Fortuna Union High School District

REQUEST FOR QUALIFICATIONS
REQUEST FOR PROPOSALS

Proposition 39
HVAC, Fenestration, and Appliance Efficiency Projects

Date Issued:
October 26, 2018

Fortuna Union High School District Contact:

Glen Senestraro, Superintendent
Fortuna Union High School District
379 12th Street, Fortuna, CA 99540

Phone: (707) 725-4461
Fax: (707) 725-6085
Email: gsenestraro@fuhsdistrict.net

Project Manager Contact:

Patrick Owen, Project Manager
Redwood Coast Energy Authority
633 3rd Street, Eureka, CA 95501

Phone: (707) 269-1700, x 318
Fax: (707) 269-1777
Email: powen@redwoodenergy.org

Proposals are due on November 29, 2018 at 2:00 p.m.
Redwood Coast Energy Authority
633 Third Street
Eureka, CA 95501
Fax or Email Proposals Will Not Be Accepted

TABLE OF CONTENTS

Request for Qualifications and Request for Proposals

REQUEST FOR QUALIFICATIONS/ REQUEST FOR PROPOSALS

Energy Efficiency Improvements

Fortuna Union High School District (District)

INTRODUCTION

The Fortuna Union High School District (District) solicits proposals responsive to this Request for Qualifications/Request for Proposals from interested Energy Service Companies (ESCOs) to implement energy efficiency improvements for the District.

The expected work product is to design, and build identified capital improvement projects that will reduce the overall energy usage at the site and comply with the California Energy Commission's (CEC) Guidelines for use of Proposition 39 funding. A proposed schedule indicating the timeline for this solicitation is identified in **Appendix A: Proposed Project Schedule**. A mandatory pre-proposal site visit and question forum will be held on **November 7, 2018 from 2:30 to 4:00pm** – meet at the District Office (not the high school office on 12th street), located near the parking lot at the south end of 14th Street, Fortuna, CA. The site visit and forum are designed to increase the likelihood that respondents have the applicable and appropriate information necessary to deliver proposed solutions that meet the District's expressed needs.

OVERVIEW

This solicitation seeks proposals for identified capital improvement projects to be conducted on property owned by the District. While complying with the California Building Code, Division of the State Architect (DSA) requirements and California Energy Commission (CEC) guidelines for use of Proposition 39 funding, the expected work product will be to:

a) Remove twenty-nine (29) existing single-pane windows of various sizes, frame materials, and action types on the administration (A) building and install new energy-efficient windows;
b) Inspect, insulate, and repair ventilation ductwork at several locations across campus;
c) Tune classroom furnace outside air intakes in Buildings B, C, D, E, F and the library;
d) Relocate the existing cafeteria walk-in cooler exhaust fan to exterior wall;
e) Update existing refrigeration evaporator fan motors to energy efficient ECM motors;
f) Install manual timers on all unit heaters.

Utility data can be provided by the Project Manager upon request.

Current allocated Proposition 39 funding available to the District for this project, including permitting and design, is $51,382. However, due to savings realized on earlier Prop 39 projects, additional funding is available for project implementation.

This procurement for design build services is authorized as an energy service contract pursuant to California Government Code sections 4217.10 et seq. Prior to the potential award of a contract to the selected ESCO, the District Board of Directors will adopt a resolution as required by Government Code section 4217.12, finding that the anticipated cost to the District for energy efficiency improvements to be provided by the proposed project will be less than the anticipated marginal cost to the District of electrical and/or thermal energy that would have been consumed by the District in the absence of this project. The contract with the selected ESCO will be the sole contract the District will hold for the completion of this project.

STATEMENT OF WORK (SOW)

The scope of services provided by the selected ESCO shall include all tasks required to design, fabricate, and install the energy efficiency improvements listed below for the District. Wherever possible, the design and installation should meet Division of the State Architect (DSA) exemption criteria found in DSA Interpretation of Regulations (IR) A -10 and A-22 (See **Appendix H**).

All listed items in this SOW are detailed in the September 2015 ASHRAE Level 2 Energy Audit Report prepared for the District by OurEvolution Energy & Engineering (OE), which is found in **Appendix L**. For reference purposes, the OE Energy Conservation Measure (ECM) ID number is provided next to each SOW item below.

The selected ESCO will:

1. **Install Window Upgrades (ECM-7)**
    a. The selected ESCO shall specify equipment and install using the materials list provided in **Appendix I**, except where deviations are indicated in the proposal.
        i. After receiving materials list approval from District, install replacement windows per window manufacturer's recommendations for proper weatherproofing and to meet warranty requirements.
        ii. Patch, primer and paint any replacement trim or plaster to match existing colors and style.
        iii. Install replacement window films for privacy on windows that currently have such coatings.
        iv. Follow lead safe work practices while removing existing windows and trim and installing replacement windows.
2. **Inspect, Clean, Repair, and Insulate Ductwork (ECM-11)**
    a. Duct Maintenance: Provide all labor and materials to inspect, clean, insulate and make repairs to duct systems at select locations at Fortuna Union High School.
        i. Duct inspection and maintenance will be required for systems housed in the buildings outlined in **Appendix I**.
        ii. See **Appendix J** for a Site Map.
    b. Mechanical
        i. Remove and replace all damaged, ripped or broken expansion joints between HVAC units and plenums and or ducting.
        ii. Repair all broken or disconnected ducting as necessary. Seal with fiber tape and mastic.
        iii. Repair all leaking ducts with fiber tape and mastic.
        iv. Perform duct cleaning on all repaired ducts.
        v. Replace/install insulation to all ducts to achieve R-8 or greater value.
    c. In addition to completing the scope defined in a. and b. above:
        i. Verify that ducting is operational post installation. If not operational, correct and verify.
3. **Tune Classroom Furnace Outside Air (OSA) Intakes (ECM-3)**
    a. Provide all labor and materials to reduce the size of OSA intake inlets mounted on exterior walls to no more than 16% of the surface area of the filter on approximately (26) furnaces in buildings B, D, E, and F.
    b. Provide all labor and materials to install manually operated dampers set to allow a maximum of 32% outside air on OSA intake inlets mounted on roof penetrations on

approximately (20) furnaces serving buildings C, F, and the classrooms in the Library (but not including the 2 furnaces serving the main library space).

4. **Walk-in Cooler Exhaust Reroute (ECM-17)**
    a. Provide all labor and materials to relocate interior walk-in cooler exhaust fan in cafeteria kitchen to exterior wall.
    b. Remove fan from existing location, properly repair and refinish empty space in wall.
    c. Install and seal all ducting needed to route exhaust to exterior wall.
    d. Properly seal exterior wall penetration surrounding exhaust fan vent, primer and paint to match existing wall finish.
5. **Replace Refrigerator Evaporator Fan Motors (ECM-15)**
    a. Provide labor and materials to replace all existing shaded-pole (SP) and permanent split capacitor (PSC) motors (approximately 11 motors) in the Cafeteria Kitchen, Snack Shack, and Agriculture Building and install high-quality commercial grade energy efficient electronically commutated motors (ECMs).
6. **Install Manual Timers on Unit Heaters (ECM-5)**
    a. Provide all labor and materials to install manual timers on all unit heaters in the Auto Shop, Bus Barn, Maintenance Building, Metal Shop, and Cafeteria.

The proposal shall contain a detailed explanation of the complete project and delineation of all work tasks to be performed by the awarded ESCO. The proposer must have the technical capability and demonstrated experience to complete the project as set out in this RFP. Additionally, the proposer must possess a California "B" contractor license. The project will require a C-20 Warm-Air Heating, Ventilating, and Air-Conditioning specialty for the ductwork, furnace intake, and damper installation portion of the project; and a C-38 license for the refrigeration exhaust reroute portion. The selected ESCO will be allowed to sub-contract these portions of the project to qualified entities.

As required by state law, any subcontractor performing more than ½ of one percent of the contract value must be listed per Section 9 of the General Conditions (see **Appendix G Subcontractor List Form**).

The selected ESCO will be expected to furnish any and all structural and mechanical designs and specifications that are requested and/or required by DSA. Please refer to DSA IR A-10 - see **Appendix H** regarding projects exempt from review.

The selected ESCO will work with the District and its representatives to determine the best approach for design. Final scope approval will be given prior to installation.

All equipment provided by the ESCO for this Project shall have a history of successful operating experience in similar installations and shall be in new, unused condition. This equipment shall be current technology with readily available non-proprietary replacement parts. All equipment used for this Project shall be approved by the District prior to installation.

ESCO's duties shall include but may not be limited to the following:

- Prepare construction documents where necessary.
- If necessary, hire design professionals to create plans and specifications for DSA approval.

- Ensure compliance with governing codes and standards including, but not limited, to Title 24 Standards and the California Building Code.
- Provide a Site Specific Safety Plan.
- Ensure the District participation and feedback in scoping process.
- Provide a schedule for completion of Project.
- Prepare a plan for ongoing equipment maintenance and system upgrade, if requested.
- Assist the District in securing all relevant rebates including rebates from programs such as the Redwood Coast Energy Watch program.
- Ensure delivery of all materials and equipment to Site(s).
- Construct/Install Project.
- Manage all sub-contractors.
- Meet regularly to update the District representatives as to Project progress .
- Obtain and maintain all licenses, permits, and authorizations as needed for the Project.
- Commission Project; provide training on equipment/systems if requested.
- Provide assistance with DSA close-out, if required.
- Post installation audit and energy savings tracking pursuant to Proposition 39 guidelines.

As required by law, ESCO shall follow the California Department of Industrial Relations requirements. The execution of the above project is subject to California prevailing wage requirements, and the selected ESCO and its subcontractors are required to pay all workers employed for the performance of this contract no less than the applicable prevailing wage rate for each such worker. This project is **_X_**/is not___ subject to compliance monitoring and enforcement by the California Department of Industrial Relations pursuant to Labor Code sections 1725.5 and 1770 *et seq.* In accordance with Labor Code sections 1725.5 and 1770 *et seq.*, all contractors and subcontractors working at the site shall be duly registered with the Department of Industrial Relations at time of bid opening and at all relevant times. Proof of registration shall be provided as to all such contractors prior to the commencement of any work.

APPENDIX A: PROPOSED PROJECT SCHEDULE

The following schedule is the proposed schedule and may change during the project.

ACTIVITY	DATE
Issue RFQ/RFP	**October 26, 2018**
Pre-Proposal Site Visit	**November 7, 2018 at 2:30 p.m.**
Responses Due	**November 29, 2018 at 2:00 p.m.**
Review and Selection of Finalist(s)	**December 11, 2018**
Interviews Scheduled and Conducted	**December 6-10, 2018**
ESCO Selected/Notice of Award issued	**December 11, 2018**
Contract Finalized/Notice to Proceed issued	**December 20, 2018**
Preliminary Design Meeting	**January 9, 2019**
Finalize Design	**January 23, 2018**
Install Project* (see note below)	**February 18 – August 2, 2019**
Construction Complete	**August 2, 2019**
Project Close-out	**August 9, 2019**

Note: unless otherwise approved by the District, all construction must occur during one or more of the following school breaks:

- **Presidents' Week** **February 18 to 22**
- **Spring Break** **April 15 to 19**
- **Summer Break** **June 2 to August 2**

APPENDIX B: PROPOSAL REQUIREMENTS AND SELECTION PROCESS

For further information, please contact:

Patrick Owen, Project Manager
Redwood Coast Energy Authority
633 3rd Street, Eureka, CA 95501

Phone: (707) 269-1700, x318
Fax: (707) 269-1777
Email: powen@redwoodenergy.org

PROPOSAL REQUIREMENTS:
Provide one (1) unstapled original, three (3) copies and one (1) electronic copy on a USB key at the time and place indicated in the cover letter to this RFQ/RFP. Fax or email proposals will not be accepted. **Late responses will not be accepted.**

Each proposal shall be submitted in writing and must include the following information:

A. ESCO PROFILE & QUALIFICATIONS
The District may award the contract to the firm that, in its sole opinion, is the most capable of providing the range of services described in this RFP. To be considered for this Project, a proposer must, at a minimum, have demonstrated knowledge and experience in design, engineering and construction capabilities relevant to the scope of this RFP. The proposal must contain a response to each of the following:

- ***Answer all questions or state "N/A" if not applicable.***
- ***Please number and re-state each subheading or question, followed by your response. This improves clarity and makes it much easier to evaluate your response.***
- ***Number all pages.***

1. Name, address, contact numbers, email, website, and summary of the responding ESCO's experience with public school projects and energy upgrades.

2. If the responding ESCO is a business entity, provide information on the type of entity, its ownership, size, and location of its principal office.

3. All applicable licenses including license numbers and expiration dates.

4. Detailed resume(s) of personnel to be assigned to the Project.

    a. Identify proposed sub-ESCO(s) by name, address, and work to be performed.
    b. Summarize the scope of services (design, construction, training, etc.) directly offered by ESCO.
    c. Describe your qualifications and ability to design and install energy efficient lighting improvements.

5. List at least three (3) applicable design and/or construction projects completed by the ESCO and proposed Subcontractors within the past five (5) years that are similar in size and scope. Identify similar projects by name, location, owner, size, and date constructed.

    a. Include a list of references including contact names and telephone numbers for the representative projects.
    b. Source of funds used for the project (if known).

6. Describe your general approach to designing and constructing lighting systems and how the District will be involved in the process.

7. Provide DIR Registration number(s) and expiration date(s) for all ESCOs and subcontractors working on the project. Public works ESCOs and Subcontractors must be registered with DIR, as specified in Labor Code section 1771.1(a). Project is subject to compliance monitoring and enforcement by DIR.

8. List of subcontractors (using form provided – **Appendix G**)

B. **IMPLEMENTATION PLAN**

Provide a preliminary implementation plan that includes but is not limited to:

1. Proposed Scope of Work
    a. ESCO may use attached Scopes of Work in **Appendix I** in their entirety,
    b. And ESCO may attach a document with proposed alterations to the Scope of Work,
    c. Or ESCO may submit their own Scope of Work and submit with proposal, documenting any major changes made.

2. Proposed energy reduction by site. See **Appendix K**.

3. Steps to ensure all applicable building codes and/or state requirements are met.

4. Steps to ensure all applicable labor compliance requirements are met.

5. Number of trainees and or apprentices to be used.

6. Submittals for proposed equipment to be installed must be included.

C. PROPOSED PROJECT PRICE

1. The proposed price shall include all project costs (including design fees, DSA fees, permits, materials, labor, testing, commissioning, inspection, etc.).
2. Pricing for each item shall be independent of other items, so that the District may select which items below it wishes to contract for.
3. Proposed price must exclude all utility rebates and incentives.
    a. Proposed Price must be broken out by site and measure type as shown below:

Proposal Item No.	***Energy Efficiency Measure***	***Description***	***Details in Statement of Work Section:***	***Total Installed Cost***
1	Window Retrofit	Fortuna High School selected window replacement	SOW & Appendix I	$_____
2	Ductwork Maintenance	Fortuna High School ductwork inspection, repair, and insulation.	SOW & Appendix I	$_____
3	Tune classroom furnace outside air intakes	Modify outside air intakes in Buildings B, C, D, E, F and the library per OE Energy Audit	SOW & Appendix I	$_____
4	Relocate exhaust fan	Reroute cafeteria kitchen exhaust fan to exterior wall	SOW	$_____
5	Refrigeration motors	Replace existing evaporator fan motors with ECM motors	SOW	$_____
6	HVAC Controls	Install Manual Timers on Unit Heaters	SOW	$_____
			Total	$_____

    b. Further breakout of the cost may be requested by the District.

INSURANCE REQUIREMENTS:
Before providing any services under this Agreement, ESCO shall be required to procure and provide proof of required insurance, as described in Section 11 of the General Conditions of the Energy Services Contract**.**

PROPOSITION 39 REQUIREMENTS:
ESCOs will be required to comply with the Proposition 39 Program requirements.

ESCO acknowledges that all work must qualify as an eligible project under Proposition 39; and that the Statement of Work may be amended to reflect changes in funding allocation and District's Energy Expenditure Plan, upon mutual agreement of the Parties and a written amendment to this Contract related to any changes in scope, payment, and duration. Prior to commencement of any Work, District shall review and approve the Project.

The ESCO will comply with and give notices required by laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on performance of the Work, including but not limited to data and reports to the California Energy Commission required under Proposition 39.

COMPENSATION & PAYMENT:
Compensation will have a not-to-exceed cap based on the estimated funding allocation for the approved project, and an agreement to modify (increase or decrease) the cap if Proposition 39 funds change.

The payment schedule will be consistent with the funding allocation schedule. The ESCO will agree to maintain and make available records for inspection by the District and other agencies and will provide or assist the District in providing required annual and final reports for the project, including data for reports to the Proposition 39 Citizens Oversight Board.

AGREEMENT
The selected ESCO must enter into a written agreement for services using the District's form agreement for Energy Services (the "Contract"), a copy of which is included as Appendix C. The Contract includes the following indemnity requirement:

> "ESCO shall indemnify, defend with counsel acceptable to Fortuna Union High School District , and hold harmless to the full extent permitted by law, Fortuna Union High School District , its governing board, officers, agents, employees, and volunteers from and against any and all liability, demands, loss, damage, claims, settlements, expenses, and costs (including, without limitation, attorney fees, expert witness fees, and costs and fees of litigation) (collectively, "Liability") of every nature arising out of or in connection with Consultant's acts or omissions with respect to this Agreement, except such Liability caused by the active negligence, sole negligence, or willful misconduct of the Fortuna Union High School District. This indemnification obligation is not limited by any limitation on the amount or type of damages or compensation payable under Workers' Compensation or other employee benefit acts, or by insurance coverage limits, and shall survive the expiration or early termination of this Agreement."

SELECTION PROCESS:
A selection committee will review the proposals and may select a short list of finalists for oral interviews.

A. REFERENCE CHECK
The District will conduct a background/reference check of the responding firms. Proposed ESCOs that appear to have the necessary qualifications and who are acknowledged as competent to provide the services requested may be placed on the short list of finalists and interviewed.

B. INTERVIEW
The District may interview selected respondents.

C. FINAL SELECTION:

Predicated upon thorough review of proposals submitted and upon interviews with selected firms, the District will make a final selection and notify all finalists in writing.
The District will negotiate the final terms for services with the firm approved by the District Board. If it is not possible to reach mutual agreement with the designated firm, the District reserves the right to enter into negotiations with another firm.
The final selection will be made on the basis of best value, which includes, but is not limited to the following criteria:

- Completeness and adherence to the requirements of this RFP.
- Qualifications and past similar experience
- Reference
- Proposed energy use reduction
- Fee and rates and base price proposal

The District reserves the right to postpone selection for its own convenience, to withdraw this Request for Proposal at any time, and to reject any and all submittals without indicating any reason for such rejection. Submitted proposals become the property of the District.

