PERFORMANCE BASED ENERGY SAVINGS AGREEMENT

BETWEEN

MCCLURE COMPANY

AND

UPPER ADAMS SCHOOL DISTRICT

DATED: JANUARY 15, 2019

TABLE OF CONTENTS

PERFORMANCE BASED ENERGY SAVINGS AGREEMENT

THIS PERFORMANCE BASED ENERGY SAVINGS AGREEMENT (the "Agreement") dated this Fifteenth day of January 2019, by and between MCCLURE COMPANY ("McClure"), Upper Adams School District having an address of 4101 North Sixth Street, Harrisburg, Pennsylvania 17110; and Upper Adams School District ("Client"), having an address of 161 North Main Street, Biglerville, Pennsylvania, 17307.

BACKGROUND

A. The Client desires to install various energy conservation measures for the purpose of achieving reductions in energy consumption or demand.

B. McClure, among other things, is in the business of providing energy conservation services to third parties, including without limitation, providing the design, implementation, and monitoring of energy conservation projects.

C. McClure has analyzed energy use at the Client's Facilities (described in Schedule A) and made recommendations as set forth herein concerning energy conservation measures which, if installed and implemented, will yield Guaranteed Energy Savings (detailed in Schedule D) to the Client.

NOW THEREFORE, in consideration of the promises contained herein, and intending to be legally bound hereby, the parties hereto agree as follows:

AGREEMENT

I. BACKGROUND:

The Background paragraphs are incorporated in this Agreement as if fully set forth in this Agreement.

II. DEFINITIONS:

The following terms when used in this Agreement, shall have the following meanings:

A. **"Agreement"** means this Agreement, and all Schedules and Addendum attached hereto and made a part hereof, including without limitation:

Schedule "A" – Client Facilities
Schedule "B" – Energy Use Base
Schedule "C" – Base Energy Rates
Schedule "D" – Guaranteed Energy Savings
Schedule "E" – Energy Conservation Measures
Schedule "F" – Total Project Fee
Schedule "G" – Insurance
Schedule "H" – Additional Terms and Conditions
Schedule "I" – Standards of Occupancy and Comfort
Schedule "J" – Materials and Maintenance Savings

Schedule "K" – Stipulated Lighting Hours of Operation
Schedule "L" – Measurement and Verification Plan
Schedule "M(a)" – Certificate of Substantial Completion
Schedule "M(b)" – Certificate of Final Completion
Exhibit B – Change Order Form
Attachment A – Scope of Work
Attachment B – Lighting Line by Line
Attachment C – Commissioning Plan

and all amendments, change orders, modifications and supplements thereof or thereto.

B. **"Base Energy Rates"** means those energy rates described on Schedule C and increased each year on a cumulative basis as shown in the table below. This is used by McClure, as set forth in Section V of the Agreement, to calculate the EC Related Cost Savings for the various EC Measures.

Percent Increase Table

Year	Electric	Gas	Oil	Propane	Water
1	3%	3%	3%	3%	3%
2	3%	3%	3%	3%	3%
3	3%	3%	3%	3%	3%
4	3%	3%	3%	3%	3%
5	3%	3%	3%	3%	3%
6	3%	3%	3%	3%	3%
7	3%	3%	3%	3%	3%
8	3%	3%	3%	3%	3%
9	3%	3%	3%	3%	3%
10	3%	3%	3%	3%	3%
11	3%	3%	3%	3%	3%
12	3%	3%	3%	3%	3%
13	3%	3%	3%	3%	3%
14	3%	3%	3%	3%	3%
15	3%	3%	3%	3%	3%
16	3%	3%	3%	3%	3%
17	3%	3%	3%	3%	3%
18	3%	3%	3%	3%	3%
19	3%	3%	3%	3%	3%
20	3%	3%	3%	3%	3%

C. **"Commencement Date"** means the first day of the month following Substantial Completion of all EC Measures.

D. **"Contract Year"** means each one-year period following the Commencement Date.

E. **"EC Measures"** means the energy conservation measures as defined in section 3752 of the Pennsylvania Guaranteed Energy Savings Act as more fully described in the attached Schedule E.

F. **"EC Related Cost Savings"** means the cost savings as defined in section 3752 of the Pennsylvania Guaranteed Energy Savings Act that will be calculated as set forth in Section V of this Agreement.

G. **"Energy Savings Period"** means the period commencing on the Commencement Date and terminating on the twentieth-year anniversary of the Commencement Date.

H. **"Energy Use Base"** means the energy usage and demand, if applicable, of the Client's Facilities, as described on Schedule B of this Agreement, which may be adjusted from time to time due to changes in any of the factors that may affect energy use of any of the Facilities, in accordance with the provisions of Section VII of this Agreement.

I. **"Equipment"** means all items of equipment provided to Client by McClure pursuant to this Agreement.

J. **"Facilities"** means the Client's facilities as detailed in Schedule "A".

K. **"Guaranteed Energy Savings,"** means the amount of dollar savings, as shown on Schedule D, that McClure guarantees that the Client will realize in EC Related Cost Savings from the EC Measures during the Energy Savings Period.

L. **"Program"** means the performance based guaranteed energy savings program, which covers the full complement of EC Measures to be designed, implemented and monitored by McClure pursuant to this Agreement, including the McClure Guaranteed Energy Savings.

M. **"Substantial Completion"** means when McClure notifies the Client in writing that the Equipment included in the EC Measures for the Program is operational and the Client confirms the same in writing to McClure, which confirmation shall not be unreasonably withheld. The Substantial Completion date shall be the earlier of:

1. The date on which Client executes a Certificate of Substantial Completion attached hereto as Schedule "M(a)"

   or

2. Twelve (12) months after McClure's receipt of Customer's Notice to Proceed subject to adjustments set forth in Section XXIX of this Agreement.

N. **"Investment Grade Audit (IGA)"** means the detailed comprehensive analysis of the Clients facilities, equipment and operating procedures for the purposes of evaluating various EC Measures for their energy savings potential, maintenance savings potential, appropriateness for the facility, and installation costs.

III. EC MEASURES:

A. The Client authorizes McClure to design, implement and monitor the Program, and McClure agrees to design, implement and monitor the Program, under and subject to the terms and conditions provided in this Agreement. McClure, itself or through its subcontractors, shall supply all labor,

materials, equipment, management, and supervision necessary to design, install and commission all of the EC Measures. McClure's responsibilities in connection with the EC Measures described on Schedule E for each of Client's Facilities (on a Facility-by-Facility basis and not necessarily on a simultaneous basis) shall include:

1. providing all necessary designs, plans and specifications;

2. selecting subcontractors; provided however, Client shall have the right to reject any subcontractor in Client's sole discretion that has not been previously approved in relation to the Notice to Proceed.

3. awarding subcontracts;

4. obtaining and evaluating submitted drawings on all equipment to be provided;

5. progress inspections during installation;

6. training the Client's personnel on proper operation of the newly installed equipment;

7. final inspection; and

8. commissioning or start-up of each item of Equipment.

B. The Client shall provide McClure and its subcontractors with access to all of the Facilities, as well as to available information requested by McClure about the Facilities and shall cooperate fully with McClure at all stages of the implementation of the EC Measures. The Client represents that it is the owner or lessee of the Facilities, that it will be the owner or lessee at all times during which any work under this Agreement is performed and during the Energy Savings Period, and that it will obtain and provide evidence of the consent of any mortgagee, owner, or other party who may have the right to disapprove any work to be done on the Facilities.

C. McClure will be required to work with current building management and maintenance personnel, to coordinate construction and provide appropriate training in the operation of all new and retrofitted equipment. No equipment shall be installed that will require the hiring of additional personnel by the Client unless Client agrees to an explicit exemption from this rule.

D. Client shall retain the option to; approve proposed equipment, materials, products and installation plans not previously pre-approved as described in Section I, Background, of this Agreement or as described in Attachment A, "Scope of Work" and Attachment C, "Major Equipment Data" of this Agreement.

E. Client shall retain the right to: (i) approve equipment specifications and installation plans for any proposed changes prior to the implementation of any modifications; and (ii) make routine inspections and be present during any equipment and systems commissioning procedures conducted. Client shall grant or deny the request within three (3) weeks of receipt of proposed requested change.

F. All drawings, reports and materials prepared by McClure in performance of the contract shall become the property of Client and shall be delivered to them as needed or within thirty (30) days after construction is completed and accepted by the Client that the project is fully installed and operating.

IV. MAINTENANCE:

A. The Client shall maintain all Equipment installed under this Agreement in a manner consistent with the manufacturer's recommended maintenance schedules and procedures.

B. The Client acknowledges and consents to McClure's right to monitor EC Related Cost Savings and energy management performance by conducting onsite measurements, including but not limited to, reading meters and installing and observing onsite monitoring equipment ("Monitoring Services"). The Client agrees to cooperate fully with any such measures instituted by McClure pursuant to this Subsection. McClure shall not institute any measures which unreasonably interfere with the business of the Client conducted at the Facilities.

V. EC RELATED COST SAVINGS:

A. EC Measures that are designated for the **Option A** method of Measurement and Verification (as set forth in Schedule L) will be measured with on-site or remote metering. Key performance factors such as lighting hours will be stipulated as part of the contract. McClure will submit a report of the results to the client upon completion of the metering period. If the EC Measures fail to meet the projected EC Related Cost Savings, McClure will repair or modify the EC Measures until the required operation is achieved. If the EC Related Cost Savings cannot be met after modification, McClure will calculate the annual energy use of the EC Measures at the installed efficiency and pay the client the difference between the base year and cost and the calculated cost.

B. EC Measures categorized as **Option B** for Measurement and Verification (as set forth in Schedule L) will be tested for energy efficient operation at the time of system start up. If the EC Measures do not operate in accordance with parameters defined in the design documents and the energy calculations, McClure will modify or repair the EC Measures until specified conditions are met. If the EC Measures cannot meet the specified operation criteria, McClure will calculate the annual energy use of the EC Measures at the installed efficiency and pay the client the difference between the base year cost and the calculated cost.

C. EC Measures categorized as **Option C** for Measurement and Verification (as set forth in Schedule L) will be measured with the "whole house" method. The current energy bills are compared to historical energy bills. The historical energy bills are referred to as the baseline.

D. EC Measures categorized as **Option D** for Measurement and Verification (as set forth in Schedule L) will be measured with computer simulation of building energy use.

If the projected energy savings are verified through either Options A, B, C, or D the client will (i) accept the EC Measures as complete, (ii) agree that long term and ongoing savings as defined in the contract schedules will be realized and (iii) waive any further measurement and verification of the EC Measures to include metering, site inspections and reporting.

E. Annual Measurement and Verification Reporting;

(i) Within (90) days after receipt of the utility data for months 1 through 12 of Contract Year 1, McClure shall submit to Client a detailed Measurement and Verification Report ("M&V Report"), which shall contain calculations and methodologies demonstrating the measured savings as set forth in Schedule L and Attachment A.

(ii) In the event of a shortfall in measured savings for any applicable Contract Year, in addition to the provisions set forth in Section VI, paragraph C, a subsequent M&V Report will be issued at no additional cost to the Client.

(iii) In the event of excess measured savings for any applicable Contract Year, the M&V Reporting obligations will be satisfied per the provisions set forth in Section VI, paragraph B.

(iv) The fee for the M&V Reporting Period is set forth in Schedule F. In the event a separate fee is not indicated in Schedule F, the fee has been incorporated into the Total Project Fee.

(v) McClure shall separately invoice the District for the fee for M&V Reporting pursuant to the terms and procedures set forth in Section XVII and Schedule F.

(vi) The M&V Report will include an "Acknowledgement and Acceptance" form. In the event the results show that the guaranteed savings have been satisfied, each party shall execute the Acknowledgement and Acceptance Form. The Client shall have (60) days to execute and return the Acknowledgement and Acceptance Form to McClure. After (60) days, and without further communication in writing from the Client, the M&V Report shall be considered accepted and conclude all further M&V Reporting obligations.

F. Calculation of EC Related Cost Savings shall be derived from the cumulative monthly savings achieved by totaling the sum of the Energy Use Savings, Fuel Switch Savings, Energy Rate Reduction Savings, Maintenance and Materials Savings, and Other Identified Savings, all as defined below, as adjusted pursuant to changes in the factors affecting energy use, as provided in Section VII of this Agreement.

1. **"Energy Use Savings"** are those savings achieved through reduction in energy and demand use. McClure will calculate Energy Use Savings achieved at each of the Facilities by subtracting the energy consumption for the then current monthly period from the Energy Use Base for the corresponding month as set forth in Schedule B hereof, and multiplying the number of units saved (i.e., therms of natural gas, kilowatts, kilowatt hours, pounds of steam, and gallons of oil) by the Base Energy Rates applicable to such monthly period. The dollar amount arrived at by such calculation shall be the Energy Use Savings for such monthly period.

2. **"Fuel Switch Savings"** are those savings achieved by switching to a more economical source of energy. McClure will calculate Fuel Switch Savings by subtracting the cost of the alternate energy utilized during each monthly period from the Energy Use Savings

for such corresponding period. The cost of the alternate energy utilized is determined by multiplying the number of units of alternate energy utilized by the average unit cost applicable to such monthly period. In no case, however, shall the unit costs used in this calculation be greater than the Base Energy Rate for such alternate energy used.

3. **"Energy Rate Reduction Savings"** are those savings achieved through a reduction in fuel and/or electricity rates by one of the following means:

(a) Improve rate from local electric utility company, natural gas company, or fuel company,

(b) Direct purchase of natural gas or electricity, or

(c) Bulk purchase of fuel.

(d) Installation of equipment to provide a secondary fuel source so that the primary fuel can be supplied on an interruptible basis

4. **"Materials and Maintenance Savings"** are those savings achieved through reduction in regularly needed materials and maintenance due to the implementation of the EC Measures identified by McClure, which are stipulated as set forth in Schedule J.

5. **"Other Identified Savings"** are those savings identified by McClure that may result from performance under this Agreement, and which do not meet the definition of the other types of savings referenced in this Section V. If such savings are agreed to by the Client, for the purposes of meeting the Guaranteed Energy Savings, these savings will be detailed in a schedule appended to this Agreement. Such savings will then be considered as a component of the EC Related Cost Savings for the purposes of this Agreement.

If the Client fails to notify McClure of changes in factors affecting energy use, as required under Section VII hereof, EC Related Cost Savings shall be calculated using good faith estimates.

VI. ENERGY SAVINGS GUARANTY:

A. Subject to changes in factors affecting energy use, as set forth in Section VII of this Agreement, McClure guarantees that the Client will realize total EC Related Cost Savings from the EC Measures during each Contract Year of not less than the Guaranteed Energy Savings set forth on Schedule D of this Agreement. Savings in any year are guaranteed to the extent necessary to make payment under the Contract Year. Savings will meet or exceed the cost of the EC Measures to be evaluated, recommended, designed, implemented or installed under this Agreement.

B. If the projected energy savings are verified through either Options A, B, C, or D the client will (i) accept the EC Measures as complete, (ii) agree that long term and ongoing savings as defined in the contract schedules will be realized and (iii) waive any further measurement and verification of the EC Measures to include metering, site inspections and reporting.

C. If the Client's EC Related Cost Savings are less than the Guaranteed Energy Savings for the first year, McClure will repair or modify the EC Measures until the required savings are achieved. If the EC Related Cost Savings cannot be met after modification, McClure will calculate the Guaranteed Energy Savings shortfall and will pay the Client the shortfall for year one. McClure will pay the year one shortfall through the length of the contract including escalation of energy costs.

D. Should a disagreement arise as to the calculation of annual total EC Related Cost Savings, an independent auditing firm may be engaged by either party to conduct a review and give an opinion on whether the calculation of annual dollar savings or deficiencies as prepared by McClure is fairly stated in accordance with this Agreement. The independent auditing firm shall be mutually agreed upon by the parties. The independent auditing firm shall identify any exceptions to the annual calculation of the EC Related Cost Savings. Exercise of the right to request a review shall in no way affect the Client's obligation to make current payments pursuant to this Agreement unless otherwise described herein. Any payments between the parties necessary to resolve any irregularities identified in the review will be made within 60 days after submission of the review to the parties. If the review is requested by McClure, McClure shall pay the cost of the review. If the review is requested by the Client, the following structure will be applied to paying for the review:

If the review determines that McClure's preparation of the annual total EC Related Cost Savings was more than 10% in error, McClure shall pay the entire cost of the review; however, if McClure's determination of the annual total EC Related Cost Savings are in error of 10% or less the Client shall pay for the entire cost of the review. In any case, the calculation of the EC Related Cost Savings shall be amended to reflect the findings of the review and the calculations of savings relating to the guarantee will be modified if necessary.

VII. CHANGES IN FACTORS AFFECTING ENERGY USE:

A. Certain factors that may affect energy use of the Facilities are taken into account when establishing the Energy Use Base. These factors include, without limitation, hours and levels of occupancy; adjustments in labor force; building use and operational procedures; temperature, humidification and ventilation levels; installed lighting and scheduled use; building construction and size; general level of repair and efficiency of heating and air conditioning equipment and other energy-using equipment; the amount of heating and air conditioning and other energy-using equipment. McClure has established the initial Energy Use Base after consideration of these factors and certain other anomalous use of the Facilities. The standards of occupancy and comfort set forth in Schedule J to this Agreement, includes the assumptions that McClure has utilized in consideration of these factors in establishing the Energy Use Base. Client acknowledges and understands that due to changes in the factors affecting energy use, the Energy Use Base may be adjusted by McClure from time to time to more accurately reflect the effect that a change in any of the factors has to the energy use of a Facility. In addition, utility data collected during the period before construction of any EC Measures may indicate a change of the energy use pattern at a Facility and require an adjustment to the Energy Use Base. McClure shall notify the Client, in writing, of all such adjustments.

B. The Client shall notify McClure within thirty (30) business days of any change in any factor that may affect energy use at any of the Facilities. McClure will determine the effect that any such change will have on EC Related Cost Savings and present to the Client a written analysis of the effects of the changes. Changes that are long term or permanent will be reflected in an adjustment to the

Energy Use Base. Temporary changes that affect energy use will be calculated and used as an adjustment to the corresponding month's EC Related Cost Savings.

C. If a change in any of the factors used in establishing the Energy Use Base occurs and results in a reduced Energy Use Base, then the Guaranteed Energy Savings will be decreased as necessary to reflect such adjustment. If, however, the change results in an increase to the Energy Use Base, then there will be no corresponding adjustment to the Guaranteed Energy Savings.

D. McClure reserves the right to identify further adjustments to the Energy Use Base due to unforeseen discoveries during final site inspections, engineering, demolition, construction and erroneous historical utility data. Discovery of further adjustments will be limited to the time period up to and including the Contract Year 1 anniversary. Identified deficiencies will be fully documented and reflected in the Contract Year 1 Measurement and Verification Report.

E. Client and McClure may from time to time agree to the modification or other change to the Facilities (outside of the EC Measures set forth in this Agreement) to one or more of the Facilities for the express purpose of increasing EC Related Cost Savings. Any such modification will be made only with the prior consent of both parties, which will not be unreasonably withheld. The Energy Use Base will not be adjusted to reflect any changes agreed to under this subparagraph. If McClure elects to pay for the cost of any such modifications, then the same may be implemented by McClure without the Client's consent so long as such changes do not unreasonably interfere with the conduct of Client's business.

E. If Client makes modifications to any of its Facilities, including but not limited to building additions, new buildings, and new or changed HVAC equipment, which is outside of the EC Measures contemplated in this Agreement, McClure has the right to charge the Client for a new engineering study or such other work reasonably required by McClure to assess the effect of such changes on savings. Such hours will be billed at current McClure engineering rates. Before initiating such work, McClure will notify the client in writing of the intent and cost associated with the work. The Client will, within 30 days in writing, notify McClure with permission to proceed, or alternatively at no charge, will stipulate that the projected EC Related Cost Savings for the affected Facility have been achieved.

VIII. WARRANTIES; REMEDIES; LIMITATIONS OF LIABILITY:

A. McClure will perform the Work in a professional and workmanlike manner. McClure will promptly re-perform any non-conforming Work for no charge as long as Client provides written notice to McClure within one (1) year following Substantial Completion or such other period identified in Attachment A. If McClure installs or furnishes goods or equipment under this Agreement, and such goods or equipment is covered by an end-user warranty from their manufacturer, McClure will transfer the warranty to the Client. The foregoing remedy with respect to the Work, together with any remedy provided by goods or equipment manufacturers, shall be Client's sole and exclusive remedies for warranty claims. Client agrees that the one (1) year period following Substantial Completion, or such other period identified in Attachment A, shall be a reasonable time for purposes of submitting valid warranty claims with respect to the Work. These exclusive remedies shall not have failed of their essential purpose so long as McClure transfers the benefits of any goods or equipment end-user warranties to Client and remains willing to re-perform any non-conforming Work for no charge within the one (1) year period described above or such other period identified in Attachment A. No other

express or implied warranties, including implied warranties of merchantability or fitness for a particular purpose are provided by McClure. This warranty does not extend to any Work that has been abused, altered, misused, repaired by Client or third parties without the supervision or prior written approval of McClure, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage.

The one (1) year period set forth herein shall not be extended by corrective work performed by McClure pursuant to this section. Notwithstanding any language herein to the contrary, if any defect in the equipment provided under this Agreement is due to: (i) an error, omission, negligence or willful misconduct of the Client, Client employee or other agent or invitee of the Client, or (ii) any act which would customarily be covered by standard forms of property or casualty insurance then, in each case, the Client shall pay McClure for the reasonable and customary time and materials cost of the repair, and such charges shall be in addition to all other payments due McClure under this Agreement.

B. In no event, whether under theory of contract, warranty, tort (including negligence), strict liability, or otherwise will either Party be liable for any indirect, special, incidental or consequential damages, including without limitation, loss of use of any equipment or property, or lost profits. With respect to Guaranteed Energy Savings, the total liability of McClure for each Contract Year shall not exceed the Guaranteed Energy Savings for such Contract Year, as set forth in Schedule D of this Agreement.

C. McClure Company is not providing advice with respect to municipal financial products or the issuance of municipal securities, including advice with respect to their structure, timing, terms and other similar matters. The Energy Savings Guarantee set forth in section VI of this Agreement, the Investment Grade Audit and the calculations on which the Guarantee and the Investment Grade Audit are based are the result of advice provided by engineers working for McClure Company.

IX. REPRESENTATIONS AND WARRANTIES OF CLIENT:

A. The Client hereby warrants and represents to McClure that: (i) the Client has provided McClure with all records heretofore requested by McClure and the information set forth therein is, and any other information subsequently provided by the Client pursuant to this Agreement is true and accurate in all material respects; and (ii) the Client has not entered into any contracts or agreements with other persons or entities regarding the provision of energy management services or with regard to servicing any of the Equipment located on the Facilities.

B. The Client represents and warrants that it has the legal power and authority to enter into this Agreement and to consummate the transactions contemplated hereby, in accordance with the terms and conditions of this Agreement. The Client has received all necessary authorizations, approvals or other action by all governmental authorities or regulatory bodies required for the due execution, delivery and performance by the Client under this Agreement. This Agreement is legally valid and binding on the Client. The Client has obtained all necessary financing commitments to finance the construction of the EC Measures and this Project.

X. AFFIRMATIVE COVENANTS OF CLIENT:

A. The parties hereto acknowledge and agree that McClure has entered into this Agreement in material reliance upon the prospect of earning compensation based on projected EC Related Cost Savings exceeding Guaranteed Energy Savings from the Facilities, as set forth herein. The parties further acknowledge and agree that said EC Related Cost Savings will not likely be obtained unless certain procedures and methods of operation designed for energy conservation are implemented and followed by the Client on a regular basis. The Client agrees that it will adhere to, follow and implement the procedures and methods of operation and maintenance set forth in this Agreement and the Schedules hereto.

B. The Client agrees that McClure shall have the right, with or without prior notice, to inspect the Facilities to determine if the Client is in compliance with its obligations as set forth above. In the event that any inspection discloses that the Client has failed on the date of the inspection to be in substantial compliance with any material items set forth above, then the Guaranteed Energy Savings shall be assumed to have been achieved for and with respect to the portion of the Contract Year during which such failure shall have existed. McClure acknowledges, understands and agrees that McClure and any of its employees, agents, subcontractors or assigns must at all times comply with all policies and procedures of Client regarding access to Client's facilities, including, without limitation, all security protocols and criminal history and related background clearance requirements.

C. The Client will provide McClure with copies of any successor or additional contracts for the management or servicing of pre-existing equipment or the Equipment, which may be executed from time to time hereinafter within ten (10) days after execution thereof.

XI. AFFIRMATIVE COVENANTS OF MCCLURE

McClure must secure all licenses and permits and comply with all federal and state laws with respect to this project. All work completed under this contract must be in compliance with all building and codes appropriate accreditation, certification and licensing standards.

This Agreement is a Prevailing Wage Rate Agreement and subject to the provisions, duties, obligations, remedies and penalties of the Pennsylvania Prevailing Wage Act, Act 15, 1961, P.L. 981, as amended, 43 P.S. Section 165-1 et seq. Upon request, McClure shall promptly provide evidence of compliance with the act.

XII. TERMINATION OF MONITORING:

The monitoring services set forth in Section IV of this Agreement shall begin on the Commencement Date and shall continue in effect for the period as set forth in Schedule D. Such services shall be automatically renewed thereafter at the end of the subsequent Contract Year, unless this Agreement is terminated pursuant to this Section. The Client may cancel the Monitoring Services; effective at the end of any Contract Year, by providing sixty (60) days advance written notice to McClure.

The Client acknowledges and agrees that if, for any reason, it (i) cancels or terminates receipt of monitoring services, (ii) fails to pay for monitoring services, (iii) fails to fulfill any of its responsibilities necessary to enable McClure to complete the work and provide monitoring services, or (iv) otherwise

cancels, terminates or materially breaches this Agreement, the Energy Savings Guarantee as set forth in Schedule D shall automatically terminate and McClure shall have no liability hereunder.

XIII. [Intentionally Omitted]

XIV. WORKING HOURS AND SCHEDULE:

It is agreed that all installation work shall be conducted with minimal disruption to the Client's daily activities. Major disruptions shall be fully coordinated and agreed upon with the Client prior to commencement of disruptive activities. Work performed during occupied periods must be returned to a condition for full use by the Client. Normal working hours shall be generally defined as 6AM to 5PM, Monday through Friday and / or in compliance with local ordinances.

XV. CHANGE ORDERS

The Total Project Fee as set forth in Schedule F is understood to be a fixed lump sum fee for the scope of work set forth in this Agreement and supporting attachments. Additional work outside of the agreed upon scope of work, if requested by the Client will be subjected to a change order and subsequent contract amendment. Change Orders shall be implemented through acceptance and execution of Exhibit A. Additionally, work corresponding to Section XXIX will be subjected to a Change Order and subsequent contract amendment as required.

XVI. TERMINATION OF AGREEMENT:

A. McClure may terminate this Agreement without further responsibility or liability upon the occurrence of any of the following events:

1. All or any part of Client's ownership or lessee's interest in the Facilities is transferred voluntarily or involuntarily by any means including but not limited to the transfer of any ownership interest in the Client;

2. If Client defaults in any payment or any other obligation to McClure under this Agreement and, after 15 days written notice of default, Client fails to cure same.

B. Client may terminate this Agreement at any time after the Client has signed off on the Measurement and Verification results and the Client has met all financial obligations as detailed in Section XVII below.

C. Either party may terminate this Agreement pursuant to Section XIX below.

D. In the event of termination, McClure and Client shall continue to be responsible for their respective payment obligations accrued under this Agreement prior to the effective date of termination.

XVII. FEES AND TERMS OF PAYMENT:

McClure will, on or about the first day of each month during the construction period, calculate the value of the work performed on account of the Total Project Fee, calculated by reference to the

values set forth on Schedule F, during the preceding month and submit same to the Client for payment. A fee of twenty percent (20%) of the Total Project Fee will be invoiced to the Client upon both parties' acceptance of the Agreement. All invoices of McClure shall be due and payable by Client within (30) days of the invoice date. The Client shall have (30) days from the date of receipt of said invoice to notify McClure of any irregularity in the billing. Interest at a rate of 0.5% per month will accrue on all unpaid balances more than (45) calendar days after the invoice date. Title to the EC Measures shall not pass until full payment by Client of the Total Project Fee. Without limitation to the obligation of Client to pay to McClure the Total Project Fee, when due as provided herein, if Client receives any third-party financing, Client shall make payment to McClure directly or authorize such third party to make payment to McClure directly.

XVIII. INDEPENDENT CONTRACTOR:

McClure is an independent contractor and is not an employee, partner, legal representative, joint venture or agent of Client. McClure does not in any way assume any of the contractual or other obligations of Client to other parties under any agreements referred to herein or otherwise. The Client is not an employee, partner, legal representative, joint venture or agent of McClure. The Client does not in any way assume any of the contractual or other obligations of McClure to other parties under any agreements referred to herein or otherwise.

XIX. CASUALTY OR CONDEMNATION OF FACILITIES:

Any fire, flood or other casualty or condemnation affecting any portion of the Facilities may be a material change. If so, the notice thereof shall be given to McClure by Client and the required Energy Use Base modifications will be made. If any fire, flood or other casualty or condemnation renders a majority of the Facilities incapable of being occupied and the affected portion is not reconstructed or restored within 120 days from the date of such casualty or condemnation, either party may terminate this Agreement by delivery of written notice to the other, in which case McClure shall receive the payments described in Section XVII. If any fire, flood or other casualty or condemnation renders any particular Facility incapable of being occupied and such Facility is not reconstructed or restored within 120 days from the date of such casualty or condemnation, McClure may remove such Facility for the purpose of calculating the Energy Savings Guaranty, in which case McClure shall receive the payments described in Section XVII with respect to such Facility, and this Agreement shall continue in full force and effect. Notwithstanding anything to the contrary in this Agreement, in no event shall McClure be obligated to make any payment to Client under the Guaranteed Energy Savings with respect to any Facility for any period of time in which such Facility incurs any casualty, including without limitation, from fire, flood, collapse or otherwise.

XX. NOTICES:

Any notice required or permitted to be given under this Agreement shall be sufficient if in writing, and if sent by registered or certified mail, postage prepaid, return receipt requested, or by facsimile, to either party at the following addresses:

If to Client: UPPER ADAMS SCHOOL DISTRICT
161 North Main Street
Biglerville, PA 17307

Fax No.: 717-677-9807

Attention: Dr. Wesley Doll

If to McClure: MCCLURE COMPANY
4101 North Sixth Street
Harrisburg, Pennsylvania 17110
Fax No.: (717) 236-5239

Attention: President

Notice shall be deemed given two days after sent by mail, or on the date of receipt of confirmation of fax, and such receipt is confirmed orally by the recipient.

XXI. GOVERNING LAW:

This Agreement shall be governed and construed under the laws of the Commonwealth of Pennsylvania, notwithstanding its law of conflicts of law. This agreement is for a public work project and the McClure Company is subject to and must comply with the requirements of the Pennsylvania Public Works Employment Verification Act, Act 127-1012 (the "Act").

XXII. INDEMNIFICATION:

A. To the extent of McClure's negligence or intentional misconduct, McClure shall indemnify, defend, and hold harmless the Client and Client's representatives and employees from and against all claims, damages, losses, and expenses arising out of the performance of the work, provided any such claim, damage, loss or expense is caused by any negligent or intentional misconduct of McClure, McClure's representative or employees. McClure shall require all contractors and subcontractors to deliver to McClure and Client a certificate of insurance coverage with types and amounts of insurance as set forth in Schedule G. All such insurance coverage for contractors and subcontractors shall list McClure and Client as additional insureds.

B. To the extent of Client's negligence or intentional misconduct, Client shall indemnify, defend and hold harmless McClure and McClure's representatives and employees from and against all claims, damages, losses and expenses arising out of the performance of the work, provided any such claim, damage, loss or expense is caused by any negligent or intentional misconduct of Client, Client's representative or employees. Notwithstanding the foregoing or any other provision of this Agreement, nothing in this Agreement shall be deemed a direct or indirect waiver of or limitation to any sovereign or governmental immunity, in any respect, applicable to Client (including, without limitation, under the Pennsylvania Political Subdivision Tort Claims Act) or impose liability, directly or indirectly, on Client from which it would otherwise be immune under applicable law.

XXIII. DOCUMENTS:

All drawings and specifications prepared by McClure shall remain the property of McClure until such time as the Total Project Fee has been paid in full, at which time, said documents shall become the property of Client. Client shall not make any changes to said documents without the prior written

consent of McClure. Client grants McClure a perpetual, non-exclusive and royalty-free license to use all such drawings, designs and specifications.

XXIV. SEVERABILITY:

This Agreement shall be severable and to the extent that any part of the Agreement is unenforceable for any reason whatsoever, the remaining parts of this Agreement shall remain in full force and effect.

XXV. ASSIGNMENT; SUCCESSORS AND ASSIGNS:

This Agreement is not assignable by either McClure or Client without the prior written consent of the other party.

XXVI. INSURANCE; RISK OF LOSS:

In the performance of the services under this Agreement, McClure shall use reasonable care to prevent the loss or damage of any of Client's equipment or property. However, notwithstanding that Client's equipment may be in the care, custody or control of McClure in connection with the performance of services under this Agreement, risk of loss or damage to the equipment and property shall remain with the Client at all times. Nothing in this Agreement places any responsibility or liability on McClure or its subcontractors for conditions pre-existing at Client's Facilities or on the equipment being worked upon. Client shall defend, indemnify and hold harmless MCCLURE and its subcontractors against any claims or liabilities based on such pre-existing conditions. McClure and Client at all times during the term of this Agreement shall carry the types of insurance coverage as set forth in the attached Schedule G.

XXVII. MEDIATION OR ARBITRATION:

Any dispute, controversy or claim arising out of or relating to this Agreement or any breach or alleged breach hereof, shall, upon the request of any party involved (and without regard to whether or not any provision of this Agreement expressly provides for arbitration), be submitted to mediation or litigation in the Court of Common Pleas of Adams County. The expenses of the mediation or litigation shall be borne equally by the parties to the mediation or litigation, provided that each party shall pay for and bear the cost of its own experts, evidence and counsel.

