled chiller, Steam to HW convertor

| Central Variable Air Volume | | | | | |
|---|---|---|---|---|---|
| **Building Area** | **Serves** | **Area SF** | **Construction Budget** | | |
| | | | **Low** | **Medium** | **High** |
| #1 | Classrooms | 26,350 | | | |
| #2 | Band / Music | 6,750 | | | |
| #3 | Blackbox | 2,380 | | | |
| #6 | Art | 4,515 | | | |
| **Total** | | **39,995** | **$3,144,500** | **$3,683,500** | **$4,500,000** |

Dedicated Outside Air/Displacement:

Install a central dedicated outside air system to serve all classroom areas. The dedicated outside air unit would be located in the boiler room. Install a new air-handling unit in the location of the existing. Replace the existing ductwork with new insulated ductwork along the same pathways. There are considerable challenges to create new pathways for ductwork and piping because of the wood structure.

Low Cost Option: Displacement requires both chilled and hot water. Work is necessarily required on the central heating plant

Medium Cost Option: Displacement requires both chilled and hot water. Work is necessarily required on the central heating plant

High Cost Option: Air-cooled chiller, Steam to HW convertor

| Dedicated Outside Air / Displacement | | | | | |
|---|---|---|---|---|---|
| **Building Area** | **Serves** | **Area SF** | **Construction Budget** | | |
| | | | **Low** | **Medium** | **High** |
| #1 | Classrooms | 26,350 | N/A | | |
| #2 | Band / Music | 6,750 | | | |
| #3 | Blackbox | 2,380 | | | |
| #6 | Art | 4,515 | | | |
| **Total** | | **39,995** | **N/A** | **N/A** | **$4,482,500** |

Additional Scope:

Additional work that may be considered with each of these options includes the following:

New Ceilings and LED Lights: **Construction Budget $ 978,000**

## AIR CONDITIONING SCOPE DETAIL

The following options to expand air conditioning are noted as “Building Area #’s”. The area to be air-conditioned is annotated on the Proposed Systems Diagrams in Appendix B.

**Building Area 1: 1932 Classrooms (26,350 Sq. Ft.):** The following is a summary of the range of possible options considered.

Options Summary:

| Building Area | Air Delivery Method | Cooling Plant | Heating Plant | Option |
|---|---|---|---|---|
| 1 - 1932 Classrooms | A - Mini-Split | B - Remote DX | A - None | 1-ABA |
| | B - Vertical Unit Ventilators | A - Integral DX | B - Steam | 1-BAB |
| | | | C - Hot Water* | 1-BAC |
| | | B - Remote DX | B - Steam | 1-BBB |
| | | | C - Hot Water* | 1-BBC |
| | | C - Chilled Water* | B - Steam | 1-BCB |
| | | | C - Hot Water* | 1-BCC |
| | C - Central VAV | B - Remote DX | B - Steam | 1-CBB |
| | | | C - Hot Water* | 1-CBC |
| | | C - Chilled Water* | B - Steam | 1-CCB |
| | | | C - Hot Water* | 1-CCC |
| | D - DOAS | C - Chilled Water* | C - Hot Water* | 1-DCC |

Notes: * There are multiple central plant options for chilled and hot water. Refer to the Central Plant section of this report.

Air Delivery: The original 1932 building construction typically ventilated the classrooms with unit ventilators. The unit ventilator were replaced in 1993 and 1996 with heating only horizontal unit ventilators. The following outlines possible new air delivery methods:

*Mini-split:* The systems would be installed while leaving the existing heating and ventilation systems in place. Because unconditioned ventilation air is delivered to the space through the existing unit ventilator, there is a risk of creating high humidity conditions.

*Vertical Unit Ventilators:* Install new vertical unit ventilators to replace the existing horizontal unit ventilators in approximately the same location. Modifications will be required to the perimeter steam finned tube radiation. Outside and relief would be available by replacing one of the windows adjacent to each unit ventilator. The perimeter casework is minimal.

*Central Variable Air Volume (VAV):* Provide a new central variable air volume system. Further investigation is required to determine viable locations to serve each of the multiple floors. Possible locations include on the roof or creating an new mechanical space in the basement. It is anticipated that the current MN Energy code will require heat recovery to be incorporated into the system. Pathways for vertical duct distribution need to be determined.

*Dedicated Outside Air (DOAS):* Options for locating a new DOAS unit are similar to locating the VAV unit as describe above. The advantage of a DOAS unit is that the volume of air it is moving is approximately 1/3 as compared to the VAV system. The equipment and associated ductwork are smaller and easier to retrofit.

Cooling Plant: Viable options studied include integral packaged DX, remote DX, and construction of a new central chilled water plant. The tight site and proximity to the neighboring residential areas presents challenges in designing new equipment to meet the noise criteria at the property line. The following outlines possible cooling plant options:

*Integral Direct Expansion (DX):* Integral DX is an option with the vertical unit ventilators and there is precedent with this type of system in the District. Design considerations need to include meeting the classroom ambient sound levels. Integral cooling systems have an impact on future maintenance by distributing possible failure points of the system.

*Remote Direct Expansion (DX):* Remote DX in an option for mini-split systems, vertical unit ventilators, and central variable air volume solutions. Condenser locations for remote DX locations need to be determined. Structural constraints of the roof need to be evaluated.

*Chilled Water:* There are multiple options to generate chilled water to meet the cooling needs of the building. Refer to the central plant options in this report for a discussion of each.

Heating Plant: Viable options include leaving the existing steam systems in place and installing a cooling only system, connecting to the existing steam plant, installing a steam to hot water convertor, or installing a new high efficiency hot water plant. The following outlines possible heating plant options.

*Steam:* The building is currently heated by a single large dual fuel steam fire tube boiler. The steam option includes modifying steam and condensate distribution piping to accommodate the new systems.

*Hot Water HX:* Includes the installation of a new steam-to-hot water heat exchanger, pumps and distribution system to deliver hot water to the new systems. Hot water distribution piping is more flexible to route to location as necessary than steam piping. The installation of a heat exchanger will easily accommodate future conversion of the stem plant to hot water.

*Hot Water Plant:* There are multiple options to generate hot water to meet the heating needs of the building. Refer to the central plant options in this report for a discussion of each.

Dehumidification: Active dehumidification requires a heating source that is currently not available with the existing steam plant during the summer months. Options for active dehumidification will depend on the extent of hot water that is installed with the new systems. If hot water distribution is included as the heating source, the heating coils will be located in the reheat position downstream of the cooling coils. If hot water is generated through a steam-to-hot water convertor, then reheat will only be possible when the steam boiler is in operation. An option to extend the time that hot water is available is to add a small high efficiency gas boiler. If the project include replacing the steam plant, the boiler capacity would be selected to provide adequate turn down during low load periods.

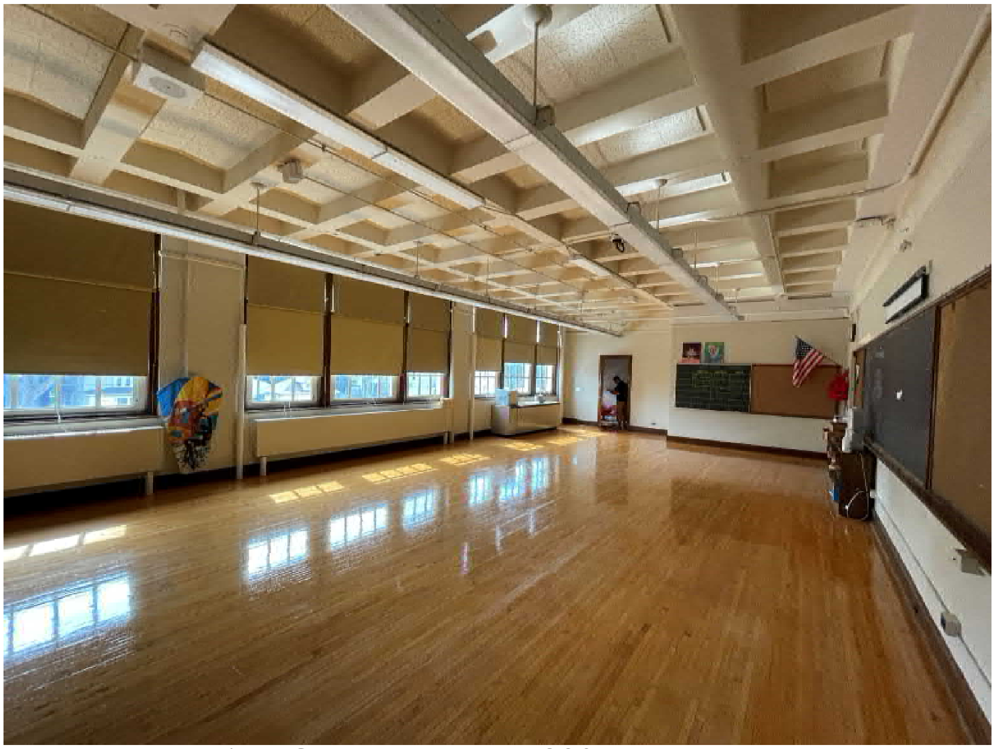
Project Risks: The following are design risks identified in implementing this project. The cost estimate includes a 15% design contingency to cover these risks. Further investigation into each of these could better define the solution and allow the design contingency to be reduced.