As part of the negotiation process, the District reserves the right to require correction of technical errors in the proposal and to modify the published Statement of Work and to approve or disapprove the list of sub-consultants. Should the District determine that specific expertise is lacking in the project team, the District will reserve the right to request specific consultants with specific expertise to be added to the team. Any interpretation of, or change in, this Request for Proposal will be made by addendum, and shall become part of the Request for Proposal and any contract awarded.

Note: Pursuant to Government Code section 4529.12, District employees are prohibited from participating in the selection process when they have a financial or business relationship with any private entity seeking to enter into a contract with the District, and the District requires compliance with all laws regarding political contributions, conflicts of interest or unlawful activities.

The District reserves the right to contract with any entity responding to this Request for Proposals. The District makes no representation that participation in the Request for Proposal process will lead to an award of contract or any consideration whatsoever. The District shall in no event be responsible for the cost of preparing any proposal in response to this Request for Proposals. The selection of ESCO(s) to participate in the Request for Proposal process if at all is at the sole discretion of the District.

From the period beginning on the date of the issuance of this Request for Proposals, and ending on the date of the award of the contract, no person, or entity submitting in response to this Request for Proposals, nor any officer, employee, representative, agent, or consultant representing such a person or entity shall contact any person within the District to engage in discussion of the process of selection or award process except for the District designee for questions listed in this Request for Proposals.

APPENDIX C: ENERGY SERVICES CONTRACT

CONTRACT

This Energy Services Contract ("Contract") is made by and between the Fortuna Union High School District ("District"), and _____ ("ESCO").

District and ESCO hereby agree as follows:

RECITALS

WHEREAS, Government Code sections 4217.10, *et seq*., authorize the District, as a public agency, to enter into an energy services agreement wherein the ESCO provides conservation services to the District from an energy conservation facility on terms that its governing body determines are in the best interest of the District;

WHEREAS, pursuant to Government Code section 4217.11(d), "conservation services" include electrical, thermal, or other energy savings resulting from conservation measures, which shall be treated as a supply of such energy;

WHEREAS, through this Contract, the District intends to contract for the engineering, system design, fabrication and installation of energy efficiency improvements that will result in energy savings to the District and which shall be a supply of energy to the District (the "Project") at the following sites: Fortuna Union High School (the "Project Sites" or "Sites", and each individually a "Site"), consistent with the terms of Government Code section 4217.10, *et seq*.;

WHEREAS, the District's Governing Board, after holding a hearing at a regularly scheduled public hearing and after having provided two weeks advanced notice of such hearing, made all findings required by Government Code section 4217.12 for the District to enter into this Contract;

WHEREAS, the ESCO shall engineer, design, and construct the Project pursuant to this Contract, including but not limited to certain General Terms and Conditions and other Contract Documents (as that term is defined in the General Conditions), which Contract Documents are incorporated into the Agreement by this reference;

NOW, THEREFORE, in consideration of the covenants hereinafter contained in this Contract, the District and ESCO agree as follows:

1. Description of Work

The ESCO will provide the design, construction, commissioning and installation of a Proposition 39 funded energy efficiency project at Fortuna Union High School in the Fortuna Union High School District. The ESCO agrees to furnish all labor, materials, equipment, plant, tools, supervision, appurtenances, and services, including transportation and utilities, required to perform and satisfactorily complete all work required for the Project in full conformance with the Contract Documents:

It shall be the responsibility of the ESCO to obtain DSA approval of the Project plans if applicable. No work shall commence at any site prior to DSA approval of the Project plans.

2. Contract Documents

The Contract Documents consist of the Complete Proposal Documents, as submitted by ESCO, including applicable drawings and calculations, the Contract, any Amendment thereto, Schematic Drawings and Specifications, Supplementary General Conditions, if any, General Conditions, Detailed Project Schedule, Proposal Requirements, Request for Proposals, Disabled Veteran Business Enterprises Requirements (if applicable), Labor Compliance Program (if applicable), all addenda, required bond(s) and insurance certificates, completed Project Questionnaire & Prequalification, all of which are incorporated herein by this reference. All Contract Documents are intended to coordinate so that any work called for in one document and not mentioned in another document is to be executed as if mentioned in all documents.

3. Proposals & Compensation

As full compensation for ESCO's complete and satisfactory performance of the work and activities described in the Contract Documents, District agrees to pay ESCO, and ESCO agrees to accept the sum of _xxxxxxxxxxxxx_ ($_xxxxxxxxx), which shall be paid to the ESCO according to the Contract Documents.

4. Prevailing Wages

This Project is subject to prevailing wage requirements, and ESCO and its Subcontractors are required to pay all workers employed for the performance of this contract no less than the applicable prevailing wage rate for each such worker.

5. Time for Completion

The starting date of the Contract shall be the day listed by the District in the Notice to Proceed and the ESCO shall fully complete all the work as detailed in accordance with Attachment A of the RFP: Proposed Project Schedule. Time is of the essence in the performance of this Contract.

6. Liquidated Damages

Liquidated damages for ESCO's failure to complete the Contract within the time fixed for completion inclusive of milestone dates are established in the amount of $200 per day per each Milestone until that Milestone is completed.

IN WITNESS WHEREOF, the parties agree to the terms of this Contract on the day and year written below.

_____	_____
District Authorized Signature	ESCO
	_____
Resolution No. _____	ESCO License No. and Expiration Date
_____	By: _____
Date	Individual Signature
	_____
	Title
	_____
	Date
	For: _____
	Corporation or Partnership
	If Corporation, Seal Below.
	_____
For use by NCSIG Members:	DIR No.

Certificates of Insurance and Bonds Approved

By: _____
Director, JPA Services

Date: _____

General Conditions to Design-Build Contract for:
Proposition 39 Energy Efficiency Improvements
Fortuna Union High School District

GENERAL CONDITIONS TABLE OF CONTENTS

1. DEFINITIONS

Addendum: A written change or revision to the Contract Documents issued to the prospective proposers prior to the time of receiving proposals.

Alternate: The sum to be added to or deducted from the base proposal if the change in scope of work as described in Alternates is accepted by the District.

Approved: Approved by the District or the District's authorized representative unless otherwise indicated in the Contract Documents.

Architect: The person or firm holding a valid license to practice architecture or engineering which has been designated (if any designated) to provide architectural or engineering design services on this Project. When Architect is referred to within the Contract Documents and no architect or engineer has in fact been designated, then the matter shall be referred to the District Superintendent or its designee.

As Directed: As directed by the District or its Project Manager, unless otherwise indicated in the Contract Documents.

As Selected: As selected by the District or its Project Manager, unless otherwise indicated in the Contract Documents.

Construction Manager: The individual or entity named as such by the District. If no Construction Manager is designated for the project, all references to the Construction Manager in these Contract Documents shall mean the District and/or its designee.

Contract: The legally binding agreement between the District and the ESCO wherein the ESCO agrees to furnish the labor, materials, equipment, and appurtenances required to perform the work described in the Contract Documents and the District agrees to pay the ESCO for such work.

Contract Documents: The Contract Documents are described in the Contract for this Project.

District and/or Owner: The District, its governing board, authorized officers and employees, and authorized representatives.

DSA: The State of California Division of the State Architect which has the authority to review, approve and inspect the safety of design, alteration and construction of school buildings.

DSA Pre-Check (PC) Approved: An "over-the-counter" design of a structure that is pre-approved by the DSA.

ESCO: The person or entity holding a valid license in the State of California required for performing this Project and who has contracted with the District to perform the construction work described in the Contract Documents. The term ESCO shall be construed to mean all of the officers, employees, Subcontractors, suppliers, or other persons engaged by the ESCO for the work of this Project.

Final Completion: Final Completion is achieved when the ESCO has fully completed all Contract Document requirements, including, but not limited to, all final punch list items and project closeout, to the District's satisfaction.

Furnish: Purchase and deliver to site of installation.

Governing Board: The Governing Board of the Fortuna Union High School District School District.

Inspector: The person engaged by the District, pursuant to Section 17311 of the Education Code, to inspect the workmanship, materials, and manner of construction of buildings or portions of buildings to determine if such construction complies with the Contract Documents and applicable codes and regulations.

Indicated (or) As Shown: Shown on drawings and/or as specified.

Install: Fix in place, for materials; and fix in place and connect, for equipment.

Modification: An authorized change to the Contract Documents which may or may not include a change in contract price and/or time.

Project: The total construction work and activities described in these Contract Documents.

Project Manager: Redwood Coast Energy Authority (RCEA) serves as the Proposition 39 Project Manager for this Project.

Proposal: The properly completed and signed proposal to perform the construction work for the Project as described in the Contract Documents.

Secure: Obtain.

Subcontractor: A person, firm, or corporation duly licensed in the State of California who has a contract with the ESCO to furnish labor, materials and equipment, and/or to install materials and equipment for work in this Contract.

2. PROJECT MANAGER

a. Role and Responsibilities

The Project Manager is responsible for the general oversight of all the working drawings, technical specifications, sketches and all other information necessary to define the work covered by these Contract Documents as generated by the ESCO. The Project Manager shall visit, inspect and observe the construction to determine general compliance with the Contract Documents. The Project Manager shall evaluate the shop drawings, samples and submittals required in the technical Specifications, and maintain an up-to-date log of all such items processed. The Project Manager will consult with the District, ESCO, and any state, county or city agency having jurisdiction over the work whenever necessary to further the best interests of the Project.

b. Disputes

Should any dispute arise respecting interpretation of the drawings and Specifications, the value of any work done or of any work omitted, or of any extra work which ESCO may be required to do or respecting the size of any payment to ESCO during the performance of this Contract, the dispute shall be decided by the Project Manager, and the Project Manager's decision shall be final and conclusive.

3. CONTRACT DOCUMENTS

a. Contents and Precedence

The Contract Documents consist of the executed Contract and all Addenda, all approved change orders, the completed Request for Proposals Form, the required Bonds and the Insurance forms, the Request for Proposals, the Notice of Award, the Notice to Proceed, the General Conditions, any supplemental Conditions, the Technical Specifications, and the Drawings. The Contract Documents are complementary, and anything required by one shall be as binding as if required by all. In case of conflicts within the Contract Documents, the order of precedence of interpretation shall be as listed above, with the executed Contract and any change order thereto having priority, and subsequent Addenda having priority over prior Addenda only to the extent modified by the subsequent Addenda. In case of conflict within the drawings, larger scale drawings shall govern smaller scale drawings, and written dimensions shall govern over scaled dimensions.

b. Ambiguities, Errors, and Inconsistencies

If, in the opinion of the ESCO, the construction details indicated on the drawings or otherwise specified are in conflict with accepted industry standards for quality construction and therefore might interfere with its full guarantee of the work involved, the ESCO shall promptly bring this information to the attention of the Project Manager for appropriate action before submittal of the proposal. ESCO's failure to request clarification or interpretation of an apparent ambiguity, error or inconsistency waives that ESCO's right to thereafter claim any entitlement to additional compensation based upon an ambiguity, inconsistency, or error, which should have been discovered by a reasonably prudent ESCO, subject to the limitations of Public Contract Code §1104. During the Project, should any discrepancy appear, or any misunderstanding arise as to the import of anything contained in the Contract Documents, the matter shall be promptly referred to the Project Manager, who will issue instructions or corrections.

c. Lines and Planes

All lines and planes appearing on contract drawings to be horizontal or vertical and not explicitly indicated otherwise shall be constructed true and plumb. All lines and planes appearing on contract drawings to intersect at right angles and not explicitly indicated otherwise shall be constructed at true right angles. Where details are indicated covering specific conditions, such details also apply to all similar conditions not specifically indicated.

d. Standards

The specification standards of the various sections of the Specifications shall be the procedural, performance, and material standards of the applicable association publications identified and shall be the required level of installation, materials, workmanship, and performance for the applicable work. Except where a specific date of issue is mentioned hereinafter, references to specification standards shall mean the edition, including amendments and supplements, in effect on the date of the Request for Proposals. Where no standard is identified, and a manufacturer is specified, the manufacturer's specifications are the standards. All standards shall be subordinate to the requirements of the applicable codes and regulations.

e. Reference to the Singular

Wherever in the Specifications an article, device or piece of equipment is referred to in the singular number; such reference shall include as many such items as are shown on Drawings or required to complete the installation.

4. INTENT OF DRAWINGS AND SPECIFICATIONS

a. Drawings and Specifications are to be read as an integrated document. The ESCO shall promptly report to the Project Manager any ambiguities, discrepancies, or errors which come to the ESCO's attention.

b. Figured dimensions shall be followed in preference to scaled dimensions, and the ESCO shall make all additional measurements necessary for the work and shall be responsible for their accuracy. Before ordering any material or doing any work, the ESCO shall verify all measurements at the Project site and shall be responsible for the correctness of same.

c. It is the intent of the drawings and Specifications to show and describe complete installations. Items shown but not specified, or specified but not shown, shall be included unless specifically omitted.

d. The Specifications shall be deemed to include and require everything necessary and reasonably incidental to the completion of all work described and indicated on the drawings, whether particularly mentioned or shown, or not.

5. TRADE DIVISIONS

Segregation of the Specifications into the designated trade divisions is only for the purpose of facilitating descriptions and shall not be considered as limiting the work of any subcontract or trade. Subject to other necessary provisions set forth in the Specifications, the terms and conditions of such limitations or inclusions shall lie solely between the ESCO and its Subcontractors. "Scope" as indicated in each section of the Specifications shall serve only as a general guide to what is included in that section. Neither the stated description nor the division of the plans and Specifications to various sections, which is done solely for convenience, shall be deemed to limit the work required, divide or indicate it by labor jurisdiction or trade practice, or set up any bidding barriers to the various Subcontractors or suppliers.

a. The ESCO shall be responsible for the proper execution of all work required by the Contract Documents and for allocating such portions as the ESCO sees fit to the various Subcontractors, subject to applicable law. The ESCO is cautioned that the various individual sections may not contain all work that the ESCO may wish to allocate to a particular Subcontractor or everything bearing on the work of a particular trade, some of which may appear in other portions of the plans or Specifications.

b. If the ESCO elects to enter into any subcontract for any section of the work the ESCO assumes all responsibility for ascertaining that the Subcontractor for the work is competent, licensed, solvent, thoroughly acquainted with all conditions and legal requirements of the work, has included all materials and appurtenances in connection therewith in the subcontract, and has performed its work in strict compliance with the Contract Documents.

c. It shall be the responsibility of the ESCO to notify each prospective Subcontractor at the time of request for proposals of all portions of the Contract Documents, including the General Conditions, Supplementary Conditions and any parts of sections of Specifications or plans that the ESCO intends to include as part of the subcontract.

6. MASTER MANDATORY PROVISIONS

a. Any material, item, or piece of equipment mentioned, listed or indicated without definition of quality, shall be consistent with the quality of adjacent or related materials, items, or pieces of equipment on the Project and in accordance with best practices.

b. Any method of installation, finish, or workmanship of an operation called for, without definition of standard of workmanship, shall be followed or performed and finished in accordance with best practices and consistent with adjacent or related installations on the Project.

c. Any necessary material, item, piece of equipment or operation not called for but reasonably implied as necessary for proper completion of the work shall be furnished, installed or performed and finished; and shall be consistent with adjacent or related materials, items, or pieces of equipment on the Project, and in accordance with best practices.

d. Names or numbered products are to be used according to the manufacturers' directions or recommendations unless otherwise specified.

7. ESCO

a. The ESCO shall perform all the work and activities required by the Contract Documents and furnish all labor, materials, equipment, tools and appurtenances necessary to perform the work and complete it to the District's satisfaction within the time specified. The ESCO shall at all times perform the work of this Contract in a competent and workmanlike manner and, if not specifically stated, accomplish the work according to the best standards of construction practice. The ESCO in no way is relieved of any responsibility by the activities of the Project Manager, engineer, inspector or DSA in the performance of such duties.

b. The ESCO shall employ a full-time competent superintendent and necessary assistants who shall have complete authority to act for the ESCO on all matters pertaining to the work. The superintendent shall be satisfactory to the District and, if not satisfactory, shall be replaced by the ESCO with one that is acceptable. Also, the superintendent shall not be changed without the written consent of the District unless the superintendent ceases to be employed by the ESCO.

c. ESCO shall make the layout of lines and elevations and shall be responsible for the accuracy of both the ESCO's and the Sub-contractors' work resulting there from. All dimensions affecting proper fabrication and installation of all Contract work must be verified by the ESCO prior to fabrication and installation by taking field measurements of the true conditions. The ESCO shall take, and assist Subcontractors in taking, all field dimensions required in performance of the work, and shall verify all dimensions and conditions on the site. If there are any discrepancies between dimensions in drawings and existing conditions which will affect the work, the ESCO shall promptly bring such discrepancies to the attention of the Project Manager for adjustment before proceeding with the work. ESCO shall be responsible for the proper fitting of all work and for the coordination of all trades, Subcontractors and persons engaged upon this Contract.

d. ESCO shall do all cutting, fitting, or patching of ESCO's work that may be required to make its several parts come together properly and fit it to receive or be received by work of other ESCOs as shown, or reasonably implied by, the drawings and Specifications for the completed work. Any cost incurred by the District due to defective or ill-timed work shall be borne by the ESCO.

8. RESPONSIBILITY OF ESCO

a. ESCO shall be held strictly responsible for the proper performance of all work covered by the Contract Documents, including all work performed by Subcontractors. All work performed under this Contract shall comply in every respect to the rules and regulations of all agencies having jurisdiction over the Project or any part thereof.

b. ESCO shall perform the duties and submit Verified Reports as defined in Sections 4-336 and 4-343 I, Group 1, Chapter 4, Part I, Title 24, California Code of Regulations ("CCR") if applicable to this project. The duties of the ESCO are as defined in Section 4-343, Group 1, Chapter 4, Part I, Title 24, of the CCR. ESCO shall keep and make available a copy of Title 24 of the CCR at the job site at all times.

c. Where, because of short supply, any item of fabricated materials and/or equipment, indicated on drawings or specified, is unobtainable and it becomes necessary, with the consent of the Project Manager, to substitute equivalent items differing in details or design, the ESCO shall promptly submit complete drawings and details indicating the necessary modifications of the work. This provision shall be governed by the terms of the General Conditions regarding Submittals: Shop Drawings, Cuts and Samples.

d. With respect to work performed at and near a school site, ESCO shall always take all appropriate measures to ensure the security and safety of students and staff, including, but not limited to, ensuring that all ESCO's employees, Subcontractors, and suppliers entering school property strictly adhere to all applicable District policies and procedures, e.g., sign-in requirements, visitor badges, and access limitations.