XXVIII. PRIOR AGREEMENTS:

This Agreement supersedes the terms and conditions of any prior agreements, understandings or representations, oral or written, between the parties, and contains the entire agreement of the parties with respect to the subject matter herein.

XXIX. EXCLUDED MATERIAL AND ACTIVITIES:

A. The Client recognizes that in connection with the installation and/or service or maintenance of Equipment at the Client's Facilities, McClure may encounter, but is not responsible for, any work

relating to (i) asbestos, materials containing asbestos, or the existence, use, detection, removal, containment or treatment thereof, or (ii) pollutants, hazardous wastes, hazardous materials, contaminants, or the storage, handling, use, transportation, treatment or the disposal, discharge, leakage, detection, removal, or containment thereof. The materials and activities listed in the foregoing sentence are hereinafter referred to as "Excluded Materials and Activities". The Client agrees that if McClure's performance of any work under this Agreement involves Excluded Materials and Activities, Client shall bear the sole risk and responsibility therefore. In the event McClure discovers Excluded Materials, McClure shall immediately cease work, remove all McClure personnel or subcontractors from the site, and notify the Client. The Client shall be responsible to handle such Excluded Materials at the Client's expense. McClure does not take title to any Excluded Materials, and does not assume any responsibility for the transportation, handling or disposal of Excluded Materials. If Excluded Materials are discovered at a Facility, McClure shall undertake no further work at such Facility except as authorized by the Client in writing.

B. Notwithstanding anything to the contrary in this Agreement, the Client hereby releases and agrees to indemnify, defend, and hold harmless McClure, its assigns, consultants, contractors, subcontractors, and their respective shareholders, officers, directors, agents and employees (and each of them) from and against all costs, claims, fines, fees, damages or liability (including without limitation, all attorneys' fees and costs, costs of settlement or suit) arising out of, or in any manner connected with any work related to Excluded Materials and Activities performed by or for the Client, or with respect to the ownership, handling or transportation of Excluded Materials, whether such claim or action arises in contract, warranty, tort (including negligence), strict liability, environmental liability, or otherwise, and from any cause whatsoever. Any such proceeding or suit shall not be settled without the prior written consent of McClure, which consent shall not be unreasonably withheld.

XXX. BONDING

A performance and payment bond will be provided which will guarantee the installation and/or improvements only. McClure Company will be responsible for the energy savings and the guaranteed energy savings, which are not covered by the bond. NOW THEREFORE, the parties hereto, have caused their duly authorized representatives to execute and deliver this Agreement as of the date first above written.

McClure Company

Signature: Todd C Kay

Print Name: Todd C Kay

Title: Exec. Vice President

Upper Adams School District

Signature: Thomas J. Wilson III

Print Name: THOMAS J. WILSON III

Title: PRESIDENT, UPPER ADAMS SCHOOL DISTRICT

SCHEDULE A – CLIENT FACILITIES

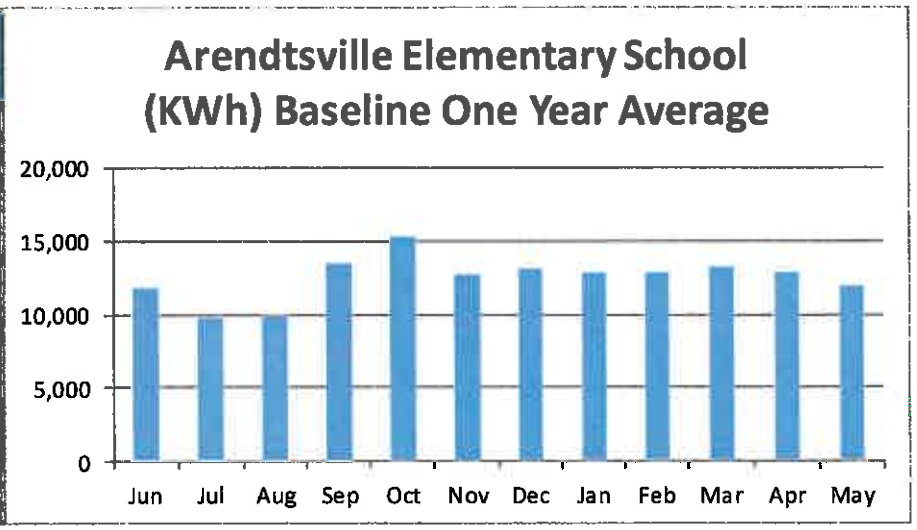
Building Name	Area (Sq Ft)	Building Type
Arendtsville Elementary School	38,900	Elementary School
Biglerville Elementary School	64,000	Elementary School
Biglerville High School/Middle School	196,000	High School/ Middle School

SCHEDULE B – ENERGY USE BASE

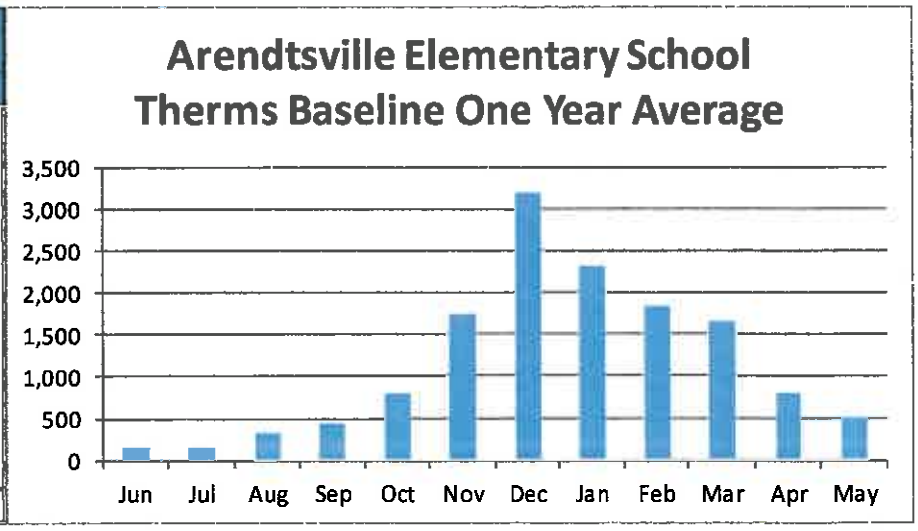
Utility data was provided by the District for analysis. The utility data provided by the Upper Adams School District ranged from June 2017 to May 2018. It was decided to use that year as it is the most current full year of utility data.

The baseline will also be adjusted to account for differences in weather patterns or for outdoor air corrections for code compliance. See the measurement and verification plan details in Schedule L or Section VII for additional clarification. The Energy Use Baseline may be revised, from time to time, due to any change in factors that affect energy use at the facility, as described within those sections

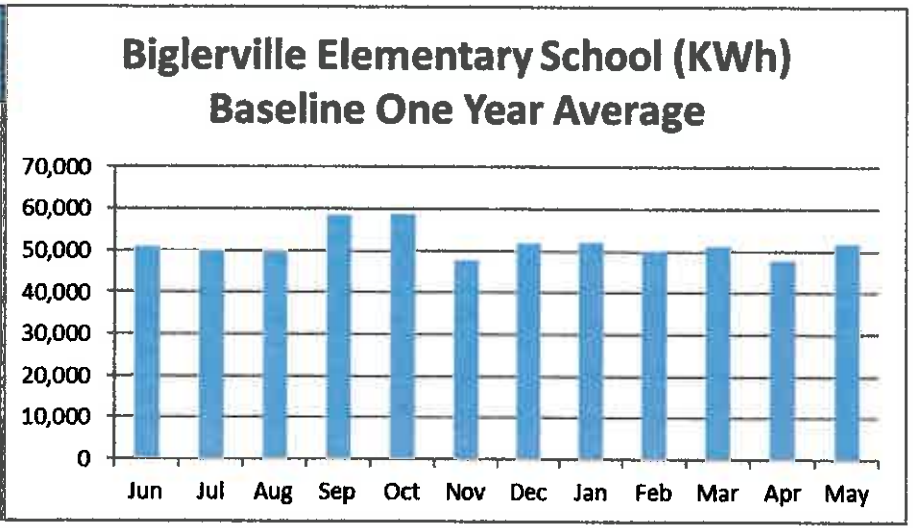
Arendtsville Elementary School (KWh) Baseline One Year Average	
Month	(KWh)
Jun	11,840
Jul	9,760
Aug	9,840
Sep	13,440
Oct	15,280
Nov	12,720
Dec	13,040
Jan	12,880
Feb	12,800
Mar	13,280
Apr	12,800
May	11,920
Total	149,600



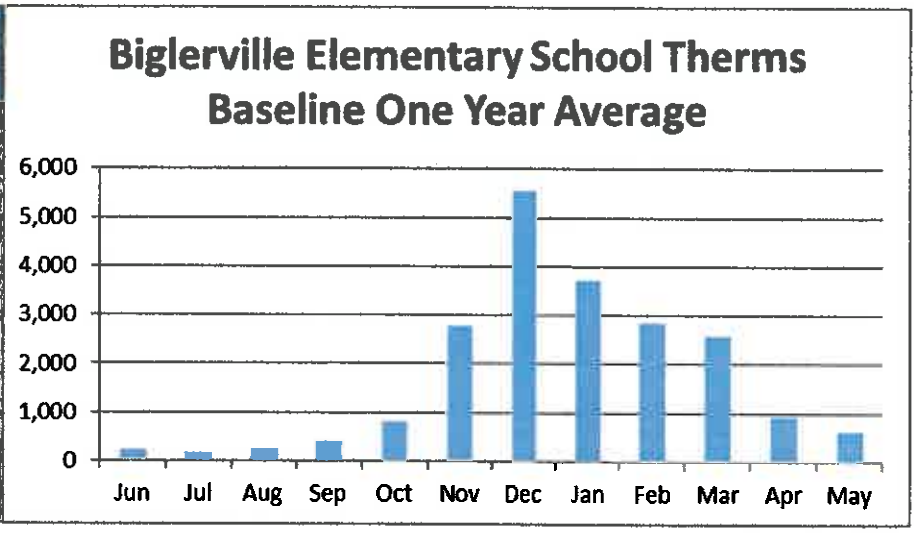
Arendtsville Elementary School Therms Baseline One Year Average	
Month	Therms
Jun	142
Jul	130
Aug	330
Sep	430
Oct	800
Nov	1,740
Dec	3,190
Jan	2,310
Feb	1,830
Mar	1,650
Apr	790
May	500
Total	13,842



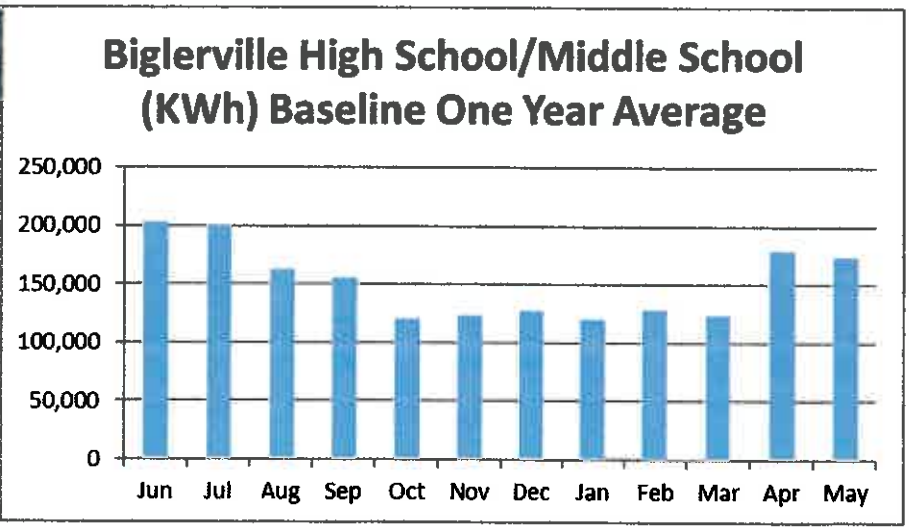
Biglerville Elementary School (KWh) Baseline One Year Average	
Month	(KWh)
Jun	51,050
Jul	49,832
Aug	49,692
Sep	58,511
Oct	58,823
Nov	47,844
Dec	51,927
Jan	52,235
Feb	50,286
Mar	51,291
Apr	47,956
May	52,070
Total	621,517



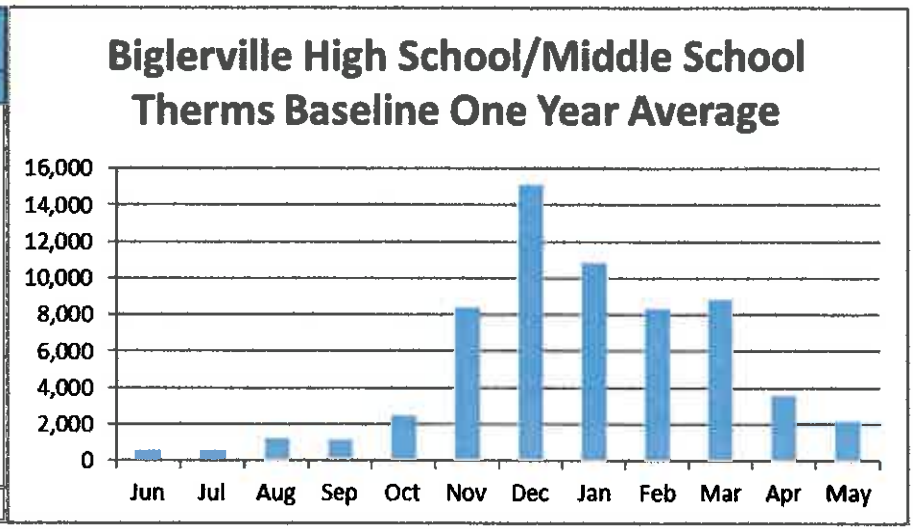
Biglerville Elementary School Therms Baseline One Year Average	
Month	Therms
Jun	231
Jul	170
Aug	250
Sep	390
Oct	810
Nov	2,790
Dec	5,570
Jan	3,730
Feb	2,860
Mar	2,590
Apr	930
May	630
Total	20,951



Biglerville High School/Middle School (KWh) Baseline One Year Average	
Month	(KWh)
Jun	202,584
Jul	200,309
Aug	163,092
Sep	155,605
Oct	120,826
Nov	123,614
Dec	127,729
Jan	120,110
Feb	128,852
Mar	123,772
Apr	179,430
May	174,398
Total	1,820,321



Biglerville High School/Middle School Therms Baseline One Year Average	
Month	Therms
Jun	532
Jul	540
Aug	1,190
Sep	1,160
Oct	2,440
Nov	8,410
Dec	15,160
Jan	10,830
Feb	8,330
Mar	8,900
Apr	3,610
May	2,200
Total	63,302



The baseline heating degree days (HDD) and cooling degree days (CDD) from the utility bill analysis is shown in the table below.

2017-2018		
Month	Heating Degree Days	Cooling Degree Days
Jun-17	8	264
Jul-17	-	394
Aug-17	1	250
Sep-17	46	157
Oct-17	172	62
Nov-17	625	-
Dec-17	975	-
Jan-18	1,088	-
Feb-18	702	-
Mar-18	794	-
Apr-18	449	15
May-18	32	146
Totals:	4,892	1,288

Data is from www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/ for the station: Harrisburg

Degree Day Explanation:

A degree day is a quantitative index demonstrated to reflect demand for energy to heat or cool houses and businesses. This index is derived from daily temperature observations at nearly 200 major weather stations in the contiguous United States. The "heating year" during which heating degree days are accumulated extends from July 1st to June 30th and the "cooling year" during which cooling degree data are accumulated extends from January 1st to December 31st. A mean daily temperature (average of the daily maximum and minimum temperatures) of 65°F is the base for both heating and cooling degree day computations. Heating degree days are summations of negative differences between the mean daily temperature and the 65°F base; cooling degree days are summations of positive differences from the same base. For example, cooling degree days for a station with daily mean temperatures during a seven-day period of 67,65,70,74,78,65 and 68, are 2,0,5,9,13,0,and 3, for a total for the week of 32 cooling degree days.

SCHEDULE C – BASE ENERGY RATES

ECM Savings from all measures at the Upper Adams School District will be calculated by using the Base Energy Rates listed below. These rates are based on the annual usage and cost from the District provided utility bills for the base line periods listed in Schedule B above.

The Base Energy Rates listed below will be increased each year on a cumulative basis at the escalation rates set forth in Section II, Paragraph B.

Electric Rates

1. Arendtsville Elementary School: $0.08848 / KWH
2. Biglerville Elementary School: $0.10062 / KWH
3. Biglerville High School/Middle School: $0.08313 / KWH

Gas Rates

1. Arendtsville Elementary School: $0.80342 / CCF
2. Biglerville Elementary School: $0.79156 / CCF
3. Biglerville High School/Middle School: $0.71791 / CCF

The fuel rates listed above serve as the baseline rate for the 12-month construction. Escalation will take effect for Contract Year 1 and all subsequent years. While some construction activities may begin during the current school year, a large portion of the project will be implemented and commissioned based on construction beginning in June 2019.

12 Month Construction Period - June 2019 through May 2020

Contract Year 1 - June 2020 through May 2021

SCHEDULE D – GUARANTEED ENERGY SAVINGS PER CONTRACT YEAR

The Guaranteed Energy Savings per Contract Year is shown in column (2) in the table below. Year One (1) savings are measured and verified. Years Two through Twenty (2 – 20) are projected based on the Year One (1) measurement. Operational Savings in Column 3 include both Operational Savings and Warranty Savings in Years One (1) through Five (5). See Detailed Operational and Maintenance Worksheet on the next page.

As of the date of this agreement, the District is analyzing funding options in collaboration with their Financial Advisor. The options vary by term and structure and will be custom tailored to best fit the District's current debt portfolio. For this reason, "lease payments", Column 6 of Schedule D is not utilized.

Upper Adams School District
Biglerville, PA
Guaranteed Energy Savings Project
Project Proforma Cash Flows
20 Year Lease Term

Total Project Cost	9,289,843
Less: Customer Equity	-
Total Amount Financed	9,289,843
First Year Energy Savings	88,581
First year Operational Savings	19,402
Total First Year Savings	107,983

One Time Escalation

Electric	0.0%

Annual Escalation Rates

Electric	3.00%
Oil, Gallons	3.00%
Propane, Gallo	3.00%
Natural Gas, Tl	3.00%
Tons, Coal	3.00%
Water	3.00%
Maintenance	3.00%

1	2	3	4	5	6	7	8	9
Year	**Energy Savings**	**Operational Savings**	**Total Savings**	**Avoided Capital Outlays**	**Lease Payments**	**Performance Assurance**	**Net Savings**	**Accumulated Savings**
const.	43,001		43,001				43,001	43,001
1	88,581	19,402	107,983	557,411	-	-	665,395	708,395
2	91,239	19,647	110,886	557,411	-	-	668,297	1,376,692
3	93,976	8,652	102,628	557,411	-	-	660,039	2,036,731
4	96,795	8,911	105,707	557,411	-	-	663,118	2,699,848
5	99,699	9,179	108,878	557,411	-	-	666,289	3,366,137
6	102,690	-	102,690	557,411	-	-	660,101	4,026,239
7	105,771	-	105,771	557,411	-	-	663,182	4,689,421
8	108,944	-	108,944	557,411	-	-	666,355	5,355,776
9	112,212	-	112,212	557,411	-	-	669,623	6,025,399
10	115,579	-	115,579	557,411	-	-	672,990	6,698,389
11	119,046	-	119,046	557,411	-	-	676,457	7,374,846
12	122,618	-	122,618	557,411	-	-	680,029	8,054,875
13	126,296	-	126,296	557,411	-	-	683,707	8,738,582
14	130,085	-	130,085	557,411	-	-	687,496	9,426,078
15	133,987	-	133,987	557,411	-	-	691,399	10,117,477
16	138,007	-	138,007	557,411	-	-	695,418	10,812,895
17	142,147	-	142,147	557,411	-	-	699,558	11,512,453
18	146,412	-	146,412	557,411	-	-	703,823	12,216,276
19	150,804	-	150,804	557,411	-	-	708,215	12,924,491
20	155,328	-	155,328	557,411	-	-	712,739	13,637,230
	2,423,219	65,790	2,489,009	11,148,222	-	-	13,637,230	

Detailed
Operational and Maintenance
Worksheet

Year	Mechanical Lighting Building Detail Operational Savings	Lighting Warranty Savings	Act 129 Rebates	Total Operational Savings
const.				
1	-	8,155	11,247	19,402
2	-	8,400	11,247	19,647
3	-	8,652	-	8,652
4	-	8,911	-	8,911
5	-	9,179	-	9,179
6	-		-	-
7	-		-	-
8	-		-	-
9	-		-	-
10	-		-	-
11	-		-	-
12	-		-	-
13	-		-	-
14	-		-	-
15	-		-	-
16	-		-	-
17	-		-	-
18	-		-	-
19	-		-	-
20	-		-	-
	-	43,296	22,494	65,790

SCHEDULE E – ENERGY CONSERVATION MEASURES

The following section lists the Energy Conservation Measures (ECM's) for the Energy Services Program at the Upper Adams School District. Details may be found in Attachment "A", Scope of work for Energy Conservation Measures and Attachment "B", Lighting Audit and Attachment "C", Commissioning.

ECM NUMBER	ECM TITLE
1	District Wide LED Lighting Upgrades
2	District Wide Building Envelope Upgrades
3	District Wide Mechanical Insulation Upgrades
4	District Wide Transformer Upgrades
5	Biglerville High School/Middle School HVAC Upgrades
6	Biglerville Elementary School HVAC Upgrades
7	Biglerville Elementary School Window Replacements
8	Biglerville Elementary School Gutter and Roof Upgrades
9	Arendtsville Elementary School HVAC Upgrades
10	District Wide Generator Upgrades

SCHEDULE F – TOTAL PROJECT FEE

The Total Project Fee for the Energy Conservation Measures listed in Schedule E is Nine Million, Two Hundred and Eighty-Nine Thousand, Eight Hundred and Forty-Three Dollars ($9,289,843).

SCHEDULE G – INSURANCE

McClure, at all times during this Agreement, shall carry as a minimum the following amounts of insurance. Greater amounts will be carried where required by law:

(1) Workers' Compensation, etc.:	
(a) State	Statutory
(b) Applicable Federal (e.g. Longshoreman's)	Statutory
(c) Employer Liability	$100,000 each incident $500,000 disease-policy limit $100,000 disease-each employee
(2) Comprehensive General Liability:	
(a) Bodily Injury & Property Damage: $1,000,000 $1,000,000	 Each Occurrence General Aggregate
(b) Products – Completed Operations $1,000,000	 General Aggregate
(c) Property Damage Liability Insurance will provide Explosion, Collapse, and Underground coverage where applicable	
(d) Personal & Advertising injury $1,000,000	 General Aggregate
(3) Comprehensive Automobile Liability:	
$1,000,000	Any one Accident or Loss for Bodily Injury & Property Damage
(4) Umbrella Liability	$5,000,000 Each Occurrence $5,000,000 Aggregate

SCHEDULE H – ADDITIONAL TERMS AND CONDITIONS

McClure shall comply with all governmental requirements applicable to the work, under this Agreement, including without limitation to the following:

(a) Human Relations Act - The provisions of the Pennsylvania Human Relations Act, Act 222 of October 27, 1955 (P.L. 744) (43 P.S. Section 951, Et. Seq.) of the Commonwealth of Pennsylvania prohibit discrimination because of race, color, religious, creed, ancestry, age, sex, national origin, handicap or disability, by employers, employment agencies, labor organizations, contractors and others. The contractor shall agree to comply with the provisions of this Act as amended that is made part of this specification. Your attention is directed to the language of the Commonwealth's non-discrimination clause in 16 PA. Code 349.101.

(b) Provision for the Use of Steel and Steel Products made in the U.S.A. - In accordance with Act 3 of the 1978 General Assembly of the Commonwealth of Pennsylvania, if any steel or steel products are to be used or supplied in the performance of the contract, only those produced in the United States as defined therein shall be used or supplied in the performance of the contract or any subcontracts there under. In accordance with Act 161 of 1982, cast iron products; shall also be included and produced in the United States. Act 141 of 1984 further defines "steel products" to include machinery and equipment. The act also provides clarifications and penalties.

(c) Environmental Statutes and Regulations - Contractor shall comply with all applicable provisions of federal and state laws dealing with the prevention of environmental pollution and the preservation of natural resources, including but not limited to Act 247 of October 25, 1972; the Federal Air Quality Act of 1967; the Clean Air Act; the Clean Water Restoration Act; the Water Pollution Control Act Amendments of 1956; the Water Quality Act of 1965; the Water Quality Improvement Act of 1970; the Water Pollution Control Act Amendments of 1972; the Water Facilities Act (see Consolidated Farmer's Home administration Act of 1961); the Watershed Protection and Flood Prevention Act; the Pennsylvania Air Pollution Control Act; the Clean Streams Law; the Solid Waste Management Act; the Municipal Waste Planning, Recycling and Waste Reduction Act; the Pennsylvania Sewage Facilities Act; AHERA; and all rules and regulations there under, including but not limited to those formulated by the United States Environmental Protection Agency and the Pennsylvania Department of Environmental Resources. Nothing contained in the Contract shall be construed as relieving Contractor in any way of Contractor's responsibility for strict compliance with all government requirements pertaining to environmental protection.

(d) Safety and Health Regulations - The Contract is to be governed at all times by applicable provisions of federal law, including but not limited to the following: William-Steiger Occupational Safety and Health Act of 1970, Public Law 91-596. Part 1910 - Occupational Safety and Health Standards, Chapter XIII of title 29, code of federal Regulations. Nothing contained in the Contract shall be construed as relieving Contractor in any way of Contractor's responsibility for strict compliance with all governmental requirements pertaining to health and safety.

(e) Bonds Required – McClure shall furnish and deliver to the Client at or before the execution of this Agreement by McClure:

i. Performance Bond – A performance bond for the installation portion of the Agreement at one hundred percent (100%) of the contract amount, conditioned upon the faithful performance of the contract in accordance with the plans, specifications and conditions of the contract, within the time specified therein. Such bond shall be solely for the protection of the Client. The surety company which issues said bond must be legally authorized to do business in the Commonwealth of Pennsylvania and must have a rating of B+, A or A+ as determined by the A.M. Best company or an equivalent rating agency deemed satisfactory to Client.

ii. Labor and Material Payment Bond – A labor and material payment bond at one hundred percent (100%) of the contract amount, solely for the protection of claimants supplying labor and/or materials to McClure to whom the contract was awarded, or to any of his subcontractors in the prosecution of the work provided for in such contract, and shall be conditioned for the prompt payment of all such material furnished or labor supplied or performed in the prosecution of the work. "Labor and/or materials" shall include public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the site. The surety company which issues said bond must be legally authorized to do business in the Commonwealth of Pennsylvania and must have a rating of B+, A or A+ as determined by the A.M. Best Company or an equivalent rating agency deemed satisfactory to Client.

iii. Additional Security – Should any surety company providing any bond required in this Contract be deemed unsatisfactory to the Client, notice will be given to McClure to that effect, and McClure shall immediately substitute a new surety company or companies satisfactory to Client, without any additional cost or expense to Client.

iv. Failure to Furnish Bonds – Failure to furnish and deliver any bond as required by this Contract, shall entitle the Client to declare McClure's Bid or Proposal to be non-responsive, and not the lowest responsible bid or proposal, and shall constitute a basis to award the contract to another bidder or proposer.

(f) Compliance With all Applicable Laws- McClure shall comply with all other applicable laws ordinances and regulations.

(g) Standard of Quality. The various materials and products specified in the specifications by name or description are given to establish a standard of quality and of cost for bid purposes. It is not the intent to limit the acceptance to any one material or product specified, but rather to name or describe it as the absolute minimum standard that is desired and acceptable.

(h) Pennsylvania Prevailing Wage Rates. This regulation and the general Pennsylvania prevailing minimum wage rates (Act 422 of 1961, P.L. 987, as amended), as determined by the Secretary of Labor and Industry, shall be paid for each craft or classification of all workers needed to perform the Contract during the anticipated term therefore in the locality in which public work is performed, are made part of this Contract.

(i) Client (UASD), pursuant to law, has policies which prohibit tobacco, alcoholic beverages, illegal drugs and weapons on school property. There shall be no smoking or smokeless tobacco anywhere on school property. Employees of the Contractor or subcontractor who are discovered onsite with tobacco, alcoholic beverages, illegal drugs or firearms, or are under the influence of alcoholic beverage or illegal drugs, will be permanently terminated from the Project and may be prosecuted by law. Firearms on school property shall be removed or be subject to confiscation and locked up. Contractor shall be responsible to monitor and enforce this policy with Contractor's employees and Contractor's subcontractor's employees.

SCHEDULE I – STANDARDS OF OCCUPANCY AND COMFORT

Listed below are the post project targeted baseline thermal comfort conditions and minimum lighting levels. See Table I.1 below for each building's baseline temperature set points and current operating status.

It is understood that existing and installed equipment may not allow for exact times and temperatures to be met, but every effort will be made to meet the below standards as closely as the equipment allows.

Buildings listed with "as is" are to remain as currently operating at the established set points, ventilation rates, and schedule set forth by the Client. The baseline for those not listed "as is" will be as described, and while there are space outliers, such as gyms and public meeting spaces, the schedule will be set up as listed with the prescribed set points. Modifications can be made but could impact the level of savings and may require an adjustment in the M&V methodology. These schedules and set points have been developed with the Client's staff and through historical project data for similar facilities.

Post project lighting levels will meet or exceed the required levels as set forth by the Illuminating Engineering Society of North America (IESNA). IESNA is the recognized standard for determining minimum lighting levels. The energy index and installation practices of the installed lighting will be in full compliance with the PA statewide 2009 Uniform Construction Code (UCC). The UCC recognizes NFPA 70: National Electrical Code as the standard for electrical related work. As for the installed lighting the UCC references the International Energy Conservation Code 2009 (IECC 2009) for lighting power requirements. While lighting power has little effect on the standards of comfort provided by adequate light levels, referenced from IESNA, the new lighting fixtures and lamps will be below the maximum power allowance found in IECC 2009 Section 505.5.2 Table 505.5.2 for each building and its function, as expected when using lower wattage lamps and fixtures to provide similar lighting levels as their existing counterparts.

IESNA RECOMMENDED LIGHTING LEVELS:

Average Reading and Writing:	50 FC
Office:	25 FC
Corridors:	10 FC
Storage:	30 FC
Entrances:	5 FC
Parking Lots:	0.8 – 3.6 FC

TABLE I.1 – Baseline Thermal Comfort Conditions

Building Name	Typical Occupied Schedule	HVAC Occupied Heating/Cooling Temperature	Ventilation Rate	HVAC Unoccupied Heating/Cooling Temperature
Biglerville Middle/High School	7:00 AM –4:00 PM Nights and Weekends per normal scheduled sporting events and activities.	72/74	In accordance With ASHRAE Std. 62.1-2004	60/85
Arendtsville Elementary School	7:00 AM –4:00 PM Nights and Weekends per normal scheduled sporting events and activities.	72/74	In accordance With ASHRAE Std. 62.1-2004	60/85
Biglerville Elementary School	7:00 AM –4:00 PM Nights and Weekends per normal scheduled sporting events and activities.	72/74	In accordance With ASHRAE Std. 62.1-2004	60/85

SCHEDULE J – OPERATIONS AND MAINTENANCE SAVINGS

General

The operations and maintenance savings have been calculated from data provided by the Client's Administration, Buildings and Grounds, industry standards and averages, actual material costs, actual repair costs, and outside purchased repairs and service costs. The Client agrees the recurring or non-recurring savings listed below are tangible and quantifiable savings as a result of the scope of work described within this contract.

The total Year 1 stipulated Operation and Maintenance Savings is $19,402. The total 20-year cumulative savings, as shown in Schedule D is $65,790.

Act 129 Utility Rebates; Cumulative Savings = $22,494

The District's Electrical Distribution Company is Met Ed/First Energy. In 2009, the Public Utility Commission mandated each of the Commonwealth's (7) EDC's implement a rebate program that incentivizes customers to proactively install energy efficient equipment. Based on Met Ed's published prescriptive rebates, we have estimated the total rebate amount to be $22,494. McClure Company will apply for the rebates on behalf of the District. All rebate money goes directly to the District. We do not have direct control of when the rebate money is disbursed, therefore, to remain conservative, we have shown them being received over a 2-year period as follows:

Year 1 = $11,247
Year 2 = $11,247

Avoided Capital Costs

General

The Guaranteed Energy Savings Act (Act 1998-57, as amended) identifies an energy-related cost savings as including (a) avoided current or planned capital expense, and (b) avoided renovation, renewal or repair costs of replacing old and unreliable equipment and systems. Capital funds budgeted for projects that will not be necessary can be utilized to offset the cost of guaranteed energy savings projects. The Act states that allowable capital costs include capital costs that the Client reasonably believes will be incurred during the term of the guaranteed energy savings contract and are documented by industry engineering standards. The Client has reviewed its planned and needed capital improvement projects and has determined that it is appropriate to proceed with a guaranteed energy savings contract.

The avoided current or planned capital expenses that are listed below are stipulated by the Client and represent the best estimate of these expenses. The Client agrees these costs represent the minimum amount of expenses that would have been incurred within the term of this contract in order to maintain the Client's current level of operation.

Furthermore, the Client agrees that the equipment and / or systems included within this Avoided Capital Costs section are considered old and unreliable, irreparable, obsolete, in need of immediate repair and / or in need of immediate implementation due to code / life safety compliance. Based on the condition of the equipment and onsite inspections and metering, the Client has concluded that it does not make long term economic sense for the Client to keep the equipment in operation.

The costs below represent the cost that will be incurred to replace certain existing equipment or systems in kind utilizing an outside contractor or provider for proper and timely installation. The estimates are based on the cost for similar equipment or systems the Client has previously installed. Current prevailing wage rates, engineering fees, architectural fees, and other similar costs are included in the estimates.