- Determining vertical pathways for new ductwork as necessary for the central air handling unit options. The existing vertical pathways will be reused to the extent possible.
- Determining a design solution for outside ventilation air with the central air handling unit options. Pathways for outside air and building relief air need to be determined.
- Space heating and cooling loads are estimated based on typical loads for this type of space. Final heating and cooling loads need to be completed.
- Integrity of the existing steam and condensate systems for options that include steam heating. Piping in poor condition may necessitate additional pipe removal. The best method to mitigate this risk is to pursue the hot water heating solution as outlined in the heating section above.

Additional Scope Considerations: The following items could be considered for inclusion in the project work scope. These items are not directly related to adding air conditioning but there would be cost efficiency by including them in the project scope and the have added value as noted.

- *Provide new ceilings and lights:* Provide new lay-in ceilings typically throughout with new LED lighting and controls. With the vertical unit ventilator options, new ceilings would allow for the air distribution above the ceiling to reduce the system noise. The ceiling condition likely will require a soffit along the exterior walls to accommodate the existing windows elevations.

Typical Photos:



**Typical Classroom – Rm 329**

**Second Floor Corridor – Looking South**

**Building Area 2 – Music (6,750 Sq. Ft.):** The following is a summary of the range of possible options considered.

Options Summary:

| Building Area | Air Delivery Method | Cooling Plant | Heating Plant | Option |
|---|---|---|---|---|
| 2 – Music | A - Mini-Split | B - Remote DX | A - None | 2-ABA |
| | B - Vertical Unit Ventilators | A - Integral DX | B - Steam | 2-BAB |
| | | | C - Hot Water* | 2-BAC |
| | | B - Remote DX | B - Steam | 2-BBB |
| | | | C - Hot Water* | 2-BBC |
| | | C - Chilled Water* | B - Steam | 2-BCB |
| | | | C - Hot Water* | 2-BCC |
| | C - Central VAV | B - Remote DX | B - Steam | 2-CBB |
| | | | C - Hot Water* | 2-CBC |
| | | C - Chilled Water* | B - Steam | 2-CCB |
| | | | C - Hot Water* | 2-CCC |
| | D - DOAS | C - Chilled Water* | C - Hot Water* | 2-DCC |

Notes: * There are multiple central plant options for chilled and hot water. Refer to the Central Plant section of this report.

Air Delivery: The Area was renovated in 1993 into its current configuration as a music suite. A single zone constant volume air handling system installed in 1993 and located in the basement provides ventilation and heating for the area. The following outlines possible new air delivery methods:

*Mini-split:* The systems would be installed while leaving the existing heating and ventilation systems in place. Because unconditioned ventilation air is delivered to the space through the existing unit ventilator, there is a risk of creating high humidity conditions.

*Vertical Unit Ventilators:* Install new vertical unit ventilators to replace the existing horizontal unit ventilators in approximately the same location. Outside and relief would be available through he outside wall.

*Central Variable Air Volume (VAV):* Replace the existing constant volume unit in the basement mechanical room with a new variable air volume system. It is anticipated that the current MN Energy code will require heat recovery to be incorporated into the system. Further investigation is necessary to determine the optimal configuration of the new mechanical systems. Pathways for vertical duct distribution need to be determined. The existing ductwork will be replaced with new insulated ductwork.

*Dedicated Outside Air (DOAS):* Options for locating a new DOAS unit are similar to locating the VAV unit as describe above. The advantage of a DOAS unit is that the volume of air it is moving is approximately 1/3 as compared to the VAV system. The equipment and associated ductwork are smaller and easier to retrofit.

Cooling Plant: Viable options studied include integral packaged DX, remote DX, and construction of a new central chilled water plant. The tight site and proximity to the neighboring residential areas presents challenges in designing new equipment to meet the noise criteria at the property line. The following outlines possible cooling plant options:

*Integral Direct Expansion (DX):* Integral DX is an option with the vertical unit ventilators and there is precedent with this type of system in the District. Design considerations need to include meeting the classroom ambient sound levels. Integral cooling systems have an impact on future maintenance by distributing possible failure points of the system.

*Remote Direct Expansion (DX):* Remote DX in an option for mini-split systems and vertical unit ventilator solutions. The condensing units could be located on grade adjacent to the building or on the roof.

*Chilled Water:* There are multiple options to generate chilled water to meet the cooling needs of the building. Refer to the central plant options in this report for a discussion of each.

Heating Plant: Viable options include leaving the existing steam systems in place and installing a cooling only system, connecting to the existing steam plant, installing a steam to hot water convertor, or installing a new high efficiency hot water plant. The following outlines possible heating plant options.

*Steam:* The building is currently heated by two large dual fuel steam fire tube boilers. The steam option includes modifying steam and condensate distribution piping to accommodate the new systems.

*Hot Water HX:* Includes the installation of a new steam-to-hot water heat exchanger, pumps and distribution system to deliver hot water to the new systems. Hot water distribution piping is more flexible to route to location as necessary than steam piping. The installation of a heat exchanger will easily accommodate future conversion of the stem plant to hot water.

*Hot Water Plant:* There are multiple options to generate hot water to meet the heating needs of the building. Refer to the central plant options in this report for a discussion of each.

Dehumidification: Active dehumidification requires a heating source that is currently not available with the existing steam plant during the summer months. Options for active dehumidification will depend on the extent of hot water that is installed with the new systems. If hot water distribution is included as the heating source, the heating coils will be located in the reheat position downstream of the cooling coils. If hot water is generated through a steam-to-hot water convertor, then reheat will only be possible when the steam boiler is in operation. An option to extend the time that hot water is available is to add a small high efficiency gas boiler. If the project include replacing the steam plant, the boiler capacity would be selected to provide adequate turn down during low load periods.

Project Risks: The following are design risks identified in implementing this project. The cost estimate includes a 15% design contingency to cover these risks. Further investigation into each of these could better define the solution and allow the design contingency to be reduced.

- Determining vertical pathways for new ductwork as necessary for the central air handling unit options. The existing structure poured concrete over clay tile. Options that require removing a concrete joist will require additional structural review.
- Determining a design solution for outside ventilation air with the central air handling unit options.
- Space heating and cooling loads are estimated based on typical loads for this type of space. Final heating and cooling loads need to be completed.
- Integrity of the existing steam and condensate systems for options that include steam heating. Piping in poor condition may necessitate additional pipe removal. The best method to mitigate this risk is to pursue the hot water heating solution as outlined in the heating section above.
- Structural capacity for options that locate new equipment on the roof. If roof options are considered, further structural evaluation will be necessary.
- Space constraints for options that include locating new central air handling units in the storage room. Final load calculations and air handling unit selections are necessary to determine the final design to fit the new equipment.

Additional Scope Considerations: The following items could be considered for inclusion in the project work scope. These items are not directly related to adding air conditioning but there would be cost efficiency by including them in the project scope and the have added value as noted.

- *Provide new ceilings and lights:* Provide new lay-in ceilings typically throughout with new LED lighting and controls. With the vertical unit ventilator options, new ceilings would allow for the air distribution above the ceiling to reduce the system noise. The ceiling condition likely will require a soffit along the exterior walls to accommodate the existing windows elevations.

Typical Photos:

**Room 129**

**Building Area 3 – Black Box / Work Rm (2,380 Sq. Ft.):** The following is a summary of the range of possible options considered.

Options Summary:

| Building Area | Air Delivery Method | Cooling Plant | Heating Plant | Option |
|---|---|---|---|---|
| 3 – Black Box / Workroom | A - Mini-Split | B - Remote DX | A - None | 2-ABA |
| | C - Central VAV | B - Remote DX | B - Steam | 2-CBB |
| | | | C - Hot Water* | 2-CBC |
| | | C - Chilled Water* | B - Steam | 2-CCB |
| | | | C - Hot Water* | 2-CCC |
| | D - DOAS | C - Chilled Water* | C - Hot Water* | 2-DCC |

Notes: * There are multiple central plant options for chilled and hot water. Refer to the Central Plant section of this report.

Air Delivery: The Area was renovated in 1993 into its current configuration as a music suite. A single zone constant volume air handling system installed in 1993 and located in the second floor mechanical room provides ventilation and heating for the area. The following outlines possible new air delivery methods:

*Mini-split:* The systems would be installed while leaving the existing heating and ventilation systems in place. Because unconditioned ventilation air is delivered to the space through the existing unit ventilator, there is a risk of creating high humidity conditions.