9. SUBCONTRACTORS

a. Nothing contained in the Contract Documents shall create any contractual relationship between any Subcontractor and the District. The District shall be deemed to be the third party beneficiary of the contract between the ESCO and each Subcontractor. If the ESCO does not specify a Subcontractor for any portion of the work to be performed under this Contract, as required by law, ESCO shall perform that portion of the work with its own forces. The ESCO shall not substitute any other person or firm as a Subcontractor for those listed in the proposal submitted by the ESCO, without the written approval of the District and in conformance with the requirements of the Public Contract Code. The District reserves the right of approval of all Subcontractors proposed for use on this Project, and to this end, may require financial, performance, and such additional information as is needed to secure this approval. If a Subcontractor is not approved, the ESCO shall promptly submit another firm of the same trade for approval.

b. The ESCO shall insert appropriate provisions in all subcontracts pertaining to work on this Project requiring the Subcontractors to be bound by all applicable terms of the Contract Documents. The ESCO shall be as fully responsible for the acts and omissions of the Subcontractors, and of persons either directly or indirectly employed by them, as the ESCO is for the acts and omissions of persons directly employed by the ESCO.

c. The ESCO shall provide a Subcontractor List Form, in the form of **Appendix G** attached hereto**,** for any subcontractor performing more than one half of one percent of work on the project.

10. PERFORMANCE AND PAYMENT BONDS

a. As directed in the Notice of Award, the ESCO shall file with the District the following bonds, using the bond forms provided with these Contract Documents:

1) A corporate surety bond, in a sum not less than 100 percent of the amount of the Contract, to guarantee the faithful performance of the Contract, substantially in form of **Appendix D**, attached hereto.

2) A corporate surety bond, in a sum not less than 100 percent of the amount of the Contract, to guarantee the payment of wages for services engaged and of bills contracted for materials, supplies, and equipment used in the performance of the Contract, substantially in the form of **Appendix E**, attached hereto.

b. Corporate sureties on these bonds and on bonds accompanying proposals must be admitted sureties as defined by law, legally authorized to engage in the business of furnishing surety bonds in the State of California. All sureties and bond forms must be satisfactory to the District. Failure to submit the required bonds within the time specified by the Notice of Award, using the forms provided by the District, may result in cancellation of the award of Contract.

c. The amount of the Contract, as used to determine the amounts of the bonds, shall be the total amount fixed in the ESCO's proposal for the performance of the required work.

d. During the period covered by the Contract, if any of the sureties upon the bonds shall become insolvent or unable, in the opinion of the District, to pay promptly the amount of such bonds to the extent to which surety might be liable, the ESCO, within thirty (30) days after notice given by the District to the ESCO, shall provide supplemental bonds or otherwise substitute another and sufficient surety approved by the District in place of the surety becoming insolvent or unable to pay. If the ESCO fails within such thirty (30) day period to substitute another and sufficient surety, the ESCO shall, if the District so elects, be deemed to be in default in the performance of its obligations hereunder, and the District, in addition to any and all other remedies, may terminate the Contract or bring any proper suit or other proceedings against the ESCO and the sureties or any of them, or may deduct from any monies then due or which thereafter may become due to the ESCO under the Contract, the amount for which the surety, insolvent or unable to pay, shall have been liable on the bonds, and the monies so deducted shall be held by the District as collateral security for the performance of the conditions of the bonds.

e. Provide one electronic copy and two hardcopy set of bonds to the Project Manager to send to the District for signature.

11. INSURANCE

a. ESCO shall obtain the following insurance from a company or companies acceptable to the District. All required insurance must be written by a company licensed to do business in the State of California at the time the policy is issued. All required insurance shall be equal to or exceed an A VIII rating as listed in Best's Insurance Guides' latest edition. On a case-by-case basis, the District may accept insurance written by a company listed on the State of California Department of Insurance List of Eligible Surplus Lines ("LESLI List") with a rating of A VIII or

above as listed in Best's Insurance Guides' latest edition. Required documentation of such insurance shall be furnished to the District within the time stated in the Notice of Award. ESCO shall not commence work nor shall it allow its employees or Subcontractors or anyone to commence work until all insurance required hereunder has been submitted and approved in writing by the District and a notice to proceed has been issued.

b. ESCO shall take out and maintain at all times during the life of this Contract, up to the date of acceptance of the work by the District, the following policies of insurance:

1). General Liability Insurance: Personal injury and replacement value property damage insurance for all activities of the ESCO and its Subcontractors arising out of or in connection with this Contract, written on a comprehensive general liability form including ESCO's protected coverage, blanket contractual, completed operations, vehicle coverage and employer's non-ownership liability coverage, in an amount no less than either

a. $1,000,000.00 combined single limit personal injury and property damage for each occurrence and $2,000,000.00 annual aggregate with a $0 umbrella/excess; or

b. $2,000,000.00 annual combined single limit

2). Builders' Risk Insurance: For a proposal over $225,000, ESCO shall procure and maintain builders' risk insurance (all-risk coverage) for an amount equal to one hundred percent of the Contract sum for the benefit of the District, and the ESCO and Subcontractors as their interest may appear. In projects involving no structural change or building construction, this requirement may be waived in writing, at the District's sole option.

These policies shall include the following coverage:

1). The inclusion of more than one insured shall not operate to impair the rights of one insured against another insured and the coverages afforded shall apply as though separate policies have been issued to each insured.

2). This policy does not exclude explosion, collapse, underground excavation hazard, or removal of lateral support.

c. Endorsements:

1). The certificate(s) for both the General Liability Policy and the Automobile Liability Policy, as well the Builders' Risk Policy if required above, shall be endorsed with the following specific language:

"The Fortuna Union High School District is named as an additional insured for all liability arising out of the operations by or on behalf of the named insured, and this policy protects the additional insured, its officers, agents and employees against liability for bodily injuries, death or property damage or destruction arising in any respect directly or indirectly in the performance of the Contract."

2) The certificates must state that the insurance is under an occurrence based, and not a claims-made policy (policies). Both the General Liability Policy and the Builders' Risk Policy specified above shall be endorsed with the following specific language:

a. The insurance provided herein is primary and no insurance held or owned by the District shall be called upon to contribute to a loss.

b. Coverage provided by this policy shall not be reduced or canceled without thirty (30) days written notice given to the District by certified mail.

d. Professional Liability Insurance For Engineer of Record (Errors and Omissions):

ESCO shall maintain in force for the period covered by this Agreement, professional liability (errors and omissions) insurance covering the Engineer of Record's activities, in the amount not less than $2,000,000 with an insurance carrier satisfactory to District. In addition, to the extent that the activities and services of engineers or consultants retained by ESCO are not covered under ESCO's professional liability insurance, ESCO shall require each engineer and consultant to obtain and maintain a policy of professional liability insurance in an amount of not less than $2,000,000 with an insurance carrier satisfactory to District, before commencing services on the Project. ESCO shall provide a copy of the insurance policies to the District upon request.

e. Automobile Liability Insurance:

ESCO shall maintain in force for the period covered by this Agreement, automobile liability insurance covering bodily injury and property damage in an amount no less than $1,000,000 combined single limit for each occurrence; $2,000,000 aggregate. Said insurance shall include coverage for owned, hired, rented, and non-owned vehicles. All certificates must state that the insurance is under an occurrence based, and not a claims-made policy (policies).

f. Documentation:

Within ten (10) calendar days following issuance of the Notice of Award of the Contract, the following documentation of insurance shall be submitted to the Project Manager electronically to send to the District for approval prior to issuance of the Notice to Proceed: signed certificates of insurance showing the limits of insurance provided and copies of the specified endorsements for each policy. Certified copies of all policies shall be provided to the District upon request.

g.

If the ESCO fails to maintain such insurance, the District may take out such insurance to cover any damages for which the District might be held liable on account of the ESCO's failure to pay such damages and deduct and retain the amount of the premiums from any sums due the ESCO under the Contract.

h. Workers' Compensation Insurance:

1). Within ten (10) calendar days following issuance of the Notice of Award of the Contract, the ESCO shall submit to Project Manager electronically in order to send to the District satisfactory proof that the ESCO and all Subcontractors it intends to employ have procured, for the period covered by the Contract, full Workers' Compensation insurance and employer's liability with limits of at least $1,000,000 with an insurance carrier satisfactory to the District for all persons whom the ESCO may employ in carrying out the work contemplated under this Contract in accordance with the Workers' Compensation Insurance and Safety Act, approved May 26, 1913, and all acts amendatory or supplemental thereto (the "Act"). Such insurance shall be maintained in full force and effect during the period covered by the Contract. In the event the ESCO is self-insured, ESCO shall furnish a Certificate of Permission to Self-Insure, signed by the Department of Industrial Relations Administration of Self-Insurance, Sacramento, California.

2). If the ESCO fails to maintain such insurance, the District may take out worker's compensation insurance to cover any compensation which the District might be liable to pay under the provisions of the Act, because of any employee of the ESCO being injured or killed and deduct and retain the amount of the premiums for such insurance from any sums due the ESCO under the Contract, or otherwise recover that amount from the ESCO or the Surety.

3). If an injury occurs to any employee of the ESCO for which the employee, or the employee's dependents in the event of the employee's death, is entitled to compensation under the provisions of the Act, or for which compensation is claimed from the District, the District may retain from the sums due the ESCO under this Contract an amount sufficient to cover such compensation, as fixed by the Act, until such compensation is paid, or until it is determined that no compensation is due, and if the District is compelled to pay such compensation, it will deduct and retain from such sums the amount so paid, or otherwise recover this sum from the ESCO or its Surety.

4). The policies represented by the certificates shall be endorsed with a Waiver of Subrogation and must contain the provision (and the certificates must so state) that the insurance cannot be canceled until thirty (30) days after written notice of intended cancellation has been given to the District by certified mail.

12. CODES AND REGULATIONS

a. The ESCO shall be knowledgeable regarding and shall comply with applicable portions of California Code of Regulations Title 24, the applicable Building Code, and all other codes, ordinances, regulations or orders of properly constituted authority having jurisdiction over the work of this Project. The ESCO shall examine the Contract Documents for compliance with these codes and regulations and shall promptly notify the Project Manager of any discrepancies.

b. All work, and materials shall be in full accordance with the latest rules and regulations of the Safety Orders of the Division of Industrial Safety, the National Electric Code, the Uniform Plumbing Code published by the Western Plumbing Officials Association, and other applicable State laws or regulations. Nothing in the Project plans or Specifications is to be construed to permit work not conforming to the applicable Codes. Buildings and/or all other construction covered by this Contract shall meet all the regulations for access by the physically handicapped as administered by the Division of the State Architect, and as may be required by federal or state law.

c. If the work under this Contract is for the construction of a school building as defined by the Education Code, then the following provisions shall apply to the Contract:

1). All work shall be executed in accordance with the current requirements of Sections 17280 et seq. or Sections 81130 of the Education Code and California Code of Regulations: Title 24 and Title 19. No deviations from the DSA approved plans and Specifications will be permitted except upon a Change Order or Addenda, signed by the District and Architect and approved by the Division of the State Architect and the State Fire Marshal, if applicable.

2). Prior to the start of construction, District shall employ a Project Inspector, approved by the Division of the State Architect, to provide inspection services as defined in Tile 24, California Code of Regulations and pursuant to Section 17311 of the Education Code. The Owner shall pay for the costs of the project inspection services, except as indicated in the General Conditions, Article 38 and the plans and Specifications. A copy of current

California Code of Regulations Title 24, approved sets of plans and Specifications, addenda and change orders, shall be kept by the School District Job Inspector on the job at all times during construction. Division of the State Architect shall be notified 48 hours in advance of the first pour of concrete.

13. PERMITS AND TAXES

a. The ESCO shall obtain and pay for all permits, fees and licenses that are required in order to perform the work under this Contract. The District shall pay connection charges and meter costs for new permanent utilities required by these Contract Documents. The ESCO shall notify the District sufficiently in advance to submit requests for service to the appropriate utility companies so as to insure connections or installation of utility services in accordance with the Project schedule.

b. The ESCO shall pay for all taxes on materials and equipment. The District is exempt from Federal Excise Tax. ESCO shall not pay Federal Excise Tax on any item in this Contract.

14. PATENTS AND ROYALTIES

All fees or claims for patents, royalties or licenses on materials, equipment or processes used in the performance of work on this Project shall be included in the amount of the proposal. The ESCO shall indemnify, defend, and hold harmless the District, its Governing Board, the Project Manager, and their officers and employees, from all claims or liability, including costs and expenses, which may arise from the use on this Project of any patented or copyrighted materials, equipment, or processes.

15. SAFETY AND FIRE PREVENTION

a. The ESCO, Subcontractors and all of their agents and employees shall fully comply with all of the provisions and requirements of CAL/OSHA, Title 8, California Code of Regulations, and all other safety codes applicable to the Project. The ESCO shall take thorough precautions at all times for the protection of persons and property and shall be liable for all damages to persons or property, either on or off the site, which occur as a result of ESCO's prosecution of the work. The ESCO shall obtain permits for, install and maintain in safe condition barricades, walkways, fences, railings, and whatever other safeguards that may be necessary to protect persons and property from damage as a result of the construction under this Contract.

b. ESCO is required to ensure Material Safety Data Sheets ("MSDS") are available in a readily accessible place at the work site for any material requiring a MSDS pursuant to the federal "Hazard Communication" standard or employee "right to know" laws. ESCO is also required to ensure proper labeling on materials brought on the job site such that any person working with the material or within the general area of the material is informed of the hazards of the material and follows proper handling and protection procedures. A copy of the MSDS shall also be promptly submitted directly to the District.

c. ESCO shall not endanger any work by cutting, excavating, or otherwise altering the work and shall not cut or alter the work of any other ESCO except with the written consent of the Project Manager, nor overload any new or existing structures by the placing or storage of materials, equipment, or other items thereon, and, if necessary, shall provide calculations proving the safety in so doing.

d. If it is necessary to work at night, or where daylight is obscured, the ESCO shall provide and maintain lighting of an adequate level to properly prosecute the work, to permit the thorough inspection of same, and to ensure the safety to workers and others.

e. ESCO shall take extraordinary care to prevent fires and keep all flammable materials and oily rags in tightly closed metal containers. ESCO shall exercise particular care when welding or cutting, and with regard to the disposition of waste materials, the nature and quantity of which might create or increase a fire hazard.

16. HAZARDOUS MATERIALS

Unless otherwise specified, this Contract does not include the removal, handling, or disturbance of any hazardous substances or materials encountered in the new construction or on the Project grounds. If such substances or materials are encountered, work shall cease in that area and the District shall be promptly notified to take appropriate action for removal or otherwise abating the condition in accordance with current regulations applicable to the District.

a. General

1). No asbestos, asbestos-containing products or other hazardous materials shall be used in this construction or in any tools, devices, clothing or equipment used to further this construction.

2). Asbestos and/or asbestos containing products shall be defined as all items containing but not limited to chrysotile, crocidolite, amosite, anthophyllite, tremo-lite or actinolite.

3). Any or all material containing greater than one tenth of one percent (>.1%) asbestos shall be defined as asbestos-containing material.

4). Any disputes involving the question of whether or not material contains asbestos shall be settled by electron microscopy; the cost of any such tests shall be paid by the ESCO.

5). All work or materials found to contain asbestos or work or material installed with asbestos containing equipment will be immediately rejected and this work shall be removed by the ESCO at no additional cost to the District.

b. Decontamination and Removal of hazardous material from prior work

1). Decontamination and removal of work found to contain asbestos or work installed with asbestos containing equipment shall be done only under the supervision of a qualified consultant, knowledgeable in the field of asbestos abatement and accredited by the Environmental Protection Agency (“EPA”).

2). The asbestos removal ESCO shall be an EPA-accredited ESCO qualified in the removal of asbestos subject to approval of the District. 3) The asbestos consultant shall be chosen and approved by the District which shall have sole discretion and final determination in this matter.

4). The work will not be accepted until asbestos contamination is reduced to levels deemed acceptable by the asbestos consultant.

c. Hold Harmless

1). Interface of work under this contract with work containing asbestos shall be executed by the ESCO at ESCO's risk and at ESCO's discretion with full knowledge of the currently accepted standards, hazards, risks and liabilities associated with asbestos work and asbestos containing products. By execution of this contract the ESCO acknowledges the above and agrees to hold harmless, as set forth in the indemnity provisions of this Contract, the Owner, its employees, agents and assigns for all asbestos liability which may be associated with this work and agrees to instruct ESCO's employees and agents with respect to the above-mentioned standards, hazards, risks and liabilities.

2). The ESCO shall, prior to commencement of this work, provide a duly signed and notarized affidavit that ESCO has instructed ESCO's employees and agents with respect to the above-mentioned standards, hazards, risks and liabilities and the contents and requirements of this portion of the Contract Documents.

d. Certification

The ESCO agrees that materials containing asbestos or other hazardous materials as defined in Federal and State law shall not be used in construction.

17. TEMPORARY FACILITIES

a. The ESCO shall obtain permits for, install and maintain in safe condition all scaffolds, hoisting equipment, barricades, walkways, or other temporary structures that may be required to accomplish the work. Such structures shall be adequate for the intended use and capable of safely accepting all loads that may be imposed upon them. They shall be installed and maintained in accordance with all applicable codes and regulations.

b. The ESCO shall provide and maintain temporary heat from an approved source whenever in the course of the work it may become necessary for curing, drying or warming spaces as may be required for the proper installation of materials or finishes. The ESCO shall provide and maintain any and all facilities that may be required for dewatering in order that work may proceed on the project. If it is necessary for dewatering to occur continually, the ESCO shall have on hand whatever spare parts or equipment that may be required to avoid interruption of service or work.

c. The ESCO shall promptly remove all such temporary facilities when they are no longer needed for the work or on completion of the project. The ESCO shall repair any damage to premises or property which resulted from the construction, use, or removal of temporary facilities and shall restore the premises and property to their original condition.

d. See the Supplemental General Conditions and/or specifications for requirements concerning temporary sanitary facilities and utilities.