1. District Wide Lighting Upgrades

The existing lighting in the District is outdated and does not provide adequate light levels in spaces according to the Illuminating Engineering Society of North America (IESNA). The lighting will be retrofitted with new LED technology which will increase lighting levels to those recommended by IESNA.

The total cost for the lighting upgrade has been estimated at $470,030.

2. District Wide Building Envelope Upgrades

The existing building envelope in the District is not adequate and allows unconditioned air to enter the buildings. This unconditioned air causes comfort issues along with addition stress on the HVAC systems. Upgrades to the building envelope will be implemented to reduce the amount of unconditioned air entering the building.

The total cost for the building envelope upgrade has been estimated at $49,076.

3. District Wide Mechanical Insulation Upgrades

The existing mechanical insulation has deteriorated. In some instances, the insulation was not installed or removed from sections of the mechanical system. This allows the heat from the mechanical system to escape to environment. This causes a reduction in the efficiency of the mechanical systems.

The total cost for the mechanical insulation upgrade has been estimated at $31,978.

4. District Wide Transformer Upgrades

The existing transformers in Biglerville Elementary and Biglerville Middle/High Schools are old and inefficient. This causes the transformers to lose energy through heat into the building. This heat reduces the efficiency of the transformers and puts additional stress on the HVAC system. Upgrades of the transformers will be implemented to reduce the amount of heat generated by the transformers.

The total cost for the transformer upgrades has been estimated at $187,076.

5. Arendtsville Elementary HVAC Upgrades

The existing HVAC system in Arendtsville Elementary School is over 30 years old and in need of replacement. All of the equipment was installed during the last major renovation in 1988. The unit ventilators are beyond their useful life and do not have air conditioning capabilities and is not cost effective to upgrade given their vintage, condition, and inefficiencies. With the equipment beyond its useful life, replacement is imminent. Any repair to the equipment would merely be to keep it operational until a holistic replacement could occur.

The total cost for replacing the HVAC system has been estimated at $1,339,631.

6. Biglerville Elementary HVAC Upgrades

The existing HVAC system in Biglerville Elementary School is over 26 years old and in need of replacement. All of the equipment was installed during the construction of the building in 1993. The air handling units and boilers are beyond their useful life and the installation of the equipment makes the maintenance of the equipment difficult and unsafe. With the equipment beyond its useful life, replacement is imminent. Any repair to the equipment would merely be to keep it operational until a holistic replacement could occur.

The total cost for replacing the HVAC system has been estimated at $3,511,260.

7. Biglerville High School/Middle School HVAC Upgrades

The existing HVAC system in Biglerville High School/Middle School is over 20 years old and in need of replacement. All of the equipment was installed during the construction/renovation of the building in 1999. The roof top units are beyond their useful life and beginning to show signs of failure. With the equipment beyond its useful life, replacement is imminent. Any repair to the equipment would merely be to keep it operational until a holistic replacement could occur.

The total cost for replacing the HVAC system has been estimated at $2,583,345.

8. Biglerville Elementary Window Upgrades

The existing windows are a wood core construction. The gutter system that serves the building has been failing and allowing moisture to infiltrate the metal covering and causing the wood core to deteriorate. The windows were installed during the original construction of the building in 1993. The windows do not have an option for repair and require a full replacement.

The total cost for replacing the windows has been estimated at $383,675.

9. Biglerville Elementary Gutter System Upgrades

The existing gutter system has deteriorated to the point that water runoff from the roof is infiltrating into and rotting the wood core windows in the building. The gutter system is corroding and the fasteners connecting the system have begun to fail. Because of the corrosion, repairs would be futile, and a full replacement of the gutter system will occur.

The total cost for replacing the gutter system has been estimated at $455,003.

10. District Wide Generator Upgrades

The existing generators in Biglerville Elementary and Biglerville Middle/High Schools are of various ages. The equipment is not sized to satisfactorily power emergency system within the buildings for prolonged power losses. Because the capacity it not upgradable, replacements to increase capacity and infrastructure to enable the service will be provided.

The total cost for replacing or upgrading the generators have been estimated at $127,235.

11. Hot Water Piping Loop and Ductwork

The existing HVAC systems in Arendtsville Elementary, Biglerville Elementary, and Middle/High Schools are being replaced. However, the system we are designing can adaptively re-use the existing piping systems, several ductwork runs, and variable air volume boxes which reduce the cost of purchasing new piping and sheet metal materials. In addition, it saves the labor of installing the new system along with the cost associated with insulating the new systems.

The total cost for replacing the piping loop and ductwork has been estimated at $2,000,000.

SCHEDULE K – STIPULATED LIGHTING HOURS OF OPERATION

Locations	Biglerville High School/Middle School	Biglerville Elementary School	Arendtsville Elementary School
CLASSROOM	2,000	2,000	2,000
OFFICE	3,000	3,000	3,000
CORRIDOR	3,200	3,200	3,200
RESTROOM	3,200	3,200	3,200
GYM	3,200	3,200	3,200
LOCKER ROOM	3,200	3,200	3,200
LIBRARY	3,200	3,200	3,200
AUDITORIUM	2,000	2,000	2,000
CAFETERIA	3,200	3,200	3,200
KITCHEN	3,200	3,200	3,200
EXIT SIGNS	8,760	8,760	8,760
STORAGE/SERVICE AREA	1,000	1,000	1,000
OTHER EDUCATIONAL	3,000	3,000	3,000
EXTERIOR	4,380	4,380	4,380

SCHEDULE L – MEASUREMENT AND VERIFICATION PLAN

Introduction

This section provides procedures and guidelines for quantifying savings resulting from the installation of ECMs under energy performance contracts and is intended to comply with the International Performance Measurement & Verification Protocol (IPMVP). The IPMVP was developed to provide a commonly accepted methodology for measuring energy savings associated with performance contracts. There are two components of M&V for Energy Saving Performance Contracting (ESPC) projects:

- **Verifying ECM potential to perform and generate savings -** by confirming that: i) baseline conditions are accurately defined, and ii) the appropriate equipment components or systems are properly installed, performing per specification and have the potential to generate predicted savings.

- **Verifying ECM performance (savings)** - by determining the actual energy savings achieved by the installed ECM.

The general approach to determining energy savings involves comparing the energy use associated with a facility, or certain systems within a facility, before installation of the ECM (baseline) and after installation of the ECM (post-installation). Therefore, in general:

Energy savings = (baseline energy use) - (post-installation energy use)

As ESPC projects are based on pay for performance, each ECM or site will have a site-specific verification process to determine its savings. For each site or project, the baseline and post-installation energy use will be defined using metering, billing analysis and/or engineering calculations (possibly including computer simulation). In addition, values for certain factors that affect energy use and savings, and that are beyond the control of McClure Company (i.e., building occupancy), may be stipulated by the client sponsoring the project.

With the completion of the project, McClure Company will submit a report that defines projected energy savings based on the before and after measurements. This report must be accepted and approved by the client.

Verifying ECM Potential to Perform

Maintaining Service Quality

The Demand Side Management (DSM) measures installed under ESPC programs should maintain or improve the quality of service provided to the client by the affected equipment or systems. For example, lighting projects that reduce lighting levels must maintain some minimum standards, i.e., the minimum standard for the facility's primary use.

Baseline Verification

Baseline conditions may be defined by either the client or McClure Company. If the baseline is client-defined, then McClure Company will have the opportunity to verify it. If the baseline is defined by McClure Company, the client will verify it. Baseline physical conditions such as equipment counts,

nameplate data, and energy consumption rate and control strategies will typically be determined through surveys, inspections and/or spot or short-term metering activities. Variables which affect baseline energy calculations such as weather, outdoor air code compliance, and building occupancy are identified.

Post-Installation Verification

In a post-installation M&V verification, McClure Company and client agree that the proper equipment components or systems were installed, are operating correctly and have the potential to generate the predicted savings. Verification methods may include surveys, inspections and/or continuous metering. McClure Company is expected to complete the system/equipment commissioning.

Verifying ECM Performance

Either after the ECM is installed, McClure Company and client will determine energy savings in accordance with an agreed-upon M&V method using verification techniques defined in this M&V plan.

Verification Techniques

Baseline energy use, post-installation energy use and energy (and cost) savings will be determined using the following M&V techniques:

- Engineering Calculations
- Metering And Monitoring
- Utility Meter Billing Analysis
- Computer Simulations, e.g. Trane Trace Building Simulation
- Agreed-Upon Stipulations By The Client and McClure Company

Estimating Energy Savings

There are numerous factors that can affect energy savings during the term of a contract such as weather, operating hours, process loads and heat exchanger fouling. In general, one ESPC contract objective may be to adjust baseline energy use up or down for factors beyond the control of McClure Company (e.g., changes in building occupancy or weather), and adjust post-installation energy use for controllable factors (e.g., maintenance of equipment efficiency).

In order to calculate energy savings, the client may in some cases stipulate the value of factors that are difficult to determine or that may vary during the contract term. In other situations, continuous or regular interval measurements throughout the term of the contract may be compared to baseline energy measurements to determine savings.

There are four industry-accepted options to verifying energy savings. **Option A** emphasizes verification of performance factors and involves determining long-term savings through use of stipulations for operational factors. **Option B and C** involves use of long term metering data; **Option B** involves end use data analysis and **Option C** involves whole building data analysis. **Option D** involves calibrated building simulation.

Option A focuses on physical assessment of equipment changes to insure the installation is to specification. Key performance factors (lighting wattage or chiller efficiency) are determined with spot

or short-term measurements and operational factors (lighting hours of operation or cooling ton-hours) are stipulated based on analysis of historical data or spot/short term measurements. The savings are determined using spot or short-term measurements. An example of the measurements will be measuring the wattage use of fixed number of samples of lighting fixtures both before and after the lighting retro-fit.

Option B savings are determined after the project completion by short term or continuous measurements taken up to one year following the completion of the installation. The baseline for option B is determined through energy measurements during the IGA phase. The actual baseline is projected to an annual cost through use of standard engineering calculations. The savings are determined by comparison of the baseline to the measured results.

Option C is also referred to as the "whole house" method to determine savings. The current year utility bills are compared to historical bills. The historical bills are adjusted to account for factors such as weather. The savings are determined by analysis of utility meter (or sub-meter) data using techniques from simple comparison to regression analysis.

Option D savings are determined through simulation of facility components and/or the whole facility. The savings are determined by energy simulation/modeling calibrated with monthly utility billing data and or end-use metering

M&V Methodology

The following table outlines the methodology proposed for each ECM:

ECM Number	ECM Title	M&V Methodology
1	District Wide Lighting Upgrades	IPMVP Option A
2	District Wide Building Envelope Upgrades	IPMVP Option A
3	District Wide Mechanical Insulation Upgrades	IPMVP Option A
4	District Wide Transformer Upgrades	IPMVP Option B
5	Biglerville High School/Middle School HVAC Upgrades	IPMVP Option A
6	Biglerville Elementary School HVAC Upgrades	IPMVP Option A
7	Biglerville Elementary School Window Replacements	IPMVP Option A
8	Biglerville Elementary School Gutter and Roof Upgrades	No Energy Savings
9	Arendtsville Elementary School HVAC Upgrades	IPMVP Option A
10	District Wide Generator Upgrades	No Energy Savings

The remainder of this section will describe the measurement and verification methods that will be used for the various ECM's on this project.

M&V Plan-Lighting Upgrades
Based on IPMVP Option: A
Lighting Spot Metering with Stipulated Operating Hours
Applies to ECM: 1

ECM Definition

The measures covered by this verification plan are lighting retrofits of existing fixtures, lamps, and/or ballasts with an identical number of more energy efficient fixtures, lamps, and/or ballasts. These lighting efficiency projects cause a reduction in demand. However, the fixtures have the same pre- and post-retrofit operating hours.

Verification Method

Surveys will be made of all baseline (existing) and post-installation (new) lighting fixtures. Corrections may be required for non-operating fixtures. The operating hours are stipulated in the contract under Schedule K and were determined by observation of facility operations and review of historical data. Fixture wattage will be determined from a combination of documentation on each fixture/ballast/lamp and spot measurements of representative fixtures or lighting circuits. The results of the verification will be presented with the M&V report.

Baseline Demand

The baseline conditions identified in the pre-installation survey will be defined by McClure Company in the IGA and verified by the Client. In the pre-installation survey, the equipment to be changed and the replacement equipment to be installed will be inventoried. The surveys will include, in a set format, fixture, lamp, and ballast types; usage area designations, counts of fixtures; and location of occupancy sensors.

Fixture Wattage Metering

McClure Company will take true RMS wattage measurements from a proposed representative 10% sample of the baseline and post-installation fixtures. Readings will be averaged to determine per fixture wattage values. For post-installation fixtures, readings will be taken after the new fixtures have been operating for at least 100 hours. Meters used for this task will be calibrated and have an accuracy of +/- 2% of reading or better. Occupancy sensor hour reductions are shown in the line by line. Hours reduced by occupancy sensors are stipulated.

Adjustments to Baseline Demand

Prior to installation of new lighting fixtures, adjustments to the baseline demand may be required for non-operating fixtures. In addition, after ECM installation, adjustments to baseline demand may be required because of remodeling or changes in occupancy.

With respect to non-operating fixtures, McClure Company will also identify any non-operating fixtures only as part of the pre and post installation electrical measurements. The report documenting the pre and post electrical readings will also document rooms that were included in the electrical measurements that had lamp or fixture failures. The number of lamps failed for each electrical reading will be documented. Non-operating fixtures are those that are typically operating but that have broken lamps, ballasts, and/or switches that are intended for repair.

For non-operating fixtures, the baseline electrical use is adjusted to account for failed lamps or fixtures for the pre-installation electrical readings. The adjustment is repeated for each failed lamp or fixture. A separate spreadsheet is included with the lighting measurement and verification report to document each instance of adjustment and the amount of the adjustment.

Determining Energy Savings

The annual baseline energy usage is the sum of the baseline kWh for all of the usage areas. The post-retrofit energy usage is calculated similarly. The pre and post electrical readings will sample a total of at least 10 % of the total fixtures to be replaced or have an existing fixture get new lamps and ballasts. The electrical savings are measured as described below, the percentage savings achieved compared to the expected savings is the percentage of the total lighting savings McClure will report as saved. The energy savings are calculated as the difference between baseline and post-installation energy usage. The stipulated operating hours will be used for both the baseline and post-installation energy calculations.

$$kWh\ Savings_t = \sum_u [\ (kW/fixture_{baseline}\ x\ Quantity_{baseline}\ ) - (\ kW/Fixture_{post}\ x\ Quantity_{post})\ x\ Hours\ of\ Operation]_{t,u}$$

Where:

$kWh\ Savings_t$ =	kilowatt-hour savings realized during the post-installation time period *t*
$kW/fixture_{baseline}$ =	lighting baseline demand per fixture for usage group *u*
$kW/fixture_{post}$ =	lighting demand per fixture during post-installation period for usage group *u*
$Quantity_{baseline}$ =	quantity of affected fixtures before the lighting retrofit adjusted for inoperative lighting fixtures for usage group *u*
$Quantity_{post}$ =	quantity of affected fixtures after the lighting retrofit for usage group *u* and time period *t*
Hours of Operation =	total number of post-installation operating hours (assumes number is the same before and after the lighting retrofit) for usage

Sample Equipment Survey Data Sheet

Project: **Upper Adams School District**

Dates: **Pre-retrofit:** May-19 **Post-retrofit:** Oct-19

Random Sample #	Bldg	IGA Line-by-Line # Bldg Location		Light Levels (fc's)	Measured Volts(RMS) (V)	Current Draw (amps)	Calculated Watts (W)
1	High School	4	Pre-retrofit	70	278.9	0.589	164.27
		Gym	Post-retrofit	80	280.3	0.350	98.11
2	High School	6	Pre-retrofit	8 (avg)	281.1	0.295	82.92
		Corridor	Post-retrofit	15 (avg)	280.9	0.184	51.69
3	High School	7	Pre-retrofit	87	279.9	0.482	134.91
		Aux Gym	Post-retrofit	110	281.2	0.269	75.64
4	Middle School	33	Pre-retrofit	26	281.1	0.379	106.54
		Exterior	Post-retrofit	23	279.8	0.121	33.86
74	Elementary School	750	Pre-retrofit	21	121.1	0.359	43.47
		Exterior	Post-retrofit	25	121.2	0.185	22.42
75	Elementary School	762	Pre-retrofit	24	119.9	0.609	73.02
		Classroom	Post-retrofit	29	119.9	0.435	52.16
76	Elementary School	806	Pre-retrofit	30	121.1	0.715	86.59
		Office	Post-retrofit	33	121.1	0.429	51.95
77	Elementary School	822	Pre-retrofit	33	120.5	0.599	72.18
		Toilet Room	Post-retrofit	39	120.3	0.282	33.92
78	High School	836	Pre-retrofit	55	120.7	4.769	575.62
		Shop	Post-retrofit	65	120.6	3.146	379.41
Totals			Pre-retrofit				23,338.80
			Post-retrofit				11,560.99

Sample Equipment Survey Data Sheet (cont.)

IGA Watts (W)	Stipulated Hours	Calculated Energy (KWh)	IGA Energy (KWh)	AS BUILT Fixture Types	NOTES
164	6,216	1,021	1,019	(1) 44SE	ONLY (1) FIXTURE SAMPLED
98	6,216	610	609	(1) LB44LP	
82	6,216	515	510	(1) 24SE	ONLY (1) FIXTURE SAMPLED
51	6,216	321	317	(1) LB24LP	
164	6,216	839	1,019	(1) 44SE	ONLY (1) FIXTURE SAMPLED
98	6,216	470	609	(1) LB44LP	
106	6,216	662	659	(1) 42SS	ONLY (1) FIXTURE SAMPLED
33	6,216	210	205	(1) LB22REF	
50	6,216	270	311	(1) 14EE	ONLY (1) FIXTURE SAMPLED
25	6,216	139	155	(1) LB14	
86	8,760	640	753	(1) 24EE	ONLY (1) FIXTURE SAMPLED
51	8,760	457	447	(1) LB24LP	
86	8,760	758	753	(2) 14EE	
51	8,760	455	447	(1) LB24LPTW	
86	6,216	449	535	(1) 24UEF	
51	6,216	211	317	(1) LB22REF	
576	6,216	3,578	3,580	(5) 34EE	ONLY (5) FIXTURES SAMPLED
380	6,216	2,358	2,362	(5) LB34LP	
22,711		136,558	133,109		
11,335		70,605	69,119		

M&V Plan-Building Envelope Upgrades
Based on IPMVP Option: A
Calculated Savings with Stipulated Variables
Applies to ECM: 2

ECM Definition

The measures covered by this verification plan are the energy savings related to the reduced electrical and thermal use associated with sealing and insulating the building envelope. The savings are determined by measuring the area of leaks that are sealed and insulation that is added. Building envelope upgrades are proposed for the High/Middle School, Biglerville Elementary School, and Arendtsville Elementary School.

Verification Method

Option A involves the use of calculations to determine the energy savings from air sealing cracks in the building envelope and adding insulation. As part of the measurement and verification report process pre- (baseline) conditions are documented in the scope of work. The scope of work itemizes the amounts of linear footage of air sealing that will be addressed along with other building envelope improvements such as weather stripping of doors and sealing of exhaust fans, and adding insulation.

After the air sealing and building envelope improvements are made, a set of post- improvement documents are assembled that verify the type and quantity of improvements that have been made. This documentation may include a combination of: photos of the work, drawings of completed work, field sketches and notes of completed work, a sign off of completed items, i.e., number of weather stripped doors. The pre and post-verified work is compared and the equations to determine energy savings identified below are used to calculate energy savings.

The stipulated variables are marked in italics below.
The following variables are measured:

- Area where leaks repaired
- Building thermal conductance (U = 1/R) based on building construction
- Heating Degree Days
- Cooling Degree days
- Government web site to determine HDD and CDD
  www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/

Baseline Demand

The baseline is existing conditions. The savings are calculated based on improvements to the building envelope.

Determining Energy Savings

Infiltration Rate

$Q = k * dp^n * A$

Q = average air flow infiltration in cubic feet per minute

A = Total infiltration crack area in square feet

k= flow coefficient = 80 cfm/pascalft^2

dp^n = differential pressure across the crack opening due to wind

n = 0.65 from ASHRAE fundamentals

dp^n = depend on average regional wind conditions

Air Leakage Cooling Loss Calculation

Cooling loss per year (BTU/year) = 60 * Q * rho * cp * CDD *24

Rho = density = 0.075

Cp = specific heat = 0.24

CDD = Cooling degree days (determined locally from weather conditions)

Conductive Cooling Loss

Cooling Energy Lost per year (BTU/year) = U * A * CDD * 24

U = 1/R = BTU/hr F ft^2

A = Area ft^2

CDD = Cooling degree days (determined locally from weather conditions)

Air Leakage Heat Loss

Heat Lost per year (BTU/year) = 60 * Q * rho * Cp * HDD *24

Where:

60 min/hr

Q = Infiltration rate

Rho = density 0.075 lb/ft^3

Cp = 0.24 BTU/lb F

HDD = Heating Degree Days

Resulting Equation:

Heat Lost per year (BTU/year) = 25.92 * Q * HDD

M&V Plan- Insulation Upgrades
Based on IPMVP Option: A
Short Term Metering with Stipulated Variables
Applies to ECM: 3

ECM Definition

The measures covered by this verification plan are the energy savings related to the reduced thermal energy use associated with providing better insulation on mechanical system components. For this M&V method, the savings associated with the ECMs are calculated based on the equations below, using a combination of stipulated variables and measured variables. Insulation upgrades are proposed for the High/Middle School, Biglerville Elementary School, and Arendtsville Elementary School.

Verification Method Overview

Surveys will be made to determine existing insulation conditions and to document where additional insulation is required. The main measured component of the energy savings is the area of un-insulated mechanical system components. In addition to providing measurements of the area to be sealed, pictures will provide additional documentation. The results of the verification will be presented with the M&V report, along with documentation of the work that was completed. The documentation of the installed work will include pictures and as built drawings/checklists of completed work.

Baseline Demand

The baseline is existing conditions and is not measured or calculated. The savings are calculated based on improvements to un-insulated components.

Determining Energy Savings

The energy savings (Q) are calculated from the equations below. The Delta T (change in Temperature) is found by the second set of equations below. Energy savings have been calculated based on the quantities of the following:

- LF (linear feet) of pipe
- Number of fittings
- Number of valves/strainers
- Number of bonnets
- Number of flange pairs
- Number of in line pumps
- Number of centrifugal pumps
- Number of steam traps

After the work is completed the quantities of actual work will be summarized and analyzed in spreadsheets. Actual, or measured quantities, will be analyzed and compared to the pre project analysis. All variables will be held constant in the pre/post analysis except for the quantity of LF (linear feet) of pipe and Number of insulated fittings.

Energy savings for the pipe insulation was calculated using the following:

$$Q = K (\Delta T) / (L + (K/Ht))$$

Where:

Q	=	Heat Loss (Btu/hr/sq.ft.)
K	=	Thermal Conductivity (Btu-in/hr-sq. ft.- °F)
L	=	Insulation Thickness (with insulation = 1 inch, bare metal = 0 inches)
Delta T	=	Surface Temp – Ambient Temp (75°F)
Ht	=	Combined Coefficients (3.2) (Radiation, Convection and Conduction) (Btu-in/hr-sq. ft.-°F)

$$(T_i - T_f) = (T_i - T_a) \times [1 - e^{-[(U \times P \times L)/(m \times Cp)]}]$$

Where:

T_i = initial (entering) fluid temperature, °F

T_f = final (leaving) fluid temperature, °F

T_a = ambient temperature, °F

U = overall heat transfer coefficient, BTU/(hr x ft^2 x °F)

P = outside perimeter of pipe or duct, ft

L = length of pipe or duct run, ft

m = flow rate of fluid, lb_m/hr

Cp= specific heat of fluid, BTU/(lb_m x °F)

M&V Plan- Transformer Upgrades
Based on IPMVP Option: B
Short Term Metering with Stipulated Variables
Applies to ECM: 4

ECM Definition

The measures covered by this verification plan are energy saving associated with replacing or adding equipment to reduce electrical use or limiting operation. Replacing aging transformers improves the transformer efficiency across the entire operating load. The improvement in transformer efficiency results in electrical energy savings. Transformer upgrades are proposed at the High/Middle School and Biglerville Elementary School.

Verification Method Overview

Surveys will be made of all baseline (existing) equipment. Corrections may be required for non-operating equipment. Equipment energy use will be determined from short-term measurements of a representative sample of equipment. The equipment to be replaced will also be metered after installation to determine the reduction in electrical use.

Baseline Demand

The steps to developing a baseline include:

1. Developing an onsite transformer inventory.
2. Determine the baseline and proposed loading, losses and efficiency based on testing data and manufacturer's data.
3. Establish hours of operation.
4. Develop a spreadsheet model of the transformers with the collected data.
5. Measure the baseline loading, losses, and efficiencies.

Determining Energy Savings

1. Develop the post-installation M&V data based upon an on-site audit.
2. Determine the post installation loading, losses, and efficiency based on actual testing data.
3. Utilize the same hours of operation for pre and post conditions.
4. Measure the post installation loading, losses and efficiency.

Energy savings will be determined by using the equations shown below applied to the pre and post loading, losses and efficiencies determined during testing.

Equations for Calculation of Energy and Demand Savings

$$KWH_{baseline} = KW\ baseline^{*}\ hours\ of\ operation\ (hr)$$

$$KWH_{post} = KW\ post^{*}\ hours\ of\ operation\ (hr)$$

$$KWH_{savings} = KWH_{baseline} - KWH_{post}$$

Each transformer type will have a measured pre and post kW that is determined as part of the M&V process based on loading and efficiency.

M&V Plan-HVAC Equipment Upgrades
Based on IPMVP Option: A
Short-Term Metering
Applies to ECM: 5, 6, and 9

ECM Definition

The measures covered by this verification plan are the energy savings associated with the HVAC upgrades at the High/Middle School, Biglerville Elementary School, and Arendtsville Elementary School. The HVAC upgrades include improvements to the classrooms, the mechanical room, Multipurpose Room, Gym, and other areas. Energy savings will be the result of improvements that include: improved equipment efficiency, better control in the amount of run time of equipment, potentially reducing the heating and cooling load within the building, optimizing and operating equipment at peak efficiency.

Verification Method Overview

Surveys will be made of all baseline (existing) equipment. Equipment energy use will be determined from short-term measurements of a representative sample of equipment and through the study of existing control system trend data. Electrical equipment study will include fans, motors, pumps, and cooling equipment. Thermal energy savings will be determined from short-term metering and trend data of gas fired equipment (boilers) and through measurements of outside air. The thermal energy impacts will incorporate calculations based on the outside air metering, engineering data, and temperature bin data.

Adjustments to Baseline Demand

The baseline energy use will be adjusted to account for changes in the weather between the baseline year and current year of measurement and verification. The adjustment for weather is usually determined as a ratio of the baseline heating degree days (HDD) and cooling degree days (CDD) to the current year HDD/CDD. This ratio is accounted for on a month to month basis or seasonal basis.

The amount of outside ventilation air entering the High/Middle School, Biglerville Elementary School and Arendtsville ES has not been finalized and is not known if it meets ventilation code requirements. Since outside air has an impact on energy use, an adjustment to the energy baseline may be made to account for the additional outside air required to meet code requirements. Industry standard weather bin data will be used to develop any necessary outdoor air adjustment.

Determining Energy Savings

After installing the HVAC upgrades, the McClure Company will install post-data loggers and review system trend data to determine the reduction in energy use of the HVAC equipment. The pre/post data logging and trend data analysis will potentially include the following equipment and systems:

Boilers (Condensing operations and Efficiencies)
Pumps and VFD equipment
Fans and Air Handlers
Air conditioning equipment
Ventilation Air, Heat Exchangers

Energy savings will be determined using the equations found below and applied to the pre and post

data logging and trend analysis.

Equations for Calculation of Energy and Demand Savings

Electrical

$KWH_{baseline}$ = *(Volts * Amps *1.732)/1,000 * sample period Interval (hr)*

KWH_{post} = *(Volts * Amps *1.732)/1,000 * sample period Interval (hr)*

$KWH_{savings} = KWH_{baseline} - KWH_{post}$

Baseline

Volts = Measured by Fluke voltmeter

Amps = Measured by Fluke ammeter.

Thermal

$BTU_{baseline} = 1.085 * cfm_{design} * (\Delta T_{measured\ baseline}) *$ *sample period Interval (hr)*

$BTU_{post} = 1.085 * cfm_{correlated} * (\Delta T_{measured\ post}) *$ *sample period Interval (hr)*

$BTU_{savings} = BTU_{baseline} - BTU_{post}$

Baseline

cfm_{design} = cubic feet per minute of code compliant design supply air (one time measurement with necessary corrections for code compliance)

$\Delta T_{measured\ baseline} = T_{setpoint} - T_{outdoor}$ = Temperature difference between set point and outdoor air temperature (metered with programmable data logger)

Post

$cfm_{correlated}$ = cubic feet per minute of design supply air from baseline correlated to operating load based on electrical metering

$\Delta T_{measured\ post} = T_{setpoint} - T_{outdoor}$ = Temperature difference between set point and outdoor air temperature (metered with programmable data logger)

Boiler

$BTU_{baseline}$= Boiler Capacity (from manufacturer) * Firing Rate % *sample period interval (hr)

BTU_{post}= Boiler Capacity (from manufacturer) * Firing Rate % *sample period interval (hr)

Percent of Outside air calculation:

% OA = (mixed air temperature – return air temperature)/ (mixed air temperature –outside air temperature)

This calculation will only occur when the unit is operating in occupied mode and not in economizer. The automation system will provide the necessary data readings every 15 minutes.

Reduced outside air =$\sum$ measured OA *baseline* - (% OA * total CFM) *post*

Cooling Energy Savings

BTU =$\sum$ (Reduced outside air (CFM) * 4.45 *(outside enthalpy – space enthalpy)) * hours at bin temperature

This calculation only occurs is outside enthalpy based on bin data is less than space enthalpy

Space enthalpy = based on 75 degree dry bulb and 50% RH

M&V Plan – Window Upgrades
Based on IPMVP Option: A
Calculated Savings with Stipulated Variables
Applies to ECM: 7

ECM Definition

This M&V method covers replacing windows at Biglerville Elementary School. The existing window glazing system, according to industry standards, indicated a U-value of about 0.45 for this system. The upgraded U-value will be verified as part of the M&V process. The overall verified increase in U-value has been computer modeled to determine energy savings.

Overview of Method

Standard engineering calculations that govern heat flow across the window assembly have been used to determine the reduction in energy consumption. The heat loss calculation is based on the U-value of the windows, the area of the windows, and the temperature across the inside and outside of the windows. The existing window U-value was determined from industry standards for single pane glass glazing systems. The area of the windows was determined by drawings and field measurements. The future U-values of the windows are specified by the window manufacturer and will be verified as part of this M&V process.

Verifying Savings

To determine energy savings, the following general equations were used to determine heat loss across the windows:

$Q=U*A*(T_{in}-T_{out})$

Q= the heat loss across the windows in Btu per hour

U=1/R-value

A=Area of windows

T_{in}= Temperature inside of building, 70 degrees F for heating, 72 degrees for cooling

T_{out}= Ambient dry bulb temperature in degrees F

Stipulated variables included:
Boiler efficiency= 88%
Cooling efficiency= 0.88 kW/ton
4,400 Total square feet of windows upgraded
Degree Days= Harrisburg

A spreadsheet energy calculation tool was utilized to obtain the energy use for the existing and upgraded window systems. The U-value of the existing windows was specified at a U-value=0.45. The new windows were specified at a U-value of 0.27 or better.

The energy savings were calculated in Btus and converted to therms and kWh by the following equations:

Energy Savings (therms)= Energy Savings (Btus)/100,000 Btu/therm

Energy Savings (kWh)= Energy Savings (Btus)/3,412 Btu/kWh

Guaranteed Energy Savings= Calculated Energy Savings * 85%

SCHEDULE M(a) - CERTIFICATE OF SUBSTANTIAL COMPLETION

PARTIES: MCCLURE COMPANY ("McClure")
4101 North Sixth Street
Harrisburg, PA 17110

And

Upper Adams School District ("Client")
161 North Main Street
Biglerville, PA 17307

DATE: _____, 20_____

PROJECT: Performance Based Energy Savings Agreement between McClure and the Client dated *Month Day, Year.*

By executing this Certificate of Substantial Completion, Client acknowledges the following:

1. The work set forth in the Performance Based Energy Savings Agreement is substantially complete.
2. Client has "Beneficial Use" of the facilities and systems are operational such that Client could occupy and utilize the facility for its intended use in accordance with the defined construction schedule in prescribed within this Agreement.
3. Client has received pertinent system and equipment operations and maintenance manuals, manufacturer's warranty information and initial training required under the Performance Based Energy Savings Agreement. Client acknowledges supplemental maintenance manuals; warranty information and training may need to be provided after the Substantial Completion date.
4. The warranty as defined in the Performance Based Energy Savings Agreement is in full effect as of the date of this Certificate of Substantial Completion.
5. The following punch list items must be completed by McClure Company (check as applicable):

   ☐ Punch list attached
   ☐ Punch list complete

6. Upon completion of the punch list items, or if such punch list items are complete, McClure and Client shall sign the Certificate of Final Completion attached hereto.

UPPER ADAMS SCHOOL DISTRICT:

Signature: _____

Printed Name: _____

Title: _____

MCCLURE COMPANY:

Signature: _____

Printed Name: _____

Title: _____

SCHEDULE M(b) - CERTIFICATE OF FINAL COMPLETION

PARTIES: MCCLURE COMPANY ("McClure")
4101 North Sixth Street
Harrisburg, PA 17110

And

Upper Adams School District ("Client")
161 North Main Street
Biglerville, PA 17307

DATED: _____, 20_____

PROJECT: Performance Based Energy Savings Agreement between McClure and the Client dated *Month Day, Year.*

By executing this Certificate of Final Completion, Client acknowledges the following:

1. The work set forth in the Performance Based Energy Savings Agreement has been reviewed and determined by Client to be fully complete.
2. Client accepts the work as complete and hereby releases McClure's obligations under and performance and payment bonds posted for the project as of the date set forth above.
3. Client agrees to release to release final payment within thirty (30) calendar days as of the execution date set forth above. Interest at a rate of 0.5% per month will accrue on all unpaid balances more than (30) calendar days after the date set forth above.