*Central Variable Air Volume (VAV):* Replace the existing constant volume unit in the second floor mechanical t mechanical room with a new variable air volume system. It is anticipated that the current MN Energy code will require heat recovery to be incorporated into the system. Further investigation is necessary to determine the optimal configuration of the new mechanical systems. Pathways for vertical duct distribution need to be determined. The existing ductwork will be replaced with new insulated ductwork.

*Dedicated Outside Air (DOAS):* Options for locating a new DOAS unit are similar to locating the VAV unit as describe above. The advantage of a DOAS unit is that the volume of air it is moving is approximately 1/3 as compared to the VAV system. The equipment and associated ductwork are smaller and easier to retrofit.

Cooling Plant: Viable options studied include integral packaged DX, remote DX, and construction of a new central chilled water plant. The tight site and proximity to the neighboring residential areas presents challenges in designing new equipment to meet the noise criteria at the property line. The following outlines possible cooling plant options:

*Remote Direct Expansion (DX):* Remote DX in an option for mini-split systems and vertical unit ventilator solutions. The condensing units could be located on grade adjacent to the building or on the roof.

*Chilled Water:* There are multiple options to generate chilled water to meet the cooling needs of the building. Refer to the central plant options in this report for a discussion of each.

Heating Plant: Viable options include leaving the existing steam systems in place and installing a cooling only system, connecting to the existing steam plant, installing a steam to hot water convertor, or installing a new high efficiency hot water plant. The following outlines possible heating plant options.

*Steam:* The building is currently heated by two large dual fuel steam fire tube boilers. The steam option includes modifying steam and condensate distribution piping to accommodate the new systems.

*Hot Water HX:* Includes the installation of a new steam-to-hot water heat exchanger, pumps and distribution system to deliver hot water to the new systems. Hot water distribution piping is more flexible to route to location as necessary than steam piping. The installation of a heat exchanger will easily accommodate future conversion of the stem plant to hot water.

*Hot Water Plant:* There are multiple options to generate hot water to meet the heating needs of the building. Refer to the central plant options in this report for a discussion of each.

Dehumidification: Active dehumidification requires a heating source that is currently not available with the existing steam plant during the summer months. Options for active dehumidification will depend on the extent of hot water that is installed with the new systems. If hot water distribution is included as the heating source, the heating coils will be located in the reheat position downstream of the cooling coils. If hot water is generated through a steam-to-hot water convertor, then reheat will only be possible when the steam boiler is in operation. An option to extend the time that hot water is available is to add a small high efficiency gas boiler. If the project include replacing the steam plant, the boiler capacity would be selected to provide adequate turn down during low load periods.

Project Risks: The following are design risks identified in implementing this project. The cost estimate includes a 15% design contingency to cover these risks. Further investigation into each of these could better define the solution and allow the design contingency to be reduced.

- Determining a design solution for outside ventilation air with the central air handling unit options.
- Space heating and cooling loads are estimated based on typical loads for this type of space. Final heating and cooling loads need to be completed.
- Integrity of the existing steam and condensate systems for options that include steam heating. Piping in poor condition may necessitate additional pipe removal. The best method to mitigate this risk is to pursue the hot water heating solution as outlined in the heating section above.

- Structural capacity for options that locate new equipment on the roof. If roof options are considered, further structural evaluation will be necessary.

Additional Scope Considerations: The following items could be considered for inclusion in the project work scope. These items are not directly related to adding air conditioning but there would be cost efficiency by including them in the project scope and the have added value as noted.

- *Provide new ceilings and lights:* Provide new lay-in ceilings typically throughout with new LED lighting and controls. With the vertical unit ventilator options, new ceilings would allow for the air distribution above the ceiling to reduce the system noise. The ceiling condition likely will require a soffit along the exterior walls to accommodate the existing windows elevations.

Typical Photos:

**Black Box Theater**

## Building Area 4 – Auditorium (10,675 Sq. Ft.):

Options Summary:

| Building Area | Air Delivery Method | Cooling Plant | Heating Plant | Option |
|---|---|---|---|---|
| 4 – Auditorium | C – Central CV | A – Packaged DX | B – Steam | 4-CAB |
| | | | C – Hot Water | 4-CAC |
| | | B – Chilled Water | B – Steam | 4-CBB |
| | | | C – Hot Water | 4-CBC |

Notes: * There are multiple central plant options for chilled. Refer to the Central Plant section of this report.

Air Delivery: Two constant volume heating only fans installed in the original 1932 construction serve the auditorium. Two large supply grilles located behind the seating area deliver ventilation air to the space. The following outlines possible new air delivery methods:

*Central Constant Volume (CV):* The existing mechanical room is tight on space. Locating the new Auditorium unit in the existing mechanical room will require removing systems that serve other areas. A possible option is to locate a new air handling unit on the roof. Further investigation is required to determine the structural constraints.

Cooling Plant: Viable options studied include integral DX, remote DX, and construction of a new central chilled water plant. The following outlines possible cooling plant options:

*Integral Direct Expansion (DX):* Integral DX is an option with the rooftop unit replacement.

*Remote Direct Expansion (DX):* A remote DX condensing unit is an to provide cooling for a replacement unit.

*Chilled Water:* There are multiple options to generate chilled water to meet the cooling needs of the building. Refer to the central plant options in this report for a discussion of each.

Heating Plant: Viable options include connecting to the existing steam plant, installing a steam to hot water convertor, or installing a new high efficiency hot water plant. The following outlines possible heating plant options.

*Steam:* The building is currently heated by a two large dual fuel steam fire tube boiler. The steam option includes modifying steam and condensate distribution piping to accommodate the new systems.

*Hot Water HX:* Includes the installation of a new steam-to-hot water heat exchanger, pumps and distribution system to deliver hot water to the new systems. Hot water distribution piping is more flexible to route to location as necessary than steam piping.

The installation of a heat exchanger will easily accommodate future conversion of the stem plant to hot water.

*Hot Water Plant:* There are multiple options to generate hot water to meet the heating needs of the building. Refer to the central plant options in this report for a discussion of each.

Dehumidification: Active dehumidification requires a heating source that can modulate to very low load conditions. Active dehumidification is not practical with a gas-fired option. The building is heated with two large steam boilers. Reheat for dehumidification is currently not available with the existing steam plant during the summer months. Options for active dehumidification will depend on the extent of hot water that is installed with the new systems. If hot water distribution is included as the heating source, the heating coils will be located in the reheat position downstream of the cooling coils. If hot water is generated through a steam-to-hot water convertor, then reheat will only be possible when the steam boiler is in operation. An option to extend the time that hot water is available is to add a small high efficiency gas boiler. If the project include replacing the steam plant, the boiler capacity would be selected to provide adequate turn down during low load periods.

Project Risks: The following are design risks identified in implementing this project. The cost estimate includes a 15% design contingency to cover these risks. Further investigation into each of these could better define the solution and allow the design contingency to be reduced.

- Determining a design solution for outside ventilation air with the central air handling unit options.
- Determine if a new central air-handling unit will fit with the space constraints in the existing mechanical room.
- Space heating and cooling loads are estimated based on typical loads for this type of space. Final heating and cooling loads need to be completed.
- Integrity of the existing steam and condensate systems for options that include steam heating. Piping in poor condition may necessitate additional pipe removal. The best method to mitigate this risk is to pursue the hot water heating solution as outlined in the heating section above.
- Structural capacity for options that locate new equipment on the roof. If roof options are considered, further structural evaluation will be necessary.

Typical Photos:

**Auditorium**

**Building Area 5 – Cafeteria (7,925 Sq. Ft.):** The following is a summary of the range of possible options considered.

Options Summary:

| Building Area | Air Delivery Method | Cooling Plant | Heating Plant | Option |
|---|---|---|---|---|
| 5 – Cafeteria | C - Central CV | A - Integral DX | B - Steam | 5-CAB |
| | | | C - Hot Water* | 5-CAA |
| | | B - Remote DX | B - Steam | 5-CBB |
| | | | C - Hot Water* | 5-CBC |
| | | C - Chilled Water* | B - Steam | 5-CCB |
| | | | C - Hot Water* | 5-CCC |

Notes: * There are multiple central plant options for chilled and hot water. Refer to the Central Plant section of this report.

Air Delivery: A constant volume heating only fan installed in the original 1932 construction serves the Cafeteria. The unit is located in a mechanical room in the basement. The following outlines possible new air delivery methods:

*Central Constant Volume (CV):* The existing mechanical room is tight on space. Locating the new Cafeteria unit in the existing mechanical room will require removing systems that serve other areas and possibly enlarging the mechanical room. Further investigation is required to determine the structural constraints.

Cooling Plant: Viable options studied include integral DX, remote DX, and construction of a new central chilled water plant. The following outlines possible cooling plant options:

*Integral Direct Expansion (DX):* Integral DX is an option with the rooftop unit replacement.

*Remote Direct Expansion (DX):* A remote DX condensing unit is an option to provide cooling for a replacement rooftop unit.