18. SIGNS

No signs may be displayed on or about the District's property (except those which may be required by law) without the District's prior written approval of size, content and location. Any signs required by the District will be designated in the Supplemental General Conditions.

19. TIME

a. The ESCO shall commence the work on the date indicated in the Notice to Proceed. Time is of the essence regarding the Contract work, and the ESCO shall prosecute the work diligently and regularly at such a rate of progress as to ensure completion of this Project within, or sooner than, the time specified.

b. The ESCOs and Subcontractors shall investigate and become aware of the amount of time required for the delivery of all equipment and materials required to perform the work under this Contract, and no extension of time shall be granted due to failure to order the equipment and materials sufficiently before their incorporation into the work so as to avoid delay to the Project.

c. The ESCO and Subcontractors shall provide and maintain enough manpower, materials and equipment to ensure a rate of construction progress that will complete the Project within or sooner than the time specified and according to the schedule of work. If, in the District's opinion, the ESCO and/or Subcontractors are not prosecuting the work at a sufficient rate of progress to meet the Project schedule, the District may direct the ESCO to provide additional manpower, materials or equipment, or to work additional hours, holidays or weekends without additional cost to the District until the work is progressing in a manner satisfactory to the District. Failure to prosecute the work in a timely manner according to the Project schedule is considered a breach of Contract and shall be cause for termination of the Contract.

20. PRE-CONSTRUCTION & CONSTRUCTION SCHEDULE

a. Within fifteen (15) calendar days after the Notice of Award of Contract, the ESCO shall prepare and submit to the Project Manager and District an electronic version of the as planned construction schedule showing in detail how the ESCO plans to prosecute the work within the time set for Final Completion. The schedule shall include the work of all trades necessary for construction of the Project and shall be sufficiently complete and comprehensive to enable progress to be monitored on a day-by-day basis. The information for each activity shall include at a minimum the activity description, duration, start date and completion date.

b. The ESCO shall take care in the preparation of the schedule to ensure that it represents an accurate and efficient plan for accomplishing the work. If the Project is more than one week behind schedule, it must be promptly revised showing how the ESCO plans to complete the work, but in no case, shall it show a completion date later than that required by the Contract, unless a time extension has been granted. The current schedule shall be kept posted in the ESCO's project office on site.

c. The ESCO shall be responsible for the coordination of all work necessary and pertaining to the construction whether actually a part of this Contract or attendant thereto. The ESCO shall notify the District and various utility companies, as far as possible in advance of their required work, in order that work schedules may be developed for all concerned, which will permit the most effective and timely accomplishment of the entire project.

21. DELAYS AND TIME EXTENSIONS

a. The ESCO may be granted a time extension if the ESCO encounters an unavoidable delay of the work due to causes completely beyond the ESCO's control and which the ESCO could not have avoided by the exercise of reasonable care, prudence, foresight and diligence. Causes for which a claim for extension of time may be made include: acts of the public enemy, acts of another ESCO in the performance of another contract with the District, priority of a

governmental agency for materials or equipment, fire, flood, violent wind storm, epidemic, quarantine restriction, strike, freight embargo, or weather of an unusually severe nature. The ESCO will not be granted time extensions for weather conditions which are normal for the location of the Project, according to the U. S. Weather Bureau Records.

b. A request for extension of time and compensation related thereto shall be made in writing to the Project Manager and District within ten (10) calendar days of the date the delay is encountered or shall be deemed waived. The request shall include a detailed description of the reasons for the delay and corrective measures by the ESCO. The request shall be accompanied by evidence that the insurance policies required by the Contract shall be in effect during the requested additional period of time. In order for the Project Manager to consider a request for time extension, the ESCO must prove that the reasons stated for the delay actually caused a delay in portions of the work which will result in completion beyond the date specified in the Contract. The ESCO may also be granted a time extension for a significant change in the scope of work which request for extension of time shall be included in a Contract modification proposal.

c. No damages or compensation or any kind shall be paid to an ESCO because of delays in the progress of work, whether such delays be avoidable or unavoidable, that are not the responsibility of District. District's liability to ESCO for delays for which District is responsible shall be limited to an extension of time unless such delays were unreasonable under the circumstances involved and were not within the contemplation of the parties when the Contract was awarded. The ESCO shall provide to the District the actual, substantiated costs to ESCO for which the ESCO may claim damages from District. Such costs, if any, shall be directly related to the Project, and shall not include costs that would be borne by the ESCO in the regular course of business, including, but not limited to, office overhead and ongoing insurance costs. Delay damages shall not include ESCO or Subcontractor markup for overhead and profit, but only actual, documented, and direct actual costs. The District shall not be liable for any damages which the ESCO could have avoided by any reasonable means including, but not limited to, the more judicious handling of forces or equipment.

d. The granting of an extension of time because of unavoidable delays shall in no way operate as a waiver on the part of the District of the right to collect liquidated damages for other delays or of any other rights to which the District is entitled.

22. LIQUIDATED DAMAGES

a. Should the ESCO fail to achieve Final Completion of this Contract within the time fixed for Final Completion, together with extensions granted by the District for unavoidable delays, ESCO shall become liable to the District in the amount specified in the Contract per calendar day for each day the Contract remains incomplete beyond the time for Final Completion, as liquidated damages and not as a penalty. ESCO may also be assessed liquidated damages for failure to meet milestones specified in the Contract Documents, regardless of impact on overall Project completion. ESCO shall not be charged with liquidated damages when the delay in completion of the work beyond the time for Final Completion is due to acts of the District. It is expressly stipulated and agreed by ESCO and District that it would be impractical and extremely difficult to fix the actual amount of damages.

b. In addition to any liquidated damages which may be assessed, if Contractor fails to achieve Final Completion of this Contract within the time fixed for Final Completion, together with extensions granted by the District for unavoidable delays, and if as a result District finds it necessary to incur any costs and/or expenses, or if District receives any claims by other

contractors, subcontractors, or third parties claiming time or other compensation by reason of Contractor's failure to complete work on time, Contractor shall pay all those costs and expenses incurred by District. These costs and expenses may include but are not limited to such items as rental payments, inspection fees, and additional architectural fees, whether related to the acquisition of facilities or caused by the delay in completion.

c. Any money due or to become due the ESCO may be retained to cover liquidated damages. Should such money not be sufficient to cover the liquidated damages, the District shall have the right to recover the balance from the ESCO or ESCO's sureties.

d. Should the District authorize suspension of the work for any cause, the time work is suspended will be added to the time for completion. Suspension of the work by the District shall not be a waiver of the right to claim liquidated damages as set forth in this section.

e. The assessment of Liquidated Damages does not otherwise limit the right of the Owner to claim a loss or damages incurred by the Owner for reasons other than delay (e.g. damages due to defective work).

23. DISTRICT'S RIGHT TO STOP WORK; TERMINATION OR SUSPENSION OF THE CONTRACT

a. District's Right to Stop Work:

In addition to or as an alternative to any and all other remedies available to the District, if the ESCO fails to correct work which is not performed in accordance with the Contract Documents, or if the ESCO persistently fails to perform the work in accordance with the Contract Documents, the District may by written order direct the ESCO to stop the work, or any portion thereof, until the cause for such order has been eliminated to the satisfaction of the District. However, the right of the District to stop the work shall not give rise to a duty on the part of the District to exercise this right for the benefit of the ESCO or any other person or entity, and the failure of the District to do so shall not be raised as a defense to the ESCO's failure to perform the work in accordance with the Contract Documents.

b. Termination for Cause:

1). If the ESCO refuses or fails to furnish sufficient materials, work force, equipment, and appurtenances to properly prosecute the work in a timely manner, or if ESCO refuses or fails to comply with any provisions of the Contract Documents, or if ESCO should file a bankruptcy petition or make a general assignment for the benefit of ESCO's creditors or if a receiver should be appointed on account of ESCO's insolvency, then the District may give the ESCO and ESCO's Surety written notice of intention to terminate the Contract. Unless within seven (7) calendar days after the serving of such notice upon the ESCO and ESCO's Surety such violation shall cease and arrangements for correction of such conditions shall be made satisfactory to the District, the Contract shall cease and terminate. In the event of such termination, the District shall immediately serve written notice thereof upon the ESCO and ESCO's Surety.

2). In the event of termination for cause, in addition to all remedies available to the District, the ESCO's Surety shall have the right to take over and perform the Contract; provided, however, that if the Surety does not commence performance within five (5) calendar days from the date of the issuance of such notice of termination, the District may take over the work and prosecute the same to completion by letting another Contract, or by any other

method that the District deems advisable. The ESCO and ESCO's Surety shall be liable for any excess cost incurred by the District thereby, and in any such event the District may take possession of such materials, equipment, and other property belonging to the ESCO as may be on the site and use same in completing the work.

c. Termination or Suspension for Convenience:

The District reserves the right, in its sole discretion, to terminate or suspend all or part of the Contract for convenience following three (3) days written notice to the ESCO. In the event of termination or suspension for convenience, ESCO shall have no claims against the District, except:

1). The actual cost of labor, materials and services provided pursuant to the Contract, and which have not yet been paid for, as documented by timesheets, invoices, receipts and the like; and

2). Five percent (5%) of the total cost of the work performed as of the date of notice of termination or suspension or five percent (5%) of the value of the work yet to be completed, whichever is less. The parties agree that this amount shall constitute full and fair compensation for all ESCO's lost profits and other damages resulting from the termination or suspension for convenience.

24. ASSIGNMENT OF CONTRACT

The ESCO may not assign or delegate all or any portion of this Contract without the written consent of the District and no such consent shall be given which would relieve the ESCO or its Surety of their responsibilities under the Contract. The ESCO may assign, without liability to the District, monies due the ESCO under the Contract to banks, trust companies or other financial institutions provided written notice thereof is promptly delivered to the District. Assignment of monies earned by the ESCO shall be subject to the same retention as other payments made to ESCO and shall also be subject to setoffs and back charges as provided by this Contract.

25. COORDINATION WITH OTHER CONTRACTS

a. The District reserves the right to do other work or award other contracts in connection with this Project. By entering into this Contract, ESCO acknowledges that there may be other ESCOs on or adjacent to the Project site whose work must be coordinated with that of its own. ESCO expressly warrants and agrees that it will cooperate with other ESCOs and will do nothing to delay, hinder, or interfere with the work of other ESCOs, or that of the District, its Project Manager and Construction Manager. ESCO also expressly agrees that in the event its work is hindered, delayed, interfered with, or otherwise affected by a separate ESCO, its sole remedy will be a direct action against the separate ESCO. To the extent allowed by law, the ESCO expressly waives any remedy against the District, its Project Manager and Construction Manager on account of delay, hindrance, interference or other such events caused by a separate ESCO.

b. If any part of ESCO's work depends upon the work of a separate ESCO, ESCO shall inspect such other work and promptly report in writing to the District and Project Manager any defects in such other work that render it unsuitable to receive the work of ESCO. Failure of the ESCO to so inspect and report shall constitute an acceptance of the other ESCO's work, except as to defects which the ESCO could not have detected through the reasonable inspection of the other ESCO's work prior to the execution of ESCO's work.

c. If ESCO is aware of a current or potential conflict between ESCO's work and the work of another ESCO on the site and is unable to informally resolve the conflict directly with the other ESCO, ESCO shall promptly provide written notice to the District, with a copy to the Project Manager and the other ESCO, specifying the nature of the conflict, the date upon which the conflict arose, and the steps taken to attempt to resolve the conflict. The District may issue written instructions to address the conflict.

d. If, through ESCO's negligence, any other ESCO or Subcontractor shall suffer loss or damage to the work, ESCO shall make a reasonable effort to settle with such other ESCO and Subcontractor by agreement or arbitration. If such other ESCO or Subcontractor shall assert any claim against the District or Project Manager, on account of any damage alleged to have been so sustained, the District or Project Manager shall notify the ESCO, who shall defend such proceedings at ESCO's own expense and save harmless and indemnify the District and the Project Manager from any such claim.

26. SUBMITTALS: SHOP DRAWINGS, CUTS AND SAMPLES

a. One electronic copy of the final shop drawings, brochures and cuts and samples in quantities specified by the Project Manager shall be submitted to the Project Manager for all items for which they are required by the plans and Specifications. Prior to transmittal, the ESCO shall examine all submittals for accuracy and completeness in order to verify their suitability for the work and compliance with the Contract Documents and shall sign and date each submittal. Submittals shall be made sufficiently before the items are required for the work so as to cause no delay and shall be in accordance with the project construction schedule.

b. In addition to information furnished as common practice, submittals shall contain the Project name and location, ESCO's name and address, Subcontractor's or supplier's name and address, date of submittal and any revisions, and reference to appropriate specification section, and/or drawing and detail numbers. The ESCO and/or the Subcontractors shall verify in the field all dimensions and relationships to adjacent work necessary to ensure the proper fit of the items submitted. If necessary, the ESCO shall make any corrections required and resubmit with all due haste in the same number as initially required.

c. Review of submittals, shop drawings, cuts or samples by the District or Project Manager shall not relieve the ESCO from complying with the requirements of the Contract Documents.

d. Any materials or equipment installed without approval shall be at the ESCO's own risk, and ESCO may be required to remove any such materials or equipment and install the specified items at ESCO's own cost, including repairs to adjacent work.

27. PAYMENTS

a. Cost Breakdown:

Prior to submitting ESCO's first request for payment, the ESCO shall prepare and submit to the Project Manager and District a cost breakdown (schedule of values) showing the major work items for each trade or operation required in construction of the Project. The work items shall be sufficiently detailed to enable the Project Manager to accurately evaluate the completion percentages requested by the ESCO. The cost for each work item shall include overhead and profit. The total of all work item costs shall equal the amount of the Contract.

b. Scope of Payment:

Payment to the ESCO at the unit price or other price fixed in the Contract for performing the work required under any item or at the lump sum price fixed in the Contract for performing all the work required under the Contract, shall be full compensation for furnishing all labor, materials, equipment and tools necessary to the work, and for performing and completing, in accordance with the Specifications, all work required under the item or under the Contract, and for all expense incurred by the ESCO for any purpose in connection with the performance and completion of the work.

c. Progress Payments:

The ESCO will, on or about the 25th day of each month, make an estimate of the value of the work completed by ESCO in the performance of the Contract. These estimates shall be subject to the review and approval of the Project Manager. The first such estimate will be of the value of the work completed after the ESCO commenced the performance of the Contract, and every subsequent estimate, except the final estimate, will be of the value of the work completed since the immediately preceding estimate. Such estimates will be based on labor, materials and equipment incorporated into the work, and items of materials and equipment delivered to the Project. The ESCO shall be responsible for the security and protection of such materials and equipment delivered to the Project and not incorporated in the work. The Governing Board has found that the Project is substantially complex and therefore requires a retention amount of 10%. Within thirty (30) calendar days after the approval of each estimate for progress payment, the District will pay to the ESCO an amount equal to ninety (90) percent of the approved estimate. Payments may at any time be withheld if in the judgment of the District the work is not proceeding in accordance with the Contract Documents, the ESCO is not complying with the requirements of the Contract, stop notices have been timely filed, the estimate contains an error, or the District has incurred costs or requests reasonable financial assurances regarding defective work by the ESCO.

b. Final Payment:

Within thirty (30) days after all required work is fully completed in accordance with the Contract Documents, the ESCO shall submit a final invoice for the total value of the work completed in accordance with the Contract, which shall be subject to review and approval by the District. As required by law, District shall pay ESCO the unpaid balance of the Contract price of the work, or the whole Contract price of the work if no progress payment has been made, determined in accordance with the terms of the Contract, less such sums as may be lawfully retained under any provision of the Contract, including, but not limited to, amounts retained as liquidated damages, for stop notices, for third-party claims for which the ESCO is required to indemnify the District, for defective work and costs incurred by the District in connection therewith, or for other such claims and damages attributable to the ESCO ("Final Payment"). Prior progress estimates and payments are subject to correction in the Final Payment. Tender of the Final Payment shall constitute denial by the District of any unresolved claim. ESCO's acceptance of the Final Payment shall operate as a full and final release to the District and its agents from any and all unasserted claims ESCO has, or may have, related to this Contract.

c. Payments Do Not Imply Acceptance of Work:

The granting of any progress payment or payments by the District or the receipt thereof by the ESCO shall not constitute acceptance of the work or of any portion thereof and shall in no way lessen the liability of the ESCO to replace unsatisfactory work or material, whether or not the unsatisfactory character of such work or material was apparent or detected at the time such payment was made.

f. Retention of Sums Charged Against ESCO:

It is mutually understood and agreed that when under any provision of this Contract the District shall charge any sums of money against the ESCO, the amount of such charge shall be deducted and retained by the District from the amount of the next succeeding progress estimate, or from any other monies due or that may become due the ESCO on account of the Contract. If on completion or termination of the Contract such monies due the ESCO are found insufficient to cover the District's charges against the ESCO, the District shall have the right to recover the balance from the ESCO or the ESCO's Sureties.

g. Release:

The ESCO and each assignee under an assignment in effect at the time of Final Payment shall, if required by the District, execute and deliver at the time of Final Payment and as a condition precedent to Final Payment, a release in form and substance satisfactory to and containing such exemptions as may be found appropriate by the District, discharging the District, its officers, agents and employees of and from liabilities, obligations and claims arising under this Contract.

h. Payment to Subcontractors and Suppliers:

The ESCO shall pay each Subcontractor and supplier promptly on receipt of each progress payment from the District for the materials, labor and equipment delivered to the site or incorporated in the work by each Subcontractor during the period for which the progress payment is made, less any retention as provided above.

i. Stop Notice Costs:

The District reserves the right to charge the ESCO or Surety, or to withhold from release of retention, all costs incurred by the District, including attorney's fees, for processing and defending stop notice claims.

28. MODIFICATIONS OF CONTRACT

a. Changes in the Work:

1). The District, before the date of acceptance of the work, may, without notice to the Sureties, order changes in the work ("Modifications"), may order extra materials and extra work in connection with the performance of the Contract, and the ESCO shall promptly comply with such orders. All Modifications must be approved by DSA and the State Fire Marshall, if applicable, as required by law.

2). If changes ordered in design, workmanship or materials are of such a nature as to increase or decrease the cost of any part of the work, the price fixed in the Contract shall be increased or decreased by such amount as represents the reasonable and proper allowance for the increase or decrease in the cost of the work in accordance with the provisions of this Article,

and any other applicable terms of the Contract, including, but not limited to, the ESCO's schedule of values and the price for allowances, if any. Except as provided by law, the **total cost of all Modifications shall not exceed ten (10) percent of the original Contract price**.