UPPER ADAMS SCHOOL DISTRICT:

Signature: _____

Printed Name: _____

Title: _____

MCCLURE COMPANY:

Signature: _____

Printed Name: _____

Title: _____

EXHIBIT A – CHANGE ORDER FORM

During the Construction Period and prior to the acceptance of the "Schedule M(b) - Certificate Final Completion", this "Exhibit A" shall be utilized to incorporate Client directed and approved changes to the original scope of work as set forth in the Original Agreement or corresponding Original Agreement Amendment.

Client Information: *Upper Adams School District*
161 North Main Street, Biglerville, PA 17307
Dr. Wesley Doll
717-677-7191
w.doll@upperadams.org

The Original Agreement (*or Amendment*) is dated (*Date*) between Upper Adams School District and McClure Company. By execution of this "Exhibit A", the Original Agreement (*or Amendment*) is hereby modified to the extent described below.

Change Order Number:

Change Order Scope Description:

Original Schedule F – Total Project Fee: $

Exhibit A Cost Impact: $

Revised Schedule F - Total Project Fee: $

Impact to Project Schedule (Description):

Other modifications to the Original Agreement (*or Amendment*) (Description):

Unless specifically changed by this "Exhibit A", all terms, conditions and provisions of the above referenced Original Agreement (*or Amendment*) remain unchanged and in full effect.

UPPER ADAMS SCHOOL DISTRICT:

Signature: _____

Printed Name: _____

Title: _____

MCCLURE COMPANY:

Signature: _____

Printed Name: _____

Title: _____

Attachment A – Scope of Work

ECM 1 – District Wide Lighting Upgrades

Areas Implemented

- ✓ Biglerville High School/Middle School
- ✓ Biglerville Elementary School
- ✓ Arendtsville Elementary School

Existing Conditions

The survey performed in March 2018 at the above facility revealed a total of 4,103 fixtures that contained primarily metal halide high hats, HPS Wall packs, T8 Fluorescent, CFL, T8 Hi-Bay and incandescent lamps of various wattages.

Existing Fluorescent Lighting

Most fixtures overall are in good serviceable condition and are well maintained with minimal lamp or ballast outages. Based on existing fixture condition most fixtures will be addressed with an energy saving retrofit consisting of a reduced wattage, direct wire self-ballasted LED lamps. New fixtures have been proposed primarily for the exterior fixtures to accommodate the new LED light source.

Following this description is a completed lighting audit in Attachment "B" – Lighting scope of work, which includes detailed line by lines. The line by line indicates the intended scope of work, including which fixtures are being retrofitted and their location.

Proposed Solution

McClure Company proposes to retrofit all T8 fluorescent lamps, and metal halide lamps with new LED linear tubes or screw in lamps that are self-ballasted. The benefit of using the self-ballasted LED tubes/lamps are less power being used per light generated and will also help reduce greenhouse gas emissions while lowering the facility electric bill. The original ballast will be removed from the fixture and direct line voltage will be run to new tombstones by the OSHA trained electricians.

Scope of Work

See Lighting Line by Line in Attachment B for complete scope of work at each of the buildings listed above.

Grants, Rebates and Tax Incentives

Certain lighting retrofit projects may qualify for grants, rebates, and/or tax Incentives. These incentives, which are provided by Federal and State Governments, and by local utility companies, can vary greatly from one region of the country to another. Since the program timeline incentives may change from time to time,

and since they may be limited to specific types of technology or products, we track and monitor these variables and work to design our projects to take full advantage of the offerings.

The following are the Grants, Rebates, and Tax Incentives that may be applicable to this project:
Utility Rebate with Electric Utilities $ 22,494*

**The rebate amount is valid for the duration of the Utility's incentive program and may change as the Utility's program changes.*

General Benefits

✓ Energy savings

✓ Standardized Lighting Stock

Operating Hours

Locations	Biglerville High School/Middle School	Biglerville Elementary School	Arendtsville Elementary School
CLASSROOM	2,000	2,000	2,000
OFFICE	3,000	3,000	3,000
CORRIDOR	3,200	3,200	3,200
RESTROOM	3,200	3,200	3,200
GYM	3,200	3,200	3,200
LOCKER ROOM	3,200	3,200	3,200
LIBRARY	3,200	3,200	3,200
AUDITORIUM	2,000	2,000	2,000
CAFETERIA	3,200	3,200	3,200
KITCHEN	3,200	3,200	3,200
EXIT SIGNS	8,760	8,760	8,760
STORAGE/SERVICE AREA	1,000	1,000	1,000
OTHER EDUCATIONAL	3,000	3,000	3,000
EXTERIOR	4,380	4,380	4,380

Energy Savings

Energy savings associated with this ECM are based on wattage reductions from the manufacturer's specified wattages found on lamp and ballast cut sheets, operational hours, and a blended utility rate.
The savings will be verified through the M&V strategy listed below.

Measurement and Verification Methodology

The M&V methodology for this ECM will be Option A as defined by the International Performance Measurement and Verification Protocol (IPMVP). Option A includes pre and post installation measurements and stipulated variables.

The lighting hours of operation throughout the campus will be stipulated and used to determine the KWH savings. The demand savings (KW) are determined by sampling a predetermined number of fixtures and measure the electric demand (Volts * Amps). The reduction in electric demand is then multiplied by the stipulated hours to determine the reduced electrical consumption.

The measured electrical savings will be projected through the life of the contract. As part of the contract negotiations additional post installation measurements may be required.

The following are calculations for determining energy and demand savings:

$$kWh\ Savings_t = \sum_u [(kW/fixture_{baseline} \times Quantity_{baseline} - kW/Fixture_{post} \times Quantity_{post}) \times Hours\ of\ Operation]_{t,u}$$

Hours of Operation

The stipulated operating hours will be used for both the baseline and post-installation energy calculations. The initial survey will include random measurements to determine the hours of operation. Theses hours will be discussed and reviewed with the customer and then used for energy savings calculations.

Where:

$kWh\ Savings_t$ =	kilowatt-hour savings realized during the post-installation time period *t*
$kW/fixture_{baseline}$ =	lighting baseline demand per fixture for usage group *u*
$kW/fixture_{post}$ =	lighting demand per fixture during post-installation period for usage group *u*
$Quantity_{baseline}$ =	quantity of affected fixtures before the lighting retrofit adjusted for inoperative lighting fixtures for usage group *u*
$Quantity_{post}$ =	quantity of affected fixtures after the lighting retrofit for usage group *u* and time period *t*
Hours of Operation =	total number of post-installation operating hours (assumes number is the same before and after the lighting retrofit) for usage group *u*

Commissioning Process

Level 1 is the proper level of commissioning for the lighting retrofit. Level 1 commissioning basically involves visual inspection of the installation.

Equipment Training

One (1) hour of training has been proposed for the lighting retrofit. The training will include but not limited to: component (lamp and ballast) selection procedures, how to determine component locations, and warranty procedures.

Warranty Information

There is a five (5) year warranty from the lamp manufacturer on the LED's.

ECM 2 – District Wide Building Envelope Upgrades

Areas Implemented

- ✓ Arendtsville Elementary School
- ✓ Biglerville Elementary School
- ✓ Biglerville High School/Middle School

Existing Conditions

The goal of our initial investigation was to identify energy loss in the facilities. However, while conducting our assessment, we encountered some areas where building envelope modifications should be performed to prevent damage from weather, pests, etc.

Building Envelope Examples

Significant quantities of air infiltration into the buildings was discovered during the envelope survey period at the Upper Adams School District. The facilities were found to be in a mixed set of conditions in regard to infiltration losses, mostly due to age. All observations were from areas with free access.

The building envelopes surveyed are in good condition but could benefit from building envelope improvements in order to stop air infiltration/ex-filtration and energy loss. Door systems were found to be the largest areas of air infiltration/ex-filtration within the district. Most entrance doors would benefit from one or more of the following: weather stripping, sweeps, or the closure or strike plate adjusted. In most cases, the door seals are either original or have been replaced. Often the replacement seals are of poor quality and are degraded by ultraviolet solar rays. Over time, the replacement seals lose their flexibility and ability to function reliably. Care should be taken to replace seals with products having extensive long-term testing (higher cycle count). Sealant is also recommended around the perimeter of the roof/wall interface. Numerous penetrations around the building were observed that would benefit from being sealed.

Proposed Solution

McClure Company is proposing to reduce the amount of infiltration air and increase critical insulation areas for the Upper Adams School District. Infiltration can be defined as unregulated outside air entering a building unintentionally. This air must be treated (heated or cooled) by the building's heating or cooling system to maintain acceptable indoor temperatures. Even the smallest cracks / penetrations can have a significant impact on the annual heating and cooling energy consumption.

The district was fully surveyed to leverage the savings opportunities available in limiting infiltration. Common savings areas include air sealing roof wall interfaces and roof edges. The table below breaks out the opportunities available with specific descriptions in subsequent paragraphs.

Building	Opportunity		
	Doors	Seal Exterior/Interior Penetrations	Seal Piping and Electrical Penetrations
Arendtsville Elementary School	X	X	X
Biglerville Elementary School	X	X	X
Biglerville Middle/High School	X	X	X

Scope of Work

The following is the proposed scope of work:

Arendtsville Elementary School

- (15 LF) Wall cracks, window/door frames and vents sealed with polyurethane sealant
- (16 Sets) Weather-strip DF
- (25) Door Sweeps
- (10) Weather-strip for center of double doors

Biglerville Elementary School

- (820 LF) Wall cracks, window/door frames and vents sealed with polyurethane sealant
- (15 Sets) Weather-strip DF
- (42) Door Sweeps
- (14) Weather-Strip for center of double doors
- (1) Set of weather-strip DF (OH Door)
- (1) Door Sweep (OH Door)

Middle/High School

- (0.03 Sq/ft) Penetrations sealed with polyurethane sealant
- (50) Sets of weather-strip DF
- (56) Door sweeps
- (11) Weather-strip for center of double door)
- (2) Sets of Weather-strip DF (OH Door)
- (1) Door Sweep (OH Door)

General Benefits

- ✓ Energy savings
- ✓ Increased Occupant Comfort
- ✓ Reduction in space temperature fluctuations

Operating Hours

Operating hours are based on the total building hours for the year which is 8,760 hours.

Energy Savings

Energy savings associated with this ECM are based on a custom hourly spreadsheet analysis utilizing ASHRAE standard engineering calculations. McClure Company utilizes custom 8760 hour spreadsheet analysis in order to more effectively calibrate to existing conditions and determine individual ECM savings in more detail. When using these spreadsheets, all of our results are then cross checked with TRACE 700, DOE eQuest or industry standard engineering checks. Any major difference between the two results is then further analyzed to make a determination for the difference.

The savings are a result of reducing the infiltration of raw outside air into the building and sealing unoccupied / occupied space thermal boundaries. The savings will be verified with the M&V methodology described below.

Measurement and Verification Methodology

The M&V methodology for this ECM will be Option A as defined by the International Performance Measurement and Verification Protocol (IPMVP). Option A includes pre and post installation measurements and stipulated variables. Stipulated variables are indicated in italics below.

Sealed areas will be documented with floor plan layouts and pictures of pre and post installation as verification. Variables for the equation include area of crack, building thermal conductance, as well as heating and cooling degree days. The verified, sealed cracks will then be used in the calculation below to verify the savings.

The measured savings will be projected through the life of the contract. As part of the contract negotiations additional post installation measurements may be required.

The following are calculations for determining energy and demand savings:

Infiltration Rate
Q = k * dp^n * A
Q = average air flow infiltration in cubic feet per minute
A = Total infiltration crack area in square feet
k= flow coefficient = 80 cfm/pascalft^2
dp^n = differential pressure across the crack opening due to wind
n = 0.65 from ASHRAE fundamentals
dp^n = depend on average regional wind conditions

Air Leakage Heat Loss Calculation
Heat loss per year (BTU/year) = 60 * Q * rho * cp * HDD *24
Rho = density = 0.075
Cp = specific heat = 0.24
HDD = Heating degree days (determined locally from weather conditions)

Air Leakage Cooling Loss Calculation
Cooling loss per year (BTU/year) = 60 * Q * rho * cp * CDD *24
Rho = density = 0.075
Cp = specific heat = 0.24
CDD = Cooling degree days (determined locally from weather conditions)

Conductive Heat Loss
Heat Lost per year (BTU/year) = U * A * HDD * 24
U = 1/R = BTU/hr F ft^2
A = Area ft^2
HDD = Heating degree days (determined locally from weather conditions)

Conductive Cooling Loss
Cooling Energy Lost per year (BTU/year) = U * A * CDD * 24
U = 1/R = BTU/hr F ft^2
A = Area ft^2
CDD = Cooling degree days (determined locally from weather conditions)

Commissioning Process

Level 1 is the proper level of commissioning for the building envelope installation. Level 1 commissioning basically involves visual inspection of the installation.

Equipment Training

No training is proposed for this ECM

Warranty Information

There is a one year warranty on installation and workmanship.

ECM 3 – District Wide Mechanical Insulation Upgrades

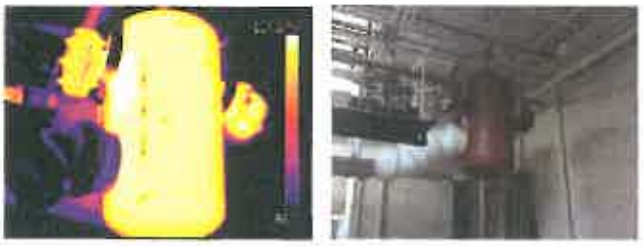
Areas Implemented

- ✓ Arendtsville Elementary School
- ✓ Biglerville High School/Middle School
- ✓ Biglerville Elementary School

Existing Conditions

The mechanical systems at the sites appeared to be generally well insulated. However, we found uninsulated piping and equipment such as valves, strainers, reducers, pumps and flange pairs in the main boiler rooms of each facility. These devices should be insulated to reduce energy loss.

Biglerville Elementary School Valve



Arendtsville Elementary School Air/Dirt Separator

Proposed Solution

McClure Company evaluated the performance of six different systems consisting of piping and equipment at three facilities for Upper Adams School District. Specifically identified and assessed were systems that were not insulated. Segments of insulation that were damaged or inadequate in terms of type or thickness were quantified but not assessed due to the inability to accurately access heat loss. This included systems that were insulated with fiberglass and mineral fiber insulations, cellular insulations, and granular insulations like calcium silicate and expanded perlite.

Scope of Work

The following is the proposed scope of work:

Arendtsville Elementary School

Proposed scope of work includes:

- 31.8 LF (linear feet) pipe
- 21 valves/strainers
- 2 in line pumps
- 29 fittings
- 29 flange pairs
- 2 centrifugal pumps

Biglerville Elementary School

Proposed scope of work includes:

- 38.3 LF pipe
- 9 valves/strainers
- 8 bonnets
- 2 centrifugal pumps
- 39 fittings
- 16 flange pairs
- 6 in line pumps

Biglerville High School/Middle School
Proposed scope of work includes:

- 16.4 LF pipe
- 8 fittings
- 32 valves/strainers
- 12 flange pairs
- 1 in line pumps
- 2 centrifugal pumps

General Benefits

✓ Energy savings

✓ Safety

Operating Hours

Operating hours for this ECM are estimated at 5,000 hours per year (heating hours)

Energy Savings

Energy savings for this ECM are based on the industry standard calculations. Insulation is applied as a safeguard to protect personnel from burns. Insulation is used to reduce ambient temperatures to prevent personnel from working under stressful high temperature conditions. *"ASTM Standard Practice C 1057"* contains a Standard Practice for Determination of Skin Contact Temperature from heated surfaces. The Standard Industry Practice is to use 140°F as the maximum temperature of a heated surface that may be contacted by working personnel.

Design of Insulation Systems is a process that must utilize numerous criteria to determine the best materials, applications and temperature changes. We have evaluated the mechanical systems and the design requirements in order to provide solutions to best integrate the often conflicting demands of initial investment, durability, value and life cycle costs. We have tried to minimize the variation of temperature in processes and to minimize energy use. In fluid systems the temperature drop can be calculated using the following equation;

Measurement and Verification Methodology

The M&V methodology for this ECM will be Option A as defined by the International Performance Measurement and Verification Protocol (IPMVP). Option A includes pre and post installation measurements and stipulated variables. Stipulated variables are indicated in italics below.

The following are calculations for determining energy savings:

$$(T_i - T_f) = (T_i - T_a) \times [1 - e^{-[(U \times P \times L)/(m \times Cp)]}]$$

Where:
T_i = initial (entering) fluid temperature, °F
T_f = final (leaving) fluid temperature, °F
T_a = ambient temperature, °F
U = overall heat transfer coefficient, BTU/(hr x ft^2 x °F)
P = outside perimeter of pipe or duct, ft
L = length of pipe or duct run, ft
m = flow rate of fluid, lb_m/hr
Cp= specific heat of fluid, BTU/(lb_m x °F)

Energy savings for the pipe insulation can also be calculated using the following:

$$Q = K (\Delta T) / (L + (K/Ht))$$

Where:

Q	=	Heat Loss (Btu/hr/sq.ft.)
K	=	Thermal Conductivity (Btu-in/hr-sq. ft.- °F)
L	=	Insulation Thickness (with insulation = 1 inch, bare metal = 0 inches)
Delta T	=	Surface Temp – Ambient Temp (75°F)
Ht	=	Combined Coefficients (3.2) (Radiation, Convection and Conduction) (Btu-in/hr-sq. ft.-°F)

Commissioning Process

Level 1 is the proper level of commissioning for the mechanical insulation upgrades. Level 1 commissioning involves visual inspection of the installation to ensure proper installation of equipment in line with the proposed scope of work.

Equipment Training

No training is proposed for this measure

Warranty Information

Installation and workmanship is under warranty for one year.

ECM 4 – District Wide Transformer Upgrades

Areas Implemented

✓ Biglerville High School/Middle School ✓ Biglerville Elementary School

Existing Conditions

A survey was completed in September 2018 which showed multiple transformers which could benefit from an upgrade.

Biglerville ES Transformer

Dry type transformers are simple pieces of equipment used to convert higher voltage, grid electricity to the lower voltage electricity required at various points within the facility. The equipment is always under some load and never actually off, as they are constantly providing the necessary "step down" of voltage to the building's circuits. While the task each transformer performs is straightforward and there are no actual moving parts, transformers vary widely on their efficiency, largely based on their vintage and construction materials. The inefficiency of the transformer is presented in the amount of waste heat it creates during the "step down" process and equates to lost electrical energy from the conversion, especially during lightly loaded operation.

Proposed Solution

McClure is proposing to upgrade the twenty-five (25) existing building dry type transformers located during the survey to new, high efficiency transformers. The replacement, high efficiency, custom built transformers utilize higher quality internal components, in this case aluminum cores, and optimized internal configurations to combat inefficiencies in the operation of the unit. The basis of design for the replacement transformers meet the US Department of Energy's Candidate Standard Level three (CSL-3), the level of efficiency deemed to provide the lowest lifecycle cost of the unit and surpass all minimum requirements of EPACT2005. The new transformers will also exceed NEMA TP-1 efficiency.

Biglerville HS/MS Transformer

The high efficiency units will be custom built to the same approximate size as those being removed to minimize on any reconfigurations or space loss.

Scope of Work

The following is the proposed scope of work:

Biglerville High School/Middle School

Tag Number	Location ID or Room #	Transformer Designation	Proposed Powersmiths OPAL Transformer	Baseline kVA	Replacement kVA	Replace
37734	100	LBSEC2	E-Saver-80R	75	75	1
37735	200 Elec	AVT	E-Saver-80R	112.5	112.5	1
37736	200 Elec	LE	E-Saver-80R	75	75	1
37737	200 Elec	CPA	E-Saver-80R	75	75	1
37738	201 Elec	LG	E-Saver-80R	75	75	1
37739	Shop	LF	E-Saver-80R	75	75	1
37740	Shop	SL	E-Saver-80R	75	75	1
37741	Shop	KITCHEN	E-Saver-80R	150	150	1
37742	Basement 102 Elec	LA	E-Saver-80R	45	45	1
37743	Basement 102 Elec	LD	E-Saver-80R	45	45	1
37744	Basement Machine Room	ELEV	E-Saver-80R	45	45	1
37745	Mdp Room	150	E-Saver-80R	150	150	1
37746	Mdp Room	30	E-Saver-80R	30	30	1
37747	Mdp Room	ELA	E-Saver-80R	30	30	1
37748	Compressor Room	15	E-Saver-80R	15	15	1
37758	Field House	FH	E-Saver-80R	45	45	1
						16

Biglerville Elementary School

Tag Number	Location ID or Room #	Transformer Designation	Proposed Powersmiths OPAL Transformer	Baseline kVA	Replacement kVA	Replace
37749	Main Elec	T5	E-Saver-80R	75	75	1
37750	Main Elec	T1	E-Saver-80R	45	45	1
37751	Main Elec	T6	E-Saver-80R	30	30	1
37752	32	T4	E-Saver-80R	45	45	1
37753	40	T7	E-Saver-80R	75	75	1
37754	43	T3	E-Saver-80R	45	45	1
37755	301	T2	E-Saver-80R	45	45	1
37756	51	T1A	E-Saver-80R	75	75	1
37757	28	PA1	E-Saver-80R	75	75	1
						9

General Benefits

✓ Energy Savings

✓ Improved Equipment Operation

Operating Hours

Operating hours for this ECM are based on 8,760 hours per year.

Energy Savings

Energy savings for this ECM are based on a custom spreadsheet analysis utilizing facility data, operations parameters, and standard equipment power requirements. The existing or base case is determined by using these parameters to develop a calibrated representation for the operation of the existing systems as described above. These results are then adjusted to the proposed operating conditions, in this case the higher efficiency of new equipment or the increased control of operation, to develop a proposed case. The difference between the two analyses is the energy savings of the ECM.

Energy savings for this ECM are a result of reducing electrical demand through efficiency improvements and control of equipment.

Measurement and Verification Methodology

The M&V methodology this ECM will be Option B as defined by the International Performance Measurement and Verification Protocol (IPMVP). Option B includes some pre and post installation measurements.

The savings are the reduced electrical use of the new or controlled equipment. Short-term metering will document existing electrical usage. The post installation energy use will be determined by metering operation of the new or controlled equipment. Once the electrical savings has been calculated the savings will project through the life of the contract.

The following are calculations for determining energy and demand savings:

$KWH_{baseline} = (Volts * Amps)/1{,}000 * sample\ period\ Interval\ (hr)$

$KWH_{post} = (Volts * Amps)/1{,}000 * sample\ period\ Interval\ (hr)$

$KWH_{savings} = KWH_{baseline} - KWH_{post}$

Volts = Measured both pre and post installation

Amps = Measured by a programmable data logger

Commissioning Process

Level 1 is the proper level of commissioning for the many of the above described measures. Level 1 commissioning basically involves visual inspection of the installation.

Equipment Training

No training has been proposed for this ECM.

Warranty Information

There is a warranty for a period of 1 year on installation and workmanship. Transformers have a manufacturer supplied 25 year pro-rated warranty on equipment.

ECM 5 – Biglerville High School/Middle School HVAC Upgrades

Areas Implemented

- ✓ Biglerville High School / Middle School

Existing Conditions

Biglerville high school/middle school has had a series of renovations and additions over the years. The gym addition was built in 1972. The last major renovation/addition was done in 2001. Most of the equipment in the building dates from that renovation including the boiler room. The building is primarily served by Aaon rooftop units (RTU) that were installed in 2001. These units are a mix of single zone units and multi-zone VAV RTUs with fan-powered boxes. The RTUs are beginning to be a maintenance issue and are therefore recommended for replacement.

Biglerville HS/MS Rooftop Units

The building has (2) gym s that are each currently served by heating-only, hot water air handling units (AHU) hung from the roof above. Most of the building is provided with cooling, so given the age of these units, it would be recommended for them to be replaced with DX cooling, hot water heating RTUs.

The high school wrestling room and adjacent fitness room are currently served by heating-only equipment. The wrestling room is served by (2) hot water, ceiling-hung unit ventilators. The heating-only equipment is approaching the end of its anticipated service life and there is interest in providing cooling for these spaces. These units are recommended for replacement.

Proposed Solution

McClure proposes to replace the existing RTUs. The new RTUs will be provided in the same location as the existing units. The new units will be reconnected to the existing supply and return ductwork. The RTUs will be provided with a VFD-controlled supply fan for varying airflow to the space, refrigerant reheat coil for dehumidification control, 100% full enthalpy economization with barometric relief, and demand controlled ventilation (DCV). The economizer allows the units to provide 'free cooling' when outdoor ambient conditions are ideal. The DCV monitors the carbon dioxide levels with the space and modulates the outdoor air in response. Any roof work associated with the installation of the RTUs is included in the scope.

McClure proposes to demolish the existing heating-only AHUs serving the gyms and replace with DX cooling/hot water heating RTUs. Each gym would be provided with (2) RTUs. The RTUs would be provided with a VFD-controlled supply fan for varying airflow to the space, refrigerant reheat coil for dehumidification control, 100% full enthalpy economization with barometric relief, and demand controlled ventilation (DCV) similar to the other classroom RTUs. The new RTUs would be reconnected to the existing ductwork.

The heating-only equipment serving the high school wrestling room and fitness room will be demolished and replaced with DX cooling, hot water heating unit ventilators. The unit ventilators will be ceiling hung and the wrestling room units will utilize the existing outdoor air ductwork and wall louver. A new outdoor air louver will be provided at the

exterior wall for the new fitness room unit. The associated condensing units will be located on a pad outside on grade. The refrigerant piping shall be routed through the ceiling to the indoor units.

Control strategies to increase savings are now possible with the new equipment selections. Some examples of these control strategies are demand control ventilation (DCV), and single zone variable air volume control (SZVAV). Demand control ventilation modulates the amount of outside air (OA) brought into the space. The OA damper in the unit is controlled by a CO2 sensor in the space. The CO2 level in a space will increase as the number of people or activity level increases. Once the CO2 level passes setpoint, the OA damper opens from a set minimum to a set maximum until CO2 levels drop below setpoint. This feature saves energy by not conditioning unnecessary amounts of OA when the space is below an acceptable CO2 level. Single zone VAV control includes adding programming to the unit that will allow the fan speed to match the heating or cooling demands. The fan will increase speed when more heating and cooling is required, but then slows down to save fan energy when the zone temperature is near or at setpoint.

Biglerville HS/MS Rooftop Unit

The use of a refrigerant coil with hot gas reheat adds an active dehumidification capability to the unit. During the cooling season, hot gas reheat uses excess heat generated from the refrigeration cycle to provide improved humidity control in the space. This is done by allowing the air to get cold enough to condense on the coil and then reheating it back to a comfortable temperature, while leaving the moisture behind.

The intent for the automation system is to become an extension of the recently upgraded automation system in the Boiler room. As each school in renovated, it will also receive a controls system upgrade and will be accessible from the home page of the automation system. The system remains to be an open protocol system, allowing the school district a wide choice of controls companies as expansions to the automation system occur in the future. All new mechanical equipment associated with this ECM will be included in the controls upgrade, as well as all existing to remain equipment.

Walk-in fridge and freezers will receive temperature monitoring controls that will alarm specified facility personnel when a fridge or freezer falls outside of an expected temperature range.

Exhaust fan control will be included on the automation system and the typical control scheme is by a time schedule. Other control options will be used in specific cases where a time schedule is not the proper means of control. Some exhaust fans will be space temperature activated, while others may require switched operation, such as exhaust fans for science rooms, fume hoods, and/or kitchen exhaust hoods. The McClure design documents will include a schedule of all exhaust fans and the control method will be included in the exhaust fan schedule.

Cabinet and unit heaters will not be part of the automation system but will be provided with new stand-alone electric controls including a thermostat and aquastat. Cabinet heaters and unit heaters normally provide heat to unoccupied areas and the requirement to include on the automation system is not necessary. Some convectors and finned tube radiators will get new thermostatic radiation valves and will be stand-alone as well. Other finned tube radiators that are in spaces with automated controlled equipment will be automated as well to work as a system for the space.

Scope of Work

The following is the proposed scope of demolition work:

- Demolish (14) existing rooftop units. Existing curbs and supports shall remain. The (14) RTUs being replaced are from the 2001 building renovation. Any other units not specifically mentioned and not included in the scope of work.
- Demolish (6) air handling units serving existing gymnasiums. Demolish associated outdoor air intake hoods on roof.
- Demolish (2) heating-only, hot water unit ventilators serving high school wrestling and fitness room spaces.

The following is the proposed scope of new work:

- Provide (14) new rooftop units on existing roof curbs and reconnect existing ductwork. Curb adapters will be provided as necessary for installation of new equipment.
- Provide (4) new rooftop units to serve the gymnasiums. Provide new ductwork to reconnect to existing supply and return ductwork. Extend hot water supply/return piping to new RTU locations. The older gym built in 1972 will be provided with new fabric supply ductwork routed between roof joists.
- Provide (3) DX cooling, hot water heating unit ventilators to serve the High School wrestling room and adjacent cardio/fitness room. Associated condensing units will be provided outside on grade directly adjacent to the rooms.
- New hydronic piping will be as follows:
    - Schedule 40 steel with Victaulic couplings 2-1/2" and up, type L copper with Pro-press fittings 2" and down.
    - All piping shall be insulated with fiberglass insulation with all service jacket in thicknesses as defined by the current Energy Code.
- New ductwork shall be galvanized steel constructed in accordance with SMACNA standards. Supply and return ductwork shall be lined with 1" thick coated duct liner. Outdoor air intake ductwork shall be externally insulated in fiberglass insulation in thicknesses as defined by the current Energy Code.
- Testing and balancing of air and water systems for all new equipment.
- Startup of new equipment.
- Electrical work needed to support Mechanical scope.
- General Construction work needed to support Mechanical scope including ceiling work, cutting wall openings, lintels, roof openings, supplemental steel, roofing work.
- Install new direct digital controls (DDC) on existing to remain equipment and all new equipment. These controls will be an extension of the new web-based control system installed on the hot water system in 2017.
- Automation System Points Lists:

Variable Air Volume Rooftop Units	Point Type			
Direct Points - Description	AI	AO	DI	DO
Supply Fan Start/Stop				X
Supply Fan Status			X	
Supply Fan VFD Control		X		
Return Temperature	X			
Supply Air Temperature	X			
Mixed Air Temperature	X			
Duct Static Pressure	X			
Suction Pressure	X			
Static High Limit			X	
Compressor 1 Enable				X
Compressor Stage 1 Modulating Control	X			
Compressor Stage 2 On/Off				X
Hot Water Valve (Non-Floating)		X		
Hot Gas Enable				X
Hot Gas Modulating		X		
Economizer Damper Control		X		
Low Temperature Alarm			X	
Fire Alarm Shut Down (Smoke Detector)			X	

Variable Air Volume Boxes with Hot Water	Point Type			
Direct Points - Description	AI	AO	DI	DO
Space Temp	X			
Space CO2	X			
Space Humidity (Three Required)	X			
Supply Air Temperature	X			
Airflow (CFM)	X			
VAV Box Damper Modulation		X		
Hot Water Valve (Non-Floating)		X		
Maximum CFM Set Point				
Minimum CFM Set Point				
Heating CFM Set Point				
Calculated Set Point				

Single Zone Variable Air Volume Rooftop Units	Point Type			
Direct Points - Description	AI	AO	DI	DO
Supply Fan Start/Stop				X
Supply Fan Status			X	
Supply Fan VFD Control		X		
Return Temperature	X			
Supply Air Temperature	X			
Mixed Air Temperature	X			
Compressor 1 Enable				X
Compressor Stage 1 Modulating Control	X			
Compressor Stage 2 On/Off				X
Hot Water Valve (Non-Floating)		X		
Hot Gas Enable				X
Hot Gas Modulating		X		
Economizer Damper Control		X		
Space Temp	X			
Space CO2	X			
Space Humidity	X			
Low Temperature Alarm			X	
Fire Alarm Shut Down (Smoke Detector)			X	

Exhaust Fans	Point Type			
Direct Points - Description	AI	AO	DI	DO
Fan Stop/Start			X	
Fan Status		X		

- The above points lists are representative of many of the types of units that will receive new automation controls. A few additional systems that will get new automation controls but do not have a points list shown here are:
  - Natural Gas Metering
  - Electric Metering
  - Domestic Water Metering
  - Walk-in Fridge and Freezer Temperature Monitoring
  - Fan Powered VAV Boxes with Hot Water Reheat
  - VAV Boxes with Electric Reheat
  - Energy Recovery Unit
  - Make-up Air Units
  - Unit Ventilators
  - Miscellaneous Finned Tube Radiation

The following areas shall be existing to remain and not included in the new work scope:

- Middle School wrestling room and team rooms.
- High School locker rooms
- High School training room, team rooms, and fitness center.
- Heating hot water plant.
- Domestic hot water plant.
- Kitchen makeup air and exhaust systems.

General Benefits

- ✓ Energy savings
- ✓ System reliability
- ✓ Reduced maintenance
- ✓ Occupant Comfort

Operating Hours

Operating hours for the equipment in this ECM are based on typical occupied hours of Monday to Friday, 7:00 AM to 4:00 PM. Consideration has been given to after school events in the gymnasium and auditorium.

Energy Savings

Energy savings for this ECM are based on a custom, 8,760 hour, spreadsheet analysis based on facility data, operational parameters, boiler combustion efficiency, and terminal unit efficiency. The existing, or base case, is determined by using these parameters and weather bin data to develop a calibrated representation for the operation of the existing HVAC system, which is then compared to actual facility energy use. These results are then adjusted to the proposed operating conditions, in this case the new efficiency of the rooftop units and operating parameters of the equipment, to develop a proposed case. The difference between the two analyses is the energy savings of the ECM. This analysis is then further checked using ASHRAE standard engineering checks or DOE approved energy modeling software such as eQuest or Trane Trace. Any differences in results are then cross checked to determine the cause of the variance.

Energy savings for this ECM are a result of increased unit efficiency. The savings will be verified through the M&V strategy listed below.