*Chilled Water:* There are multiple options to generate chilled water to meet the cooling needs of the building. Refer to the central plant options in this report for a discussion of each.

Heating Plant: Viable options include connecting to the existing steam plant, installing a steam to hot water convertor, or installing a new high efficiency hot water plant. The following outlines possible heating plant options.

*Steam:* The building is currently heated by a two large dual fuel steam fire tube boiler. The steam option includes modifying steam and condensate distribution piping to accommodate the new systems.

*Hot Water HX:* Includes the installation of a new steam-to-hot water heat exchanger, pumps and distribution system to deliver hot water to the new systems. Hot water distribution piping is more flexible to route to location as necessary than steam piping. The installation of a heat exchanger will easily accommodate future conversion of the stem plant to hot water.

*Hot Water Plant:* There are multiple options to generate hot water to meet the heating needs of the building. Refer to the central plant options in this report for a discussion of each.

<u>Dehumidification:</u> Active dehumidification requires a heating source that is currently not available with the existing steam plant during the summer months. Options for active dehumidification will depend on the extent of hot water that is installed with the new systems. If hot water distribution is included as the heating source, the heating coils will be located in the reheat position downstream of the cooling coils. If hot water is generated through a steam-to-hot water convertor, then reheat will only be possible when the steam boiler is in operation. An option to extend the time that hot water is available is to add a small high efficiency gas boiler. If the project include replacing the steam plant, the boiler capacity would be selected to provide adequate turn down during low load periods.

<u>Project Risks:</u> The following are design risks identified in implementing this project. The cost estimate includes a 15% design contingency to cover these risks. Further investigation into each of these could better define the solution and allow the design contingency to be reduced.

- Determining a design solution for outside ventilation air with the central air handling unit options.
- Determine the optimal configuration for the central air-handling unit to fit within the space constraints of the existing mechanical room.
- The structural capacity of the roof for options that include roof mounted equipment need to be further investigated.
- Space heating and cooling loads are estimated based on typical loads for this type of space. Final heating and cooling loads need to be completed.
- Integrity of the existing steam and condensate systems for options that include steam heating. Piping in poor condition may necessitate additional pipe removal. The best method to mitigate this risk is to pursue the hot water heating solution as outlined in the heating section above.

Typical Photos:

**Cafeteria**

**Building Area 6 – Art (4,515 Sq. Ft.):** The following is a summary of the range of possible options considered.

Options Summary:

| Building Area | Air Delivery Method | Cooling Plant | Heating Plant | Option |
|---|---|---|---|---|
| 6 – Art | A - Mini-Split | B - Remote DX | A - None | 6-ABA |
| | C - Central VAV | B - Remote DX | B - Steam | 6-CBB |
| | | | C - Hot Water* | 6-CBC |
| | | C - Chilled Water* | B - Steam | 6-CCB |
| | | | C - Hot Water* | 6-CCC |
| | D - DOAS | C - Chilled Water* | C - Hot Water* | 6-DCC |

Notes: * There are multiple central plant options for chilled and hot water. Refer to the Central Plant section of this report

Air Delivery: Constant volume heating only rooftop units installed in 1993 serve each of the two areas. The following outlines possible new air delivery methods:

*Mini-split:* The systems would be installed while leaving the existing heating and ventilation systems in place. Because unconditioned ventilation air is delivered to the space through the existing unit ventilator, there is a risk of creating high humidity conditions.

*Central Constant Volume (CV):* Replace the existing rooftop unit with a new rooftop unit with cooling. Reuse the existing supply and return ductwork to the extent possible. Modifying the existing distribution to install a variable air volume system should be considered because each area includes spaces with varying load profiles. Further investigation is required to determine the structural constraints.

Cooling Plant: Viable options studied include integral DX, remote DX, and construction of a new central chilled water plant. The following outlines possible cooling plant options:

*Integral Direct Expansion (DX):* Integral DX is an option with the rooftop unit replacement.

*Remote Direct Expansion (DX):* A remote DX condensing unit is an option to provide cooling for a replacement rooftop unit.

*Chilled Water:* There are multiple options to generate chilled water to meet the cooling needs of the building. Refer to the central plant options in this report for a discussion of each.

Heating Plant: Viable options include connecting to the existing steam plant, installing a steam to hot water convertor, or installing a new high efficiency hot water plant. The following outlines possible heating plant options.

*Steam:* The building is currently heated by a two large dual fuel steam fire tube boiler. The steam option includes modifying steam and condensate distribution piping to accommodate the new systems.

*Hot Water HX:* Includes the installation of a new steam-to-hot water heat exchanger, pumps and distribution system to deliver hot water to the new systems. Hot water distribution piping is more flexible to route to location as necessary than steam piping. The installation of a heat exchanger will easily accommodate future conversion of the stem plant to hot water.

*Hot Water Plant:* There are multiple options to generate hot water to meet the heating needs of the building. Refer to the central plant options in this report for a discussion of each.

Dehumidification: Active dehumidification requires a heating source that is currently not available with the existing steam plant during the summer months. Options for active dehumidification will depend on the extent of hot water that is installed with the new systems. If hot water distribution is included as the heating source, the heating coils will be located in the reheat position downstream of the cooling coils. If hot water is generated through a steam-to-hot water convertor, then reheat will only be possible when the steam boiler is in operation. An option to extend the time that hot water is available is to add a small high efficiency gas boiler. If the project include replacing the steam plant, the boiler capacity would be selected to provide adequate turn down during low load periods.

Project Risks: The following are design risks identified in implementing this project. The cost estimate includes a 15% design contingency to cover these risks. Further investigation into each of these could better define the solution and allow the design contingency to be reduced.

- The structural capacity of the roof for options that include roof mounted equipment need to be further investigated.
- Space heating and cooling loads are estimated based on typical loads for this type of space. Final heating and cooling loads need to be completed.
- Integrity of the existing steam and condensate systems for options that include steam heating. Piping in poor condition may necessitate additional pipe removal. The best method to mitigate this risk is to pursue the hot water heating solution as outlined in the heating section above.

Typical Photos:

**Room G105**

**Building Area 7 – Gymnasium (8,415 Sq. Ft.):** The following is a summary of the range of possible options considered.

Options Summary:

| Building Area | Air Delivery Method | Cooling Plant | Heating Plant | Option |
|---|---|---|---|---|
| 7 – Gymnasium | C - Central CV | A - Integral DX | B - Steam | 7-CAB |
| | | | C - Hot Water* | 7-CAA |
| | | B - Remote DX | B - Steam | 7-CBB |
| | | | C - Hot Water* | 7-CBC |
| | | C - Chilled Water* | B - Steam | 7-CCB |
| | | | C - Hot Water* | 7-CCC |

Notes: * There are multiple central plant options for chilled and hot water. Refer to the Central Plant section of this report.

Air Delivery: Two constant volume heating only air-handling units hung at the structure within the gymnasium provide ventilation and heating. The following outlines possible new air delivery methods:

*Central Constant Volume (CV):* Replace the existing air handling units with new constant volume units with cooling. Options to combine the units into a single air handler should be considered. Options to locate the new air handling system on the roof should be considered. Further investigation is required to determine the structural constraints.

Cooling Plant: Viable options studied include integral DX, remote DX, and construction of a new central chilled water plant. The following outlines possible cooling plant options:

*Integral Direct Expansion (DX):* Integral DX is an option with the rooftop unit replacement.

*Remote Direct Expansion (DX):* A remote DX condensing unit is an option to provide cooling for a replacement rooftop unit.

*Chilled Water:* There are multiple options to generate chilled water to meet the cooling needs of the building. Refer to the central plant options in this report for a discussion of each.

Heating Plant: Viable options include connecting to the existing steam plant, installing a steam to hot water convertor, or installing a new high efficiency hot water plant. The following outlines possible heating plant options.

*Steam:* The building is currently heated by a two large dual fuel steam fire tube boiler. The steam option includes modifying steam and condensate distribution piping to accommodate the new systems.

*Hot Water HX:* Includes the installation of a new steam-to-hot water heat exchanger, pumps and distribution system to deliver hot water to the new systems. Hot water distribution piping is more flexible to route to location as necessary than steam piping. The installation of a heat exchanger will easily accommodate future conversion of the stem plant to hot water.

*Hot Water Plant:* There are multiple options to generate hot water to meet the heating needs of the building. Refer to the central plant options in this report for a discussion of each.

Dehumidification: Active dehumidification requires a heating source that is currently not available with the existing steam plant during the summer months. Options for active dehumidification will depend on the extent of hot water that is installed with the new systems. If hot water distribution is included as the heating source, the heating coils will be located in the reheat position downstream of the cooling coils. If hot water is generated through a steam-to-hot water convertor, then reheat will only be possible when the steam boiler is in operation. An option to extend the time that hot water is available is to add a small high efficiency gas boiler. If the project include replacing the steam plant, the boiler capacity would be selected to provide adequate turn down during low load periods.