3). In the case of a disputed work item, the District may direct the ESCO to perform the disputed work at no additional cost to the District on the grounds that the work is adequately indicated in the Contract Documents, and therefore already included in the Contract price. If the ESCO maintains that the disputed work represents a modification to the Contract, ESCO may submit a claim in accordance with Article 50, Resolution of Construction Claims. Notwithstanding any dispute regarding the requirements of the Contract Documents, ESCO shall promptly and fully comply with the District's directive. ESCO's failure to do so shall be deemed a material breach of this Contract, and in addition to all other remedies, District may, at its sole discretion, hire another ESCO and/or use its own forces to complete the disputed work at ESCO's sole expense, and may deduct the cost of such work from the Contract price.

b. Cost Breakdown

When the Modification is proposed, the ESCO shall furnish a complete breakdown of actual costs of both credits and extras, itemizing materials, labor, taxes, overhead and profit. Subcontract work shall be so indicated. All costs must be fully documented. The following limitations shall apply:

1). Limitations Where Contract Price Changes are Involved:

(a) Overhead and Profit for the ESCO. The ESCO's overhead and profit on the cost of subcontracts shall be a sum not exceeding ten percent (10%) of such costs. The ESCO's overhead and profit on the costs of work performed by the ESCO shall be a sum not exceeding fifteen percent (15%) of such costs. Overhead and profit shall not be applied to the cost of taxes and insurance by ESCO or Subcontractors or to credits. No processing or similar fees may be charged by the ESCO in connection with the Modification.

(b) Bond Premiums. The actual rate of bond premiums as paid on the total cost (including taxes) will be allowed, but with no markup for profit and overhead.

(c) Taxes. State and city sales taxes should be indicated. Federal excise tax shall not be included. (District will issue an exemption on request.)

2). Change Order Certification:

All change orders and requests for proposed change orders shall be deemed to include the following certification by the ESCO:

"The undersigned ESCO approves the foregoing as to the changes in work, if any, and as to the Contract price specified for each item and as to the extension of time allowed, if any, for completion of the Project as stated herein, and agrees to furnish all labor, materials, and service and to perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of claims which have no basis in fact or which ESCO knows are false are made at the sole risk of the ESCO and may be a violation of the False Claims Act, as set forth in Government Code §§12650 et seq. It is understood that the

changes to the Contract Documents set forth herein shall only be effective upon approval by the Governing Board of the District.

"It is expressly understood that the value of the extra work or changes expressly includes any and all of the ESCO's costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages, or time extensions not included herein are deemed waived."

c. Unit Prices, Schedule of Values, or Allowances:

Where Unit Prices, a Schedule of Values, and/or Allowances are required by the Contract Documents, that pricing shall govern in computing any additions to or deductions from the Contract price on account of any added or omitted work. Unit Prices listed in the original proposal include all costs and no addition of any description will be allowed.

d. Time and Materials:

If it is impractical, because of the nature of the work, or for any other reason, to fix an increase in price in advance, the Change Order may fix a maximum price which shall not under any circumstances be exceeded, and subject to such limitation, such alteration, modification or extra shall be paid for at the actual necessary cost as determined by the sum of the following items (1) to (5) inclusive:

1). Labor, including premium on compensation insurance and charge for Social Security taxes, and other taxes pertaining to labor.

2). Material, including sales taxes and other taxes pertaining to materials.

3). Plant and equipment rental, to be agreed upon in writing before the work is begun. No charge for the cost of repairs to plant or equipment will be allowed.

4). Overhead and profit computed at fifteen percent (15%) of the total of Items (1) to (3) inclusive.

5). The proportionate cost of premiums on bonds computed at one and one-half percent (1-1/2%) of the total of items (1) to (4) inclusive.

If the Time and Materials work is done by a Subcontractor, the amount shall be determined as set forth above under items (1) to (5) inclusive. The ESCO's overhead and profit on the costs of subcontracts (exclusive of taxes and insurance) shall not exceed ten percent (10%) of such costs.

The District reserves the right to furnish such materials as it may deem expedient, and no allowance will be made for profit thereon. The above-described methods of determining the payment for work and materials shall not apply to the performance of any work or the furnishing of any material which, in the judgment of the District, may properly be classified under items for which prices are established in the Contract.

e. Oral Modifications:

No oral statements of any person shall in any manner or degree modify or otherwise affect the terms of the Contract.

9. INDEMNITY

ESCO shall defend with counsel acceptable to the District, indemnify and hold harmless to the full extent permitted by law, the District and its Board of Trustees, officers, agents, Project Manager, construction manager, employees and volunteers from and against any and all liability, loss, damage, claims, expenses, fines, judgments and costs (including, without limitation, attorney's fees and costs and fees of litigation) (collectively, "Liability") of every nature arising out of or in connection with ESCO's performance of the Project or its failure to comply with any of its obligations contained in these Contract Documents, except such Liability caused by the active negligence, sole negligence or willful misconduct of the District. Such indemnification shall extend to all claims, demands, or liabilities occurring after completion of the project as well as during the progress of the work. Pursuant to Public Contract Code §9201, District shall timely notify ESCO of receipt of any third-party claim relating to this Project.

10. WARRANTY OF TITLE

ESCO warrants that title to all work, materials or equipment included in a request for payment shall pass and transfer to the District whether or not they are installed or incorporated in the Project, free from any claims, liens or encumbrances, when such payment is made to the ESCO. ESCO further warrants that no such work, materials or equipment have been purchased for work under the Contract subject to an agreement by which an interest therein or an encumbrance thereon is retained by the seller or supplier.

11. USE OF COMPLETED PARTS OF THE WORK BEFORE ACCEPTANCE

Whenever the work or any part thereof is in a condition suitable for use, and the best interest of the District requires such use, as determined by the District, the District may take possession of, connect to, open for public use, or use the work or a part thereof. When so used, maintenance and repairs due to ordinary wear and tear or vandalism will be made at District's expense. The use by the District of the work or part thereof as contemplated in this section shall in no case be construed as constituting acceptance of the work or any part thereof, including, but not limited to, the right to assess liquidated damages. Such use shall neither relieve the ESCO of any of ESCO's responsibilities under the Contract nor act as a waiver by the District of any of the conditions thereof. ESCO shall continue to maintain all insurance, including Builder's Risk insurance, on the entire Project, and diligently pursue full completion of the work.

12. GUARANTEE & WARRANTY

By signing this Contract, ESCO agrees to the following guarantee and warranty:

We hereby guarantee and warrant our work on the Proposition 39 Energy Project for a period of two (2) years from the date of filing of the Notice of Completion.

ESCO shall promptly repair or replace to the satisfaction of the District any or all work that appears defective in workmanship, equipment and/or materials for whatever reason, ordinary wear and tear and unusual abuse or neglect excepted, together with any other work which may be damaged or displaced in so doing. ESCO agrees to promptly correct and remedy any failure by the ESCO to conform its work, activities and services to the requirements of the Contract Documents. ESCO shall provide an electronic version of the workmanship warranty stating such 10 days after the final inspection.

ESCO shall provide **post-construction a 10% warranty bond** for any work that may need repair or replacement post-installation for a period of two years from the date of filing the Notice of Completion or ESCO can provide a two-year maintenance period from the Payment and Performance bonds from the date of filing the Notice of Completion. See **Appendix F**.

In the event of the ESCO's failure to comply with the above-mentioned obligations within the ten (10) calendar days of notice, or sooner if required by an emergency, ESCO hereby authorizes the District to have the defects or deficiencies repaired, remedied, corrected and made good at ESCO's expense, and ESCO shall pay the costs and charges therefore upon demand. The warranty bond will cover these costs and charges as well for a period of two years from the date of filing the Notice of Completion.

13. PROTECTION OF WORK AND PROPERTY

a. The ESCO shall be responsible for each operation and all work on the Project, both permanent and temporary. The ESCO shall protect the work and materials from damage due to negligence, the action of the elements, the carelessness of third parties, vandalism, or any other cause whatsoever, until the final completion and acceptance of the Project. Should improper work by the ESCO be covered by another ESCO and damage or defects result, the whole work affected shall be made good by the ESCO to the satisfaction of the Project Manager and District without expense to the District. The ESCO shall take reasonable care to avoid damage to existing facilities or utilities, whether on the Project or adjacent to it, and ESCO shall be liable for any damage thereto or interruption of service due to ESCO's operations. If the ESCO encounters any facilities or utilities not shown on the drawings or not reasonably inferable there from, ESCO shall promptly notify the Project Manager about them, and shall do no further work which may cause damage to same. If it is determined that some action needs to be taken regarding facilities not shown, the ESCO will be given directives on what action to take, and any additional cost to the ESCO incurred thereby will be handled by Change Order.

b. The property limits of the area of the Project are indicated on the drawings. Except for work specifically shown or noted, ESCO shall confine ESCO's operations within the indicated property limits. The ESCO shall provide, install, and maintain all shoring, bracing and underpinning necessary to support adjacent property, streets, buildings and structures, that may be affected by building operations for this work; shall serve or cause to be served all legal notices to adjoining property owners that may be necessary for their protection; and shall protect from damage all adjacent buildings, fences, landscaping, and repair or replace any such property damaged in the course of work under the Contract.

14. USE OF ROADWAYS AND WALKWAYS

The ESCO shall not unnecessarily interfere with use of any roadway, walkway or other facility for vehicular or pedestrian traffic, by any party entitled to use it. Wherever such interference becomes necessary for the proper and convenient performance of the work and no satisfactory detour route exists, the ESCO shall, before beginning the interference, provide a satisfactory detour, temporary bridge, or other proper facility for traffic to pass around or over the interference and shall maintain it in satisfactory condition as long as the interference continues, all without extra payment unless otherwise expressly stipulated in the Contract Documents.

15. MATERIALS

a. Unless explicitly stated otherwise, all specified equipment and material comprising the work of this Contract, as being provided or furnished or installed, shall imply the inclusion of all components, hardware and accessories, required for complete installation and satisfactory operation as intended by the manufacturer. Wherever the method of installation of any material is not explicitly specified, the installation shall be as recommended by manufacturer.

b. Wherever in the Contract Documents it is provided that the ESCO shall furnish materials or equipment for which no detailed specifications are set forth, such materials or equipment shall be new and of the best grade for the purpose for which they will be used when incorporated in the work. Materials specified by reference to a number or symbol of a specific standard, such as A.S.M., Federal Specification, State Standard, Trade Association, or similar standards, shall comply with requirements in the latest revision thereof and any amendment or supplement in effect on the date of the Request for Proposals.

c. None of the materials to be provided furnished or installed on this project shall contain asbestos or any other "hazardous substance" as that term is defined by federal or state law.

16. SUBSTITUTIONS

a. Wherever in the drawings or Specifications a material or product is called for by trade or brand names or manufacturer and model number, alternative items of equal quality and purpose may be proposed for use by the ESCO. The burden of proof of equality is on the ESCO, and ESCO shall furnish all information and supplies necessary for the Project Manager to make a thorough evaluation of the proposed substitution. The Project Manager's decision about the equality of the proposed substitution is final, and if the proposed substitution is not approved, the ESCO shall install the item called for. Proposed substitutions and any changes in adjacent work caused by them shall be made by the ESCO at no additional cost to the District.

b. Proposed substitutions shall be submitted sufficiently before actual need to allow time for thorough evaluation. Substitutions shall not be proposed for the reason that submittals were not made early enough to avoid delay. Project Manager's review of substitutions shall not relieve the ESCO from complying with the requirements of the drawings and Specifications. Requests for substitution will be considered if received within 30 days after receipt of the Notice of Award. Requests received more than 30 days after receipt of the Notice of Award may be considered or rejected at the discretion of the Project Manager. Contractor shall identify the product, or the fabrication or installation method to be replaced in the request. Contractor shall also provide complete documentation showing compliance with the requirements for substitutions, as set forth herein, and the following information, as appropriate:

- Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
- Samples, where applicable or requested.
- A detailed comparison on the same page of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect. All differences in products shall be noted.

- A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.

- Certification by the Contractor that the substitution proposed complies in every significant respect to that required by the Contract Documents, and that it shall:

    - Be equal to or better in every significant respect to specified material or product and shall perform adequately in the intended application.

    - Provide the same or greater warranty for the substitution as for the specified product.

    - Provide the same required fire rating for the substitution as for the specified product.

    - Coordinate installation and make changes to other Work, which may be required for the Work to be complete with no additional costs to Owner.

c. In the event ESCO makes substitutions in materials, equipment, or designs, with or without the District's approval, other than those authorized herein, the ESCO shall then assume full responsibility for the effects of such substitutions on the entire project, including the design, and shall reimburse the District for any charges resulting from such substitutions, including any charges for modifications in the work of other trades, and including any charges for additional design and review, plus reasonable and customary mark-ups.

17. TESTING

a. Materials, equipment, or other work requiring tests may be specified in the Contract Documents, and they shall be adequately identified and delivered to the site in ample time before intended use to allow for testing. If such materials, equipment or other work should be covered without required testing and approval, they shall be uncovered at the ESCO's expense, including any repairs or replacement resulting there from. The ESCO shall notify the District and Project Manager when and where such materials, equipment or other work are ready for testing, and ESCO shall bear the cost of making them available for testing. The ESCO shall notify the District and Project Manager sufficiently before the need for testing so as to cause no delay in the work and, in any case, at least forty-eight (48) hours prior to the need for testing.

b. The cost of initial tests called for will be paid by the District and will be performed by independent testing consultants retained by the District. All other tests and inspections specified or otherwise required to substantiate compliance with specified requirements for quality of material or performance of operation shall be paid for by the ESCO. If retesting or additional testing is necessary because of substandard initial test results, the costs thereof shall be paid by the ESCO, including any repairs or replacement resulting there from.

18. INSPECTION

a. All materials, equipment and workmanship used in the work of the Project shall be subject to inspection or testing at all times and locations during construction and/or manufacture. The District's and Project Manager's authorized representatives and representatives of other agencies having authority over the work shall have access to the work for the above purposes at all reasonable times and locations. Any material or work found to be unsatisfactory or not according to the Contract Documents shall be replaced with the correct material or work and the

defective items promptly removed, all at the ESCO's expense, when directed to do so by any of the above-named persons having authority over the work. The cost of review time and analysis by the Project Manager or other District consultants necessitated by incomplete or defective work by the ESCO shall be charged to the ESCO.

b. Inspection and testing by the District or its representatives shall not relieve the ESCO from complying with the requirements of the Contract Documents. The ESCO is responsible for its own quality control.

c. Whenever required by the District or Project Manager, the ESCO shall furnish all tools, labor and materials necessary to make an examination of work in place by uncovering the same. Should such work be found unsatisfactory, the cost of examination and reconstruction shall be paid by the ESCO. Should such work be found satisfactory, the cost of examination and reconstruction of the work shall be paid by Change Order unless the ESCO improperly covered the work before it could be inspected or tested. If the ESCO considers it necessary or desirable to work on Saturday, Sunday or a holiday, ESCO shall seek written approval from the District at least forty-eight (48) hours before the commencement of such work.

19. CLEANUP

a. The ESCO shall maintain the premises and area of the work shall be in a reasonably clean condition. No burning of rubbish on-site shall be allowed. The ESCO shall control dust on the site by sprinkling at whatever intervals are necessary to keep it laid down and shall take measures to prevent dust and debris from being accidentally transported outside the area of the work.

b. Final cleaning, such as sweeping, dusting, vacuuming, dry and wet mopping, polishing, sealing, waxing and other finish operations normally required on newly installed work shall be taken to indicate the finished conditions of the various new and existing surfaces to restore area to condition at the time of acceptance. Prior to the time of acceptance, all marks, stains, fingerprints, dust, dirt, splattered paint and blemishes resulting from the various operations shall be removed throughout the Project. Stair treads and risers shall be wet-mopped. Glass shall be left clean and polished both inside and outside. Plumbing fixtures and light fixtures shall be washed clean. Hardware and other unpainted metals shall be cleaned, and all building papers and other temporary protections shall be removed throughout the building, or portion of the building where ESCO was involved, all to the satisfaction of the Project Manager and District. The exterior of the buildings, playfields, exterior improvements, planting spaces, and other work areas shall be similarly clean and in good order.

20. CONSTRUCTION WASTE MANAGEMENT

a. Scope

1). This Article includes requirements for the diversion by the ESCO of construction and demolition debris from landfills. The ESCO shall develop and implement a Waste Management Plan as specified herein. The ESCO shall take a pro-active, responsible role in the management of construction and demolition waste and require all Subcontractors, vendors, and suppliers to participate in the effort.

2). The District has established that this Project shall generate the least amount of waste practicable and that processes shall be utilized that ensure the generation of as little waste as possible due to over-packaging, error, poor planning, breakage, mishandling, contamination or other factors.

3). As much of the waste materials as economically feasible shall be reused, salvaged or recycled. Waste disposal in landfills shall be minimized.

4). The ESCO is encouraged to use waste hauling companies that separate recyclable materials. The ESCO shall work with its waste haulers in providing other recycling methods as appropriate.

5). The ESCO is responsible for implementation of any special programs involving rebates or similar incentives related to the recycling of waste. Revenues or other savings obtained for salvage or recycling accrue to the ESCO.

b. References

1). "Builders' Guide to Reuse and Recycling, A Directory for Construction and Demolition Materials."

2). "Construction Site Recycling, a Guide for Building ESCOs ". For a copy of the guide call 1-888-442-2666 or go to www.recycleworks.org.

3). "Where to Recycle Construction and Demolition Debris." For a copy of the guide call 1-888-442-2666 or go to www.recycleworks.org.

c. Definitions

1). General: Construction and demolition waste includes products of demolition or removal, excess or unusable construction materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work.

2). Divert" means to use material for any lawful purpose other than disposal in a landfill or transfer facility for disposal

3). "Recycling Service" means an off-site service that provides processing of material and diversion from a landfill.

4). "Hauler" means the entity that transports construction and demolition debris to either a landfill or a recycling service.

d. Compliance with Regulatory Requirements

1). The ESCO shall perform all handling, storage, transportation and disposal of construction debris in compliance with all applicable Federal, State, regional, and local statutes, laws, regulations, rules, ordinance, codes and standards.