Measurement and Verification Methodology

The M&V methodology for this ECM will be Option A as defined by the International Performance Measurement and Verification Protocol (IPMVP). Option A includes pre and post installation measurements and stipulated variables.

Commissioning Process

Since the new HVAC System will interface to a new DDC control system, the commissioning process must be of the highest level and level 3 commissioning is proposed. Level 3 commissioning is the most detailed and exhaustive application of the commissioning process. Level 3 commissioning is meant to ensure system operation, including all control sequences, is adequately checked and that functional performance is achieved in all respects.

Before any functional testing will occur, the contractor will perform all pre-start up checks and tests.

Level 3 commissioning involves a visual inspection of the installation, system startup check and documentation of start-up procedures, functional testing to ensure integrated operating systems function

as designed, customer attendance and sign off that all functional tests have been completed and the system operation meets expectations.

Equipment Training

Sixteen (16) hours of training is proposed for this ECM and training will cover, but is not limited to: safety, general maintenance, and general system operation.

Additionally, (16) hours of controls training will be provided. This training will be for all controls and will cover, but is not limited to: control sequence review, scheduling, set point override, and system architecture.

Warranty Information

There is a (1) year warranty on installation and workmanship. Warranty on equipment varies by manufacturer.

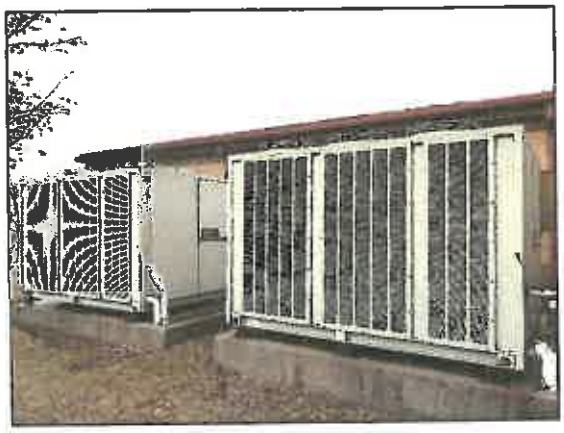
ECM 6 – Biglerville Elementary School HVAC Upgrades

Areas Implemented

- ✓ Biglerville Elementary School

Existing Conditions

Biglerville Elementary School was built in 1993. A small classroom addition extended the building in 2005. The building is served by a gas-fired, hot water heating plant. The heating plant consists of (3) 1,900 MBH gas-fired Patterson-Kelley Thermific boilers. The boilers provide heating hot water throughout the building using (2) 15-HP Taco base-mounted, end suction pumps sized at 330 GPM and 100 ft. HD. The boilers have each had their heat exchangers replaced within the last few years. The boilers continue to be a maintenance issue and given their age, they are recommended for replacement. Additionally, the hot water pumps and system accessories like expansion tank, air separator, etc. are over twenty years old and therefore recommended for replacement, as well. The domestic hot water system is served by (3) gas-fired AO Smith water heaters. Each water heater is less than ten years old and the system is operating in good condition and not recommended for replacement.



Biglerville ES Existing Condensing Units

The original building is entirely heated and cooled by (5) variable air volume (VAV) air handling units (AHU) with remote condensing units. All the AHUs are located above the ceilings. (2) of the corresponding condensing units are located on grade and the other (3) are located on the flat roof area, accessible from the library courtyard. These AHUs supply fan-powered VAV terminal units with hot water heating coils throughout the building. The AHUs and VAVs are very difficult to access for proper maintenance. They are located between the wood joists and not provided with acceptable service platforms. Additionally, the AHUs and condensing units are at the end of their anticipated service life and therefore a system replacement is recommended.

The classrooms in the addition are each served by 4-Ton single-zone AHUs with hot water duct coils. Each unit has an associated condensing unit located on grade. These AHUs are in adequate condition as they were installed in 2005, however they have the similar issue of being difficult to access for maintenance. Therefore, they are also recommended for replacement.

Proposed Solution

McClure proposes to remove the (3) existing gas-fired, copper fin Lochinvar boilers and replacement with (2) high efficiency, condensing style, hot water boilers. The boilers shall utilize natural gas as its fuel source similar to the existing. The boilers shall be Category IV, sealed combustion type. The heating system shall be designed for low temperature heating water, an increased water temperature drop, and incorporate an integral hot water reset schedule to reduce energy consumption. The boiler vent material shall be double wall, AL29-4C stainless steel and be run independent for each boiler through the exterior wall. The boiler combustion air intake ducts shall be insulated galvanized steel run independent for each as well. The existing pumps and any hot water accessories will be entirely removed and replaced with (2) base-mounted, end suction pumps with variable frequency drives (VFD). The pumps with operate in a duty/standby arrangement. New hot water accessories including expansion tank, chemical feeder,

and air-dirt separator will all be provided. New hot water piping will be provided, as necessary, to accommodate the new equipment layout.

McClure Company is proposing the replacement of the existing VAV systems serving the classrooms with self-contained, vertical unit ventilators (VUV) with direct expansion (DX) cooling and hot water heating. The existing HWS/R piping will be extended to the new VUV. The new VUV will include an integral energy recovery wheel which reduces the amount of energy required to heat or cool the code required outdoor ventilation air. Additionally, these units will be provided with 100% outdoor air economization, demand controlled ventilation (DCV) to maximize efficiency, and hot gas refrigerant reheat for dehumidification control. The installation of the VUVs will also include a new outdoor air louver and wall box through the exterior wall behind the unit. The louver is required to provide a path for the flow of outdoor air and relief air to the unit. The VUV shall be ducted above the ceiling and utilize the existing supply ductwork and diffuser layout, as possible. The associated AHUs shall be drained down and the refrigerant shall be reclaimed. The condensing units and associated refrigerant piping shall be demolished. The AHUs and associated supply and return main ductwork shall be abandoned in place.

VUVs will also be provided for the classroom addition area. The VUVs shall utilize the existing diffuser layouts and the existing ductwork as much as possible. Similarly, the existing AHUs shall be drained and abandoned in place. The associated condensing units and refrigerant piping shall be demolished entirely.

Proposed Airedale Solution

The VUVs will be air source heat pumps with hot water back-up heat. The air source heat pumps will provide efficient cooling and heating in the spring, summer and fall. During winter months, heat pump efficiency decreases at low ambient temperatures. The classroom units will automatically switch to hot water heat when this option is more efficient. The VUVs will include demand control ventilation, an energy recovery wheel and hot gas reheat.

Demand control ventilation modulates the amount of outside air (OA) brought into the space. The OA damper in the unit is controlled by a CO2 sensor in the space. The CO2 level in a space will increase as the number of people or activity level increases. Once the CO2 level passes setpoint the OA damper opens from a set minimum to a set maximum until CO2 levels drop below setpoint. This feature saves energy by not conditioning unnecessary amounts of OA when the space is below setpoint. The energy recovery wheel preconditions incoming OA with relief air from the space. This reclaims energy that would otherwise be lost to the atmosphere. Preconditioning the OA reduces the amount of energy required to reach the desired leaving air temperature from the heating/cooling coil. During the cooling season, hot gas reheat uses excess heat generated from the refrigeration cycle to provide improved humidity control in the space. This is done by allowing the air to get cold enough to condense and then reheating it back to a comfortable temperature while leaving the moisture behind.

McClure proposes to provide a new DX/hot water air handling unit to serve the multipurpose room and adjacent spaces. A new condensing unit will be located on the existing concrete pad with refrigerant piping utilizing the path of the demolished piping. New VAV terminal units with hot water coils will be provided to replace the existing.

McClure proposes to provide a new packaged DX/hot water RTU to serve the library and adjacent support areas. The unit will be located on the existing flat roof area and be ducted down to connect to the existing ductwork. New VAV terminals with hot water coils will be provided to replace the existing.

The main office area and support spaces are currently served by the fan-powered VAV system. McClure proposes to remove the existing fan-powered boxes and associated inlet ductwork back to be sealed at the mains. A variable refrigerant flow (VRF) system will be installed in the Elementary School office area to provide heating and cooling to the spaces. Each zone will be provided with a ducted VRF fan coil unit for individual control. The system will utilize the existing downstream VAV duct and diffuser layout. An individual VRF system shall serve the office, health suite, and support spaces. Another separate VRF system shall serve the classroom offices and support spaces. The associated VRF condensing units will be located adjacent to the space they serve on grade. An inline outdoor air fan shall provide ventilation air directly ducted to the return of each VRF fan coil unit.

As each school is renovated, it will also receive a controls system upgrade and will be accessible from the home page of the newly installed automation system. The system remains to be an open protocol system, allowing the school district a wide choice of controls companies as expansions to the automation system occur in the future. All new mechanical equipment associated with this ECM will be included in the controls upgrade, as well as all existing to remain equipment.

Walk-in fridge and freezers will receive temperature monitoring controls that will alarm specified facility personnel when a fridge or freezer falls outside of an expected temperature range.

Exhaust fan control will be included on the automation system and the typical control scheme is by a time schedule. Other control options will be used in specific cases where a time schedule is not the proper means of control. Some exhaust fans will be space temperature activated, while others may require switched operation, such as exhaust fans for science rooms, fume hoods, and/or kitchen exhaust hoods. The McClure design documents will include a schedule of all exhaust fans and the control method will be included in the exhaust fan schedule.

Cabinet and unit heaters will not be part of the automation system but will be provided with new stand-alone electric controls including a thermostat and aquastat. Cabinet heaters and unit heaters normally provide heat to unoccupied areas and the requirement to include on the automation system is not necessary. Convectors and finned tube radiators will get new thermostatic radiation valves and will be stand-alone as well.

Scope of Work

The following is the proposed scope of demolition work:

- Demolish (3) 1,900 MBH gas-fired P-K boilers. Associated breeching shall be demolished. Unused wall openings shall be entirely sealed.
- Demolish (2) 15-HP hot water base-mounted, end suction pumps.
- Demolish (2) condensing units on grade. Evacuate and reclaim refrigerant. Demolish associated refrigerant piping back to AHU. Patch and completely seal unused wall openings for demolished refrigerant piping. Exterior concrete pad shall be existing to remain for new Multipurpose room condensing unit.
- Demolish (3) condensing units on roof and associated refrigerant piping down through roof to AHU. Evacuate and reclaim refrigerant piping. Demolish support steel on roof. Patch and seal roof openings.
- Demolish all fan-powered VAV terminal units and inlet ductwork back to main ductwork. Seal duct takeoff at main to be abandoned in place. Existing supply ductwork downstream of unit shall be reused, as possible, for new HVAC layout.
- Demolish existing AHU and return fan serving Library and adjacent spaces.
- Demolish existing AHU and return fan serving multipurpose room and adjacent spaces.
- Drain (3) AHUs serving classroom areas. AHUs and associated main ductwork upstream and downstream of units to be abandoned in place.
-

The following is the proposed scope of new work:

- Provide (2) Aerco Benchmark natural gas-fired, condensing boilers mounted on existing concrete housekeeping pads. Pads will be extended, as necessary, to accommodate new boilers. Vent and intake ductwork shall be routed through exterior wall.
- Provide (2) 15-HP hot water base-mounted, end-suction pumps w/ variable frequency drives (VFD). Pumps will be located on the existing concrete housekeeping pads.
- Provide heating hot water piping accessories including expansion tank, chemical feeder and air/dirt separator.
- Provide (36) vertical unit ventilators (VUV) with DX cooling and hot water heating coils to serve classroom spaces. The units will include integral energy recovery wheels. Supply ductwork will be routed above the ceiling and distributed to the space with 2x2 supply diffusers in the ceiling grid.
- Provide variable refrigerant flow (VRF) system to offer heating and cooling for the office areas. The main office system shall consist of (10) ducted VRF fan coil units serving the individual spaces. The VRF system serving the classroom support offices shall consist of (8) ducted VRF fan coil units. Each system shall have a corresponding condensing unit on grade. An inline outdoor air fan will be ducted to each fan coil unit to provide code-required ventilation air. The fan will be provided with a filter box section and a hot water duct coil shall be provided to maintain minimum temperature.
- Provide DX/HW VAV RTU to replace existing split system AHU system the Library and adjacent support rooms.
- Provide new multipurpose room split system AHU with associated condensing unit on existing exterior pad on grade.
- Provide new hot water supply and return piping extended from the existing system to accommodate new mechanical equipment layout.
- New hydronic piping to all new equipment shall be the following:
    - Schedule 40 steel with Victaulic couplings 2-1/2" and up, type L copper with Pro-press fittings 2" and down.
    - All piping shall be insulated with fiberglass insulation with all service jacket in thicknesses as defined by the current Energy Code.
- New ductwork shall be galvanized steel constructed in accordance with SMACNA standards. Supply and return ductwork shall be lined with 1" thick coated duct liner. Outdoor air intake ductwork shall be externally insulated in fiberglass insulation in thicknesses as defined by the current Energy Code.
- All required electrical work for the installation of the HVAC system will be included.
- All required General Construction work for the installation of the HVAC system is included. This work includes removal and reinstallation of existing ceilings, chases/shafts, work associated with installation of classroom VUVs, cutting wall openings, lintels, roof openings, supplemental steel, and roofing work.
- Commissioning and functional testing is included.
- Coring and sleeves are included.
- Testing and balancing of new air and water systems for all new equipment.
- Cleaning and flushing of new piping systems.
- Install new direct digital controls (DDC) on existing to remain equipment and all new equipment. These controls will be an extension of the new web-based control system installed on the high school hot water system in 2017.

- Automation System Points Lists:

Hot Water System		Point Type		
Direct Points - Description	AI	AO	DI	DO
Boiler(s) Enable/Disable				X
Boiler HWS Reset Based on OA (4-20mA)		X		
Boiler 1 Alarm			X	
Boiler 2 Alarm			X	
Boiler 1 Status			X	
Boiler 2 Status			X	
HW System Pump Pair Enable/Disable				X
HW System Pump 1 Status			X	
HW System Pump 2 Status			X	
Outside Air Temperature	X			
Outside Air Humidity	X			
HW System Supply Water Temperature	X			
HW System Return Water Temperature	X			
Emergency Boiler Shutdown Switch Position			X	
Boiler Room Carbon Monoxide Level			X	

Boiler Control		Point Type		
Integration Points - Description	AI	AO	DI	DO
Boiler 1 Status			X	
Boiler 1 Alarm			X	
Boiler 1 Isolation Valve		X		
Boiler 1 Isolation Valve Position			X	
Boiler 1 Leaving Temperature	X			
Boiler 1 Firing Rate	X			
Boiler 1 Run hours	X			
Boiler 2 Status			X	
Boiler 2 Alarm			X	
Boiler 2 Isolation Valve		X		
Boiler 2 Isolation Valve Position			X	
Boiler 2 Leaving Temperature	X			
Boiler 2 Firing Rate	X			
Boiler 2 Run hours	X			

Self-Sensing Variable Speed Pump Control	Point Type			
Integration Points - Description	AI	AO	DI	DO
Pump 1 Motor Current	X			
Pump 1 Motor Torque	X			
Pump 1 Operating Hours	X			
Pump 1 Total Electrical Consumption (KWH)	X			
Pump 1 Current Power (KW)	X			
Pump 1 Speed (rpm)	X			
Pump 1 Operating head (ft)	X			
Pump 1 Flow (GPM)	X			
Pump 1 Motor Current	X			
Pump 1 Motor Torque	X			
Pump 1 Operating Hours	X			
Pump 1 Total Electrical Consumption (KWH)	X			
Pump 2 Current Power (KW)	X			
Pump 2 Speed (rpm)	X			
Pump 2 Operating head (ft)	X			
Pump 2 Flow (GPM)	X			
Pump 2 Motor Current	X			
Pump 2 Motor Torque	X			
Pump 2 Operating Hours	X			
Pump 2 Total Electrical Consumption (KWH)	X			

Vertical Unit Ventilator	Point Type			
Direct Points - Description	AI	AO	DI	DO
Supply Fan Status			X	
Condenser Fan Status			X	
Supply Air Temperature	X			
Low Limit Alarm Status	X			
Condensate High Level Alarm	X			
High / Low Pressure Alarm	X			
Supply Fan Enable				X
Supply Fan High Speed				X
EA/OA Ventilation Fan Enable; Wheel Enable				X
OA Ventilation Fan Speed Ctrl (0-10Vdc)		X		
Condenser Fan Speed Ctrl (0-10Vdc)		X		
OA Damper Enable				X
Hot Gas Reheat Enable				X
Reversing Valve Enable				X

Hot Water Valve Ctrl (2-10 Vdc)		X		
Compressor Enable				X
Capacity Ctrl Solenoid				X
Space Temperature	X			
Space CO2	X			
Space Humidity	X			

Variable Air Volume Rooftop Units		Point Type		
Direct Points - Description	AI	AO	DI	DO
Supply Fan Start/Stop				X
Supply Fan Status			X	
Supply Fan VFD Control		X		
Return Temperature	X			
Supply Air Temperature	X			
Mixed Air Temperature	X			
Duct Static Pressure	X			
Suction Pressure	X			
Static High Limit			X	
Compressor 1 Enable				X
Compressor Stage 1 Modulating Control	X			
Compressor Stage 2 On/Off				X
Hot Water Valve (Non-Floating)		X		
Hot Gas Enable				X
Hot Gas Modulating		X		
Economizer Damper Control		X		
Low Temperature Alarm			X	
Fire Alarm Shut Down (Smoke Detector)			X	

Variable Air Volume Boxes with Hot Water		Point Type		
Direct Points - Description	AI	AO	DI	DO
Space Temperature	X			
Space CO2	X			
Space Humidity (Three Required)	X			
Supply Air Temperature	X			
Airflow (CFM)	X			
VAV Box Damper Modulation		X		
Hot Water Valve (Non-Floating)		X		
Maximum CFM Set Point				
Minimum CFM Set Point				
Heating CFM Set Point				

Calculated Set Point

Single Zone Variable Air Volume Rooftop Units			Point Type	
Direct Points - Description	AI	AO	DI	DO
Supply Fan Start/Stop				X
Supply Fan Status			X	
Supply Fan VFD Control		X		
Return Temperature	X			
Supply Air Temperature	X			
Mixed Air Temperature	X			
Compressor 1 Enable				X
Compressor Stage 1 Modulating Control	X			
Compressor Stage 2 On/Off				X
Hot Water Valve (Non-Floating)		X		
Hot Gas Enable				X
Hot Gas Modulating		X		
Economizer Damper Control		X		
Space Temp	X			
Space CO2	X			
Space Humidity	X			
Low Temperature Alarm			X	
Fire Alarm Shut Down (Smoke Detector)			X	

Exhaust Fans		Point Type		
Direct Points - Description	AI	AO	DI	DO
Fan Stop/Start			X	
Fan Status		X		

- The above points lists are representative of many of the types of units that will receive new automation controls. A few additional systems that will get new automation controls but do not have a points list shown here are:
  - Natural Gas Metering
  - Electric Metering
  - Domestic Water Metering
  - Walk-in Fridge and Freezer Temperature Monitoring
  - Domestic Hot Water System
  - Variable Refrigerant Flow (VRF) Fan Coil Unit BACnet Integration
  - Relief Dampers
  - Radiant Ceiling Panels
  - Split System A/C Units

General Benefits

- ✓ Energy savings
- ✓ System reliability
- ✓ Reduced maintenance
- ✓ Occupant Comfort

Operating Hours

Operating hours for the equipment in this ECM are based on typical occupied hours of Monday to Friday, 7:00 AM to 4:00 PM. Consideration has been given to after school events in the gymnasium and auditorium.

Energy Savings

Energy savings for this ECM are based on a custom, 8,760 hour, spreadsheet analysis based on facility data, operational parameters, boiler combustion efficiency, and terminal unit efficiency. The existing, or base case, is determined by using these parameters and weather bin data to develop a calibrated representation for the operation of the existing HVAC system, which is then compared to actual facility energy use. These results are then adjusted to the proposed operating conditions, in this case the new efficiency of the terminal units and operating parameters of the equipment, to develop a proposed case. The difference between the two analyses is the energy savings of the ECM. This analysis is then further checked using ASHRAE standard engineering checks or DOE approved energy modeling software such as eQuest or Trane Trace. Any differences in results are then cross checked to determine the cause of the variance.

Energy savings for this ECM are a result of increased unit efficiency. The savings will be verified through the M&V strategy listed below.

Measurement and Verification Methodology

The M&V methodology for this ECM will be Option A as defined by the International Performance Measurement and Verification Protocol (IPMVP). Option A includes pre and post installation measurements and stipulated variables.

Commissioning Process

Since the new HVAC System will interface to a new DDC control system, the commissioning process must be of the highest level and level 3 commissioning is proposed. Level 3 commissioning is the most detailed and exhaustive application of the commissioning process. Level 3 commissioning is meant to ensure system operation, including all control sequences, is adequately checked and that functional performance is achieved in all respects.

Before any functional testing will occur, the contractor will perform all pre-start up checks and tests.

Level 3 commissioning involves a visual inspection of the installation, system startup check and documentation of start-up procedures, functional testing to ensure integrated operating systems function as designed, customer attendance and sign off that all functional tests have been completed and the system operation meets expectations.

Equipment Training

Sixteen (16) hours of training is proposed for this ECM and training will cover, but is not limited to: safety, general maintenance, and general system operation.

Additionally, (16) hours of controls training will be provided. This training will be for all controls and will cover, but is not limited to: control sequence review, scheduling, set point override, and system architecture.

Warranty Information

There is a (1) year warranty on installation and workmanship. Warranty on equipment varies by manufacturer.

ECM 7 – Biglerville Elementary School Window Replacements

Areas Implemented

✓ Biglerville Elementary School

Existing Conditions

The existing windows in the Biglerville Elementary School are comprised largely of double pane glass and deteriorating wood case framework. While several renovations have taken place over the years, the windows have remained the same. The windows are still functional however very inefficient, and several areas have begun to experience problems such as inoperability. This relates to windows that are meant to open and close but no longer work. Water is also infiltrating the building through the deteriorated framework. A complete replacement of the existing windows will greatly benefit energy reduction efforts in the building as well as operational use.

Biglerville ES Window

Proposed Solution

McClure Company is proposing to install new 2" x 4-1/2" Thermal Storefront framing that has a white exterior and dark green interior. The new windows will be comprised of a fixed sheet of glass that is non-operable. The glass used will be 1" Gray Tinted Tempered Low E (Solarban 60 #3 Surface). The three fixed trapezoidal shaped clerestory windows will also be replaced as part of this scope of work.

Scope of Work

The following is the proposed scope of work:

- Demo existing windows and framing
- Install new framing in existing window openings
- Install approximately 4,400 square feet of new glass

General Benefits

✓ Energy savings
✓ Reduced Sun Infiltration
✓ Reduced Air Infiltration
✓ Reduced Sun Glare

Operating Hours

Operating hours for this ECM are based on 8,760 hours per year.

Energy Savings

Energy savings for this ECM are based on a custom, 8,760 hour spreadsheet analysis based on facility data, operations parameters, and HVAC system efficiency. The existing or base case is determined by using these parameters and weather bin data to develop a calibrated representation for the operation of the existing window system scope described above. These results are then adjusted to the proposed operating conditions, in this case the new insulation value (R Value) of the proposed windows to develop a proposed case. The difference between the two analyses is the energy savings of the ECM. This analysis is then further

checked using ASHRAE standard engineering checks or DOE approved energy modeling software such as eQuest or Trane Trace. Any differences in results are then cross checked to determine the cause of the variance.
Energy savings for this ECM are a result of increased insulation of the window assembly and frame. The savings will be verified through the M&V strategy listed below.

Measurement and Verification Methodology

The M&V methodology for this ECM will be Option A as defined by the International Performance Measurement and Verification Protocol (IPMVP). Option A includes pre and post installation measurements and stipulated variables.

Commissioning Process

Level 1 is the proper level of commissioning for the window installation. Level 1 commissioning involves visual inspection of the installation.

Equipment Training

No training has been proposed for this ECM

Warranty Information

There is a (2) year warranty on installation and workmanship. Warranty on the glass and framing varies by manufacturer.

ECM 8 – Biglerville Elementary School Gutter and Roof Upgrades

Areas Implemented

✓ Biglerville Elementary School

Existing Conditions

The existing roofing gutter system on the Biglerville Elementary School has begun to deteriorate in spots causing water infiltration into parts of the building, more specifically the window frames. In addition to allowing water past, the gutters have also begun to rust and bend out of shape due to years to weather and snow load. It is recommended that the entire gutter system on the roof be removed and replaced.

In addition to the gutters needing to be renovated, the metal roof itself is in good condition but does require minor repairs in spots. The section of flat rubber roof that currently houses several condensing units is in poor condition and need to be replaced. It is recommended that the metal roof smalls repairs be fixed and the rubber roof be torn off and replaced.

Biglerville ES Roof/Gutter System

Proposed Solution

McClure Company is proposing remove the existing gutters and downspouts and replace them with a new 24-gauge steel Kynar finished metal. The flat roof section will also be removed, and new insulation will be installed before a new EPDM membrane is fully adhered to the roof.

Scope of Work

The following is the proposed scope of work:

<u>Gutter System and Metal Roof</u>

- Remove and dispose of existing gutters and downspout
- Install new 24-gauge steel Kynar finished gutters and downspouts
- Install snow rail around perimeter of roof
- Perform identified repairs to metal roof

<u>Flat Roof Inside Courtyard</u>

- Remove Existing EPDM Membrane
- Install ½" of high density iso coverboard overtop of existing insulation
- Install new .060 EPDM membrane that is fully adhered
- Provide all necessary flashings

ECM 9 – Arendtsville Elementary School HVAC Upgrades

Areas Implemented

- ✓ Arendtsville Elementary School

Existing Conditions

Arendtsville Elementary School was originally built in the 1950s. It has undergone several renovations over the years, most notably with a classroom wing addition in 1988. Much of the mechanical equipment was installed in 2007. Heating hot water is provided by (2) 1,500 MBH natural gas-fired Thermal Solution boilers installed in 2007. Hot water is circulated to the building by (2) 5-HP base-mounted, end suction pumps that operate as duty/standby. The pumps operate with variable frequency drives (VFD). The boiler room equipment is in adequate condition and is recommended as existing to remain.

Arendtsville ES Existing Unit Ventilator

The classrooms and multipurpose room are served by heating-only, hot water unit ventilators that were installed in 2007. The unit ventilators are in good condition, but offer no cooling, poor air distribution, and no airflow modulation. There is limited cooling throughout the school. The cafeteria is served by (2) unit ventilators with associated condensing units on the roof. The office area is served by packaged terminal air conditioners (PTACs) and a 1-Ton split system air conditioning unit. The library and adjacent computer room each has a small cooling-only roof top unit (RTU) as well as a heating-only unit ventilator. Additionally, one classroom is provided with cooling via a 1.5-Ton ceiling-hung, heat pump cassette with condensing unit on the roof. McClure recommends upgrading the heating-only systems at Arendtsville Elementary to provide cooling, dehumidification, and improved airflow throughout the classrooms.

Proposed Solution

McClure Company is proposing the replacement of the existing heating-only unit ventilators with self-contained, vertical unit ventilators (VUV) with direct expansion (DX) cooling and hot water heating. The existing unit ventilator louver openings shall be insulated and blanked off. The existing HWS/R piping will be extended to the new VUV. The new VUV will include an integral energy recovery wheel which reduces the amount of energy required to heat or cool the code required outdoor ventilation air. Additionally, these units will be provided with 100% outdoor air economization, demand controlled ventilation (DCV) to maximize efficiency, and hot gas refrigerant reheat for dehumidification control. The installation of the VUVs will also include a new outdoor air louver and wall box through the exterior wall behind the unit. The louver is required to provide a path for the flow of outdoor air and relief air to the unit. The VUV shall be ducted above the ceiling to provide better supply air distribution within the space by via diffusers in the ceiling. New shelving will be provided in the location of the demolished unit ventilator.

The VUVs will be air source heat pumps with hot water back-up heat. The air source heat pumps will provide efficient cooling and heating in the spring, summer and fall. During winter months, heat pump efficiency decreases at low ambient temperatures. The classroom units will automatically switch to hot water heat when this option is more efficient.

McClure proposes to remove the existing heating-only unit ventilators and small RTUs serving the library and adjacent computer room. McClure will provide a new DX/hot water RTU to serve the library and adjacent spaces. The RTU will be provided with a VFD-controlled supply fan for varying airflow to the space, refrigerant reheat coil for

dehumidification control, 100% full enthalpy economization with barometric relief, and demand controlled ventilation (DCV). The existing supply/return ductwork and diffusers shall be reused, as possible. The existing unit ventilator louver opening will be insulated and blanked off. New shelving will be provided in the location of the demolished unit ventilator.

Proposed Airedale Solution

Demand control ventilation modulates the amount of outside air (OA) brought into the space. The OA damper in the unit is controlled by a CO2 sensor in the space. The CO2 level in the space will increase as the number of people or activity level increases. Once the CO2 level reaches the setpoint, the OA damper opens from a set minimum level to a set maximum until CO2 levels drop below setpoint. This feature saves energy by not conditioning unnecessary amounts of OA when the space is below setpoint. The energy recovery wheel preconditions incoming OA with relief air from the space. This reclaims energy that would otherwise be lost to the atmosphere. Preconditioning the OA reduces the amount of energy required to reach the desired leaving air temperature from the heating/cooling coil. During the cooling season, hot gas reheat uses excess heat generated from the refrigeration cycle to provide improved humidity control in the space. This is done by allowing the air to get cold enough to condense and then reheating it back to a comfortable temperature while leaving the moisture behind.

As each school in renovated, it will also receive a controls system upgrade and will be accessible from the home page of the newly installed automation system. The system remains to be an open protocol system, allowing the school district a wide choice of controls companies as expansions to the automation system occur in the future. All new mechanical equipment associated with this ECM will be included in the controls upgrade, as well as all existing to remain equipment.

Walk-in fridge and freezers will receive temperature monitoring controls that will alarm specified facility personnel when a fridge or freezer falls outside of an expected temperature range.

Exhaust fan control will be included on the automation system and the typical control scheme is by a time schedule. Other control options will be used in specific cases where a time schedule is not the proper means of control. Some exhaust fans will be space temperature activated, while others may require switched operation, such as exhaust fans for science rooms, fume hoods, and/or kitchen exhaust hoods. The McClure design documents will include a schedule of all exhaust fans and the control method will be included in the exhaust fan schedule.

Cabinet and unit heaters will not be part of the automation system but will be provided with new stand-alone electric controls including a thermostat and aquastat. Cabinet heaters and unit heaters normally provide heat to unoccupied areas and the requirement to include on the automation system is not necessary. Some convectors and finned tube radiators will get new thermostatic radiation valves and will be stand-alone as well. Other finned tube radiators that are in spaces with automated controlled equipment will be automated as well to work as a system for the space.

Scope of Work

The following is the proposed scope of demolition work:

- Demolish (16) heating-only, floor-mounted classroom unit ventilators and associated controls, wiring, etc. Existing outdoor air louver shall be insulated and entirely sealed.

- Demolish (1) heating-only, ceiling-hung classroom unit ventilator serving computer room and associated controls, wiring, etc. Existing outdoor air roof intake shall be entirely sealed.