Project Risks: The following are design risks identified in implementing this project. The cost estimate includes a 15% design contingency to cover these risks. Further investigation into each of these could better define the solution and allow the design contingency to be reduced.

- Determining a design solution for outside ventilation air with the central air handling unit options.
- Determine the optimal configuration for the central air-handling unit to fit within the space constraints of the existing mechanical room.
- The structural capacity of the roof for options that include roof mounted equipment need to be further investigated.
- Space heating and cooling loads are estimated based on typical loads for this type of space. Final heating and cooling loads need to be completed.
- Integrity of the existing steam and condensate systems for options that include steam heating. Piping in poor condition may necessitate additional pipe removal. The best method to mitigate this risk is to pursue the hot water heating solution as outlined in the heating section above.

Additional Scope Considerations: The following items could be considered for inclusion in the project work scope. These items are not directly related to adding air conditioning but there would be cost efficiency by including them in the project scope and the have added value as noted.

- *Provide de-stratification fans:* Provide centrifugal style de-stratification fans to improve air circulation and energy performance.

Typical Photos:

**Gymnasium**

**9 - Central Plant Options:** Centralizing the heating and cooling plants has benefits of replacing aged infrastructure, improving the overall operating efficiency of the building and reducing on-going maintenance cost by reducing the number of failures points in the building systems. The building currently has a centralized steam plant. The building does not have a centralized cooling systems approach. The following options have been considered.

Options Summary:

| Building Area | Cooling Approach | Heating Approach | Option |
|---|---|---|---|
| 9 - Central Plant | A - Air Cooled Chiller | A - STM Distribution | 4-AA |
| | | B - STM w/ HW HX | 4-AB |
| | | C - HW Plant | 4-AC |
| | C - Geo Thermal | A - STM Hybrid | 4-CA |
| | | B - HW Hybrid | 4-CB |
| | | C - Full Size Heat | 4-CC |

Cooling Plant: Centralizing the building cooling plant will improve the overall building operating efficiency and reduce the on-going maintenance requirements. The tight urban location and proximity to residential neighbors presents a risk of noise from centralized systems having a negative impact. Any centralized solution that has outside equipment will need to be evaluated for the sound levels at the adjacent property line. Final load calculations are necessary to determine the final chiller size.

*Air Cooled Chiller:* Because of site constraints and the proximity to the neighbors, the most likely option for locating the chiller is in the parking lot to the North. A study of the chiller sound output at the school property line needs to be completed. For the purposes of estimating, it is assumed that the chiller will have all of the available factory sound attenuation features and will be installed in a masonry enclosure with sound attenuating panels. It is possible that this option will not be viable due to excessive noise concerns.

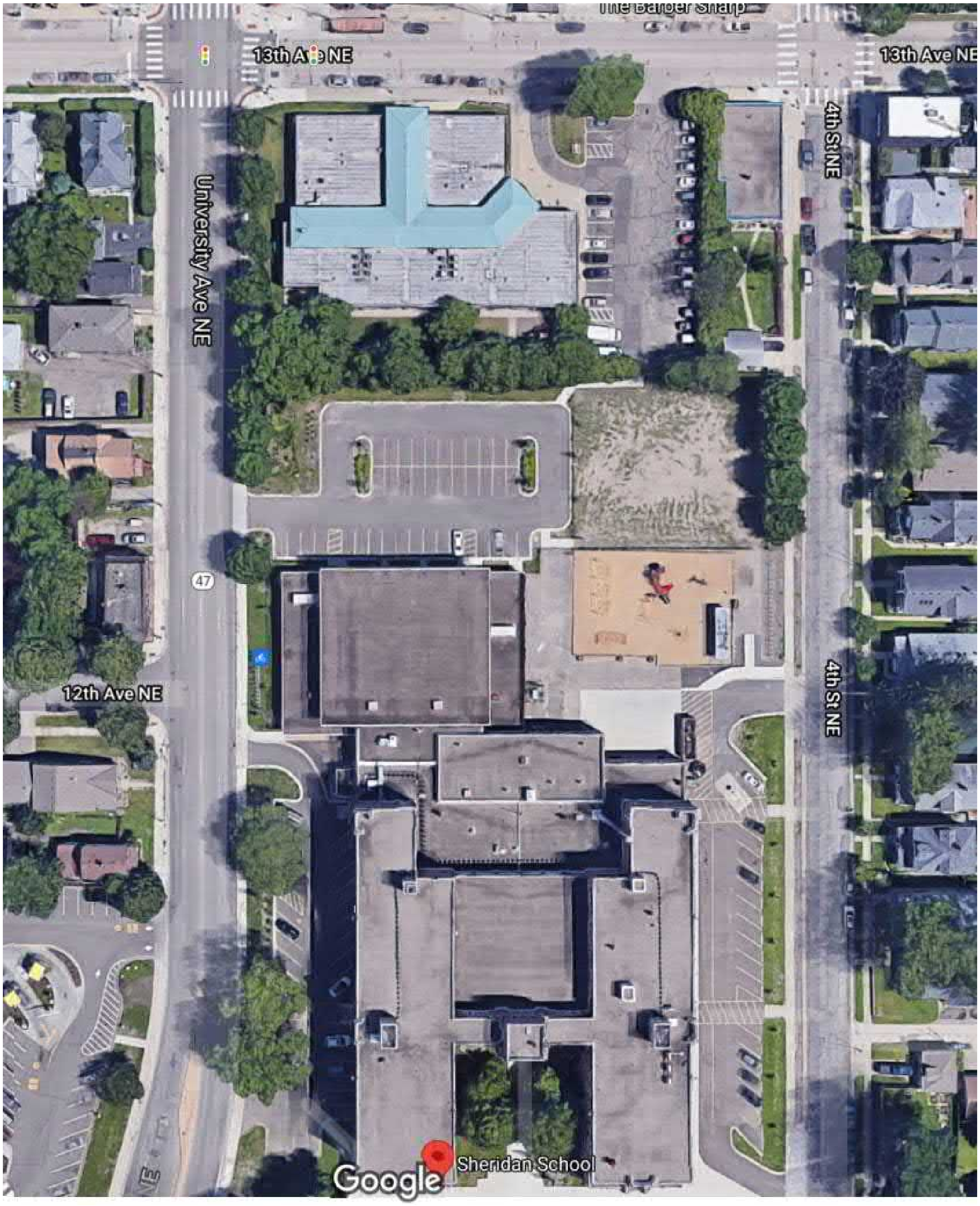
*Ground Coupled Geo-thermal:* A ground coupled geothermal solution has the advantage in eliminating the risk of a sound impact to the adjacent residential neighbors. The adjacent field to the north is a possible location for the well field. Further study and a test well is necessary to determine the site specific well conditions to optimize the depth, capacity, and cost. Alternate geothermal technologies including Darcy Solutions closed loop systems should be considered to further reduce the cost and size of the well field.

Heating Plant: Two dual fuel steam fire-tube boiler currently serves the building for heating. Converting the building to hot water for heating will reduce the overall operating cost of the building, reduce the regular maintenance requirements, and allow greater flexibility in routing piping to terminal heating systems throughout the building.

*Hot Water Boilers:* Includes replacing the existing steam systems with a new high efficiency hot water dual fuel boiler plant. The plant will consist of multiple boilers to provide redundancy in the event of equipment failure. The existing steam and condensate piping will be removed. A variable primary hot water supply and return with multiple supply pumps will be distribute hot water throughout the building.

*Ground Coupled Geo-thermal:* If the ground coupled geo-thermal option is selected for cooling, the plant would also provide heating capacity for the building. Options for geo-thermal would be to increase the size of the well field and deliver all of the building heating needs from the central plant or provide a hybrid plant that includes high efficiency boiler capacity for peak heating loads. Because of the limited site available for the well field, increasing to size to match the building heating loads may not be possible. Further evaluation and a test well is necessary to determine the maximum heating capacity potential.

Typical Photo:




**Arial View of Site**

# Appendix A:

Existing Systems Diagram

Redacted

# Appendix B:

Proposed Systems Diagrams

Redacted

# Appendix C:

## Dehumidification Capabilities

The recommended solution to provide air conditioning to the classrooms includes a steam-to-hot water convertor to provide for the heating needs of the new systems including VAV reheat. De-humidification will be coincident with cooling. Active de-humidification will only be possible when the boiler plant is in operation.