2). Nothing stated on the drawings, in this Article 40 or in any other provision of the Contract Documents shall be construed as allowing work that is not in strict compliance with all applicable Federal, State, regional, and local statutes, laws, regulations, rules, ordinances, codes and standards.

e. Performance Requirement

1). The ESCO shall divert a minimum of 50 percent (50%) of the total Project construction and demolition waste from landfills.

f. Quality Control

1). General:

i) The ESCO shall not permit materials designated for diversion to become contaminated or to contaminate the site or surrounding areas.

2). Training and Coordination:

i) The ESCO shall designate an on-site party [or parties] who will be responsible for instructing workers and Subcontractors and overseeing and documenting the results of the Waste Management Plan for the Project.

ii) The ESCO shall furnish copies of the Waste Management Plan to all on-site supervisors, each Subcontractor, and the District's representative.

iii) The ESCO shall include construction waste management as an item on the agenda of all progress meetings.

3). The Waste Management Plan:

i) The ESCO shall prepare a Waste Management Plan for diverting the specified percentage of construction debris from landfills, including written and graphic information indicating how the waste will be diverted.

ii) Include in the plan both on-site recycling of construction debris and off-site diversion from landfills.

iii) Identify the means and methods for collecting and separating each type of debris deemed reusable or recyclable.

iv) List the off-site recycling service and hauler of each designated debris item who has agreed to accept and divert that item from the landfill in the proposed quantities anticipated. List the service and hauler company name, address, telephone number, and persons contacted.

v) List the name of individuals on the ESCO's staff responsible for waste prevention and management.

vi) List the actions that will be taken to reduce solid waste generation, including coordination with Subcontractors to ensure awareness and participation.

vii) Describe the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.

viii) Characterize the waste to be generated, including estimated types and quantities. Name the landfills and/or incinerator to be used.

ix) List the specific waste materials that will be salvaged for resale, salvaged and reused on the Project, salvaged and stored for reuse on a future project, or recycled. Recycling facilities that will be used shall be identified by name, location, and phone number.

x) Identify the materials that cannot be recycled or reused with an explanation or justification, to be approved by the Project Manager.

The ESCO shall submit the Waste Management Plan to the Project Manager within 10 calendar days after receipt of the Notice to Proceed, or prior to any waste removal, whichever occurs first. The ESCO shall promptly revise and resubmit the Plan as required by the Project Manager. Review of the ESCO's Waste Management Plan will not relieve the ESCO of responsibility for compliance with applicable environmental regulations or meeting Project diversion requirements.

g. Plan Implementation

1). The ESCO shall implement the approved Waste Management Plan.

2). The ESCO shall maintain a log of each load and of each category of waste that is diverted from the landfill. The ESCO shall separately log the debris sent to a Class III landfill and materials sent to recycling facilities.

3). The ESCO shall include in the log the type of load, load weight, name of the hauling service, recycling service or landfill, and the date accepted by the recycling service or by the landfill.

4). The ESCO shall retain and make available all weight tickets and copies of receipts and invoices relating to the implementation of the Plan.
5). The District reserves the right to audit the log at any time.

h. Material Handling

1). Designate a specific area or areas on site to facilitate the separation of materials for potential reuse, salvage, recycling, and return. Clearly mark bins for each category of waste.
2). Keep waste bins and pile areas neat and clean. Do not contaminate non-recyclable waste with materials designated for reuse or recycling.

i. ESCO's Responsibilities

1). Provide on-site instruction of the appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
2). Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in a manner that maximizes recyclability and salvageability of identified materials. Provide the necessary containers, bins and storage areas to facilitate effective waste management. Provide barriers and enclosures around recyclable material storage areas which are nonhazardous and recyclable or reusable and which shall be located away from construction traffic. Provide adequate space for pick-up and delivery. Use cleaning materials that are nonhazardous and biodegradable.

21. INSTRUCTIONS AND MANUALS

One electronic copy of all maintenance instructions application/installation instructions and service manuals called for in the Specifications shall be provided by the ESCO. These shall be complete as to drawings, details, parts lists, performance data and other information that may be required for the District to easily maintain and service the materials and equipment installed under this Contract. All manufacturers' application/installation instructions shall be given to the Project Manager at least ten (10) days prior to first material application or installation of the item. The maintenance instructions and manuals, along with any specified guarantees, shall be delivered to the Project Manager for review prior to submitting to District, and the ESCO or appropriate Subcontractors shall instruct District's personnel in the operation and maintenance of the equipment prior to final acceptance of the Project. All documentation must be received by Project Manager within thirty (30) calendar days after District's notice of completion.

22. AS-BUILT DRAWINGS

The ESCO and all Subcontractors shall maintain on the work site a separate complete set of contract drawings which will be used solely for the purpose of recording changes made in any portion of the work during the course of construction, regardless of the reason for the change. As changes occur, there will be included or marked on this record set on a daily basis if necessary to keep them up to date at all times. Actual locations to scale shall be identified on the drawings for all runs of mechanical and electrical work, including all site utilities, installed underground, in walls, floors, and furred spaces, or otherwise concealed. Deviations from the drawings shall be shown in detail. All main runs, whether piping, conduit, duct work, drain lines, etc., shall be located in addition by dimension and elevation. Progress payments may be delayed or withheld until such time as the record set is brought up to date to the satisfaction of the Project Manager. The ESCO shall verify that all changes in the work are included in the "AS-BUILT" drawings and deliver the complete set thereof to the Project Manager for review

and approval within thirty (30) calendar days after District's notice of completion. District's acceptance and approval of the "AS-BUILT" drawings are a necessary condition precedent to the release of the final retention.

23. SUBSTITUTION OF SECURITIES

a. Pursuant to Public Contract Code section 22300, ESCO may request in writing that it be allowed at its own expense to substitute securities for moneys withheld by District to ensure performance under this Contract. Only securities listed in Government Code Section 16430 and bank or savings and loan certificates of deposit, interest-bearing demand deposit accounts standby letters of credit, or any other security mutually agreed to by ESCO and District shall qualify under this Article. Securities equivalent to the amount withheld shall be deposited with the District or with a state or federally chartered bank in California as the escrow agent. Upon satisfactory completion of the Contract and on written authorization by the District, the securities shall be returned to ESCO. ESCO shall be the beneficial owner of the securities and shall receive any interest thereon. The ESCO may alternatively request District to make payment of retentions earned directly to the escrow agent at the expense of the ESCO.

b. At the expense of the ESCO, the ESCO may direct the investment of the payments into securities and the ESCO shall receive the interest earned on the investments upon the same terms provided for above for securities deposited by ESCO. Upon satisfactory completion of the contract, ESCO shall receive from the escrow agent all securities, interest, and payments received by the escrow agent from the District. The ESCO shall pay to each Subcontractor, not later than 20 days of receipt of payment, the respective amount of interest earned, net of costs attributed to retention withheld from each Subcontractor, on the amount of retention.

c. Any escrow agreement entered into pursuant to this Article shall comply with Public Contract Code section 22300 and shall be subject to approval by District's counsel.

24. NO DISCRIMINATION

It is the policy of the District that, in connection with all work performed under this public works contract, there shall be no discrimination against any prospective or active employee or any other person engaged in the work because of actual or perceived race, color, ancestry, national origin, ethnic group identification, religion, sex, gender, sexual orientation, age, physical or mental disability, or marital status. The ESCO agrees to comply with applicable Federal and California laws including, but not limited to, the California Fair Employment Practice Act, beginning with Government Code §12900, Government Code §11135, and Labor Code §§ 1735, 1777.5, 1777.6 and 3077.5. In addition, the ESCO agrees to require like compliance by all Subcontractors and suppliers.

25. LABOR STANDARDS

a. Work Hours:

In accordance with Labor Code section 1810, eight (8) hours of labor shall constitute a legal day's work under this Contract. ESCO and any Subcontractor shall pay workers overtime pay as required by Labor Code section 1815. The ESCO shall pay each worker, laborer, mechanic or persons performing work under this Contract at a rate not less than the prevailing wage for each craft or classification covering the work actually performed.

b. Penalty:

ESCO shall forfeit to District as a penalty the sum of twenty-five dollars ($25.00) for each worker employed in the execution of this Contract by ESCO or any Subcontractor for each calendar day during which the worker is required or permitted to work more than eight (8) hours in any one (1) calendar day or more than forty (40) hours per calendar week in violation of Article 3, Division 2, Part 7, Chapter 1 of the California Labor Code.

c. Employment of Apprentices:

ESCO shall comply with Labor Code §§1773.3, 1777.5 and 1777.6, and 3077 et. Seq., each of which is incorporated by reference into this Contract. These sections require that ESCOs and Subcontractors employ apprentices in apprenticeable occupations in a ratio of not less than one (1) hour of apprentice work for every five (5) hours of labor performed by a journeyman, unless an exception is granted and that ESCOs and Subcontractors shall not discriminate against otherwise qualified employees as apprentices on any public works solely on the ground of actual or perceived race, religion, color, national origin, ethnic group identification, sex, gender, sexual orientation, age, or physical or mental disability. Only apprentices who are in training under written apprenticeship occupations shall be employed. The responsibility for compliance with these provisions for all apprenticeable occupations rests with ESCO.

d. The ESCO shall be knowledgeable of and comply with Labor Code sections 1727, 1773.5, 1775, 1777, 1777.5, 1810, 1813, 1860, including all amendments thereto; each of these sections is incorporated by reference into this Contract.

26. GENERAL RATE OF PER DIEM WAGES

a. On File:

As required by Labor Code section 1773.2, the District has available copies of the general prevailing rate of per diem wages for workers employed on public work as determined by the Director of the Department of Industrial Relations, which shall be available to any interested party on request. ESCO shall post a copy of the document at each job site.

b. Prevailing Wage Rate:

The ESCO and each Subcontractor shall pay each worker performing work under this Contract at a rate not less than the prevailing wage as defined in Labor Code section 1771 and 1774 and Section 16000(a) of Title 8, California Code of Regulations.

c. Penalty:

In accordance with Section 1775 of the Labor Code, the ESCO shall forfeit to the District as penalty, the sum of fifty dollars ($50.00) for each calendar day, or portion thereof, for each worker paid less than the prevailing wage rates, as determined by the Director of the California Department of Industrial Relations, for any work done under this Contract by ESCO or by any Subcontractor. ESCO shall also pay each worker the difference between the stipulated prevailing wages rates and the amount actually paid to such worker.

27. RECORD KEEPING

a. The ESCO agrees to comply with the provisions of Sections 1776 and 1812 of the Labor Code. The ESCO and each Subcontractor shall keep or cause to be kept an accurate record showing the names, addresses, social security numbers, work classifications, straight time and overtime hours worked each day and week of all workers employed by ESCO in connection with the execution of this Contract or any subcontract there under and showing the actual per diem wages paid to each of such workers. These records shall be certified and shall be open at all reasonable hours to the inspection of the District awarding the Contract, its officers and agents, and to the Chief of the Division of Labor Statistics and Law Enforcement of the State Department of Industrial Law Enforcement of the State Department of Industrial Relations, and his or her other deputies and agents.

b. In addition, copies of the above records shall be available as follows:

1). A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request;

2). A certified copy of all payroll records shall be made available for inspection or furnished upon request to the District, the Division of Labor Standards Enforcement, and the Division of Apprenticeship Standards of the Department of Industrial Relations;

3). A certified copy of all payroll records shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through either the District, the Division of Apprenticeship Standards, or the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested payroll records have not been previously provided, the requesting party shall, prior to being provided the records, reimburse the costs of the ESCO, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of the ESCO.

c. The ESCO shall file a certified copy of the records with the entity requesting the records within ten days after receipt of a written request. Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of the ESCO awarded the Contract or performing the Contract shall not be marked or obliterated.

d. The ESCO shall inform the Owner of the location of the records, including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.

e. In the event of noncompliance with the requirements of this section, the ESCO shall have ten days in which to comply after receipt of written notice specifying in what respects the ESCO must comply with this section. Should noncompliance still be evident after the ten-day period, the ESCO shall, as a penalty to the District, forfeit one hundred dollars ($100.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

f. Responsibility for compliance with this provision shall be with the ESCO.

28. PROJECT COMPLETION

a. When all of the work to be performed under this Contract has been fully completed, the ESCO shall notify the Project Manager and District, in writing, setting a date for inspection. The ESCO and Subcontractor representatives shall attend the inspection. As a result of this inspection, the Project Manager will prepare a list of items ("punch list") that are incomplete or not installed according to the Contract Documents. Failure to include items on this list does not relieve the ESCO from fulfilling all requirements of the Contract Documents.

b. The Project Manager will promptly deliver the punch list to the ESCO and it will include a period of time by which the ESCO shall complete all items listed thereon. On completion of all items on the punch list, verified by a final inspection, and all other Contract requirements, so that Final Completion has been achieved to the District's satisfaction, the District will file a Notice of Completion with the County Recorder. Payment of retention from the Contract, less any sums withheld pursuant to the terms of this Contract or applicable law, shall not be made sooner than thirty-five (35) calendar days after the date of filing of Notice of Completion.

c. District reserves the right to occupy buildings and/or portions of the site at any time before Completion, and occupancy shall not constitute final acceptance of any part of the Work covered by the Contract Documents, nor shall such occupancy extend the date specified for completion of the Work. Beneficial occupancy of building(s) does not commence any warranty period or entitle Contractor to any additional compensation due to such occupancy or affect in any way or amount Contractor's obligation to pay liquidated damages for failure to complete the Project on time.

29. TRENCHING OR OTHER EXCAVATIONS

a. Excavations or Trenches Deeper than Four Feet:

If the project involves digging trenches or other excavations that extend deeper than four feet, the following provisions shall be a part of this Contract:

1). The ESCO shall promptly, and before the following conditions are disturbed, provide written notice to the District if the ESCO finds any of the following conditions:

(a) Material that the ESCO believes may be a hazardous waste, as defined in Section 25117 of the Health and Safety Code, which is required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law.

(b) Subsurface or latent physical conditions at the site which are different from those indicated or expected.

I Unknown physical conditions at the site of any unusual nature or which are materially different from those ordinarily encountered and generally recognized as inherent in work which the ESCO generally performs.

2). In the event that the ESCO notifies the District that ESCO has found any of the conditions specified in subparagraphs (a), (b) or (c), above, the District shall promptly investigate the condition(s). If the District finds that the conditions are materially different or that a hazardous waste is present at the site which will affect the ESCO's cost of, or the time required for, performance of the Contract, the District shall issue a change order in accordance with the procedures set forth in this Contract.

3). In the event that a dispute arises between the District and the ESCO regarding any of the matters specified in Paragraph (2), above, the ESCO shall proceed with all work to be performed under the Contract and the ESCO shall not be excused from completing the Project as provided in the Contract. In performing the work pursuant to this Paragraph, the ESCO retains all rights provided by Article 50 which pertains to the resolution of disputes between the contracting parties.

b. Regional Notification Center:

The ESCO, except in an emergency, shall contact the appropriate regional notification center at least two (2) days prior to commencing any excavation if the excavation will be conducted in an area that is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the District, and obtain an inquiry identification number from that notification center. No excavation shall be commenced and/or carried out by the ESCO unless an inquiry identification number has been assigned to the ESCO or any Subcontractor and the ESCO has given the District the identification number. Any damages or delays arising from ESCO's failure to make appropriate notification shall be at the sole risk and expense of the ESCO and shall not be considered for an extension of the Contract time.

c. Existing Utility Lines:

1). Pursuant to Government Code section 4215, the District assumes the responsibility for removal, relocation, and protection of main or trunk utility lines and facilities located on the construction site at the time of commencement of construction under this contract with respect to any such utility facilities that are not identified in the plans and Specifications. ESCO shall not be assessed for liquidated damages for delay in completion of the Project caused by the failure of the District or the owner of a utility to provide for removal or relocation of such utility facilities.

2). Locations of existing utilities provided by the District shall not be considered exact, but approximate within reasonable margin and shall not relieve ESCO of responsibilities to exercise reasonable care nor costs of repair due to ESCO's failure to do so. The District shall compensate ESCO for the costs of locating and repairing damage not due to the failure of ESCO to exercise reasonable care and removing or relocating such utility facilities not indicated in the plans and Specifications with reasonable accuracy.

3). No provision herein shall be construed to preclude assessment against ESCO for any other delays in completion of the project. Nothing in this Section shall be deemed to require the District to indicate the presence of existing service laterals, appurtenances, or other utility lines, with the exception of main or trunk lines, whenever the presence of such utilities on the site of the construction Project can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of the construction.