The following is the proposed scope of new work:

- Provide (15) vertical unit ventilators (VUV) with DX cooling and hot water heating coils to serve classroom spaces. The units will include integral energy recovery wheels. Supply ductwork will be routed above the ceiling and distributed to the space with 2x2 supply diffusers in the ceiling grid.
- Provide new rooftop unit with DX cooling and hot water heating to serve library and adjacent spaces. Existing supply/return ductwork shall be reused, as possible. Variable air volume (VAV) terminal units shall be provided at each zone for individual temperature control.
- Provide new hot water supply and return piping extended from the existing system to accommodate new mechanical equipment layout.
- New hydronic piping to all new equipment shall be the following:
    - Schedule 40 steel with Victaulic couplings 2-1/2" and up, type L copper with Pro-press fittings 2" and down.
    - All piping shall be insulated with fiberglass insulation with all service jacket in thicknesses as defined by the current Energy Code.
- New ductwork shall be galvanized steel constructed in accordance with SMACNA standards. Supply and return ductwork shall be lined with 1" thick coated duct liner. Outdoor air intake ductwork shall be externally insulated in fiberglass insulation in thicknesses as defined by the current Energy Code.
- All required electrical work for the installation of the HVAC system will be included.
- All required General Construction work for the installation of the HVAC system is included. This work includes removal and reinstallation of existing ceilings, chases/shafts, work associated with installation of classroom VUVs, and sealing/insulating of existing unused wall louver.
- Commissioning and functional testing is included.
- Coring and sleeves are included.
- Testing and balancing of new air and water systems for all new equipment.
- Cleaning and flushing of new piping systems.
- Commissioning and functional testing is included.
- Install new direct digital controls (DDC) on existing to remain equipment and all new equipment. These controls will be an extension of the new web-based control system installed on the high school hot water system in 2017.
- Automation System Points Lists:

Hot Water System	Point Type			
Direct Points - Description	AI	AO	DI	DO
Boiler(s) Enable/Disable				X
Boiler HWS Reset Based on OA (4-20mA)		X		
Boiler 1 Alarm			X	
Boiler 2 Alarm		X		
Boiler 1 Status		X		
Boiler 2 Status		X		
HW System Pump Pair Enable/Disable			X	
HW System Pump 1 Status	X			
HW System Pump 2 Status	X			

Outside Air Temperature	X			
Outside Air Humidity		X		
HW System Supply Water Temperature		X		
HW System Return Water Temperature		X		
Emergency Boiler Shutdown Switch Position			X	
Boiler Room Carbon Monoxide Level				X

Boiler Control	Point Type			
Integration Points - Description	AI	AO	DI	DO
Boiler 1 Status				X
Boiler 1 Alarm				X
Boiler 1 Isolation Valve			X	
Boiler 1 Isolation Valve Position				X
Boiler 1 Leaving Temperature		X		
Boiler 1 Firing Rate	X			
Boiler 1 Run hours	X			
Boiler 2 Status				X
Boiler 2 Alarm				X
Boiler 2 Isolation Valve			X	
Boiler 2 Isolation Valve Position				X
Boiler 2 Leaving Temperature		X		
Boiler 2 Firing Rate	X			
Boiler 2 Run hours	X			

Self-Sensing Variable Speed Pump Control	Point Type			
Integration Points - Description	AI	AO	DI	DO
Pump 1 Motor Current		X		
Pump 1 Motor Torque		X		
Pump 1 Operating Hours	X			
Pump 1 Total Electrical Consumption (KWH)	X			
Pump 1 Current Power (KW)		X		
Pump 1 Speed (rpm)		X		
Pump 1 Operating head (ft)	X			
Pump 1 Flow (GPM)	X			
Pump 1 Motor Current		X		
Pump 1 Motor Torque		X		
Pump 1 Operating Hours	X			
Pump 1 Total Electrical Consumption (KWH)	X			

Pump 2 Current Power (KW)		X		
Pump 2 Speed (rpm)		X		
Pump 2 Operating head (ft)	X			
Pump 2 Flow (GPM)	X			
Pump 2 Motor Current		X		
Pump 2 Motor Torque		X		
Pump 2 Operating Hours	X			
Pump 2 Total Electrical Consumption (KWH)	X			

Vertical Unit Ventilator			Point Type	
Direct Points - Description	AI	AO	DI	DO
Supply Fan Status			X	
Condenser Fan Status				X
Supply Air Temperature		X		
Low Limit Alarm Status		X		
Condensate High Level Alarm		X		
High / Low Pressure Alarm	X			
Supply Fan Enable				X
Supply Fan High Speed				X
EA/OA Ventilation Fan Enable; Wheel Enable				X
OA Ventilation Fan Speed Ctrl (0-10Vdc)			X	
Condenser Fan Speed Ctrl (0-10Vdc)		X		
OA Damper Enable				X
Hot Gas Reheat Enable				X
Reversing Valve Enable				X
Hot Water Valve Ctrl (2-10 Vdc)			X	
Compressor Enable				X
Capacity Ctrl Solenoid				X
Space Temperature	X			
Space CO2	X			
Space Humidity		X		

Single Zone Variable Air Volume Rooftop Units				Point Type
Direct Points - Description	AI	AO	DI	DO
Supply Fan Start/Stop				X
Supply Fan Status			X	
Supply Fan VFD Control			X	
Return Temperature		X		
Supply Air Temperature		X		

Mixed Air Temperature		X		
Compressor 1 Enable				X
Compressor Stage 1 Modulating Control		X		
Compressor Stage 2 On/Off			X	
Hot Water Valve (Non-Floating)			X	
Hot Gas Enable				X
Hot Gas Modulating		X		
Economizer Damper Control			X	
Space Temp		X		
Space CO2	X			
Space Humidity		X		
Low Temperature Alarm			X	
Fire Alarm Shut Down (Smoke Detector)				X

Exhaust Fans			Point Type	
Direct Points - Description	AI	AO	DI	DO
Fan Stop/Start				X
Fan Status		X		

- The above points lists are representative of many of the types of units that will receive new automation controls. A few additional systems that will get new automation controls but do not have a points list shown here are:
  - Natural Gas Metering
  - Electric Metering
  - Domestic Water Metering
  - Walk-in Fridge and Freezer Temperature Monitoring
  - Domestic Hot Water System
  - Unit Ventilators
  - Relief Dampers
  - Split System A/C Units

The following areas shall be existing to remain and not included in the new work scope:

- The cafeteria and kitchen areas.
- Multipurpose room.
- Nursing suite.
- Main office area.
- Library and adjacent computer room.
- Boiler room.

General Benefits

- ✓ Energy savings
- ✓ System reliability
- ✓ Reduced maintenance
- ✓ Occupant Comfort

Operating Hours

Operating hours for the equipment in this ECM are based on typical occupied hours of Monday to Friday, 7:00 AM to 4:00 PM. Consideration has been given to after school events in the gymnasium and auditorium.

Energy Savings

Energy savings for this ECM are based on a custom, 8,760 hour, spreadsheet analysis based on facility data, operational parameters, boiler combustion efficiency, and terminal unit efficiency. The existing, or base case, is determined by using these parameters and weather bin data to develop a calibrated representation for the operation of the existing HVAC system, which is then compared to actual facility energy use. These results are then adjusted to the proposed operating conditions, in this case the new efficiency of the terminal units and operating parameters of the equipment, to develop a proposed case. The difference between the two analyses is the energy savings of the ECM. This analysis is then further checked using ASHRAE standard engineering checks or DOE approved energy modeling software such as eQuest or Trane Trace. Any differences in results are then cross checked to determine the cause of the variance.

Energy savings for this ECM are a result of increased unit efficiency. The savings will be verified through the M&V strategy listed below.

Measurement and Verification Methodology

The M&V methodology for this ECM will be Option A as defined by the International Performance Measurement and Verification Protocol (IPMVP). Option A includes pre and post installation measurements and stipulated variables.

Commissioning Process

Since the new HVAC System will interface to a new DDC control system, the commissioning process must be of the highest level and level 3 commissioning is proposed. Level 3 commissioning is the most detailed and exhaustive application of the commissioning process. Level 3 commissioning is meant to ensure system operation, including all control sequences, is adequately checked and that functional performance is achieved in all respects.

Before any functional testing will occur, the contractor will perform all pre-start up checks and tests.

Level 3 commissioning involves a visual inspection of the installation, system startup check and documentation of start-up procedures, functional testing to ensure integrated operating systems function as designed, customer attendance and sign off that all functional tests have been completed and the system operation meets expectations.

Equipment Training

Sixteen (16) hours of training is proposed for this ECM and training will cover, but is not limited to: safety, general maintenance, and general system operation.

Additionally, (16) hours of controls training will be provided. This training will be for all controls and will cover, but is not limited to: control sequence review, scheduling, set point override, and system architecture.

Warranty Information

There is a (1) year warranty on installation and workmanship. Warranty on equipment varies by manufacturer.

ECM 10 – District Wide Generator Upgrades

Areas Implemented

- ✓ Biglerville High School/Middle School
- ✓ Biglerville Elementary School

Existing Conditions:

The existing High School generator appears to be a Onan 35kW 43.8KVA, 277/480 V, Natural Gas unit with a transfer switch. Per conversations with the school staff it has been determined that the generator currently feeds emergency lighting, (1) boiler, (1) HW Pump, Information Technology, and the Information Technology Server Room Cooling Unit in the high school. The current generator is unfortunately not large enough to support adding more than what is currently on it. It is recommended that the district replace the generator with a larger unit that can power multiple items such as additional boilers, pumps and walk-in coolers within the building.

Biglerville HS/MS Generator

The existing Biglerville Elementary School generator appears to be of Kohler design and per the existing electrical drawings, shows it has the ability to handle more load. According to district personnel the generator currently supplies emergency power to all systems in the building except for Information Technology. It is recommended to use any extra capacity to add circuits for I.T.

Proposed Solution:

McClure Company is proposing to replace the existing High School 35kW Onan generator with a new 80kW, 277/480V 3-phase natural gas generator. The new generator is currently proposed to sit outside of the building due to it increased size. In addition, a new 480-120/208V transformer will be installed along with a new 150A automatic transfer switch. The new generator will be capable of supplying enough power to serve the existing load as well as the walk-in coolers within the building.

McClure Company is also proposing to leave the existing Biglerville Elementary School Kohler Generator in place and add additional circuits for the I.T. systems in the building.

Scope of Work:

The following is the proposed scope of work:

- Remove existing HS generator and provide new 80KW, 277/480V 3-Phase generator with remote annunciator and (1) 150A ATS's
- Provide new 480V normal emergency (NE) panelboards
- Provide 480-120/208V transformer and panel for IT circuits
- Provide conduit and wire to transfer cooler and freezer to generator
- Provide conduit and wire to transfer walk-in coolers to generator
- Provide required conduit and wire

- Provide (6) circuits for IT Equipment in the Elementary School

General Benefits

✓ System reliability

✓ System Expansion

Operating Hours

Operating hours for the equipment in this ECM are based on 8,760 hours per year.

Energy Savings

No energy savings are associated with this measure.

Measurement and Verification Methodology

Because no energy savings are associated with this measure, measurement and verification is not applicable.

Commissioning Process

The generator upgrades will act as an independent system and is not a component of a larger integrated system, so the appropriate level of commissioning is level 2.

Level 2 commissioning includes comprehensive pre-startup testing of the various system components. The commissioning supervisor along with the appropriate subcontractors will conduct system tests to ensure the system condition and capabilities are acceptable and meet or exceed contractual requirements.

Equipment Training

Two (2) hours of training is proposed for this ECM and training will cover, but is not limited to: safety, general maintenance, and general system operation.

Warranty Information

There is a (1) year warranty on installation and workmanship. Warranty on equipment varies by manufacturer.

	LOCATION:			EXISTING				PROPOSED	
Line Ref	Building	Floor	Location	Existing Hrs. per Year	Existing QTY	Existing Fixture Description	Existing Lighting Description	Proposed QTY	Proposed Lighting Description
	Biglerville High School / Middle School								
1	Biglerville High School / Middle School	2	301	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
2	Biglerville High School / Middle School	2	302	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
3	Biglerville High School / Middle School	2	201	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
4	Biglerville High School / Middle School	2	202	2,000	9	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
5	Biglerville High School / Middle School	2	Hallway	3,200	8	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	8	4 PIN LED RETROFIT LAMP BYPASS BALLAST
6	Biglerville High School / Middle School	2	Hallway	3,200	9	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 2L LED TUBE /SELF BALLAST
7	Biglerville High School / Middle School	2	303	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
8	Biglerville High School / Middle School	2	304	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
9	Biglerville High School / Middle School	2	306	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
10	Biglerville High School / Middle School	2	308	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
11	Biglerville High School / Middle School	2	310	2,000	11	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	11	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
12	Biglerville High School / Middle School	2	309	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
13	Biglerville High School / Middle School	2	307	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
14	Biglerville High School / Middle School	2	305	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
15	Biglerville High School / Middle School	2	Hallway	3,200	1	2x4 Deep-Cell Parabolic Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
16	Biglerville High School / Middle School	2	Hallway	3,200	11	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	11	RETROFIT 4' 2L LED TUBE /SELF BALLAST
17	Biglerville High School / Middle School	2	203	2,000	11	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	11	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
18	Biglerville High School / Middle School	2	205	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
19	Biglerville High School / Middle School	2	207	2,000	16	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	16	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
20	Biglerville High School / Middle School	2	209	2,000	16	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	16	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
21	Biglerville High School / Middle School	2	210	2,000	16	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	16	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
22	Biglerville High School / Middle School	2	210	2,000	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
23	Biglerville High School / Middle School	2	Storage	800	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
24	Biglerville High School / Middle School	2	208	2,000	16	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	16	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
25	Biglerville High School / Middle School	2	208	2,000	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
26	Biglerville High School / Middle School	2	Between storag	1,000	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
27	Biglerville High School / Middle School	2	Between 209	1,000	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
28	Biglerville High School / Middle School	2	206	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
29	Biglerville High School / Middle School	2	206	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
30	Biglerville High School / Middle School	2	204	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
31	Biglerville High School / Middle School	2	204	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
32	Biglerville High School / Middle School	2	Men's	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
33	Biglerville High School / Middle School	2	Women's	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
34	Biglerville High School / Middle School	2	Hallway	3,200	21	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	21	RETROFIT 4' 2L LED TUBE /SELF BALLAST
35	Biglerville High School / Middle School	2	200 custodial	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
36	Biglerville High School / Middle School	2	Boys	3,200	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
37	Biglerville High School / Middle School	2	Girls	3,200	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
38	Biglerville High School / Middle School	2	211	2,000	9	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
39	Biglerville High School / Middle School	2	211	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
40	Biglerville High School / Middle School	2	212	2,000	9	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
41	Biglerville High School / Middle School	2	212	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
42	Biglerville High School / Middle School	2	213	2,000	9	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
43	Biglerville High School / Middle School	2	213	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
44	Biglerville High School / Middle School	2	215	2,000	6	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
45	Biglerville High School / Middle School	2	214 locked	3,000	4	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
46	Biglerville High School / Middle School	2	200 electrical	1,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
47	Biglerville High School / Middle School	2	Hallway	3,200	12	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
48	Biglerville High School / Middle School	2	Hallway	3,200	1	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	1	4 PIN LED RETROFIT LAMP BYPASS BALLAST
49	Biglerville High School / Middle School	2	Hallway	3,200	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
50	Biglerville High School / Middle School	2	Lobby area	3,200	25	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	25	RETROFIT 4' 3L LED TUBE /SELF BALLAST
51	Biglerville High School / Middle School	2	Security control	3,000	2	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST
52	Biglerville High School / Middle School	2	Tech coordinato	3,000	4	2x4 Deep-Cell Parabolic Fixture	3L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 3L LED TUBE /SELF BALLAST
53	Biglerville High School / Middle School	2	216	3,000	2	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST
54	Biglerville High School / Middle School	2	200 storage	800	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST

55	Biglerville High School / Middle School	2	201 electrical	800	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
56	Biglerville High School / Middle School	2	Wrestling room	3,200	12	1x8 Industrial Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST
57	Biglerville High School / Middle School	2	Hallway	3,200	12	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
58	Biglerville High School / Middle School	2	Top of steps	3,200	4	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
59	Biglerville High School / Middle School	2	Training room 2	3,200	6	1x8 Industrial Fixture	4L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 4L LED TUBE /SELF BALLAST
60	Biglerville High School / Middle School	2	Boys team room	3,200	19	1x4 Surface-Mounted Strip Fixture	1L 4' F28 T8 ELE N BALLAST	19	RETROFIT 4' 1L LED TUBE /SELF BALLAST
62	Biglerville High School / Middle School	2	Gym storage 14	3,200	12	1x8 Industrial Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST
63	Biglerville High School / Middle School	2	Girls ream room	3,200	19	1x4 Surface-Mounted Strip Fixture	1L 4' F28 T8 ELE N BALLAST	19	RETROFIT 4' 1L LED TUBE /SELF BALLAST
64	Biglerville High School / Middle School	2	143 equipment	1,000	6	1x8 Industrial Fixture	4L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 4L LED TUBE /SELF BALLAST
65	Biglerville High School / Middle School	2	Top of end stair	3,200	4	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
66	Biglerville High School / Middle School	2	Custodian office	3,000	2	1x8 Industrial Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST
67	Biglerville High School / Middle School	2	600 custodial	800	1	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
68	Biglerville High School / Middle School	2	Girls locker roo	3,200	60	1x4 Surface-Mounted Strip Fixture	1L 4' F28 T8 ELE N BALLAST	60	RETROFIT 4' 1L LED TUBE /SELF BALLAST
69	Biglerville High School / Middle School	2	North gym	3,200	38	Highbay Fixture	2x4 4L T5	38	RETROFIT 4' 4L LED T5 / SELF BALLAST
70	Biglerville High School / Middle School	2	North gym	3,200	16	Surface-Mounted Fixture	250 WATT HPS HIGH BAY	16	NEW LED CANOPY 100 W
71	Biglerville High School / Middle School	2	Hallway	3,200	15	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 2L LED TUBE /SELF BALLAST
72	Biglerville High School / Middle School	2	Boys locker roo	3,200	60	1x4 Surface-Mounted Strip Fixture	1L 4' F28 T8 ELE N BALLAST	60	RETROFIT 4' 1L LED TUBE /SELF BALLAST
73	Biglerville High School / Middle School	2	156 storage	1,000	9	1x4 Surface-Mounted Strip Fixture	1L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 1L LED TUBE /SELF BALLAST
74	Biglerville High School / Middle School	2	Coaches 158	3,000	11	1x4 Surface-Mounted Strip Fixture	1L 4' F28 T8 ELE N BALLAST	11	RETROFIT 4' 1L LED TUBE /SELF BALLAST
75	Biglerville High School / Middle School	2	Coaches 158	3,000	1	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
76	Biglerville High School / Middle School	2	Cafeteria	3,200	14	Decorative Fixture	0	14	NO CHANGE
77	Biglerville High School / Middle School	2	Cafeteria	3,200	14	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	14	RETROFIT 4' 2L LED TUBE /SELF BALLAST
78	Biglerville High School / Middle School	2	Cafeteria	3,200	15	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 4L LED TUBE /SELF BALLAST
79	Biglerville High School / Middle School	2	End hallway	3,200	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
80	Biglerville High School / Middle School	2	Doorway	3,200	2	High Hat Fixture 6"	COMPACT FLUORESCENT 23W HW (2)	2	4 PIN LED RETROFIT LAMP BYPASS BALLAST
81	Biglerville High School / Middle School	2	Kitchen custodi	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
82	Biglerville High School / Middle School	2	Th cage	3,200	3	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 4L LED TUBE /SELF BALLAST
83	Biglerville High School / Middle School	2	Food Service ar	3,200	14	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	14	RETROFIT 4' 4L LED TUBE /SELF BALLAST
84	Biglerville High School / Middle School	2	Food Service ar	3,200	1	1x3 Recessed Lens Fixture	2L 3' F25 ELE N BALLAST	1	RETROFIT 3' 2L LED TUBE /SELF BALLAST
85	Biglerville High School / Middle School	2	Kitchen	3,200	17	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	17	RETROFIT 4' 4L LED TUBE /SELF BALLAST
86	Biglerville High School / Middle School	2	Kitchen	3,200	4	1x3 Recessed Lens Fixture	2L 3' F25 ELE N BALLAST	4	RETROFIT 3' 2L LED TUBE /SELF BALLAST
87	Biglerville High School / Middle School	2	Storage 2	1,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
88	Biglerville High School / Middle School	2	Storage 1	3,000	1	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 4L LED TUBE /SELF BALLAST
89	Biglerville High School / Middle School	2	Storage 3	1,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
90	Biglerville High School / Middle School	2	Cafeteria office	3,000	1	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 4L LED TUBE /SELF BALLAST
91	Biglerville High School / Middle School	2	Restroom	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
92	Biglerville High School / Middle School	2	General recievi	1,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
93	Biglerville High School / Middle School	2	Hallway	3,200	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
94	Biglerville High School / Middle School	2	Office of studen	3,000	6	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 3L LED TUBE /SELF BALLAST
95	Biglerville High School / Middle School	2	Office of studen	8,750	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
96	Biglerville High School / Middle School	2	District busines	3,000	4	2x4 Deep-Cell Parabolic Fixture	3L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 3L LED TUBE /SELF BALLAST
97	Biglerville High School / Middle School	2	District busines	3,000	2	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
98	Biglerville High School / Middle School	2	District busines	3,000	4	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
99	Biglerville High School / Middle School	2	District busines	3,000	2	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
100	Biglerville High School / Middle School	2	Boys	3,200	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
101	Biglerville High School / Middle School	2	Girls	3,200	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
102	Biglerville High School / Middle School	2	Board room	3,000	10	2x4 Deep-Cell Parabolic Fixture	3L 4' F28 T8 ELE N BALLAST	10	RETROFIT 4' 3L LED TUBE /SELF BALLAST
103	Biglerville High School / Middle School	2	Board room	3,000	12	High Hat Fixture	50 WATT INCANDESCENT	12	RELAMP 7W MR16 LED GU5.3
104	Biglerville High School / Middle School	2	Admin offices h	3,200	4	High Hat Fixture 6"	COMPACT FLUORESCENT 23W HW (2)	4	4 PIN LED RETROFIT LAMP BYPASS BALLAST
105	Biglerville High School / Middle School	2	Admin offices h	3,200	3	High Hat Fixture	50 WATT INCANDESCENT	3	RELAMP 7W MR16 LED GU5.3
106	Biglerville High School / Middle School	2	Right office	3,000	2	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
107	Biglerville High School / Middle School	2	End office thru	3,000	4	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
108	Biglerville High School / Middle School	2	Hallway office 1	3,000	2	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST
109	Biglerville High School / Middle School	2	Hallway office 2	3,000	1		EXISTING LED FIXTURE	1	NO CHANGE
110	Biglerville High School / Middle School	2	Hallway office 3	3,000	2	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
111	Biglerville High School / Middle School	2	Server room	800	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
112	Biglerville High School / Middle School	2	Men's	3,200	1	Vanity Fixture	1L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 1L LED TUBE /SELF BALLAST
113	Biglerville High School / Middle School	2	Women's	3,200	1	Vanity Fixture	1L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 1L LED TUBE /SELF BALLAST
114	Biglerville High School / Middle School	2	Kitchenette	3,000	2	2x4 Deep-Cell Parabolic Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
115	Biglerville High School / Middle School	2	Storage	1,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
116	Biglerville High School / Middle School	2	Hallway	3,200	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
117	Biglerville High School / Middle School	2	602	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED

118	Biglerville High School / Middle School	2	603 shop class	2,000	3	1x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 3L LED TUBE /SELF BALLAST
119	Biglerville High School / Middle School	2	603 shop class	2,000	5	1x8 Industrial Fixture	4L 4' F28 T8 ELE N BALLAST	5	RETROFIT 4' 4L LED TUBE /SELF BALLAST
120	Biglerville High School / Middle School	2	603 shop class	2,000	38	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	38	RETROFIT 4' 2L LED TUBE /SELF BALLAST
121	Biglerville High School / Middle School	2	Loft	2,000	6	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
122	Biglerville High School / Middle School	2	Paint shop	2,000	2	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
123	Biglerville High School / Middle School	2	Storage room	1,000	2	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
124	Biglerville High School / Middle School	2	604	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
125	Biglerville High School / Middle School	2	601	2,000	24	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	24	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
126	Biglerville High School / Middle School	2	Storage	1,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
127	Biglerville High School / Middle School	2	Storage	1,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
128	Biglerville High School / Middle School	2	Hallway	3,200	20	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	20	RETROFIT 4' 2L LED TUBE /SELF BALLAST
130	Biglerville High School / Middle School	2	501	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
131	Biglerville High School / Middle School	2	501	2,000	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
132	Biglerville High School / Middle School	2	Ladies restroom	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
133	Biglerville High School / Middle School	2	503	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
134	Biglerville High School / Middle School	2	503	2,000	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
135	Biglerville High School / Middle School	2	502	2,000	16	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	16	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
136	Biglerville High School / Middle School	2	502	2,000	2	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST
137	Biglerville High School / Middle School	2	men's room	3,200	1	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
138	Biglerville High School / Middle School	2	Observatiok	3,000	1	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
139	Biglerville High School / Middle School	2	Hallway	3,200	5	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	5	RETROFIT 4' 2L LED TUBE /SELF BALLAST
140	Biglerville High School / Middle School	2	Hallway	3,200	2	High Hat Fixture 6"	COMPACT FLUORESCENT 23W HW (2)	2	4 PIN LED RETROFIT LAMP BYPASS BALLAST
141	Biglerville High School / Middle School	2	Door 9 hallway	3,200	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
142	Biglerville High School / Middle School	2	504	2,000	13	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	13	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
143	Biglerville High School / Middle School	2	504	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
144	Biglerville High School / Middle School	2	400 hallway	3,200	14	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	14	RETROFIT 4' 2L LED TUBE /SELF BALLAST
145	Biglerville High School / Middle School	2	Teacher room	3,000	2	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
146	Biglerville High School / Middle School	2	Teacher room	3,000	8	High Hat Fixture	50 WATT INCANDESCENT	8	RELAMP 7W MR16 LED GU5.3
147	Biglerville High School / Middle School	2	Restroom	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
148	Biglerville High School / Middle School	2	418	2,000	9	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
149	Biglerville High School / Middle School	2	Office locked	3,000	6	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
150	Biglerville High School / Middle School	2	414	2,000	15	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
151	Biglerville High School / Middle School	2	413	2,000	15	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
152	Biglerville High School / Middle School	2	415	2,000	15	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
153	Biglerville High School / Middle School	2	417 team planni	3,000	3	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
154	Biglerville High School / Middle School	2	417 team planni	3,000	2	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST
155	Biglerville High School / Middle School	2	400 data	800	1	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 4L LED TUBE /SELF BALLAST
156	Biglerville High School / Middle School	2	412	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
157	Biglerville High School / Middle School	2	410	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
158	Biglerville High School / Middle School	2	408	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
159	Biglerville High School / Middle School	2	406	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
160	Biglerville High School / Middle School	2	Principal	3,000	3	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
161	Biglerville High School / Middle School	2	Principal	3,000	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
162	Biglerville High School / Middle School	2	Principal	3,000	2	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
163	Biglerville High School / Middle School	2	Boys	3,200	2	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
164	Biglerville High School / Middle School	2	Girls	3,200	2	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
165	Biglerville High School / Middle School	2	400 custodial	800	1	Surface-Mounted Fixture	COMPACT FLUORESCENT 23W S/I	1	RELAMP 9 WATT LED A LAMP S/I
166	Biglerville High School / Middle School	2	403	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
167	Biglerville High School / Middle School	2	403	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
168	Biglerville High School / Middle School	2	405	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
169	Biglerville High School / Middle School	2	407	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
170	Biglerville High School / Middle School	2	409	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
171	Biglerville High School / Middle School	2	411	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
172	Biglerville High School / Middle School	2	Hallway	3,200	17	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	17	RETROFIT 4' 2L LED TUBE /SELF BALLAST
173	Biglerville High School / Middle School	2	402 high school	2,000	15	1x8 Pendant-Mounted Uplight/Downligh	4L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 4L LED TUBE /SELF BALLAST
174	Biglerville High School / Middle School	2	402 high school	2,000	5	1x4 Pendant-Mounted Uplight/Downligh	2L 4' F28 T8 ELE N BALLAST	5	RETROFIT 4' 2L LED TUBE /SELF BALLAST
175	Biglerville High School / Middle School	2	Storage	1,000	1	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
176	Biglerville High School / Middle School	2	Storage	1,000	1	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
177	Biglerville High School / Middle School	2	402 track lights	2,000	24	Track-Mounted Fixture	50 WATT INCANDESCENT	24	RELAMP 7W MR16 LED GU5.3
178	Biglerville High School / Middle School	2	401 middle sch	2,000	15	1x8 Pendant-Mounted Uplight/Downligh	4L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 4L LED TUBE /SELF BALLAST
179	Biglerville High School / Middle School	2	Track lights	2,000	32	Track-Mounted Fixture	50 WATT INCANDESCENT	32	RELAMP 7W MR16 LED GU5.3
180	Biglerville High School / Middle School	2	400 middle sch	2,000	9	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED

181	Biglerville High School / Middle School	2	Storage	1,000	1	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
182	Biglerville High School / Middle School	2	Hallway	3,200	7	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	7	RETROFIT 4' 2L LED TUBE /SELF BALLAST
183	Biglerville High School / Middle School	2	Hallway	3,200	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
184	Biglerville High School / Middle School	2	Hallway track lig	3,200	22	Track-Mounted Fixture	65 WATT INCAN FLOOD	22	RELAMP 11 WATT LED BR S/I
185	Biglerville High School / Middle School	2	Basement stairv	8,760	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
186	Biglerville High School / Middle School	2	Basement stairv	8,760	1	2x4 Deep-Cell Parabolic Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
187	Biglerville High School / Middle School	1	Distance learnir	2,000	6	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 4L LED TUBE /SELF BALLAST
188	Biglerville High School / Middle School	1	School nurse w	3,000	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
189	Biglerville High School / Middle School	1	Nurse office	3,000	3	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 3L LED TUBE /SELF BALLAST
190	Biglerville High School / Middle School	1	Nurse office	3,000	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
191	Biglerville High School / Middle School	1	Nurse office	3,000	1	High Hat Fixture 6"	COMPACT FLUORESCENT 23W HW (2)	1	4 PIN LED RETROFIT LAMP BYPASS BALLAST
192	Biglerville High School / Middle School	1	Nurse closet	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
193	Biglerville High School / Middle School	1	Nurse class	3,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
194	Biglerville High School / Middle School	1	Shower	3,200	1	1x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
195	Biglerville High School / Middle School	1	Restroom	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
196	Biglerville High School / Middle School	1	Closet	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
197	Biglerville High School / Middle School	1	Beds	3,000	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
198	Biglerville High School / Middle School	1	Faculty room	3,000	7	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	7	RETROFIT 4' 3L LED TUBE /SELF BALLAST
199	Biglerville High School / Middle School	1	Copier	3,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
200	Biglerville High School / Middle School	1	Restroom	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
201	Biglerville High School / Middle School	1	School office su	3,000	14	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	14	RETROFIT 4' 3L LED TUBE /SELF BALLAST
202	Biglerville High School / Middle School	1	School office su	3,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
203	Biglerville High School / Middle School	1	Assistant princi	3,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
204	Biglerville High School / Middle School	1	Dean	3,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
205	Biglerville High School / Middle School	1	Mid office	3,000	3	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 3L LED TUBE /SELF BALLAST
206	Biglerville High School / Middle School	1	Mid office	3,000	8	High Hat Fixture	50 WATT INCANDESCENT	8	RELAMP 7W MR16 LED GU5.3
207	Biglerville High School / Middle School	1	Mail room	3,000	6	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
208	Biglerville High School / Middle School	1	Principal	3,000	2	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST
209	Biglerville High School / Middle School	1	Small office	3,000	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
210	Biglerville High School / Middle School	1	Small office	3,000	1	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
211	Biglerville High School / Middle School	1	College advisor	3,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
212	Biglerville High School / Middle School	1	Testing materia	3,000	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
213	Biglerville High School / Middle School	1	Library	3,200	74	1x4 Pendant-Mounted Uplight/Downligh	3L 4' F28 T8 ELE N BALLAST	74	RETROFIT 4' 3L LED TUBE /SELF BALLAST
214	Biglerville High School / Middle School	1	Library	3,200	30	1x4 Pendant-Mounted Uplight/Downligh	3L 3' F25 ELE N BALLAST	30	RETROFIT 3' 3L LED TUBE /SELF BALLAST
215	Biglerville High School / Middle School	1	Library	3,200	19	1x4 Pendant-Mounted Uplight/Downligh	3L 4' F28 T8 ELE N BALLAST	19	RETROFIT 4' 3L LED TUBE /SELF BALLAST
216	Biglerville High School / Middle School	1	Library	3,200	2	1x4 Pendant-Mounted Uplight/Downligh	3L 3' F25 ELE N BALLAST	2	RETROFIT 3' 3L LED TUBE /SELF BALLAST
217	Biglerville High School / Middle School	1	Library	3,200	10	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	10	4 PIN LED RETROFIT LAMP BYPASS BALLAST
218	Biglerville High School / Middle School	1	Library	3,200	5	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 23W HW (2)	5	4 PIN LED RETROFIT LAMP BYPASS BALLAST
219	Biglerville High School / Middle School	1	Library work ro	2,000	8	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	8	RETROFIT 4' 2L LED TUBE /SELF BALLAST
220	Biglerville High School / Middle School	1	Library classroo	2,000	11	2x4 Deep-Cell Parabolic Fixture	4L 4' F28 T8 ELE N BALLAST	11	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
221	Biglerville High School / Middle School	1	Hallway	3,200	12	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
222	Biglerville High School / Middle School	1	Hallway	3,200	2	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	2	4 PIN LED RETROFIT LAMP BYPASS BALLAST
223	Biglerville High School / Middle School	1	Main stairwell fo	3,200	11	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	11	4 PIN LED RETROFIT LAMP BYPASS BALLAST
224	Biglerville High School / Middle School	1	Main stairwell fo	3,200	6	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 3L LED TUBE /SELF BALLAST
225	Biglerville High School / Middle School	1	Stairwell	8,760	10	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	10	4 PIN LED RETROFIT LAMP BYPASS BALLAST
226	Biglerville High School / Middle School	1	Stairwell	8,760	5	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	5	4 PIN LED RETROFIT LAMP BYPASS BALLAST
227	Biglerville High School / Middle School	1	Main foyer hallv	3,200	9	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 3L LED TUBE /SELF BALLAST
228	Biglerville High School / Middle School	1	Main foyer hallv	3,200	10	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	10	4 PIN LED RETROFIT LAMP BYPASS BALLAST
229	Biglerville High School / Middle School	1	Guidance office	3,000	6	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 4L LED TUBE /SELF BALLAST
230	Biglerville High School / Middle School	1	Conference	3,000	3	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
231	Biglerville High School / Middle School	1	Conference	3,000	6	High Hat Fixture	50 WATT INCANDESCENT	6	RELAMP 7W MR16 LED GU5.3
232	Biglerville High School / Middle School	1	Corner office	3,000	2	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
233	Biglerville High School / Middle School	1	Mid office	3,000	2	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
234	Biglerville High School / Middle School	1	File room	3,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
235	Biglerville High School / Middle School	1	101	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
236	Biglerville High School / Middle School	1	103	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
237	Biglerville High School / Middle School	1	105	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
238	Biglerville High School / Middle School	1	107	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
239	Biglerville High School / Middle School	1	109	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
240	Biglerville High School / Middle School	1	Hallway	3,200	20	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	20	RETROFIT 4' 2L LED TUBE /SELF BALLAST
241	Biglerville High School / Middle School	1	108	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
242	Biglerville High School / Middle School	1	108	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL

243	Biglerville High School / Middle School	1	106	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
244	Biglerville High School / Middle School	1	106	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
245	Biglerville High School / Middle School	1	104	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
246	Biglerville High School / Middle School	1	104	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
247	Biglerville High School / Middle School	1	102	2,000	12	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
248	Biglerville High School / Middle School	1	102	8,760	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
249	Biglerville High School / Middle School	1	Women	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
250	Biglerville High School / Middle School	1	Men	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
251	Biglerville High School / Middle School	1	Stairwell	8,760	5	Wall-Mounted Fixture	1L 4' F32 T8 ELE N BALLAST	5	RETROFIT 4' 1L LED TUBE /SELF BALLAST
252	Biglerville High School / Middle School	1	Stairwell	8,760	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
253	Biglerville High School / Middle School	1	PR-D	1,000	1	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 3L LED TUBE /SELF BALLAST
254	Biglerville High School / Middle School	1	100 electrical	1,000	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
255	Biglerville High School / Middle School	1	100 data	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
256	Biglerville High School / Middle School	1	PR-C	800	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
257	Biglerville High School / Middle School	1	PR-B	800	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
258	Biglerville High School / Middle School	1	Hallway	3,200	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
259	Biglerville High School / Middle School	1	111 chorus	2,000	23	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	23	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
260	Biglerville High School / Middle School	1	Storage	1,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
261	Biglerville High School / Middle School	1	Office	3,000	1	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 4L LED TUBE /SELF BALLAST
262	Biglerville High School / Middle School	1	110 band	2,000	23	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	23	RETROFIT 4' 4L LED TUBE /SELF BALLAST DUAL SWITCHED
263	Biglerville High School / Middle School	1	Storage	1,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
264	Biglerville High School / Middle School	1	Office	3,000	1	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 4L LED TUBE /SELF BALLAST
265	Biglerville High School / Middle School	1	Hallway	3,200	10	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	10	RETROFIT 4' 2L LED TUBE /SELF BALLAST
266	Biglerville High School / Middle School	1	Music storage	800	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
267	Biglerville High School / Middle School	1	Music storage	1,000	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
268	Biglerville High School / Middle School	1	Mechanical roo	1,000	7	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	7	RETROFIT 4' 2L LED TUBE /SELF BALLAST
269	Biglerville High School / Middle School	1	South gym	3,200	28	Highbay Fixture	2x4 4L T5	28	RETROFIT 4' 4L LED T5 / SELF BALLAST
270	Biglerville High School / Middle School	1	Boys team roon	3,200	7	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	7	RETROFIT 4' 2L LED TUBE /SELF BALLAST
271	Biglerville High School / Middle School	1	Boys team roon	3,200	3	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	3	4 PIN LED RETROFIT LAMP BYPASS BALLAST
272	Biglerville High School / Middle School	1	Girls team room	3,200	7	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	7	RETROFIT 4' 2L LED TUBE /SELF BALLAST
273	Biglerville High School / Middle School	1	Girls team room	3,200	3	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	3	4 PIN LED RETROFIT LAMP BYPASS BALLAST
274	Biglerville High School / Middle School	1	Hallway	3,200	17	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	17	RETROFIT 4' 2L LED TUBE /SELF BALLAST
275	Biglerville High School / Middle School	1	Hallway	3,200	2	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	2	4 PIN LED RETROFIT LAMP BYPASS BALLAST
276	Biglerville High School / Middle School	1	Stairwell	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
277	Biglerville High School / Middle School	1	Stairwell	8,760	10	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	10	RETROFIT 4' 2L LED TUBE /SELF BALLAST
279	Biglerville High School / Middle School	1	Gym storage	3,200	9	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 2L LED TUBE /SELF BALLAST
280	Biglerville High School / Middle School	1	Wrestling room	3,200	40	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	40	RETROFIT 4' 2L LED TUBE /SELF BALLAST
281	Biglerville High School / Middle School	1	Hallway to gym	3,200	9	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 2L LED TUBE /SELF BALLAST
282	Biglerville High School / Middle School	1	Stage	2,000	6	High Hat Fixture 10"	COMPACT FLUORESCENT 23W HW (2)	6	4 PIN LED RETROFIT LAMP BYPASS BALLAST
283	Biglerville High School / Middle School	1	Stage storage	1,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
284	Biglerville High School / Middle School	1	Stage	2,000	2	Wall-Mounted Fixture	65 WATT INCAN FLOOD	2	RELAMP 11 WATT LED BR S/I
285	Biglerville High School / Middle School	1	Auditorium cylin	2,000	21		COMPACT FLUORESCENT 45W HW (3)	21	NO CHANGE
286	Biglerville High School / Middle School	1	Auditorium lowe	2,000	16	High Hat Fixture 6"	COMPACT FLUORESCENT 23W HW (2)	16	4 PIN LED RETROFIT LAMP BYPASS BALLAST
287	Biglerville High School / Middle School	1	Media room	2,000	4	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 4L LED TUBE /SELF BALLAST
288	Biglerville High School / Middle School	1	Hallway outside	3,200	10	2x4 Recessed Lens Fixture	4L 4' F28 T8 ELE N BALLAST	10	RETROFIT 4' 4L LED TUBE /SELF BALLAST
289	Biglerville High School / Middle School	1	Hallway outside	3,200	10	High Hat Fixture 8"	COMPACT FLUORESCENT 23W HW (2)	10	4 PIN LED RETROFIT LAMP BYPASS BALLAST
290	Biglerville High School / Middle School	1	Hallway outside	3,200	6	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
291	Biglerville High School / Middle School	1	Hallway outside	3,200	18	2x4 Deep-Cell Parabolic Fixture	3L 4' F28 T8 ELE N BALLAST	18	RETROFIT 4' 3L LED TUBE /SELF BALLAST
292	Biglerville High School / Middle School	1	Concessions	3,200	3	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 3L LED TUBE /SELF BALLAST
293	Biglerville High School / Middle School	1	Maintenance ge	1,000	20	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	20	RETROFIT 4' 2L LED TUBE /SELF BALLAST
294	Biglerville High School / Middle School	1	Maintenance of	3,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
295	Biglerville High School / Middle School	1	Restroom	3,200	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
296	Biglerville High School / Middle School	1	110;data	3,000	2	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 3L LED TUBE /SELF BALLAST
297	Biglerville High School / Middle School	1	101 electrical	1,000	6	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
298	Biglerville High School / Middle School	1	Mechanical roo	1,000	13	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	13	RETROFIT 4' 2L LED TUBE /SELF BALLAST
299	Biglerville High School / Middle School	1	101 custodial	1,000	1	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
300	Biglerville High School / Middle School	1	Hallway	3,200	7	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	7	RETROFIT 4' 2L LED TUBE /SELF BALLAST
301	Biglerville High School / Middle School	1	Stairwell	8,760	10	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	10	RETROFIT 4' 2L LED TUBE /SELF BALLAST
302	Biglerville High School / Middle School	1	Gym storage - 2	1,000	3	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
303	Biglerville High School / Middle School	1	Grease collecti	1,000	1	Wall-Mounted Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
304	Biglerville High School / Middle School	1	Stairwell	8,760	4	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 3L LED TUBE /SELF BALLAST
305	Biglerville High School / Middle School	1	Stairwell	8,760	1	Wall-Mounted Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST

306	Biglerville High School / Middle School	EXT	Door 15 door 14	4,380	2	Wallpack Fixture	70 WATT MH WALLPACK	2	NEW LED 30 WATT DUAL FEED WALLPACK
307	Biglerville High School / Middle School	EXT	Door 13	4,380	1	Wallpack Fixture	250 WATT MH WALLPACK	1	NEW LED WALL PACK 48 W
308	Biglerville High School / Middle School	EXT	Door 13 dual fe	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
309	Biglerville High School / Middle School	EXT	Door 12 Dual fe	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
310	Biglerville High School / Middle School	EXT	Door 11	4,380	2	Surface-Mounted Fixture	175 WATT MH LOW BAY	2	NEW LED CANOPY 60 W
311	Biglerville High School / Middle School	EXT	Door 10	4,380	3	Surface-Mounted Fixture	175 WATT MH LOW BAY	3	NEW LED CANOPY 60 W
312	Biglerville High School / Middle School	EXT	Door 9	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
313	Biglerville High School / Middle School	EXT	Door 9	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
314	Biglerville High School / Middle School	EXT	District office pe	4,380	5	Shoebox Fixture	250 WATT MH SHOEBOX	5	NEW LED AREA LIGHT 70 W FIXED ARM
315	Biglerville High School / Middle School	EXT	Side wall small	4,380	5	Wallpack Fixture	70 WATT HPS WALLPACK	5	NEW LED WALL PACK 26 W
316	Biglerville High School / Middle School	EXT	Door 6	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
317	Biglerville High School / Middle School	EXT	Front wall small	4,380	1	Wallpack Fixture	70 WATT HPS WALLPACK	1	NEW LED WALL PACK 26 W
318	Biglerville High School / Middle School	EXT	Door 5	4,380	1	Wallpack Fixture	250 WATT MH WALLPACK	1	NEW LED WALL PACK 48 W
319	Biglerville High School / Middle School	EXT	Door 4	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
320	Biglerville High School / Middle School	EXT	Flag floods	4,380	2	Floodlight Fixture	175 WATT MH FLOOD	2	NEW LED FLOOD 20 W
321	Biglerville High School / Middle School	EXT	Door 1w	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
322	Biglerville High School / Middle School	EXT	Door 1e	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
323	Biglerville High School / Middle School	EXT	Front lot pole lig	4,380	8	Shoebox Fixture	250 WATT MH SHOEBOX	8	NEW LED AREA LIGHT 70 W FIXED ARM
324	Biglerville High School / Middle School	EXT	Front lot pole lig	4,380	8	Shoebox Fixture	250 WATT MH SHOEBOX	8	NEW LED AREA LIGHT 70 W FIXED ARM
325	Biglerville High School / Middle School	EXT	Tennis court	4,380	12	Shoebox Fixture	1,000 WATT MH SHOEBOX	12	NEW LED AREA LIGHT 280 W FIXED ARM
326	Biglerville High School / Middle School	EXT	Right corner ent	4,380	2	Wallpack Fixture	70 WATT MH WALLPACK	2	NEW LED 30 WATT DUAL FEED WALLPACK
327	Biglerville High School / Middle School	EXT	Right corner ent	4,380	1	Wallpack Fixture	250 WATT MH WALLPACK	1	NEW LED WALL PACK 48 W
328	Biglerville High School / Middle School	EXT	Door 24 23	4,380	2	Wallpack Fixture	70 WATT MH WALLPACK	2	NEW LED 30 WATT DUAL FEED WALLPACK
329	Biglerville High School / Middle School	EXT	Door 24 23	4,380	1	Wallpack Fixture	250 WATT MH WALLPACK	1	NEW LED WALL PACK 48 W
330	Biglerville High School / Middle School	EXT	Door 22;21	4,380	2	Wallpack Fixture	70 WATT MH WALLPACK	2	NEW LED 30 WATT DUAL FEED WALLPACK
331	Biglerville High School / Middle School	EXT	Door 22;21	4,380	1	Wallpack Fixture	250 WATT MH WALLPACK	1	NEW LED WALL PACK 48 W
332	Biglerville High School / Middle School	EXT	Door 20	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
333	Biglerville High School / Middle School	EXT	Door 19 canopy	4,380	1	High Hat Fixture 8"	70 WATT MH HIGH HAT	1	RELAMP 15 WATT LED PAR 38 S/I 277
334	Biglerville High School / Middle School	EXT	Wall floods	4,380	4	Floodlight Fixture	400 WATT MH FLOOD	4	NEW LED FLOOD 128 W KNUCKLE
335	Biglerville High School / Middle School	EXT	Garage wall pac	4,380	1	Wallpack Fixture	150 WATT MH WALLPACK	1	NEW LED WALL PACK 26 W PHOTO CELL
336	Biglerville High School / Middle School	EXT	Door 18	4,380	1	Wallpack Fixture	150 WATT HPS WALLPACK	1	NEW LED JELLY JAR FIXTURE
337	Biglerville High School / Middle School	EXT	Door17	4,380	1	Wallpack Fixture	70 WATT MH WALLPACK	1	NEW LED 30 WATT DUAL FEED WALLPACK
338	Biglerville High School / Middle School	EXT	Door 17	4,380	1	High Hat Fixture 8"	70 WATT MH HIGH HAT	1	RELAMP 15 WATT LED PAR 38 S/I 277
339	Biglerville High School / Middle School	EXT	Ground Sign flo	4,380	2	Floodlight Fixture	175 WATT MH FLOOD	2	NEW LED FLOOD 20 W
	Total: Biglerville High School / Middle School				**2,403**			**2,403**	
	Biglerville Elementary School								
1	Biglerville Elementary School	1	Main entrance l	3,200	4	1x4 Surface-Mounted Strip Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
2	Biglerville Elementary School	1	Main entrance f	3,200	2	High Hat Fixture	50 WATT INCANDESCENT	2	RELAMP 7W MR16 LED GU5.3
3	Biglerville Elementary School	1	Main entrance h	3,200	6	Surface-Mounted Fixture	COMPACT FLUORESCENT 23W S/I	6	RELAMP 9 WATT LED A LAMP S/I
4	Biglerville Elementary School	1	Main entrance h	3,200	6	High Hat Fixture	50 WATT INCANDESCENT	6	RELAMP 7W MR16 LED GU5.3
5	Biglerville Elementary School	1	Display Case	3,200	4	1x3 Surface-Mounted Strip Fixture	1L 3' F25 ELE N BALLAST	4	RETROFIT 3' 1L LED TUBE /SELF BALLAST
6	Biglerville Elementary School	1	Main office	3,000	4	High Hat Fixture 8"	COMPACT FLUORESCENT 26W HW	4	4 PIN LED RETROFIT LAMP BYPASS BALLAST
7	Biglerville Elementary School	1	Main office	3,000	6	2x4 Deep-Cell Parabolic Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
8	Biglerville Elementary School	1	Conference roo	3,000	3	2x4 Deep-Cell Parabolic Fixture	3L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 3L LED TUBE /SELF BALLAST DUAL SWITCHED
9	Biglerville Elementary School	1	Conference roo	3,000	8	High Hat Fixture	60 WATT INCANDESCENT	8	RELAMP 11 WATT LED BR S/I
11	Biglerville Elementary School	1	Copy room	3,000	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
12	Biglerville Elementary School	1	Restroom	3,200	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
13	Biglerville Elementary School	1	Restroom	3,200	1	Vanity Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
14	Biglerville Elementary School	1	Principal	3,000	4	2x4 Deep-Cell Parabolic Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
15	Biglerville Elementary School	1	Office	3,000	2	2x4 Deep-Cell Parabolic Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
16	Biglerville Elementary School	1	Nurse office ent	3,000	4	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	4	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
17	Biglerville Elementary School	1	Nurse office	3,000	5	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	5	RETROFIT 4' 2L LED TUBE /SELF BALLAST
18	Biglerville Elementary School	1	Nurse office	3,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
19	Biglerville Elementary School	1	Nurse storage	1,000	2	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
20	Biglerville Elementary School	1	Nurse restroom	3,000	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
21	Biglerville Elementary School	1	Nurse restroom	3,000	1	Vanity Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
22	Biglerville Elementary School	1	Beds	3,000	2	Wall-Mounted Fixture	2L 3' F25 ELE N BALLAST	2	RETROFIT 3' 2L LED TUBE /SELF BALLAST
23	Biglerville Elementary School	1	Nurse testing	3,000	1	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST

24	Biglerville Elementary School	1	Closet	800	1	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
25	Biglerville Elementary School	1	Staff restroom	3,200	1	High Hat Fixture 6"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
26	Biglerville Elementary School	1	Staff restroom	3,200	1	High Hat Fixture 6"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
27	Biglerville Elementary School	1	Faculty room 22	3,000	17	High Hat Fixture 6"	COMPACT FLUORESCENT 13W HW (2)	17	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
28	Biglerville Elementary School	1	22 hallway	3,200	7	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	7	RETROFIT 4' 2L LED TUBE /SELF BALLAST
29	Biglerville Elementary School	1	Jonathan street	3,200	11	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	11	RETROFIT 4' 2L LED TUBE /SELF BALLAST
30	Biglerville Elementary School	1	Kindergarten ha	3,200	8	2x2 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	8	RETROFIT 4' 2L LED TUBE /SELF BALLAST
31	Biglerville Elementary School	1	Coves	3,200	24	1x4 Surface-Mounted Strip Fixture	2L 4' F28 T8 ELE N BALLAST	24	RETROFIT 4' 2L LED TUBE /SELF BALLAST
32	Biglerville Elementary School	1	Hallway	3,200	2	Decorative Fixture	COMPACT FLUORESCENT 23W S/I	2	RELAMP 9 WATT LED A LAMP S/I
33	Biglerville Elementary School	1	McIntosh ave h	3,200	26	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	26	RETROFIT 4' 2L LED TUBE /SELF BALLAST
34	Biglerville Elementary School	1	Cove	3,200	12	1x4 Surface-Mounted Strip Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
35	Biglerville Elementary School	1	Hallway	3,200	2	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	2	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
36	Biglerville Elementary School	1	Apple harvest s	3,200	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
37	Biglerville Elementary School	1	Apple harvest s	3,200	4	1x4 Surface-Mounted Strip Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
38	Biglerville Elementary School	1	Apple harvest s	3,200	2	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	2	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
39	Biglerville Elementary School	1	York imperial st	3,200	8	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	8	RETROFIT 4' 2L LED TUBE /SELF BALLAST
40	Biglerville Elementary School	1	York imperial st	3,200	2	High Hat Fixture	50 WATT INCANDESCENT	2	RELAMP 7W MR16 LED GU5.3
41	Biglerville Elementary School	1	Vestibule by 32	3,200	4	1x4 Surface-Mounted Strip Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
42	Biglerville Elementary School	1	Winesnap stree	3,200	6	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
43	Biglerville Elementary School	1	Winesnap stree	3,200	2	Decorative Fixture	COMPACT FLUORESCENT 23W S/I	2	RELAMP 9 WATT LED A LAMP S/I
44	Biglerville Elementary School	1	Winesnap stree	3,200	12	1x4 Surface-Mounted Strip Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
45	Biglerville Elementary School	1	Winesnap stree	3,200	3	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	3	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
46	Biglerville Elementary School	1	Winesnap stree	3,200	2	High Hat Fixture	50 WATT INCANDESCENT	2	RELAMP 7W MR16 LED GU5.3
47	Biglerville Elementary School	1	Apple blossom	3,200	7	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	7	RETROFIT 4' 2L LED TUBE /SELF BALLAST
48	Biglerville Elementary School	1	Cove	3,200	12	1x4 Surface-Mounted Strip Fixture	1L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 1L LED TUBE /SELF BALLAST
49	Biglerville Elementary School	1	Cove	3,200	3	High Hat Fixture 6"	COMPACT FLUORESCENT 13W HW (2)	3	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
50	Biglerville Elementary School	1	Cove	3,200	2	High Hat Fixture	50 WATT INCANDESCENT	2	RELAMP 7W MR16 LED GU5.3
51	Biglerville Elementary School	1	Library	3,200	58	1x4 Pendant-Mounted Uplight/Downligh	3L 4' F28 T8 ELE N BALLAST	58	RETROFIT 4' 3L LED TUBE /SELF BALLAST
52	Biglerville Elementary School	1	41	3,000	4	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
53	Biglerville Elementary School	1	Server room	1,000	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
54	Biglerville Elementary School	1	19 classroom	1,640	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
55	Biglerville Elementary School	1	Entrance hallwa	3,200	2	Decorative Fixture	COMPACT FLUORESCENT 23W S/I	2	RELAMP 9 WATT LED A LAMP S/I
56	Biglerville Elementary School	1	Coves	3,200	20	1x4 Surface-Mounted Strip Fixture	2L 4' F28 T8 ELE N BALLAST	20	RETROFIT 4' 2L LED TUBE /SELF BALLAST
57	Biglerville Elementary School	1	Ramp	3,200	4	High Hat Fixture 6"	COMPACT FLUORESCENT 13W HW (2)	4	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
58	Biglerville Elementary School	1	17 hallway	3,200	6	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
59	Biglerville Elementary School	1	17 hallway	3,200	1	2x2 Recessed Lens Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
60	Biglerville Elementary School	1	31	1,640	15	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 3L LED TUBE /SELF BALLAST
61	Biglerville Elementary School	1	31	2,000	1	High Hat Fixture 6"	COMPACT FLUORESCENT 13W HW	1	RELAMP LED 5W PL GX23 BASE BYPASS BALLAST
62	Biglerville Elementary School	1	In between stor	1,000	1	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
63	Biglerville Elementary School	1	Restroom	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
64	Biglerville Elementary School	1	29	1,640	15	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 3L LED TUBE /SELF BALLAST
65	Biglerville Elementary School	1	29	2,000	1	High Hat Fixture 6"	COMPACT FLUORESCENT 13W HW	1	RELAMP LED 5W PL GX23 BASE BYPASS BALLAST
66	Biglerville Elementary School	1	Restroom	3,200	1	Wall-Mounted Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
67	Biglerville Elementary School	1	27	1,640	16	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	16	RETROFIT 4' 2L LED TUBE /SELF BALLAST
68	Biglerville Elementary School	1	27	2,000	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
69	Biglerville Elementary School	1	Closet	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
70	Biglerville Elementary School	1	Restroom	3,200	1	Vanity Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
71	Biglerville Elementary School	1	In between stor	1,000	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
72	Biglerville Elementary School	1	23	1,640	16	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	16	RETROFIT 4' 2L LED TUBE /SELF BALLAST
73	Biglerville Elementary School	1	23	2,000	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
74	Biglerville Elementary School	1	Closet	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
75	Biglerville Elementary School	1	Restroom	3,200	1	Vanity Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
77	Biglerville Elementary School	1	30	1,640	15	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 2L LED TUBE /SELF BALLAST
78	Biglerville Elementary School	1	30	2,000	1	High Hat Fixture 6"	COMPACT FLUORESCENT 13W HW	1	RELAMP LED 5W PL GX23 BASE BYPASS BALLAST
79	Biglerville Elementary School	1	Restroom	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
80	Biglerville Elementary School	1	In between stor	1,000	1	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
81	Biglerville Elementary School	1	28	1,640	15	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 2L LED TUBE /SELF BALLAST
82	Biglerville Elementary School	1	28	2,000	1	High Hat Fixture 6"	COMPACT FLUORESCENT 13W HW	1	RELAMP LED 5W PL GX23 BASE BYPASS BALLAST
83	Biglerville Elementary School	1	Restroom	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
85	Biglerville Elementary School	1	26	1,640	16	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	16	RETROFIT 4' 2L LED TUBE /SELF BALLAST
86	Biglerville Elementary School	1	26	2,000	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
87	Biglerville Elementary School	1	Bathroom	3,200	1	Vanity Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST

88	Biglerville Elementary School	1	Closet	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
89	Biglerville Elementary School	1	In between stor	1,000	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
90	Biglerville Elementary School	1	24	1,640	16	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	16	RETROFIT 4' 2L LED TUBE /SELF BALLAST
90	Biglerville Elementary School	1	24	2,000	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
90	Biglerville Elementary School	1	Bathroom	3,200	1	Vanity Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
90	Biglerville Elementary School	1	Closet	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
91	Biglerville Elementary School	1	23	2,000	9	2x4 Deep-Cell Parabolic Fixture	2L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 2L LED TUBE /SELF BALLAST
92	Biglerville Elementary School	1	21	2,000	9	2x4 Deep-Cell Parabolic Fixture	2L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 2L LED TUBE /SELF BALLAST
93	Biglerville Elementary School	1	17	2,000	5	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	5	RETROFIT 4' 2L LED TUBE /SELF BALLAST
94	Biglerville Elementary School	1	17	2,000	18	1x4 Pendant-Mounted Uplight/Downligh	2L 4' F28 T8 ELE N BALLAST	18	RETROFIT 4' 2L LED TUBE /SELF BALLAST
95	Biglerville Elementary School	1	Closet	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
96	Biglerville Elementary School	1	15	1,640	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
97	Biglerville Elementary School	1	13	1,640	6	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
98	Biglerville Elementary School	1	11	1,640	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
99	Biglerville Elementary School	1	10	1,000	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
100	Biglerville Elementary School	1	Foyer	3,200	10	1x4 Surface-Mounted Strip Fixture	2L 4' F28 T8 ELE N BALLAST	10	RETROFIT 4' 2L LED TUBE /SELF BALLAST
101	Biglerville Elementary School	1	201 cafeteria se	3,200	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
102	Biglerville Elementary School	1	Restroom	3,200	1	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
103	Biglerville Elementary School	1	Restroom	3,200	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
104	Biglerville Elementary School	1	Janitor	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
105	Biglerville Elementary School	1	Chemical storag	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
106	Biglerville Elementary School	1	Dish wash	3,200	5	1x4 Vapor-Proof Fixture	2L 4' F28 T8 ELE N BALLAST	5	RETROFIT 4' 2L LED TUBE /SELF BALLAST
107	Biglerville Elementary School	1	6 kitchen	3,200	19	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	19	RETROFIT 4' 2L LED TUBE /SELF BALLAST
108	Biglerville Elementary School	1	Food storage	1,000	4	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
109	Biglerville Elementary School	1	Kitchen office	3,200	1	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
110	Biglerville Elementary School	1	Table storage	1,000	6	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	6	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
111	Biglerville Elementary School	1	Gym	3,200	20	Highbay Fixture	2x4 3L T5	20	RETROFIT 4' 3L LED T5 / SELF BALLAST
112	Biglerville Elementary School	1	Stage	3,200	10	Track-Mounted Fixture	75 WATT INCAN FLOOD	10	RELAMP 17 WATT LED BR S/I
113	Biglerville Elementary School	1	Stage	3,200	2	Floodlight Fixture	250 WATT INCAN QUARTZ	2	NEW LED FLOOD 50 W
114	Biglerville Elementary School	1	Stage	3,200	2	Surface-Mounted Fixture	100 WATT INCAN FLOOD	2	RELAMP 15 WATT LED PAR 38 S/I
115	Biglerville Elementary School	1	Stage	3,200	4	1x4 Surface-Mounted Wrap Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
116	Biglerville Elementary School	1	Stage storage	1,000	4	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
117	Biglerville Elementary School	1	Stage stairs	8,760	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
118	Biglerville Elementary School	1	Gym office	3,000	3	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
119	Biglerville Elementary School	1	100	2,460	4	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
120	Biglerville Elementary School	1	107	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
121	Biglerville Elementary School	1	105	1,000	13	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	13	RETROFIT 4' 2L LED TUBE /SELF BALLAST
122	Biglerville Elementary School	1	103	1,000	6	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
123	Biglerville Elementary School	1	101	1,000	6	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
124	Biglerville Elementary School	1	104 boys	3,200	2	1x4 Pendant-Mounted Uplight/Downligh	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
125	Biglerville Elementary School	1	104 boys	3,200	1	Wall-Mounted Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
126	Biglerville Elementary School	1	106 girls	3,200	2	1x4 Pendant-Mounted Uplight/Downligh	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
127	Biglerville Elementary School	1	106 girls	3,200	1	Wall-Mounted Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
128	Biglerville Elementary School	1	402	1,640	12	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
129	Biglerville Elementary School	1	402	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
130	Biglerville Elementary School	1	400	1,640	12	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
131	Biglerville Elementary School	1	400	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
132	Biglerville Elementary School	1	405	1,640	12	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
133	Biglerville Elementary School	1	405	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
134	Biglerville Elementary School	1	403	1,640	12	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
135	Biglerville Elementary School	1	403	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
136	Biglerville Elementary School	1	401 classroom	2,000	12	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
137	Biglerville Elementary School	1	Closet	800	1	2x2 Surface-Mounted Box Fixture	2L 4' F32 U TUBE T8 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST/REFL
138	Biglerville Elementary School	1	Restroom	3,200	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
139	Biglerville Elementary School	1	Restroom	3,200	1	Vanity Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
140	Biglerville Elementary School	1	Staff restroom	3,200	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
141	Biglerville Elementary School	1	Staff restroom	3,200	1	Vanity Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
142	Biglerville Elementary School	1	30 workroom	3,000	6	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
143	Biglerville Elementary School	1	32	1,000	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
144	Biglerville Elementary School	1	34	1,640	6	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
145	Biglerville Elementary School	1	36	1,640	7	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	7	RETROFIT 4' 2L LED TUBE /SELF BALLAST
146	Biglerville Elementary School	1	38	1,640	12	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST

147	Biglerville Elementary School	1	Restroom	3,200	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
148	Biglerville Elementary School	1	Restroom	3,200	1	Vanity Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
149	Biglerville Elementary School	1	42 44	1,640	18	2x4 Surface-Mounted Box Fixture	4L 4' F32 T8 ELE N BALLAST	18	RETROFIT 4' 4L LED TUBE /SELF BALLAST
150	Biglerville Elementary School	1	46	1,640	9	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 2L LED TUBE /SELF BALLAST
151	Biglerville Elementary School	1	48	1,640	10	2x4 Surface-Mounted Box Fixture	2L 4' F28 T8 ELE N BALLAST	10	RETROFIT 4' 2L LED TUBE /SELF BALLAST
152	Biglerville Elementary School	1	50	1,640	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
153	Biglerville Elementary School	1	50	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
154	Biglerville Elementary School	1	Closet	800	1	Wall-Mounted Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
155	Biglerville Elementary School	1	52	1,640	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
156	Biglerville Elementary School	1	52	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
158	Biglerville Elementary School	1	Boys	3,200	3	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
159	Biglerville Elementary School	1	Boys	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
160	Biglerville Elementary School	1	Girls	3,200	3	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
161	Biglerville Elementary School	1	Girls	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
162	Biglerville Elementary School	1	Restroom hallw	3,200	3	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW	3	RELAMP LED 5W PL GX23 BASE BYPASS BALLAST
163	Biglerville Elementary School	1	54	1,640	15	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 3L LED TUBE /SELF BALLAST
164	Biglerville Elementary School	1	51	1,640	15	2x4 Recessed Lens Fixture	3L 4' F28 T8 ELE N BALLAST	15	RETROFIT 4' 3L LED TUBE /SELF BALLAST
165	Biglerville Elementary School	1	51	2,000	1	1x4 Surface-Mounted Strip Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
166	Biglerville Elementary School	1	Storage room	1,000	9	1x4 Industrial Fixture	2L 4' F28 T8 ELE N BALLAST	9	RETROFIT 4' 2L LED TUBE /SELF BALLAST
167	Biglerville Elementary School	1	49	2,000	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
168	Biglerville Elementary School	1	49	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
169	Biglerville Elementary School	1	Closet	800	1	Wall-Mounted Fixture	2L 2' F17 ELE N BALLAST	1	RETROFIT 2' 2L LED TUBE /SELF BALLAST
170	Biglerville Elementary School	1	47	2,000	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
171	Biglerville Elementary School	1	47	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
173	Biglerville Elementary School	1	45	1,640	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
174	Biglerville Elementary School	1	Closet	800	1	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
175	Biglerville Elementary School	1	Janitor	656	2	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
176	Biglerville Elementary School	1	Janitor	800	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
177	Biglerville Elementary School	1	Staff restroom	3,200	1	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	1	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
178	Biglerville Elementary School	1	39 37	1,640	6	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
179	Biglerville Elementary School	1	35	1,640	4	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
180	Biglerville Elementary School	1	33	1,640	14	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	14	RETROFIT 4' 2L LED TUBE /SELF BALLAST
181	Biglerville Elementary School	1	31	1,640	14	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	14	RETROFIT 4' 2L LED TUBE /SELF BALLAST
182	Biglerville Elementary School	1	501	1,640	11	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	11	RETROFIT 4' 2L LED TUBE /SELF BALLAST
183	Biglerville Elementary School	1	501	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
184	Biglerville Elementary School	1	503	2,000	11	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	11	RETROFIT 4' 2L LED TUBE /SELF BALLAST
185	Biglerville Elementary School	1	503	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
186	Biglerville Elementary School	1	505	1,640	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
187	Biglerville Elementary School	1	508	1,640	13	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	13	RETROFIT 4' 2L LED TUBE /SELF BALLAST
188	Biglerville Elementary School	1	506	1,640	12	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
189	Biglerville Elementary School	1	506	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
190	Biglerville Elementary School	1	504	1,640	11	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	11	RETROFIT 4' 2L LED TUBE /SELF BALLAST
191	Biglerville Elementary School	1	504	2,000	2	High Hat Fixture 8"	COMPACT FLUORESCENT 13W HW (2)	2	RELAMP LED 5W PL GX23 BASE (2) BYPASS BALLAST
192	Biglerville Elementary School	1	Girls	3,200	3	1x4 Pendant-Mounted Uplight/Downligh	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
193	Biglerville Elementary School	1	Girls	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
194	Biglerville Elementary School	1	Boys	3,200	3	1x4 Pendant-Mounted Uplight/Downligh	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
195	Biglerville Elementary School	1	Boys	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
196	Biglerville Elementary School	1	309	1,640	3	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
197	Biglerville Elementary School	1	307	1,640	6	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
198	Biglerville Elementary School	1	305	1,640	6	2x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
199	Biglerville Elementary School	1	303	1,640	6	2x4 Deep-Cell Parabolic Fixture	2L 4' F28 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
200	Biglerville Elementary School	1	19	1,000	3	1x4 Recessed Lens Fixture	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
206	Biglerville Elementary School	1	Boys apple blos	3,200	2	1x4 Pendant-Mounted Uplight/Downligh	2L 4' F28 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
207	Biglerville Elementary School	1	Boys apple blos	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
208	Biglerville Elementary School	1	Girls	3,200	3	1x4 Pendant-Mounted Uplight/Downligh	2L 4' F28 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
208	Biglerville Elementary School	1	Girls	3,200	1	Vanity Fixture	2L 4' F28 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
209	Biglerville Elementary School	EXT	Main entrance	4,380	5	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	5	4 PIN LED RETROFIT LAMP BYPASS BALLAST
210	Biglerville Elementary School	EXT	Front walkway s	4,380	10	Shoebox Fixture	150 WATT HPS SHOEBOX	10	NEW LED AREA LIGHT 55 W FIXED ARM
211	Biglerville Elementary School	EXT	Ground flag floo	4,380	2	Floodlight Fixture	175 WATT MH FLOOD	2	NEW LED FLOOD 20 W
212	Biglerville Elementary School	EXT	Front small wall	4,380	2	Wallpack Fixture	COMPACT FLUORESCENT 13W HW	2	RELAMP LED 5W PL GX23 BASE BYPASS BALLAST
213	Biglerville Elementary School	EXT	Front drive pole	4,380	6	Shoebox Fixture	250 WATT HPS SHOEBOX	6	NEW LED AREA LIGHT 70 W FIXED ARM
214	Biglerville Elementary School	EXT	Left side lot	4,380	4	Shoebox Fixture	250 WATT HPS SHOEBOX	4	NEW LED AREA LIGHT 70 W FIXED ARM