# Appendix D:

## Cost Estimate Detail

**SSD#1 Minneapolis Public Schools**
**Air Conditioning Cost Estimating**

**Cost Basis - June 2021**

**CLASSROOM LOW - MEDIUM - HIGH**

| | | Ventilation Area | Bldg Total | | |
|---|---|---|---|---|---|
| **BUILDING AREA 1 - 1932 Classrooms** | 26,350 | | | VUV Qty = | 25 |
| **BUILDING AREA 2 - Music** | 6,750 | | | | |
| **BUILDING AREA 3 - Black box** | 2,380 | | | | |
| **BUILDING AREA 6 - Art** | 4,515 | | | | |
| **Area - SQ FT** | **39,995** | **26,350** | **126,286** | | |

**Building Area #2 and #3** — **9,130 SQ FT**

| Specification Division | | Areas #1 - VUV, Integral DX, Modify Steam | | | Area #2 and #3 - AHU VAV, Remote DX, Modify Steam | | |
|---|---|---|---|---|---|---|---|
| | | Sq. Ft. / Qty | Unit Cost | Cost | Sq. Ft. / Qty | Unit Cost | Cost |
| **Division 02 - Demolition (excludes Div 21, 22, 23, and 26)** | | | | **$ 30,000** | | | **$ 4,565** |
| Miscellaneous | | 25 | $ 1,200 | $ 30,000 | 9,130 | $ 0.50 | $ 4,565 |
| **Division 03 - Concrete** | | | | **$ -** | | | **$ 15,130** |
| Floor Patch and Repair | | | | $ - | 9,130 | $ 1.00 | $ 9,130 |
| Cast-in-place / Misc | | | | $ - | 1 | $ 6,000 | $ 6,000 |
| **Division4 - Masonary** | | | | **$ -** | | | **$ -** |
| Non-bearing Infill | | | | $ - | | | $ - |
| Load bearing - new wall construction | | | | $ - | | | $ - |
| **Division 5 - Metals** | | | | **$ -** | | | **$ 9,130** |
| Structural Steel / Misc. Fabrications Allowance | | | | - | 9,130 | $ 1.00 | 9,130 |
| **Division 6 - Carpentry** | | | | **$ 62,500** | | | **$ -** |
| Rough Carpentry | | | | $ - | | | $ - |
| Casework Modifications | | 25 | $ 2,500 | $ 62,500 | | | |
| **Division 7 - Thermal / Moisture Protection** | | | | **$ -** | | | **$ -** |
| Roof Patch and Repair | | | | $ - | | | $ - |
| Roof New Construction | | | | $ - | | | $ - |
| Fire Stopping / Miscellaneous | | | | $ - | | | $ - |
| **Division 8 - Openings** | | | | **$ 87,500** | | | **$ 9,000** |
| Access Panels | | | | - | | | - |
| Doors / Hardware | | | | - | | | - |
| Windows | | | | - | | | - |
| Louvers | | 25 | $ 3,500 | 87,500 | 2 | $ 4,500 | 9,000 |
| **Division - 9 Finishes** | | | | **$ 60,000** | | | **$ 29,673** |
| Soffits / Chases | | | | $ - | 9,130 | $ 1.50 | $ 13,695 |
| Floor Patch and Repair | | 25 | $ 1,200 | $ 30,000 | 9,130 | $ 1.00 | $ 9,130 |
| Acoustic Ceilings | | | | $ - | | | $ - |
| Painting | | 25 | $ 1,200 | $ 30,000 | 9,130 | $ 0.75 | $ 6,848 |
| **Division 10 - Specialties** | | | | **$ -** | | | **$ -** |
| Miscellaneous | | | | - | | | - |
| **Division 11 - Equipment** | | | | **$ -** | | | **$ -** |
| Miscellaneous | | | | $ - | | | $ - |
| **Division 12 - Furnishings** | | | | **$ -** | | | **$ -** |
| Casework | | | | $ - | | | $ - |
| Miscellaneous | | | | $ - | | | $ - |
| **Division 21 - Fire Protection** | | | | **$ 13,175** | | | **$ 13,695** |
| Demolition | | | | $ - | | | $ - |
| New / Modify Existing | | 26,350 | $ 0.50 | $ 13,175 | 9,130 | $ 1.50 | $ 13,695 |
| **Division 22 - Plumbing** | | | | **$ -** | | | **$ -** |
| Demolition | | | | $ - | | | $ - |
| Plumbing Fixtures | | | | $ - | | | $ - |
| Micellaneous | | | | $ - | | | $ - |
| **Division 23 - HVAC** | | | | **$ 1,050,000** | | | **$ 708,240** |
| Air Handling Equipment (VUV's / AHU's / RTU's) | | 25 | $ 18,500 | $ 462,500 | 1 | $ 50,000 | $ 50,000 |
| Cooling Plant Equipment (Chiller / DX / Heat Pump) | | | | $ - | 1 | $ 16,000 | $ 16,000 |
| Heating Plant Equipment (Boiler) | | | | $ - | | | $ - |
| Demolition | | 25 | $ 1,200 | $ 30,000 | 9,130 | $ 1.00 | $ 9,130 |
| AHU Equipment Installation / Start-up | | 25 | $ 2,500 | $ 62,500 | 1 | $ 20,000 | $ 20,000 |
| Cooling Plant Equipment Installation | | | | $ - | 1 | $ 24,000 | $ 24,000 |
| Heating Plant Installation | | | | $ - | 1 | $ 140,000 | $ 140,000 |
| Chilled Water Distribution | | | | $ - | | | $ - |
| Steam / Condensate Distribution | | 25 | $ 2,500 | $ 62,500 | 1 | $ 20,000 | $ 20,000 |
| Hot Water Distribution | | | | $ - | 9,130 | $ 8.00 | $ 73,040 |
| Ductwork Distribution Misc. (VAV's / Exhaust) | | 25 | $ 10,000 | $ 250,000 | 9,130 | $ 32.00 | $ 292,160 |
| Controls | | 25 | $ 6,500 | $ 162,500 | 9,130 | $ 6.50 | $ 59,345 |
| Test and Balance | | 25 | $ 800 | $ 20,000 | 9,130 | $ 0.50 | $ 4,565 |
| **Division 26 - Electrical** | | | | **$ 142,500** | | | **$ 18,130** |
| Demolition | | 25 | $ 1,200 | $ 30,000 | 9,130 | $ 0.50 | $ 4,565 |
| Electrical Service | | 1 | $ 50,000 | $ 50,000 | | | $ - |
| Power Connections | | 25 | $ 2,500 | $ 62,500 | 2 | $ 4,500 | $ 9,000 |
| Lighting and Controls | | | | $ - | 9,130 | $ 0.50 | $ 4,565 |
| **Division 27 - Technology** | | | | **$ -** | | | **$ 4,565** |
| Demolition Allowance | | | | $ - | | | $ - |
| Fire / Sound / Data Allowance | | | | $ - | 9,130 | $ 0.50 | $ 4,565 |
| **DIVISION SUB-TOTAL** | | | | **$ 1,445,675** | | | **$ 812,128** |
| **Division 1 - General Conditions** | | | | **$ 252,993** | | | **$ 142,122** |
| OH & P | 10% | | | $ 144,568 | | | $ 81,213 |
| Liability Insurance | 1% | | | $ 14,457 | | | $ 8,121 |
| Performance Bond | 2% | | | $ 21,685 | | | $ 12,182 |
| General Contractor Misc. | 5% | | | $ 72,284 | | | $ 40,606 |
| **CONSTRUCTION SUB-TOTAL** | | | | **$ 1,698,668** | | | **$ 954,250** |
| **CONTINGENCY** | 15% | | | **$ 254,800** | | | **$ 143,137** |
| **CONSTRUCTION GRAND-TOTAL** | | | | **$ 1,953,468** | | | **$ 1,097,387** |
| **COST per SQ FT** | | | | **$ 74.14** | | | **$ 120.20** |