4). If ESCO, while performing work under this Contract, discovers utility facilities not identified by the District in the project plans and Specifications, ESCO shall immediately notify the District and the utility in writing. The cost of repair for damage to above-mentioned visible facilities without prior written notification to the District shall be borne by the ESCO.

d. Prompt Notification:

ESCO understands, acknowledges and agrees that the purpose for prompt notification to the District pursuant to these provisions is to allow the District to investigate the condition(s) so that the District shall have the opportunity to decide how the District desires to proceed as a result of

the conditions. Accordingly, failure of ESCO to promptly notify the District in writing, pursuant to these provisions, shall constitute ESCO's waiver of any claim for damages incurred as a result of the conditions.

e. Trenches Five Feet and Deeper:

Pursuant to Labor Code section 6705, if the contract price exceeds $25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the ESCO shall, in advance of excavation, promptly submit to the District and/or a registered civil or structural engineer employed by the District or Project Manager, a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

30. RESOLUTION OF CONSTRUCTION CLAIMS

a. Public work claims of $375,000 or less between the ESCO and the District are subject to the provisions of Article 1.5 (commencing with §20104) of Chapter 1 of Part 2 of the Public Contract Code ("Article 1.5 claim"). For purposes of Article 1.5, "public work" has the same meaning as set forth in §§3100 and 3106 of the Civil Code; "claims" means a separate demand by ESCO for a time extension or payment of money or damages arising from work done by or on behalf of ESCO pursuant to the Contract and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to or the amount of the payment which is disputed by the District.

b. All claims shall be submitted on or before the date of the Final Payment and shall include all documents necessary to substantiate the claim. District shall respond in writing within 45 days of receipt of claim if the claim is less than or equal to $50,000 ("$50,000 claim") or within 60 days if the claim is over $50,000 but less than or equal to $375,000 ("50,000 - $375,000 claim"). In either case, District may request in writing within 30 days of receipt of claim any additional documentation supporting the claim or relating to any defenses to the claim which the District may have against the ESCO. Any additional information shall be requested and provided upon mutual agreement of the District and the ESCO. District's written response to the claim shall be submitted to ESCO within 15 days after receipt of the further documentation for $50,000 claims or within 30 days after receipt of the further documentation for $50,000 - $375,000 claims or within a period of time no greater than that taken by the ESCO in producing the additional information, whichever is greater.

c. Within 15 days of receipt of the District's response, if ESCO disputes the District's written response, or within 15 days of the District's failure to respond within the time prescribed, the ESCO shall provide written notification to District demanding an informal conference to meet and confer ("conference") to be scheduled by District within 30 days. Following the conference, if any claim or portion remains in dispute, the ESCO may file a claim as provided in Chapter 1 (commencing with §900) and Chapter 2 (commencing with §910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the period of time within which a claim must be filed is tolled from the time the claimant submits a written claim pursuant to this section until the time that claim is denied as a result of the conference process, including any period of time utilized by the meet and confer process.

d. Pursuant to Public Contract Code §20104.2(f), this section does not apply to tort claims and does not change the period for filing claims or actions specified by Chapter 1 (commencing with §900) and Chapter 2 (commencing with §910) of Part 3 of Division 3.6 of Title 1 of the Government Code.

e. If a civil action is filed, within 60 days, but no earlier than 30 days, following the filing of responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide that both parties select a disinterested third person mediator within 15 days, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days of the commencement of the mediation unless time is extended upon a good cause showing to the court or by stipulation of the parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

f. If the matter remains in dispute, the case shall be submitted to judicial arbitration as set forth in Public Contract Code §§20104.4 (b)(1) through (b)(3).

g. For any claim in excess of $375,000, the ESCO and the District shall follow the same process as for an Article 1.5 claim. The District will forward a response within 60 days of submittal of any such claim. Judicial arbitration is not required for claims in excess of $375,000. Claims shall also be processed consistent with Public Contract Code section 9204, which provides processing timelines and procedures, and requires that undisputed claims be promptly paid in accordance with this code provision.

h. In addition, for all unresolved claims that the ESCO wishes to pursue, the ESCO shall file a timely claim pursuant to the Government Claims Act and shall otherwise comply with the procedures set forth in that Act prior to commencing any litigation against the District. The accrual date for any such claim is the date the dispute or controversy first arose regarding the issues raised in the claim.

i. "The date of Final Payment," as used in this Article 50, means the date the public entity is required to release retention proceeds in accordance with Public Contract Code §7107 regardless of whether any payment is made to the ESCO at that time.

j. The claims required by this Article are jurisdictional and conditions precedent to the commencement of any further legal proceedings. Strict compliance with all filing deadlines is mandatory.

31. DISABLED VETERANS PARTICIPATION GOALS (Applies to K-12 districts only.)

In accordance with Education Code §17076.11, this District has a participation goal for disabled veteran business enterprises ("DVBE") of at least 3 percent (3%) per year of the overall dollar amount of funds allocated to the District by the State Allocation Board pursuant to the Leroy F. Greene School Facilities Act of 1998 for construction or modernization and expended each year by the District. Prior to, and as a condition precedent for final payment under any contract for such project, the ESCO shall provide appropriate documentation to the District identifying the amount paid to DBVE in conjunction with the Contract, so that the District can assess its success at meeting this goal.

32. RETENTION OF DVBE RECORDS (Applies to K-12 districts only.)

The ESCO agrees that, for all contracts subject to DVBE participation goals, the State and the District have the right to review, obtain and copy all records pertaining to performance of the contract in accordance with DVBE requirements. The ESCO agrees to provide the State or the District with any relevant information requested and shall permit the State or District access to its premises upon reasonable notice for purposes of interviewing employees and inspecting

records. The ESCO agrees to maintain such records for a period of three years after final payment under the Contract.

33. FINGERPRINTING (Applies to K-12 districts only.)

District Determination of Fingerprinting Requirement Application

The District has considered the totality of the circumstances concerning the Project and has determined that the ESCO and ESCO's employee (which includes **Subcontractor employees):**

_____ are subject to the requirements of Education Code §45125.2 and Paragraph (a) below, is applicable.

__X__ are not subject to the requirements of Education Code §45125.2**,** and Paragraph (b) below, is applicable.

a. Contracts for Construction, Reconstruction, Rehabilitation or Repair of a School Facility Involving More than Limited Contact with Students (§45125.2)

By execution of the Contract, the ESCO acknowledges that ESCO is entering into a contract for the construction, reconstruction, rehabilitation, or repair of a school facility where the ESCO and/or ESCO's employees will have more than limited contact with students and the services to be provided do not constitute an emergency or exceptional situation. In accordance with Education Code §45125.2 the ESCO shall, at ESCO's own expense, (1) install a physical barrier to limit contact with students by ESCO and/or ESCO's employees, and/or (2) provide for the continuous supervision and monitoring of the ESCO and/or ESCO's employees by an employee of the ESCO who has received fingerprint clearance from the California Department of Justice, and/or (3) provide for the surveillance of the ESCO and ESCO's employees by a District employee.

b. Contracts for Construction, Reconstruction, Rehabilitation or Repair of a School Facility Involving Only Limited Contact with Students (§45125.2)

By execution of the Contract, the ESCO acknowledges that ESCO is entering into a contract for the construction, reconstruction, rehabilitation or repair of a school facility involving only limited contact with students. Accordingly, the parties agree that the following conditions apply to any work performed by the ESCO and ESCO's employees on a school site: (1) ESCO and ESCO's employees shall check in with the school office each day immediately upon arriving at the school site; (2) ESCO and ESCO's employees shall inform school office staff of their proposed activities and location at the school site; (3) Once at such location, ESCO and ESCO's employees shall not change locations without contacting the school office; (4) ESCO and ESCO's employees shall not use student restroom facilities; and (5) If ESCO and/or ESCO's employees find themselves alone with a student, ESCO and ESCO's employees shall immediately contact the school office and request that a member of the school staff be assigned to the work location.

54. LABOR COMPLIANCE PROGRAM

If this Contract is for a public works project over $25,000 or for a maintenance project over $15,000, ESCO acknowledges that the project is subject to compliance monitoring and enforcement by the California Department of Industrial Relations in accordance with California Labor Code sections 1725.5 and 1770 *et seq*. All contractors and subcontractors working at the

site shall be duly registered with the Department of Industrial Relations at time of bid opening and at all relevant times. Proof of registration shall be provided as to all such contractors prior to the commencement of any work. ESCO shall coordinate with the Architect to ensure that DIR is advised of the award of the construction contract in a timely manner by filing form PWC-100 with DIR within ten days of award of the contract, but no later than the first day in which the ESCO has workers employed upon the project.

55. DRUG-FREE WORKPLACE CERTIFICATION

ESCO certifies all of the following:

a. ESCO is aware of the provisions and requirements of California Government Code §§ 8350 et seq., the Drug Free Workplace Act of 1990.

b. ESCO is authorized to certify, and does certify, that a drug free workplace will be provided by doing all of the following:

1). Publishing a statement notifying all employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited in ESCO's workplace and specifying actions which will be taken against employees for a violation of the prohibition;

2). Establishing a drug-free awareness program to inform employees about all of the following:

(i) The dangers of drug abuse in the workplace;

(ii) ESCO's policy of maintaining a drug-free workplace;

(iii) The availability of drug counseling, rehabilitation and employee-assistance programs;

and

(iv) The penalties that may be imposed upon employees for drug abuse violations;

3.) Requiring that each employee engaged in the performance of Work on the Project be given a copy of the statement required by subdivision (a), above, and that as a condition of employment by ESCO in connection with the Work on the Project, the employee agrees to abide by the terms of the statement.

c. ESCO understands that if the District determines that ESCO has either: (a) made a false certification herein, or (b) violated this certification by failing to carry out and to implement the requirements of Government Code §§ 8350 et seq., the Contract is subject to termination, suspension of payments, or both. ESCO further understands that, should ESCO violate the terms of the Drug-Free Workplace Act of 1990, ESCO may be subject to debarment in accordance with the provisions of Government Code §§ 8350, et seq.

34. PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted, and this Contract shall be read and enforced as though it were included, and if through mistake or otherwise any provision is not inserted or is not correctly inserted, upon application of either party the Contract shall be amended to make the insertion or correction. All references to statutes and regulations shall include all amendments, replacements, and enactments on the subject which are in effect as of the date of this Contract.

35. GENERAL PROVISIONS

a. Assignment and Successors:

Neither party may transfer or assign its rights or obligations under the Contract Documents, in part or in whole, without the other party's prior written consent. The Contract Documents are binding on the heirs, successors, and permitted assigns of the parties hereto.

b. Third Party Beneficiaries:

There are no intended third-party beneficiaries to the Contract.

c. Choice of Law and Venue

The Contract Documents shall be governed by California law, and venue shall be in the Superior Court of the county in which the project is located, and no other place.

d. Severability

If any provision of the Contract Documents is determined to be illegal, invalid, or unenforceable, in part of in whole, the remaining provisions, or portions of the Contract Documents shall remain in full force and effect.

e. Entire Agreement

The Contract Documents constitute the final, complete, and exclusive statement of the terms of the agreement between the parties regarding the subject matter of the Contract Documents and supersedes all prior written or oral understandings or agreements of the parties.

f. Waiver

No waiver of a breach, failure of any condition, or any right or remedy contained in or granted by the provisions of the Contract Documents shall be effective unless it is in writing and signed by the party waiving the breach, failure, right, or remedy. No waiver of any breach, failure, right, or remedy shall be deemed a waiver of any other breach, failure, right, or remedy, whether or not similar, nor shall any waiver constitute a continuing waiver unless the writing so specifies.

g. Headings

The headings in the Contract Documents are included for convenience only and shall neither affect the construction or interpretation of any provision in the Contract Documents nor affect any of the rights or obligations of the parties to the Contract.

--End–

APPENDIX D: PERFORMANCE BOND

WHEREAS, the Governing Board of the Fortuna Union High School District ("District"), at its meeting on _____, 2018, has awarded to _____ ("Principal"), the Contract for performance of the following project ("Project"):
Proposition 39 Clean Energy Generation Project

WHEREAS, the Principal is required under the terms of the Contract to furnish a bond to the District as obligee ensuring its full and faithful performance of the Contract Documents, which are fully incorporated herein by this reference,

NOW, THEREFORE, we, the Principal and _____, as Surety, hereby guarantee the Principal's full, faithful and complete performance of the Contract Document requirements in the penal sum of _____ dollars ($_____) for the payment of which sum will and truly be made, we bind ourselves, our heirs, executors, administrators and successors, jointly, severally, and firmly by this agreement to perform or have performed all of the work and activities required to complete the Project pursuant to the Contract Documents and to pay to the District all damages the District incurs as a result of the Principal's failure to fully perform in accordance with the Contract Documents.

The condition of the obligation is such that if the Principal, its heirs, executors, administrators, successors or assigns shall in all things abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract Documents and any amendment thereof made as therein provided, on its or their parts to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall insure and indemnify and save harmless the District, its officers and agents, as therein stipulated, then this obligation shall become null and void. Otherwise, it shall be and remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the Contract Documents shall in any way affect its obligations on this bond and it does hereby waive notice of any such change, extension of time, alteration or addition.

Principal and Surety further agree to pay all costs incurred by the District in connection with enforcement of this bond, including, but not limited to the District's reasonable attorney's fees and costs incurred, with or without suit, in addition to any other sum required by this bond. Surety further agrees that death, dissolution, or bankruptcy of the Principal shall not relieve the Surety of its obligations hereunder.

In witness whereof, this instrument has been duly executed by the Principal and Surety this _____ day of _____, 2018.

To be signed by Principal and Surety and acknowledgment and notarial seal to be attached.

_____
PRINCIPAL

By: _____

TITLE _____

_____
SURETY

By: _____

TITLE _____

The above bond is accepted and approved this _____ day of _____, 2018_.

By: _____
Authorized District Signature

APPENDIX E: PAYMENT BOND

WHEREAS, the Fortuna Union High School District ("District") and the ESCO, _____ ("Principal") have entered into a contract ("Contract") for the furnishing of all materials, labor, services, equipment, tools, supervision and transportation necessary, convenient and proper for the _____ project ("Project") which Contract dated _____, 2018, and all of the Contract Documents made part thereof are fully incorporated herein by this reference; and

WHEREAS, ESCO/Principal is required by Division 4, Part 6, Title 3, Chapter 5 (commencing at Section 9550) of the California Civil Code to furnish a bond in connection with the contract;

NOW, THEREFORE, we, the ESCO/Principal and _____ as Surety, are held firmly bound unto Owner in the penal sum of $_____ Dollars ($_____), lawful money of the United States of America for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the ESCO/Principal, his/her or its heirs, executors, administrators, successors, or assigns, or a Subcontractor, shall fail to pay any person or persons named in Civil Code Section 9100 or fail to pay for any materials or other supplies used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Code with respect to work or labor thereon of any kind, or shall fail to deduct, withhold, and pay over to the Employment Development Department any amounts required to be deducted, withheld, and paid over by Section 13020 of the Unemployment Insurance Code with respect to work and labor thereon of any kind, then said Surety will pay for the same, in or to an amount not exceeding the amount set forth above, and in case suit is brought upon this bond Surety will also pay such reasonable attorney's fees as shall be fixed by the court, awarded and taxed as provided in Division 4, Part 6, Title 3, Chapter 5 (commencing at Section 9550) of the California Civil Code.

This bond shall inure to the benefit of any of the persons named in Section 9100 of the California Civil Code so as to give a right of action to such person or their assigns in any suit brought upon this bond. It is further stipulated and agreed that the Surety of this bond shall not be exonerated or released from the obligation of the bond by any change, extension of time for performance, addition, alteration, or modification in, to, or of any contract, plans, specifications, or agreement pertaining or relating to any scheme or work of improvement described above or pertaining or relating to the furnishing of labor, materials, or equipment therefore, nor by any change or modification of any terms of payment or extension of the time for any payment pertaining or relating to any scheme or work of improvement described above, nor by any rescission or attempted rescission of the contract, agreement, or bond, nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond, nor by any fraud practiced by any person other than the claimant seeking to recover on the bond, and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given, and under no circumstances shall Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the Owner and original

ESCO or on the part of any obligee named in such bond, but the sole conditions of recovery shall be that claimant is a person described in Section 8400 and 8402 of the California Civil Code and has not been paid the full amount of his/her or its claim and that Surety does hereby waive notice of any such change, extension of time, addition, alteration, or modification.

In witness whereof, this instrument has been duly executed by the Principal and Surety this _____ day of _____, 2018.

To be signed by Principal and Surety and acknowledgment and notarial seal to be attached.

_____
PRINCIPAL

By:
_____

_____
Title

_____
SURETY

By:
_____

_____
Title

The above bond is accepted and approved this _____ day of _____, 2018.

By:_____
Authorized District Signature

APPENDIX F: WARRANTY BOND

KNOW ALL PERSONS BY THESE PRESENTS, that

WHEREAS, the _____("District") and the contractor _____, ("Contractor")-have entered into a Contract ("Contract") for the following project (Project):

Proposition 39 Energy Efficiency Improvements

WHEREAS, Principal is required under the terms of the Agreement to furnish warranty security for the work performed pursuant to the Agreement in the amount of [$_____] to guarantee replacement and repair of the improvements as described in the Agreement for a period of one year following the date of recordation of the notice of acceptance of the Improvements against any defective work or labor done, or defective materials furnished.

NOW, THEREFORE, we, the Principal, and _____ as Surety, are held and firmly bound unto the City in the penal sum of _____Dollars ($_____) lawful money of the United States, being not less than 10 percent (10%) of the amount payable by the terms of the Contract, for the payment of which sum well and truly to be made we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

The condition of this obligation is such that if Principal shall indemnify City for all loss that City may sustain by reason of any defective materials or workmanship which become apparent during the period of one year from and after acceptance of the improvements by the City Council of City, then this obligation shall be null and void; otherwise, this obligation shall remain in full force and effect.

As a part of the obligation secured hereby and in addition to the face amount specified, costs and reasonable expenses and fees shall be included, including reasonable attorneys' fees incurred by City in successfully enforcing the obligation, all to be taxed as costs and included in any judgment rendered.

Surety's obligations hereunder are independent of the obligations of any other surety for the performance of the Contract, and suit may be brought against Surety and such other sureties, jointly and severally, or against any one or more of them, or against less than all of them without impairing the City's rights against the others.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the City or its successors or assigns.

Surety shall provide City with thirty (30) days' written notice of Principal's default prior to Surety terminating, suspending or revoking the bond.

The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed there under or the Specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their seals this day of _____, 2018, the name and corporate seal of each corporate body being hereto affixed, and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

To be signed by Principal and Surety and acknowledgment and notarial seal to be attached.

_____
PRINCIPAL

By: _____

TITLE _____

_____
SURETY

By: _____

TITLE _____

The above bond is accepted and approved this _____ day of _____, 2018.

By: _____
Authorized District Signature

_____
Print Name & Title

APPENDIX G: SUBCONTRACTOR LIST FORM

Each proposer shall list below the name and location of place of business for each Subcontractor who will perform a portion of the Contract work in an amount in excess of 1/2 of 1 percent of the total contract price. The nature of the work to be subcontracted shall also be described. Per SB96 Public Contract Code 4104, please list the DIR registration number for each Subcontractor.

DESCRIPTION OF WORK	NAME	LOCATION	LICENSE # & DIR #

DSA

IR A-10

ALTERATION AND RECONSTRUCTION PROJECTS—DSA APPROVAL EXEMPTION

Disciplines:	Structural	**History:**	Revised 01-26-18	Revised 02-04-15	Revised 11-03-10
	Fire & Life Safety		Revised 06-30-16	Revised 04-30-14	Revised 07-02-09
	Access Compliance		Revised 02-12-16	Revised 05-15-13	Revised 12-08-08
				Revised 02-22-13	Revised 03-17-08
				Revised 01-24-12	Revised 05-29-07
				Revised 03-10-11	Issued 11-16-05

PURPOSE: The purpose of this Interpretation of Regulations (IR) is to clarify when plans and specifications for alteration or reconstruction projects governed by California Education Code Sections 17295 and 81133 are required to be submitted to the Division of the State Architect (DSA) for review and approval, and to make the annual adjustment to the construction cost thresholds cited in the California Education Code sections.

1. EXCEPTIONS:

1.1 DSA review and approval is not required for alteration or reconstruction projects to school buildings governed by the Field Act with an estimated construction cost of $103,300, or less, for 2017 and 2018.