215	Biglerville Elementary School	EXT	Left side small	4,380	3	Shoebox Fixture	150 WATT HPS SHOEBOX	3	NEW LED AREA LIGHT 55 W FIXED ARM
216	Biglerville Elementary School	EXT	Left wall small	4,380	7	Wallpack Fixture	COMPACT FLUORESCENT 13W HW	7	RELAMP LED 5W PL GX23 BASE BYPASS BALLAST
217	Biglerville Elementary School	EXT	Door 9 recesse	4,380	1	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	1	4 PIN LED RETROFIT LAMP BYPASS BALLAST
218	Biglerville Elementary School	EXT	Door 10 recess	4,380	3	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	3	4 PIN LED RETROFIT LAMP BYPASS BALLAST
219	Biglerville Elementary School	EXT	Back wall small	4,380	2	Wallpack Fixture	COMPACT FLUORESCENT 13W HW	2	RELAMP LED 5W PL GX23 BASE BYPASS BALLAST
220	Biglerville Elementary School	EXT	Door 12 recess	4,380	1	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	1	4 PIN LED RETROFIT LAMP BYPASS BALLAST
221	Biglerville Elementary School	EXT	Door 11 recess	4,380	1	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	1	4 PIN LED RETROFIT LAMP BYPASS BALLAST
222	Biglerville Elementary School	EXT	Door 13 recess	4,380	1	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	1	4 PIN LED RETROFIT LAMP BYPASS BALLAST
223	Biglerville Elementary School	EXT	Back walls by p	4,380	6	Wallpack Fixture	COMPACT FLUORESCENT 13W HW	6	RELAMP LED 5W PL GX23 BASE BYPASS BALLAST
224	Biglerville Elementary School	EXT	Door 16 recess	4,380	1	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	1	4 PIN LED RETROFIT LAMP BYPASS BALLAST
225	Biglerville Elementary School	EXT	Door 18	4,380	1	1x1 Recessed Lens Fixture	COMPACT FLUORESCENT 26W HW	1	4 PIN LED RETROFIT LAMP BYPASS BALLAST
	Total: Biglerville Elementary School				1,205			1,205	
	[illegible]								
1	Arendtsville Elementary School	1	Vestibule	3,200	4	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
2	Arendtsville Elementary School	1	Mechanical Roc	1,000	6	1x4 Industrial Fixture	2L 4' F32 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
3	Arendtsville Elementary School	1	Hallway	3,200	55	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	55	RETROFIT 4' 2L LED TUBE /SELF BALLAST
4	Arendtsville Elementary School	1	211	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
5	Arendtsville Elementary School	1	210	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
6	Arendtsville Elementary School	1	209	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
7	Arendtsville Elementary School	1	207	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
8	Arendtsville Elementary School	1	208	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
9	Arendtsville Elementary School	1	206	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
10	Arendtsville Elementary School	1	205	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
11	Arendtsville Elementary School	1	204	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
12	Arendtsville Elementary School	1	203	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
13	Arendtsville Elementary School	1	Boys Restroom	3,200	3	1x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
14	Arendtsville Elementary School	1	Girls Restroom	3,200	3	1x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
15	Arendtsville Elementary School	1	Hallway	3,200	3	High Hat Fixture 6"	100 WATT INCANDESCENT	3	RELAMP 11 WATT LED BR S/I
16	Arendtsville Elementary School	1	Mens Restroom	3,200	2	1x2 Vanity Fixture	COMPACT FLUORESCENT 23W S/I	2	RELAMP 9 WATT LED A LAMP S/I
17	Arendtsville Elementary School	1	Womens Restro	3,200	2	1x2 Vanity Fixture	COMPACT FLUORESCENT 23W S/I	2	RELAMP 9 WATT LED A LAMP S/I
18	Arendtsville Elementary School	1	Faculty Room	3,000	8	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	8	RETROFIT 4' 2L LED TUBE /SELF BALLAST
19	Arendtsville Elementary School	1	Hallway	3,200	1	High Hat Fixture 10"	100 WATT INCANDESCENT	1	RELAMP 11 WATT LED BR S/I
20	Arendtsville Elementary School	1	Library 201	2,000	30	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	30	RETROFIT 4' 2L LED TUBE /SELF BALLAST
21	Arendtsville Elementary School	1	Server Room S	800	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
22	Arendtsville Elementary School	1	106	2,000	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
23	Arendtsville Elementary School	1	Library Office	3,000	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
24	Arendtsville Elementary School	1	Art Room	2,000	13	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	13	RETROFIT 4' 2L LED TUBE /SELF BALLAST
25	Arendtsville Elementary School	1	Art Storage	2,000	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
26	Arendtsville Elementary School	1	Kiln	800	1	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
27	Arendtsville Elementary School	1	Art/Music Stora	800	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
28	Arendtsville Elementary School	1	Storage	1,000	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
29	Arendtsville Elementary School	1	Practice Room	2,000	1	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
30	Arendtsville Elementary School	1	Custodian C2	800	1	Jelly Jar Fixture	100 WATT INCANDESCENT	1	RELAMP 15 WATT LED A LAMP S/I
31	Arendtsville Elementary School	1	Music Room 11	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
32	Arendtsville Elementary School	1	Music Storage	1,000	1	Jelly Jar Fixture	COMPACT FLUORESCENT 23W S/I	1	RELAMP 9 WATT LED A LAMP S/I
33	Arendtsville Elementary School	1	112	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
34	Arendtsville Elementary School	1	111	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
35	Arendtsville Elementary School	1	110	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
36	Arendtsville Elementary School	1	109	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
37	Arendtsville Elementary School	1	Computer Lab 1	2,000	6	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
38	Arendtsville Elementary School	1	107	2,000	12	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	12	RETROFIT 4' 2L LED TUBE /SELF BALLAST
39	Arendtsville Elementary School	1	105	2,000	8	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	8	RETROFIT 4' 2L LED TUBE /SELF BALLAST
40	Arendtsville Elementary School	1	Guidance 104	3,000	4	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
41	Arendtsville Elementary School	1	Conference Roc	3,000	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
42	Arendtsville Elementary School	1	Nurse	3,000	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
43	Arendtsville Elementary School	1	Nurse Exam	3,000	3	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
44	Arendtsville Elementary School	1	Nurse beds	3,000	2	1x4 Vanity Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
45	Arendtsville Elementary School	1	Nurse beds	3,000	1	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
46	Arendtsville Elementary School	1	Nurse Restroon	3,000	2	1x2 Vanity Fixture	COMPACT FLUORESCENT 23W S/I	2	RELAMP 9 WATT LED A LAMP S/I
47	Arendtsville Elementary School	1	Main Office	3,000	6	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	6	RETROFIT 4' 2L LED TUBE /SELF BALLAST
48	Arendtsville Elementary School	1	Principals Offic	3,000	4	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
49	Arendtsville Elementary School	1	Boys Restroom	3,200	3	1x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST

50	Arendtsville Elementary School	1	Girls Restroom	3,200	3	1x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	3	RETROFIT 4' 2L LED TUBE /SELF BALLAST
51	Arendtsville Elementary School	1	Girls Restroom	3,200	1	1x4 Surface-Mounted Wrap Fixture	2L 4' F32 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
52	Arendtsville Elementary School	1	Custodian	800	1	Jelly Jar Fixture	100 WATT INCANDESCENT	1	RELAMP 15 WATT LED A LAMP S/I
53	Arendtsville Elementary School	1	Storage	1,000	2	1x4 Industrial Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
54	Arendtsville Elementary School	1	Guidance 301	3,000	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
55	Arendtsville Elementary School	1	Gym 303	3,200	18	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	18	RETROFIT 4' 2L LED TUBE /SELF BALLAST
56	Arendtsville Elementary School	1	Gym Storage S	1,000	4	1x4 Industrial Fixture	2L 4' F32 T8 ELE N BALLAST	4	RETROFIT 4' 2L LED TUBE /SELF BALLAST
57	Arendtsville Elementary School	1	Stage Storage	1,000	2	1x4 Industrial Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
58	Arendtsville Elementary School	1	Stage	2,000	1	1x4 Industrial Fixture	2L 4' F32 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
59	Arendtsville Elementary School	1	Stage	2,000	3	Cobra-Head Pole Mounted Fixture	100 WATT INCANDESCENT	3	RELAMP 15 WATT LED A LAMP S/I
60	Arendtsville Elementary School	1	Stage	2,000	3	Pendant Fixture	COMPACT FLUORESCENT 45W S/I	3	RELAMP 15 WATT LED A LAMP S/I
61	Arendtsville Elementary School	1	Stage	2,000	3	Lowbay Fixture	100 WATT INCANDESCENT	3	RELAMP 15 WATT LED A LAMP S/I
62	Arendtsville Elementary School	1	Café Storage	1,000	2	1x4 Surface-Mounted Wrap Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
63	Arendtsville Elementary School	1	Kitchen 304	3,200	13	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	13	RETROFIT 4' 2L LED TUBE /SELF BALLAST
64	Arendtsville Elementary School	1	Kitchen Office	3,200	1	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
65	Arendtsville Elementary School	1	Kitchen Restroc	3,200	1	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	1	RETROFIT 4' 2L LED TUBE /SELF BALLAST
66	Arendtsville Elementary School	1	Kitchen Sink	3,200	2	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
67	Arendtsville Elementary School	1	Cafeteria 305	3,200	17	2x4 Recessed Lens Fixture	2L 4' F32 T8 ELE N BALLAST	17	RETROFIT 4' 2L LED TUBE /SELF BALLAST
68	Arendtsville Elementary School	1	S305	3,200	2	1x4 Industrial Fixture	2L 4' F32 T8 ELE N BALLAST	2	RETROFIT 4' 2L LED TUBE /SELF BALLAST
69	Arendtsville Elementary School	B	Basement	1,000	8	1x4 Industrial Fixture	2L 4' F32 T8 ELE N BALLAST	8	RETROFIT 4' 2L LED TUBE /SELF BALLAST
70	Arendtsville Elementary School	B	Basement Step	8,760	2	Wallpack Fixture	100 WATT INCANDESCENT	2	RELAMP 15 WATT LED A LAMP S/I
71	Arendtsville Elementary School	B	Basement Step	8,760	2	Decorative Fixture	COMPACT FLUORESCENT 23W S/I	2	RELAMP 9 WATT LED A LAMP S/I
72	Arendtsville Elementary School	EXT	Front canopy s	4,380	5	Surface-Mounted Fixture	COMPACT FLUORESCENT 26W HW	5	NO CHANGE
73	Arendtsville Elementary School	EXT	Ground flag flo	4,380	2	Floodlight Fixture	175 WATT MH FLOOD	2	NEW LED FLOOD 20 W
74	Arendtsville Elementary School	EXT	Wall flood led	4,380	1	Floodlight Fixture	EXISTING LED FIXTURE	1	NO CHANGE
75	Arendtsville Elementary School	EXT	Left wall small v	4,380	10	Wallpack Fixture	COMPACT FLUORESCENT 13W HW	10	NO CHANGE
76	Arendtsville Elementary School	EXT	Lot poles	4,380	5	Shoebox Fixture	250 WATT MH SHOEBOX	5	NEW LED AREA LIGHT 70 W FIXED ARM
77	Arendtsville Elementary School	EXT	Back wall small	4,380	5	Wallpack Fixture	COMPACT FLUORESCENT 13W HW	5	NO CHANGE
78	Arendtsville Elementary School	EXT	Back surface m	4,380	3	Surface-Mounted Fixture	COMPACT FLUORESCENT 26W HW	3	NO CHANGE
79	Arendtsville Elementary School	EXT	Corner wall pac	4,380	1	Wallpack Fixture	50 WATT HPS WALLPACK	1	NEW LED WALL PACK 26 W
	Total: Arendtsville Elementary School				**494**			**494**	

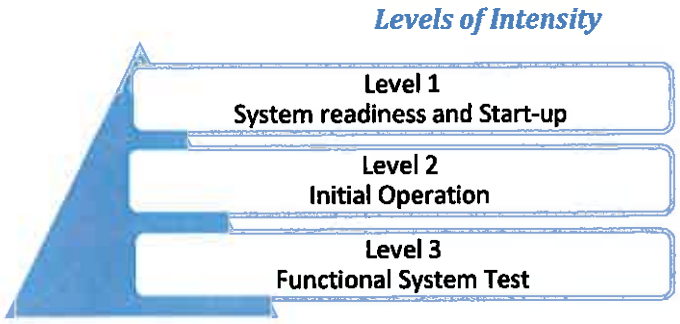
Attachment C – Commissioning Plan

Commissioning Methodology

The following sample table shows an ECM and the proposed level of commissioning. Once the final list of all ECM's is developed this table will be updated.

ECM Number	ECM Title	Level of Commissioning
1	District Wide LED Lighting Upgrades	Level 1
2	District Wide Building Envelope Upgrades	Level 1
3	District Wide Mechanical Insulation Upgrades	Level 1
4	District Wide Transformer Upgrades	Level 1
5	Biglerville High School/Middle School HVAC Upgrades	Level 3
6	Biglerville Elementary School HVAC Upgrades	Level 3
7	Biglerville Elementary School Window Replacements	Level 1
8	Biglerville Elementary School Gutter and Roof Upgrades	Level 1
9	Arendtsville Elementary School HVAC Upgrades	Level 3
10	District Wide Generator Upgrades	Level 2

Commissioning Levels



Proposed Energy Conservation Measures (ECMs) can vary greatly in size, scope and complexity. Systems can be of a critical or highly specialized nature or can be as simple as plugging in a new specialized control. Because of this potential for variance, McClure Company will employ three different levels of commissioning intensity.

Level 1 - System Readiness and Startup

The McClure Company project manager, commissioning supervisor, and appropriate subcontractor should perform Level 1 Commissioning during the construction and acceptance phases of the project. This level basically involves a visual inspection of the installation.

The contractor performs all required tasks. The Commissioning supervisor documents the installation. On example of an ECM specific to this project that level 1 commissioning is appropriate is the Lighting Upgrade.

Level 1 commissioning is intended to:

- Ensure that the contractor meets basic contractual requirements to produce a complete installation, in accordance with the contract documents.
- Help the contractor plan, organize, and coordinate that part of his/her work related to completing the

installation and getting equipment and systems ready to start properly, safely, and on schedule.

- Identify problems that may arise and provide a mechanism for problem resolution by the responsible parties, with necessary follow-up.
- Provide documentation showing that system installation is in accordance with requirements.

Level 2 - Initial Operation

Level 2 commissioning requires the pre-start up testing of the various systems. The commissioning supervisor along with the appropriate subcontractor conducts systems tests to ensure system condition and capacities.

Level 2 commissioning is proper level of commissioning for an ECM that acts as an independent system and is not a component of a larger integrated system. An example of an independent system for projects is a steam and condensate replacement. While the replacement of the steam and condensate system will have an impact on energy savings, the replacement of the steam and condensate system once it has been pressure tested and no longer leaks, will not have an impact on heating systems. This project will involve level 2 commissioning.

Level 2 commissioning is intended to include comprehensive pre-start up checks and tests, and to:

- Ensure that the contractor meets basic contractual requirements to produce a fully functioning installation in accordance with the contract documents.
- Ensure that system operations are checked, and that specified performance is achieved in all respects. This is where McClure Company's approach of using the service of an independent commissioning supervisor really adds value.
- Provide documentation showing that system operation is in accordance with requirements.
- Ensure that the contractor is able to operate the equipment and systems and can demonstrate system performance according to contract requirements.
- Provide a framework for giving training demonstrations in proper systems operation to the Client(s), and for providing maintenance instructions and recommendations for the completed system.

Level 3 - Functional System Test

Level 3 commissioning is the most detailed and exhaustive application of the commissioning process.

Level 3 is the required level of commissioning when the individual components of the system are integrated into a control system. An example of a system specific to this project that will require level 3 commissioning is ECM 5 which will tie into existing building systems.

Level 3 commissioning is intended to:

- Ensure that systems operation, including all control sequences, is adequately checked and that functional performance, as specified by the requirements, is achieved in all respects.
- Provide documentation that reflects system operation in accordance with requirements.
- Ensure that the contractor is able to operate the equipment and systems and demonstrate system performance and functionality (according to contract requirements), to the client(s).
- Provide a framework for giving training in proper systems operation to the clients(s), and for providing maintenance instructions and recommendations for the completed system.

Sample Commissioning Reports

McClure Company
4101 North Sixth Street
P. O. Box 1579
Harrisburg, PA 17105-1579
Tel. 717.232.9743
Fax 717.236.5239
24-hr. Svc. 717.233.6431
www.mcclureco.com

HVAC Start-Up Sheet

Job Name		Unit No.	
Job No.		Mfr.	
Date		Model No.	
		Serial No.	

Evaporator / Fan Section	Cooling	Heating
Entering Air/Water Temp.	Cool	Heat
Leaving Air/Water Temp.	Cool	Heat
Supply Fan Amps	Nameplate / Actual	L1 / L2 / L3
Return Fan Amps	Nameplate / Actual	L1 / L2 / L3
Lube Motor/Drive		
Belt Adjust		
Belt Replace		
Filter Inspect		
Filter Replace/Clean		
Check Electrical Connections		
Economizer Operation		
Set Points		
Filter Sizes		
Belt Sizes		
Compressor Section		
Discharge Pressure Per Circuit	Cool 1 / 2 / 3	3 1 / 2 / 3
Suction Pressure Per Circuit	Cool 1 / 2 / 3	3 1 / 2 / 3
Check Crankcase Heater		
Oil Level/Pressure		
Amps/1. L1 / L2 / L3	2 L1 / L2 / L3	3 L1 / L2 / L3
Volts/ 1. L1 / L2 / L3	2 L1 / L2 / L3	3 L1 / L2 / L3
Sight Glass Clear ?		
HI Press Cycle CI/CO		
LO Press Cycle CI/CO		
Superheat/Circuit	1 / 2 / 3	
Sub Cooling/Circuit	1 / 2 / 3	
Liquid Line Temp/Circuit	1 / 2 / 3	
Suction Line Temp/Circuit	1 / 2 / 3	
Condenser		
Volts	Nameplate / Actual	L1 / L2 / L3
Fan/Amps	Nameplate / Actual	L1 / L2 / L3
Belt Adjust		
Belt Replace		
Belt Sizes		
Lube Motor/Drive		
Entering Air/Water Temp.		
Leaving Air/Water Temp.		

McClure Company
4101 North Sixth Street
P. O. Box 1579
Harrisburg, PA 17105-1579
Tel. 717.232.9743
Fax 717.236.5239
24-hr. Svc. 717.233.6431
www.mcclureco.com

HVAC Start-Up Sheet

Job Name	0	Unit No.	0
Job No.	0	Mfr.	0
Date	0	Model No.	0
		Serial No.	0

Heating Section / Electric Heat	Cooling				Heating					
Volts	Nameplate		Actual		L1		L2		L3	
Amps/Stage	Nameplate		Actual		L1		L2		L3	
Stage 1			Actual		L1		L2		L3	
Stage 2			Actual		L1		L2		L3	
Stage 3			Actual		L1		L2		L3	
Check Electrical Connections										
Gas Heat										
Line Pressure Inches WC	Nameplate		Actual							
Manifold Pressure Inches WC	Nameplate		Actual							
Cooling Tower										
Fan Amps	Nameplate		Actual							
Pump Amps	Nameplate		Actual							
Sump Heater Amps	Nameplate		Actual							
Check Water Level										
Check Damper Operation										
Check Bleed Off										
Belt Sizes										

Field Notes / Additional Information
CRANK CASE HEATER 138A00
TWO COMPRESSOR
THREE CONDENSER FANS

McClure Company

System Ready to Start-up
Check List

Date _____ Date Req'd _____
Project Manager _____
Foreman to Contact _____
Owner to Contact _____
Address _____

Construction Job # _____
Service Job # _____
Job Phone # _____
Special Instructions _____

CHILLERS	Ready Yes	No	N/A	Air Handlers / Rooftop Units / ERU	Ready Yes	No	N/A
Equip Tag:				Equip Tag:			
Unit set and secured in correct location				Shipping blocks & Hardware Removed			
Unit set level				Unit set and secured in correct location			
Air clearances adequate				Unit set level			
Service clearances around unit sufficient				Service clearances around unit sufficient			
Any visible damage				Any visible damage			
Any apparent Oil or Refrigerant leaks				Any apparent Oil or Refrigerant leaks			
Flow Switch installed				Sealed between unit & roof curb			
Temp or DP switch installed				Duct work completed			
System filled and air purged (glycol)				Filter installed correctly			
Pumps started (CHW or Condenser)				Condensate Piping complete			
Electrical Complete				Gas Piping complete			
Control wiring Completed				Gas Regulator & Valves installed			
Control Valves operable				Vibration Isolators (in free state)			
Will we have a building load				Electrical Complete			
Disconnect switch installed				Control wiring Completed			
Correct fuse installed				Disconnect switch installed			
Vibration Isolators (in free state)				Correct fuse installed			
Suction Pipe Insulated				Belts on site			
All components installed (hot gas bypass, expansion valves, solenoid valves, sight glass, driers, etc.				Economizers installed and wired			
Piping leak checked				O & M Manual on site			
Chilled Water piping insulated				Submittals on site			
O & M Manual on site				Accessories on site (in dry area)			
Submittals on site				Is there factory start-up included			
Is Relief Valves & PRV Piped to Exterior							
Flush Piping only, not chiller							
Strainer installed at chiller							
Refrigerant Monitor installed complete							
Heat Trace required							
Is there factory start-up included							

COMMISSIONING PLAN
FUNCTIONAL PERFORMANCE TESTS

Project Name
Town, PA

4101 North Sixth Street
Harrisburg, PA 17110
717-232-9743
717-236-5239 fax

McClure Company is recognized for quality work in many technical construction market segments. Our approach is designed to deliver unexpected service at every level of the organization as it relates to specific projects, to not only meet installation standards, but also to maximize completion, budget, and quality that exceeds your expectations. Our participation in the following organizations helps to advance our standards.

MCAA

The American Society of Mechanical Engineers

Mechanical Service Contractors of Am MSCA

NATIONAL CERTIFIED PIPE WELDING BUREAU

TABB

TESTING, ADJUSTING AND BALANCING BUREAU

THE PROFESSIONAL'S CHOICE

SMACNA CONTRACTOR

BCA Building Commissioning Association

FUNCTIONAL PERFORMANCE TESTS

Two Pipe Unit Ventilators
UV-2 Room No. 012 CAFETERIA

Tests:	Yes	No
The UV is indexed to occupied/un-occupied by the time of day schedule 6:00AM to 6:00PM Monday through Friday:	X	
The discharge air temperature is limited to 120°F:	X	
In the heating warm-up mode the fan is energized and the coil valve is 100% open:	X	
When the occupied space temperature is achieved the hot water coil valve modulates closed:	X	
The warm-up sequence includes an optimal start time:	X	
Whenever the UV is in the occupied mode the fan runs continuously:	X	
When the mechanical plant is in the heating mode and upon a fall in space temperature 1°F below set point the dual temperature coil valve modulates open:	X	
When the mechanical plant is in the heating mode and upon a rise in space temperature 1°F above set point the dual temperature coil valve modulates closed :	X	
When the mechanical plant is in the cooling mode and upon a fall in space temperature 1°F below set point the dual temperature coil valve modulates closed: :	X	
When the mechanical plant is in the cooling mode and upon a rise in space temperature 1°F above set point the dual temperature coil valve modulates open :	X	
The wall mounted thermostat is calibrated, actual 68°F@ thermostat, BAS reading 68.5°F:	X	
When indexed to the dual temperature coil valve is 100% open:	X	
In the heating unoccupied mode, the UV fan is cycled to maintain space temperature set point 55°	X	
In the cooling unoccupied mode the valve is closed an the fan is off:	X	
A global signal is sent to the UV when the central system is in the heating or cooling mode	X	

Two Pipe Unit Ventilators w/ DX Cooling
UV-30 Room No.

Tests:	Yes	No
The UV-30 is indexed to occupied/un-occupied by the time of day schedule 6:00AM to 6:00PM Monday through Friday:	X	
The discharge air temperature is limited to 120°F:	X	
In the heating warm-up mode, the fan is energized and the coil valve is 100% open:	X	
The outdoor air damper is 100% closed:	X	
When the occupied space temperature is achieved the hot water coil valve modulates closed:	X	
The warm-up sequence includes an optimal start time:	X	

Whenever the UV is in the occupied mode the fan runs continuously:	X	
The outdoor air damper opens to the minimum position of 20%:	X	
When the mechanical plant is in the heating mode and upon a fall in space temperature 1°F below set point the dual temperature coil valves modulates open:	X	
When the mechanical plant is in the heating mode and upon a rise in space temperature 1°F above set point the dual temperature coil valves modulates closed and the mechanical cooling is enabled:	X	
When the mechanical plant is in the cooling mode and upon a rise in space temperature 1°F above set point the dual temperature coil valves modulates open:	X	
Tests:	**Yes**	**No**
The wall mounted thermostat is calibrated; actual 68°F@ thermostat, BAS reading 68°F:	X	
When indexed to the unoccupied mode and the mechanical plant is the heating mode, the dual temperature coil valve is 100% open:	X	
In the heating unoccupied mode, the UV fan is cycled to maintain space temperature set point 55°	X	
In the cooling unoccupied mode, the UV valve is closed and the fan is off:	X	
A global signal is sent to the UV when the mechanical plant system is in the heating or cooling mode	X	

Existing Air Handling Units

AH-2 Gymnasium

Tests:	Yes	No
The unit is indexed to occupied/un-occupied by the time of day schedule 6:00AM to 6:00PM Monday through Friday:	X	

Warm-up Mode

Tests:	Yes	No
The supply fan is energized, and the outside air damper is closed:	X	
The hot water coil valve is open:	X	
When the warm-up temperature is achieved the outdoor air damper remains closed but the hot water valve modulates to maintain temperature set point:	X	
The warm-up sequence includes an optimal start time:	X	

Occupied Mode

Tests:	Yes	No
The supply fan is energized and runs continuously:	X	
The outdoor air damper opens to the reduced minimum position:	X	
When the mechanical plant is in the heating mode and upon a fall in space temperature 1°F below set point the coil valves modulates open:	X	
When the mechanical plant is in the heating mode and upon a rise in space temperature 1°F above set point the coil valve modulates closed:	X	
Upon a continued rise in space temperature the unit is indexed to the economizer mode of operation:	X	

The mixed air controller overrides the outdoor damper to the mixed air temperature from falling below the 50°F set point:	X	
If economizer is not available and the space temperature rises above set point the mechanical cooling is enabled:	X	
When the CO2 level in the space is above 1,200 ppm the outdoor air damper modulates open to the design minimum position:	X	
The CO2 sequence operates only in the occupied made and when the supply fan is energized:	X	
The mixed air temperature act as a low limit:	X	

Safeties and alarms

Tests:	Yes	No
When the supply fan fails an alarm is generated @ the operator work station:	X	
When the discharge air temperature is below 40°F an alarm is generated @ the operator work station:	X	
Upon smoke detection the supply and exhaust fans shut down and an alarm is generated @ the operator work station	X	
When the low limit safety switch mounted on the leaving side of the hot water reheat coil trips @ 38°F, the supply fan shuts down and the outdoor air damper closes:	X	

New Air Handling Unit
AH-1 Library

Tests:	Yes	No
The unit is indexed to occupied/un-occupied by the time of day schedule 6:00AM to 6:00PM Monday through Friday:	X	

Warm-up Mode

Tests:	Yes	No
The supply fan is energized, and the outside air damper is closed:	X	
The dual temperature coil valve is open:	X	
When the warm-up temperature set point 70°F is achieved the outdoor air damper remains closed but the dual temperature valve modulates to maintain temperature set point:	X	
The warm-up sequence includes an optimal start time:	X	
When the mechanical plant is in cooling mode the duct mounted electric reheat coil replaces the AHU coil:	X	
When the mechanical plant is in cooling mode the dual temperature coil is in by-pass:	X	
The warm-up sequence includes an optimal start time:	X	

Occupied Mode

Tests:	Yes	No
The supply fan is energized and runs continuously:	X	
The outdoor air damper opens to the minimum position:	X	
Following test with the Mechanical Plant in Cooling Mode		

When the mechanical plant is in the cooling mode and upon a fall in space temperature 1°F below set point the coil valves modulates closed:	X	
When the mechanical plant is in the cooling mode and upon a continued fall in space temperature 1°F below set point the 1st stage of electric heat is energized:	X	
When the space temperature stays below the set point the 2nd stage of electric heat is energized:	X	
Upon a rise in space humidity above 58% RH the chilled water valve opens:	X	
If the discharge air temperature or space temperature fall below set point the 1st stage of electric heat is energized:	X	
When the discharge air temperature or space temperature stay below the set point the 2nd stage of electric heat is energized:	X	
When the space humidity falls below set point the unit returns to normal operation:	X	
The mixed air controller overrides the outdoor damper to the mixed air temperature from falling below the 50°F set point:	X	

Unoccupied Mode

Tests:	Yes	No
The supply fan is off:	X	
The outside air damper is closed:	X	
The dual temperature coil valve is closed:	X	
When the space temperature falls below 55°F set point the fan is on and the dual temperature coil valve modulates to maintain space temperature set point:	X	
When the Mechanical Plant is in cooling mode the electric coil is enabled upon a fall in space temperature:	X	
When the space humidity is above set point 58% RH and chilled water is available the coil valve opens:	X	
If the space temperature or discharge air temperature falls below set point and the Mechanical Plant is in cooling mode, the 1st stage of electric heat is energized:	X	

Occupied Mode with the Mechanical Plant in Heating Mode

Tests:	Yes	No
The supply fan is energized and runs continuously:	X	
Upon a rise in space temperature 1°F above set point the mechanical cooling is enabled:[1]	X	
Upon a continued rise in space temperature and a 50% call for cooling the 2nd stage of mechanical cooling is enabled:	X	
Upon a fall in space temperature 1°F below set point the dual temperature coil valve modulates open:	X	
If supply air temperature cannot be maintained with the valve 100% open the 1st stage of electric heat is enabled:	X	
Upon a rise in space humidity above 60% RH the 1st stage of mechanical cooling is enabled:	X	
If the discharge air temperature or space temperature fall below set point the dual temperature coil valve modulates open:	X	

[1] There is not an economizer mode for AH-1

If the discharge air temperature or space temperature continue to fall below set point the 1st stage of electric heat is energized:	X	
When the discharge air temperature or space temperature stay below the set point the 2nd stage of electric heat is energized:	X	
When the space humidity falls below set point the unit returns to normal operation:	X	
When the discharge air temperature or space temperature stay below the set point the 2nd stage of electric heat is energized:	X	
With the mechanical plant in heating mode and AH-1 in the unoccupied mode and a call for humidity control. The heating the hot water coil valve modulates open to maintain space or discharge air temperature:	X	

Safeties and alarms

Tests:	Yes	No
When the supply fan fails an alarm is generated @ the operator work station:	X	
When the discharge air temperature is below40°F an alarm is generated @ the operator work station:	X	
Upon smoke detection the supply and exhaust fans shut down and an alarm is generated @ the operator work station	X	
When the low limit safety switch mounted on the leaving side of the hot water reheat coil trips @ 38°F, the supply fan shuts down and the outdoor air damper closes:	X	
When compressor #1 fails an alarm is generated @ the operator work station:	X	
When compressor #2 fails an alarm is generated @ the operator work station:	X	
A high condensate alarm is generated @ the operator work station:	X	

OPERATOR'S WORKSTATION GRAPHICS

ENERGY RECOVERY UNITS

Operator Adjustable - Commandable

Tests:	Yes	No
Unit START/STOP	X	
Space humidity set point	X	
Heat Wheel On/Off	X	
O. A. heating set point	X	
R. A. cooling set point stage 1	X	
R. A. cooling set point stage 2	X	
Occupied/Unoccupied	X	
Humidity control On/Off	X	
Reheat control On/Off	X	

Alarms at the Workstation

Tests:	Yes	No
Supply fan failed	X	
Exhaust fan failed	X	
Heat wheel failed	X	
Low discharge air temperature	X	
Freeze stat	X	

Graphics only

Tests:	Yes	No
Heating enable	X	
Heating on/off	X	
Dehumidification on/off	X	
Cooling stages on/off	X	

MECHANICAL PLANT
Operator Adjustable - Commandable

Tests:	Yes	No
Pump P-1 Stop/Start	X	
Pump P-2 Stop/Start	X	
Boiler 1 Stop/Start	X	
Boiler 2 Stop/Start	X	
Dual temperature hot water supply temperature	X	

Alarms at the Workstation

Tests:	Yes	No
P-1 failure	X	
P-2 failure	X	
Boiler #1 failure	X	
Boiler #2 failure	X	

Graphics only

Tests:	Yes	No
System return water temperature	X	
Outside air temperature	X	
Outside humidity	X	
Pump P-1 status	X	
Pump P-2 status	X	
Pump P-1 speed	X	
Pump P-2 speed	X	
Boiler 1 status	X	
Boiler 2 status	X	
Diverting valve V-1 status	X	
Isolation valve V-2 status	X	
Isolation valve V-3 status	X	
Switchover valve V-4 status	X	
Bypass valve V-5 status	X	
Hot water differential pressure	X	
Combustion damper status		

AIR HANDLING UNIT AC-1
Operator Adjustable - Commandable

Tests:	Yes	No
Space Humidity	X	
Space Temperature	X	
AC-1 stop/start	X	

Alarms at the Workstation

Tests:	Yes	No
Supply fan failure	X	
Freeze stat	X	
Smoke detector	X	
Low discharge air temperature	X	
Compressor #1 failed	X	
Compressor #2 failed	X	
High condensate	X	
Dirty filter	X	

Graphics only

Tests:	Yes	No
Electric Heat status	X	
DX cooling stage #1 status	X	
DX cooling stage #2 status	X	
Supply fan status	X	
Discharge air temperature	X	
Mixed air temperature	X	
Space relative humidity	X	
Space temperature	X	

Classroom Unit Ventilators

Operator Adjustable - Commandable

Tests:	Yes	No
Supply fan on/off	X	
Dual temperature water valve open/closed	X	
Space temperature set point	X	

Alarms at the Workstation

Tests:	Yes	No
Supply fan failed	X	
Freeze stat (UV-30 & 31) only	X	

Graphics only

Tests:	Yes	No
Supply fan status	X	
Space temperature	X	
Dual temperature valve position	X	
Outdoor air damper position (UV 30 & 31 only)	X	
DX enabled/disabled (UV-30 & 31 only)	X	