**Building Area #6** — **4,515 SQ FT**; **Auditorium Building Area #4** — **10,675 SQ FT**

| Specification Division | Area #6 - RTU CV, Interal DX, Modify STM | | | Area #4 -RTU CV, Remote DX, Modify STM | | |
|---|---|---|---|---|---|---|
| | Sq. Ft. / Qty | Unit Cost | Cost | Sq. Ft. / Qty | Unit Cost | Cost |
| **Division 02 - Demolition (excludes Div 21, 22, 23, and 26)** | | | **$ 2,258** | | | **$ 5,338** |
| Miscellaneous | 4,515 | $ 1 | $ 2,258 | 10,675 | $ 0.50 | $ 5,338 |
| **Division 03 - Concrete** | | | **$ -** | | | **$ 5,338** |
| Floor Patch and Repair | | | $ - | 10,675 | $ 0.50 | $ 5,338 |
| Cast-in-place / Misc | | | $ - | | | $ - |
| **Division4 - Masonary** | | | **$ -** | | | **$ -** |
| Non-bearing Infill | | | $ - | | | $ - |
| Load bearing - new wall construction | | | $ - | | | $ - |
| **Division 5 - Metals** | | | **$ -** | | | **$ 24,000** |
| Structural Steel / Misc. Fabrications Allowance | | | - | 1 | $ 24,000 | 24,000 |
| **Division 6 - Carpentry** | | | **$ -** | | | **$ -** |
| Rough Carpentry | | | $ - | | | $ - |
| Casework Modifications | | | $ - | | | |
| **Division 7 - Thermal / Moisture Protection** | | | **$ -** | | | **$ 5,000** |
| Roof Patch and Repair | | | $ - | 1 | $ 5,000 | $ 5,000 |
| Roof New Construction | | | $ - | | | $ - |
| Fire Stopping / Miscellaneous | | | $ - | | | $ - |
| **Division 8 - Openings** | | | **$ -** | | | **$ -** |
| Access Panels | | | - | | | - |
| Doors / Hardware | | | - | | | - |
| Windows | | | - | | | - |
| Louvers | | | - | | | - |
| **Division - 9 Finishes** | | | **$ -** | | | **$ 21,350** |
| Soffits / Chases | | | $ - | | | $ - |
| Floor Patch and Repair | | | $ - | | | $ - |
| Acoustic Ceilings | | | $ - | | | $ - |
| Painting | | | $ - | 10,675 | $ 2.00 | $ 21,350 |
| **Division 10 - Specialties** | | | **$ -** | | | **$ -** |
| Miscellaneous | | | - | | | - |
| **Division 11 - Equipment** | | | **$ -** | | | **$ -** |
| Miscellaneous | | | $ - | | | $ - |
| **Division 12 - Furnishings** | | | **$ -** | | | **$ -** |
| Casework | | | $ - | | | $ - |
| Miscellaneous | | | $ - | | | $ - |
| **Division 21 - Fire Protection** | | | **$ -** | | | **$ 16,013** |
| Demolition | | | $ - | - | | $ - |
| New / Modify Existing | | | $ - | 10,675 | $ 1.50 | $ 16,013 |
| **Division 22 - Plumbing** | | | **$ -** | | | **$ -** |
| Demolition | | | $ - | | | $ - |
| Plumbing Fixtures | | | $ - | | | $ - |
| Micellaneous | | | $ - | | | $ - |
| **Division 23 - HVAC** | | | **$ 70,773** | | | **$ 431,194** |
| Air Handling Equipment (VUV's / AHU's / RTU's) | 2 | $ 10,000 | $ 20,000 | 1 | $ 60,000 | $ 60,000 |
| Cooling Plant Equipment (Chiller / DX / Heat Pump) | | | $ - | 1 | $ 24,000 | $ 24,000 |
| Heating Plant Equipment (Boiler) | | | $ - | | | $ - |
| Demolition | 4,515 | $ 1.00 | $ 4,515 | 10,675 | $ 0.75 | $ 8,006 |
| AHU Equipment Installation / Start-up | 2 | $ 7,500 | $ 15,000 | 1 | $ 15,000 | $ 15,000 |
| Cooling Plant Equipment Installation | | | $ - | 1 | $ 25,000 | $ 25,000 |
| Heating Plant Installation | | | $ - | | | $ - |
| Chilled Water Distribution | | | $ - | | | $ - |
| Steam / Condensate Distribution | 2 | $ 4,500 | $ 9,000 | 1 | $ 35,000 | $ 35,000 |
| Hot Water Distribution | | | $ - | | | $ - |
| Ductwork Distribution Misc. (VAV's / Exhaust) | 2 | $ 3,500 | $ 7,000 | 10,675 | $ 22.00 | $ 234,850 |
| Controls | 2 | $ 6,500 | $ 13,000 | 1 | $ 24,000 | $ 24,000 |
| Test and Balance | 4,515 | $ 1 | $ 2,258 | 10,675 | $ 0.50 | $ 5,338 |
| **Division 26 - Electrical** | | | **$ 9,000** | | | **$ 20,338** |
| Demolition | | | $ - | 10,675 | $ 0.50 | $ 5,338 |
| Electrical Service | | | $ - | | | $ - |
| Power Connections | 2 | $ 4,500 | $ 9,000 | 2 | $ 7,500.00 | $ 15,000 |
| Lighting and Controls | | | $ - | | | $ - |
| **Division 27 - Technology** | | | **$ -** | | | **$ 13,175** |
| Demolition Allowance | | | $ - | | | $ - |
| Fire / Sound / Data Allowance | | | $ - | 26,350 | $ 0.50 | $ 13,175 |
| **DIVISION SUB-TOTAL** | | | **$ 82,030** | | | **$ 541,744** |
| **Division 1 - General Conditions** | | | **$ 14,355** | | | **$ 94,805** |
| OH & P | | | $ 8,203 | | | $ 54,174 |
| Liability Insurance | | | $ 820 | | | $ 5,417 |
| Performance Bond | | | $ 1,230 | | | $ 8,126 |
| General Contractor Misc. | | | $ 4,102 | | | $ 27,087 |
| **CONSTRUCTION SUB-TOTAL** | | | **$ 96,385** | | | **$ 636,549** |
| **CONTINGENCY** | | | **$ 14,458** | | | **$ 95,482** |
| **CONSTRUCTION GRAND-TOTAL** | | | **$ 110,843** | | | **$ 732,031** |
| **COST per SQ FT** | | | **$ 24.55** | | | **$ 5.80** |

**Cafeteria Building Area #5** — **7,925 SQ FT**; **Gymnasium Building Area #7** — **8,415 SQ FT**

| Specification Division | Area #5 - Central VAV, Remote DX, Modify STM | | | Area #7 - AHU CV, Remote DX, Modify STM | | |
|---|---|---|---|---|---|---|
| | Sq. Ft. / Qty | Unit Cost | Cost | Sq. Ft. / Qty | Unit Cost | Cost |
| **Division 02 - Demolition (excludes Div 21, 22, 23, and 26)** | | | **$ 3,963** | | | **$ 8,415** |
| Miscellaneous | 7,925 | $ 0.50 | $ 3,963 | 8,415 | $ 1.00 | $ 8,415 |
| **Division 03 - Concrete** | | | **$ 6,000** | | | **$ 4,208** |
| Floor Patch and Repair | | | $ - | 8,415 | $ 0.50 | $ 4,208 |
| Cast-in-place / Misc | 1 | $ 6,000 | $ 6,000 | | | |
| **Division4 - Masonary** | | | **$ -** | | | **$ -** |
| Non-bearing Infill | | | $ - | | | |
| Load bearing - new wall construction | | | $ - | | | $ - |
| **Division 5 - Metals** | | | **$ 12,000** | | | **$ 8,000** |
| Structural Steel / Misc. Fabrications Allowance | 1 | $ 12,000 | 12,000 | 2 | $ 4,000 | 8,000 |
| **Division 6 - Carpentry** | | | **$ -** | | | **$ -** |
| Rough Carpentry | | | $ - | | | $ - |
| Casework Modifications | | | | | | |
| **Division 7 - Thermal / Moisture Protection** | | | **$ 2,500** | | | **$ 5,000** |
| Roof Patch and Repair | 1 | $ 2,500 | $ 2,500 | 2 | $ 2,500 | $ 5,000 |
| Roof New Construction | | | $ - | | | $ - |
| Fire Stopping / Miscellaneous | | | $ - | | | $ - |
| **Division 8 - Openings** | | | **$ -** | | | **$ -** |
| Access Panels | | | - | | | - |
| Doors / Hardware | | | - | | | - |
| Windows | | | - | | | - |
| Louvers | | | - | | | - |
| **Division - 9 Finishes** | | | **$ 15,850** | | | **$ 12,623** |
| Soffits / Chases | | | $ - | | | $ - |
| Floor Patch and Repair | | | $ - | | | $ - |
| Acoustic Ceilings | 7,925 | $ 1.00 | $ 7,925 | | | $ - |
| Painting | 7,925 | $ 1.00 | $ 7,925 | 8,415 | $ 1.50 | $ 12,623 |
| **Division 10 - Specialties** | | | **$ -** | | | **$ -** |
| Miscellaneous | | | - | | | - |
| **Division 11 - Equipment** | | | **$ -** | | | **$ -** |
| Miscellaneous | | | $ - | | | $ - |
| **Division 12 - Furnishings** | | | **$ -** | | | **$ -** |
| Casework | | | $ - | | | $ - |
| Miscellaneous | | | $ - | | | $ - |
| **Division 21 - Fire Protection** | | | **$ 7,925** | | | **$ 4,208** |
| Demolition | - | | $ - | - | | $ - |
| New / Modify Existing | 7,925 | $ 1.00 | $ 7,925 | 8,415 | $ 0.50 | $ 4,208 |
| **Division 22 - Plumbing** | | | **$ -** | | | **$ -** |
| Demolition | | | $ - | | | $ - |
| Plumbing Fixtures | | | $ - | | | $ - |
| Micellaneous | | | $ - | | | $ - |
| **Division 23 - HVAC** | | | **$ 314,106** | | | **$ 141,415** |
| Air Handling Equipment (VUV's / AHU's / RTU's) | 1 | $ 30,000 | $ 30,000 | 2 | $ 15,000 | $ 30,000 |
| Cooling Plant Equipment (Chiller / DX / Heat Pump) | 1 | $ 15,000 | $ 15,000 | 2 | $ 4,500 | $ 9,000 |
| Heating Plant Equipment (Boiler) | | | $ - | | | $ - |
| Demolition | 7,925 | $ 0.75 | $ 5,944 | 8,415 | $ 0.50 | $ 4,208 |
| AHU Equipment Installation / Start-up | 1 | $ 15,000 | $ 15,000 | 2 | $ 5,000 | $ 10,000 |
| Cooling Plant Equipment Installation | 1 | $ 10,000 | $ 10,000 | 2 | $ 7,500 | $ 15,000 |
| Heating Plant Installation | | | $ - | | | $ - |
| Chilled Water Distribution | | | $ - | | $ 4.50 | $ - |
| Steam / Condensate Distribution | 1 | $ 20,000 | $ 20,000 | 2 | $ 4,500 | $ 9,000 |
| Hot Water Distribution | | | $ - | | | $ - |
| Ductwork Distribution Misc. (VAV's / Exhaust) | 7,925 | $ 24.00 | $ 190,200 | 2 | $ 15,000 | $ 30,000 |
| Controls | 1 | $ 24,000 | $ 24,000 | 2 | $ 15,000 | $ 30,000 |
| Test and Balance | 7,925 | $ 0.50 | $ 3,963 | 8,415 | $ 0.50 | $ 4,208 |
| **Division 26 - Electrical** | | | **$ 20,888** | | | **$ 14,208** |
| Demolition | 7,925 | $ 0.50 | $ 3,963 | 8,415 | $ 0.50 | $ 4,208 |
| Electrical Service | | | $ - | | | $ - |
| Power Connections | 2 | $ 4,500 | $ 9,000 | 4 | $ 2,500.00 | $ 10,000 |
| Lighting and Controls | 7,925 | $ 1.00 | $ 7,925 | | | $ - |
| **Division 27 - Technology** | | | **$ 3,963** | | | **$ 4,208** |
| Demolition Allowance | | | $ - | | | $ - |
| Fire / Sound / Data Allowance | 7,925 | $ 0.50 | $ 3,963 | 8,415 | $ 0.50 | $ 4,208 |
| **DIVISION SUB-TOTAL** | | | **$ 387,194** | | | **$ 202,283** |
| **Division 1 - General Conditions** | | | **$ 67,759** | | | **$ 35,399** |
| OH & P | | | $ 38,719 | | | $ 20,228 |
| Liability Insurance | | | $ 3,872 | | | $ 2,023 |
| Performance Bond | | | $ 5,808 | | | $ 3,034 |
| General Contractor Misc. | | | $ 19,360 | | | $ 10,114 |
| **CONSTRUCTION SUB-TOTAL** | | | **$ 454,953** | | | **$ 237,682** |
| **CONTINGENCY** | | | **$ 68,243** | | | **$ 35,652** |
| **CONSTRUCTION GRAND-TOTAL** | | | **$ 523,196** | | | **$ 273,334** |
| **COST per SQ FT** | | | **$ 66.02** | | | **$ 32.48** |

**Building Area Total** — **39,995 SQ FT**; **Building Area** — **7,925 SQ FT**

| Specification Division | Area #1, #2, #3, and #6- Add for Ceilings and Lights | | | Area #4 - Add for Ceilings and Lights | | |
|---|---|---|---|---|---|---|
| | Sq. Ft. / Qty | Unit Cost | Cost | Sq. Ft. / Qty | Unit Cost | Cost |
| **Division 02 - Demolition (excludes Div 21, 22, 23, and 26)** | | | **$ 19,998** | | | **$ 3,963** |
| Miscellaneous | 39,995 | $ 0.50 | $ 19,998 | 7,925 | $ 0.50 | $ 3,963 |
| **Division 03 - Concrete** | | | **$ -** | | | **$ -** |
| Floor Patch and Repair | | | $ - | | | $ - |
| Cast-in-place / Misc | | | $ - | | | $ - |
| **Division4 - Masonary** | | | **$ -** | | | **$ -** |
| Non-bearing Infill | | | $ - | | | $ - |
| Load bearing - new wall construction | | | $ - | | | $ - |
| **Division 5 - Metals** | | | **$ -** | | | **$ -** |
| Structural Steel / Misc. Fabrications Allowance | | | - | | | - |
| **Division 6 - Carpentry** | | | **$ -** | | | **$ -** |
| Rough Carpentry | | | $ - | | | $ - |
| Casework Modifications | | | $ - | | | $ - |
| **Division 7 - Thermal / Moisture Protection** | | | **$ -** | | | **$ -** |
| Roof Patch and Repair | | | $ - | | | $ - |
| Roof New Construction | | | $ - | | | $ - |
| Fire Stopping / Miscellaneous | | | $ - | | | $ - |
| **Division 8 - Openings** | | | **$ -** | | | **$ -** |
| Access Panels | | | - | | | - |
| Doors / Hardware | | | - | | | - |
| Windows | | | - | | | - |
| Louvers | | | - | | | - |
| **Division - 9 Finishes** | | | **$ 239,970** | | | **$ 51,513** |
| Soffits / Chases | 39,995 | $ 2.00 | $ 79,990 | 7,925 | $ 2.00 | $ 15,850 |
| Floor Patch and Repair | | | $ - | | | $ - |
| Acoustic Ceilings | 39,995 | $ 3.50 | $ 139,983 | 7,925 | $ 3.50 | $ 27,738 |
| Painting | 39,995 | $ 0.50 | $ 19,998 | 7,925 | $ 1.00 | $ 7,925 |
| **Division 10 - Specialties** | | | **$ -** | | | **$ -** |
| Miscellaneous | | | - | | | - |
| **Division 11 - Equipment** | | | **$ -** | | | **$ -** |
| Miscellaneous | | | $ - | | | $ - |
| **Division 12 - Furnishings** | | | **$ -** | | | **$ -** |
| Casework | | | $ - | | | $ - |
| Miscellaneous | | | $ - | | | $ - |
| **Division 21 - Fire Protection** | | | **$ 99,988** | | | **$ 19,813** |
| Demolition | | | $ - | | | $ - |
| New / Modify Existing | 39,995 | $ 2.50 | $ 99,988 | 7,925 | $ 2.50 | $ 19,813 |
| **Division 22 - Plumbing** | | | **$ -** | | | **$ -** |
| Demolition | | | $ - | | | $ - |
| Plumbing Fixtures | | | $ - | | | $ - |
| Micellaneous | | | $ - | | | $ - |
| **Division 23 - HVAC** | | | **$ 125,000** | | | **$ -** |
| Air Handling Equipment (VUV's / AHU's / RTU's) | | | $ - | | | $ - |
| Cooling Plant Equipment (Chiller / DX / Heat Pump) | | | $ - | | | $ - |
| Heating Plant Equipment (Boiler) | | | $ - | | | $ - |
| Demolition | | | $ - | | | $ - |
| AHU Equipment Installation / Start-up | | | $ - | | | $ - |
| Cooling Plant Equipment Installation | | | $ - | | | $ - |
| Heating Plant Installation | | | $ - | | | $ - |
| Chilled Water Distribution | | | $ - | | | $ - |
| Steam / Condensate Distribution | | | $ - | | | $ - |
| Hot Water Distribution | | | $ - | | | $ - |
| Ductwork Distribution Misc. (VAV's / Exhaust) | 25 | $ 5,000 | $ 125,000 | | | $ - |
| Controls | | | $ - | | | $ - |
| Test and Balance | | | $ - | | | $ - |
| **Division 26 - Electrical** | | | **$ 239,970** | | | **$ 47,550** |
| Demolition | 39,995 | $ 0.50 | $ 19,998 | 7,925 | $ 0.50 | $ 3,963 |
| Electrical Service | | | $ - | | | $ - |
| Power Connections | | | $ - | | | $ - |
| Lighting and Controls | 39,995 | $ 5.50 | $ 219,973 | 7,925 | $ 5.50 | $ 43,588 |
| **Division 27 - Technology** | | | **$ -** | | | **$ -** |
| Demolition Allowance | | | $ - | | | $ - |
| Fire / Sound / Data Allowance | | | $ - | | | $ - |
| **DIVISION SUB-TOTAL** | | | **$ 724,925** | | | **$ 122,838** |
| **Division 1 - General Conditions** | | | **$ 126,862** | | | **$ 21,497** |
| OH & P | | | $ 72,493 | | | $ 12,284 |
| Liability Insurance | | | $ 7,249 | | | $ 1,228 |
| Performance Bond | | | $ 10,874 | | | $ 1,843 |
| General Contractor Misc. | | | $ 36,246 | | | $ 6,142 |
| **CONSTRUCTION SUB-TOTAL** | | | **$ 851,787** | | | **$ 144,334** |
| **CONTINGENCY** | | | **$ 127,768** | | | **$ 21,650** |
| **CONSTRUCTION GRAND-TOTAL** | | | **$ 979,555** | | | **$ 165,984** |
| **COST per SQ FT** | | | **$ 24.49** | | | **$ 20.94** |