1.2 DSA review and approval is not required for alteration or reconstruction projects to school buildings governed by the Field Act with an estimated construction cost greater than $103,300, but not in excess of $232,425, for 2017 and 2018 when all of the following conditions are met:

1.2.1 A California-registered structural engineer shall examine the project and prepare a written statement certifying that the project does not contain any work of a structural nature. The statement must attest that the work does not cause any alteration or reconstruction of structural elements nor trigger structural rehabilitation per Title 24, Part 1, Section 4-309(c). This statement shall bear the signature and stamp or seal of the structural engineer and shall be filed with the appropriate DSA regional office.

1.2.2 The design professional in responsible charge of the project shall prepare a statement certifying that the plans and specifications (1) contain no work that is regulated by the accessibility standards of Title 24, (2) contain no work that triggers accessibility upgrades to existing buildings or facilities, and (3) meet all applicable fire and life safety standards. This statement shall bear the signature and stamp or seal of the design professional and shall be filed with the appropriate DSA regional office.

1.2.3 Within 10 days of the project completion, a DSA-certified project inspector shall sign and submit a verified report to DSA indicating that the completed project is in conformance with the plans and specifications. Form DSA 999: Inspection Verified Report for Projects Exempt from DSA Approval, is available from the DSA website at www.dgs.ca.gov/dsa/Forms.aspx.

2. VOLUNTARY SUBMITTAL: This interpretation does not preclude a design professional or school district from choosing to submit plans and specifications with the appropriate fee to DSA for review, even when the project is exempted from DSA plan review requirements as outlined herein.

3. REQUIREMENT TO COMPLY: Projects not requiring DSA approval (i.e., exempt projects) shall comply with all currently effective design, construction, and inspection provisions of the California Code of Regulations, Title 24, as adopted by DSA. **When authorizing construction of exempt projects described in this interpretation, the school district assumes responsibility to ensure compliance with all code provisions.**

4. DEFINITION: For this interpretation, "design professional in responsible charge" or "design professional" shall be the architect, structural engineer, or professional engineer (e.g., mechanical engineer for mechanical-only projects; electrical engineer for electrical-only projects), licensed to practice in California, who is responsible for the completion of the project design work.

5. ANNUAL ADJUSTMENT OF COST THRESHOLDS: Construction cost thresholds cited in this interpretation are based on June 2017 figures of $103,300 and $232,425, and are adjusted annually commencing January 1, 2018, per the California Education Code. Annual adjustments are calculated using the first January issue of *Engineering News-Record's U.S. 20 City Construction Cost Index*.

6. PROJECT COST DETERMINATION: For purposes of this interpretation, the estimated construction cost shall be determined at the completion of project design. For the purpose of determining estimated project cost, the scope of the project shall be limited to construction on one site only.

In accordance with Education Code Section 17280, the estimated construction cost used in determining exemption from DSA review shall not include the cost of air-conditioning equipment[1] and insulation materials[2], and installation cost of such equipment and materials when such installation does not cause structural alterations[3] to a school building (i.e., affects primary or secondary framing members). In cases where such installation causes structural alterations to a school building, the provisions of Title 24, Part 1, Section 4-309 will apply and the project may require DSA review and approval.

[1] For purposes of this provision, air conditioning (AC) equipment includes heating, ventilation, and air conditioning (HVAC), AC units, heating units, or ventilation units, and does not include ductwork or utility services (i.e., electrical and/or gas service) to the equipment.

[2] For purposes of this provision, insulation materials must be of the same type as previously installed in accordance with building standards.

[3] For purposes of this provision, the exclusion of HVAC-related cost is valid only when a determination of no structural alteration is made by a California-registered structural engineer in accordance with requirements of Section 1.2.1 of this IR.

7. SUBDIVISION OF PROJECTS PROHIBITED: Construction projects shall not be subdivided for the purpose of obtaining exemption from DSA review and approval.

REFERENCES:

California Code of Regulations (CCR) Title 24
Part 1, California Building Standards Administrative Code
Sections 4-306, 4-308, 4-309, 4-315, 4-336, 4-406 and 5-102

California Education Code, Sections 17295 and 81133

CONSTRUCTION PROJECTS AND ITEMS EXEMPT FROM DSA REVIEW

Disciplines:	All Disciplines	**History:**	Revised 08-25-15	Revised in its entirety 08-14-14
			Revised 06-16-15	Revised 03-22-13
			Revised 11-24-14	Issued 08-15-08

PURPOSE: The purpose of this Interpretation of Regulations (IR) is to clarify when plans and specifications for small construction projects on existing public school sites are required to be submitted to the Division of the State Architect (DSA) for review, approval, and construction oversight.

INTERPRETATION:

1. CALIFORNIA BUILDING STANDARDS CODE COMPLIANCE:

1.1 The following does not require DSA structural and fire and life safety approval. However, this work shall comply with all currently effective design, construction, and inspection provisions of the California Code of Regulations (CCR), Title 24, as amended by DSA. Inspection shall be performed by a DSA certified project inspector.

- Maintenance work per Section 4-315, Part 1, California Administration Code (CAC) and defined in Section 4-314 Part 1, CAC.

1.2 The following do not require DSA structural and fire and life safety approval and are exempt from the Field Act. However, this work shall comply with all currently effective design, construction, and inspection provisions of the CCR, Title 24, as adopted by the California Building Standards Commission.

- Structures or items not considered a school building per Section 4-314, Part 1, CAC.
- Non-school structures per Section 4-310, Part 1, CAC and maintenance of those structures.

When authorizing construction of exempt projects described in this interpretation, the school district assumes responsibility to assure compliance with all code provisions. Architects and engineers providing project design must be licensed as required by the rules governing the licensing of architects and engineers. See Business and Professions Code Sections 6735 and 5535 through 5538.

It is not mandatory to obtain DSA concurrence that a project is exempt. However, written concurrence may be requested in accordance with DSA procedure PR 14-02.

2. ACCESS COMPLIANCE REQUIREMENTS: All projects, whether governed by the Field Act or not, shall comply with all applicable accessibility provisions of the CCR, Title 24. Some projects that are exempt from DSA structural and fire and life safety approval, including non-school structures per Section 4-310, Part 1, CAC, are required to be submitted to DSA for review and approval by the access compliance section per Government Code Sections 4450-4461. See Appendix A for project types that fall into this category.

3. CONSTRUCTION PROJECTS AND ITEMS ELIGIBLE FOR EXEMPTION: See Appendix A for a list of construction projects and items eligible for exemption from DSA structural safety, fire and life safety, and/or access compliance review and approval. Checkmarks in Appendix A are used to indicate whether an item is or is not eligible for exemption from review by one or more disciplines. Footnotes clarify any special conditions under which an item is or is not eligible for exemption.

CONSTRUCTION PROJECTS AND ITEMS EXEMPT FROM DSA REVIEW

3.1 Items listed in Appendix A are exempt only when complying with one of the following:

a. The item(s) constitutes the entire scope of a project.

b. The item(s) is part of a set of plans for a larger school project, and both of the following are provided:

1. A note on the construction documents stating the item(s) is "not part of the DSA approval." Without this note, DSA will treat this item(s) as described in Section 5.

2. A letter by the school district board, superintendent, or facilities director acknowledging the item will not be approved or certified by DSA.

3.2 For projects in which the scope of work consists entirely of exempt structures or items not considered a school building or maintenance listed in Appendix A, the estimated construction costs limitations per Sections 4-308 and 4-309(a), Part 1, CAC (see also IR A-10) will not apply.

4. EXEMPT RECONSTRUCTION AND ALTERATIONS: In addition to projects listed in Appendix A, projects involving alterations or repairs to existing approved school buildings may be exempt from DSA review and approval based on the estimated construction costs. Refer to IR A-10 "Alteration and Reconstruction Projects–DSA Approval Exemption."

For exempt alteration or reconstruction projects constructed in accordance with Section 4-309(a), Part 1, CCR, form DSA 999 "Inspection Verified Report for Projects Exempt From DSA Approval" will be required.

5. VOLUNTARY SUBMITTAL: This interpretation does not preclude a school district from choosing to submit plans and specifications for exempt projects, with the appropriate fee, to DSA for review. Voluntary submittal of an exempt project or item will trigger full DSA plan review for code conformance and construction oversight, including inspections and materials testing.

6. PROJECT INSPECTION REQUIREMENTS: Exempt projects not submitted to DSA or projects consisting of access compliance work only, DSA will not supervise nor certify the construction, and the reporting requirements for certification of construction per Part 1, CCR will not be required to be submitted to DSA.

This administrative interpretation of regulations (IR) is intended for use by the Division of the State Architect (DSA) staff, and as a resource for design professionals, to promote more uniform statewide criteria for plan review and construction inspection of projects within the jurisdiction of DSA which includes State of California public elementary and secondary schools (grades K-12 and community colleges), and state-owned or state-leased essential services buildings. This IR indicates acceptable practices as stipulated in the California Administrative code (CCR, Title 24, Part 1) and aligning with DSA policies and procedures. This IR is reviewed on a regular basis and is subject to revision at any time. Please check the DSA website for currently effective IRs. Administrative and technical IRs are listed on the DSA website at: http://www.dgs.ca.gov/dsa/Resources/IRManual.aspx.

Administrative IRs are effective upon publication. Questions regarding the effect for existing projects can be directed to the DSA Regional Office with plan review and construction oversight authority for the project.

Appendix A–Construction Projects and Items Eligible for Exemption

	Exempt from SS Review		Exempt from AC Review		Exempt from FLS Review	
Project Description	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
1. Cell or antenna towers and poles less than 35 ft. tall (lighting poles, flag poles, poles supporting open mesh fences, etc.) not in designated fire lane(s).		✓		✓[1]		✓
2. Cell or antenna towers and poles greater than 35 ft. above grade not in designated fire lane(s).	✓[6]			✓	✓	
3. Soil retaining walls less than four feet tall without surcharge or a sloping backfill.		✓		✓[1]		✓
4. Baseball dugouts less than 250 sq.ft. of floor area with lightweight roof construction and soil retaining walls less than four feet tall without surcharge or a sloping backfill (if applicable).		✓	✓[2]			✓
5. Ball walls or yard walls less than six feet above grade, not in a designated fire lane.		✓		✓[1]		✓
6. Free standing signs, scrolling message signs, scoreboards, or solid clad fences of which the apex is less than eight feet above the highest adjacent grade.		✓		✓[1, 4]		✓
7. Bleachers and grandstands five rows of seats or less with the first row starting at ground level.		✓	✓[2]			✓
8. Ancillary accessory facilities to athletic fields (one-story, not over 250 sq.ft., used for equipment storage, toilets, snack bar, ticket booths, etc.).		✓	✓[2]			✓
9. Playhouses less than 250 sq.ft. of floor area and playground equipment of any size.		✓	✓[3]			✓
10. Open-mesh baseball backstops less than 35 ft. in height for cantilevered pole systems.		✓[7]	✓[3]			✓[7]
11. Open-mesh fences less than 35 ft. in height or ornamental and security fencing with spaced rails and pickets less than eight feet in height.		✓[7]		✓[4]		✓[7]
12. New or replacement of sidewalks.		✓	✓			✓
13. Landscaping.		✓	✓[4]			✓
14. Replacement in-kind of mechanical, electrical, or plumbing units.[16]		✓[9]		✓[13]		✓[9]
15. Cosmetic maintenance work such as painting, wallpapering, etc., as defined in Title 24, Part 1, Section 4-314.[16]		✓		✓[15]		✓

CONSTRUCTION PROJECTS AND ITEMS EXEMPT FROM DSA REVIEW

	Exempt from SS Review		Exempt from AC Review		Exempt from FLS Review	
Project Description	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
16. Installation of synthetic (artificial turf) play fields or running tracks.		✓	✓			✓
17. Installation of new parking areas not involving fire lane(s).		✓	✓			✓
18. Installation of new surfacing over existing parking areas (such as asphalt overlays).		✓	✓[5]			✓
19. Removal and replacement of existing parking area surfacing.[16]		✓	✓[5]			✓
20. Installation of seal-coating at existing parking areas (including new striping), or normal maintenance such as restriping or the filling of potholes and cracks.[16]		✓		✓		✓
21. Batting cages with open-mesh sidewalls and loose netting roof: batting cages consisting of cantilever poles with loose netting sidewalls and roofs.		✓	✓[3]			✓
22. Reroofing with in-kind roof or replacing with light-weight, non-metal, non-tile roof, and insulation system.[16]		✓[10]		✓[11]		✓
23. Weatherization/caulking.[16]		✓		✓[11]		✓
24. Window replacement (glazing only–not rated or requiring frame replacement).[16]		✓		✓[11]		✓
25. Window shading devices–window screens (applied to glazing only), and solar shading devices requiring no structural attachment.[16]		✓		✓[11]		✓
26. Energy Management Systems.		✓		✓[13]		✓
27. Lighting upgrade: re-lamping, ballast replacement, fixture replacement.[16]		✓		✓[13]		✓
28. Water-heating upgrades, not including solar thermal installations on roofs.[16]		✓		✓[13]		✓
29. Solar tubes or small skylight installations for which no structural framing member is altered or penetrations of fire rated assemblies.		✓[14]	✓[12]			✓
30. Fire alarm systems: Includes new systems and replacements or alterations to existing systems.		✓		✓	✓[8]	

Notes:

1. No height limit for access compliance exemption.
2. Required for all, no exception.
3. Playground structures must comply with Chapter 11B, Section 11B-1008 Play Structures of the 2013 CBC and may also trigger path of travel upgrade requirements under Chapter 11B, Section 11B-202.4.
4. Required if accessible path of travel is impacted. Required if the fence or gate crosses any accessible route of travel. Gates for pedestrian use on an accessible route of travel are required to comply with applicable accessibility requirements; installation of fencing and/or gates does not trigger other CBC, Section11B-202.4 requirements.
5. US Department of Justice has issued guidance that resurfacing of parking facilities is an alteration. Restriping, as a maintenance activity, may require access review if accessible parking spaces are impacted.

6. For any component, regardless of size, type, or cost, added to an existing tower, the tower and the component connection to the tower will require DSA structural and fire and life safety review. The cost exemptions of IR A-10 do not apply since this work is an addition and not an alteration. Installation of additional cellular equipment or replacement of existing cellular equipment mounted at grade will require DSA review unless the equipment is confined within an enclosed (fenced) area previously approved and certified by DSA for cell tower equipment, and the equipment is located a minimum distance from the fence equal to the height of the structure.
7. If open-mesh fences or backstops greater than eight feet are cladded with windscreens, slats, signs, or similar attachments, DSA structural and fire and life safety review will be required.
8. AC review will be provided by the DSA FLS staff as part of the FLS review process. AC review fees are not required.
9. Mechanical, electrical, and plumbing unit replacement in-kind includes any or all units on a building when all of the following requirements are met:
    - Each new unit must be of equal or lesser weight to the existing unit being replaced, and weigh no greater than 2000 lbs.
    - Each new unit must be placed in the same location as the existing unit.
    - Each new unit must be placed without requiring alteration to the existing structural framing or altering existing supporting curb or platform. Exception: Adaptive metal curbs may be utilized provided the applied combined gravity plus lateral forces to the structure are not increased.
    - Each new unit must be placed without requiring alteration to the existing ceiling.
    - Each new unit must be placed without requiring replacement of ductwork, grilles, electrical components, etc.
10. Weight of new roof covering and insulation is not to exceed the weight of the removed existing roof covering and insulation. Changes in roofing systems are limited to lightweight non-metal, non-tile roof and insulation systems. Applications of an in-kind second roofing layer may be exempt provided the additional layer does not exceed the weight of the original roofing material.
11. Considered normal maintenance which does not affect the “usability of the building,” this construction falls under CBC Section 11B-202.4 Exception 7.
12. Considered an Alteration per CBC Chapter 2 Section 202, this construction is not exempt from the requirements of CBC Section 11B-202.4.
13. Under the definition of “Alteration” in Chapter 2 Section 202 of the CBC, this work is considered “changes to mechanical and electrical systems” that is not an alteration for purposes of accessibility. It also falls under CBC Section 11B-202.4 Exception 7 and does not trigger path of travel upgrade requirements unless usability (read “accessibility”) of the facility is affected.
14. The installation of solar tubes or small skylights (2 ft x 2 ft max) in which no structural framing member is altered shall be exempt unless the number of solar tubes or skylights would cause more than 5% of the roof diaphragm to be removed.
15. Changing or replacement of floor coverings is an alteration for purposes of accessibility and in addition to meeting accessibility requirements may trigger path of travel upgrades in accordance with Chapter 11B Section 11B-202.4.
16. Items are considered maintenance and shall be exempt subject to the provisions of Section 1.1 of this Interpretation. ←

APPENDIX I: ITEMIZED SCOPES OF WORK

Retrofit existing single-pane windows with energy-efficient models:

Table 1. Fortuna Union High School Window Inventory (Administration Building)

Fortuna Union High School								
Administration Building Window Schedule								
Building	Elevation	Width	Height	Frame Type	Occupancy	Action Type	Glazing	Quantity
Administration/1	South	5' 0"	5' 0"	Metal	Bathroom	Awning/Fixed	Single Pane	1
Administration/2	South	5' 0'	5' 0'	Metal	Office	Fixed	Single Pane	2
Administration/3	South	3' 0"	5' 0"	Metal	Bathroom	Awning/Fixed	Single Pane	2
Administration/4	West	5' 0"	7' 0"	Metal	Office	Fixed/Awning	Single Pane	6
Administration/5	West	1' 0"	6' 0"	Wood	Main Hallway	Fixed	Single Pane	2
Administration/6	West	8' 0"	2' 0"	Wood	Main Hallway	Fixed	Single Pane	1
Administration/7	North	5' 0"	5' 0"	Metal	Office	Awning/Fixed	Single Pane	2
Administration/8	North	5' 0"	8' 0"	Metal	Main Entrance	Awning/Fixed	Single Pane	4
Administration/9	North	6' 0"	3' 0"	Wood	Main Entrance	Fixed	Single Pane	1
Administration/10	East	5' 0"	5' 0"	Metal	Office	Awning/Fixed	Single Pane	4
Administration/11	East	3' 0"	6' 0"	Wood	Counseling Office	Fixed	Single Pane	1
Administration/12	East	3' 0"	2' 0"	Wood	Counseling Office	Fixed	Single Pane	3
TOTAL								29
Total Window Count								**29**

APPENDIX I: ITEMIZED SCOPES OF WORK, continued

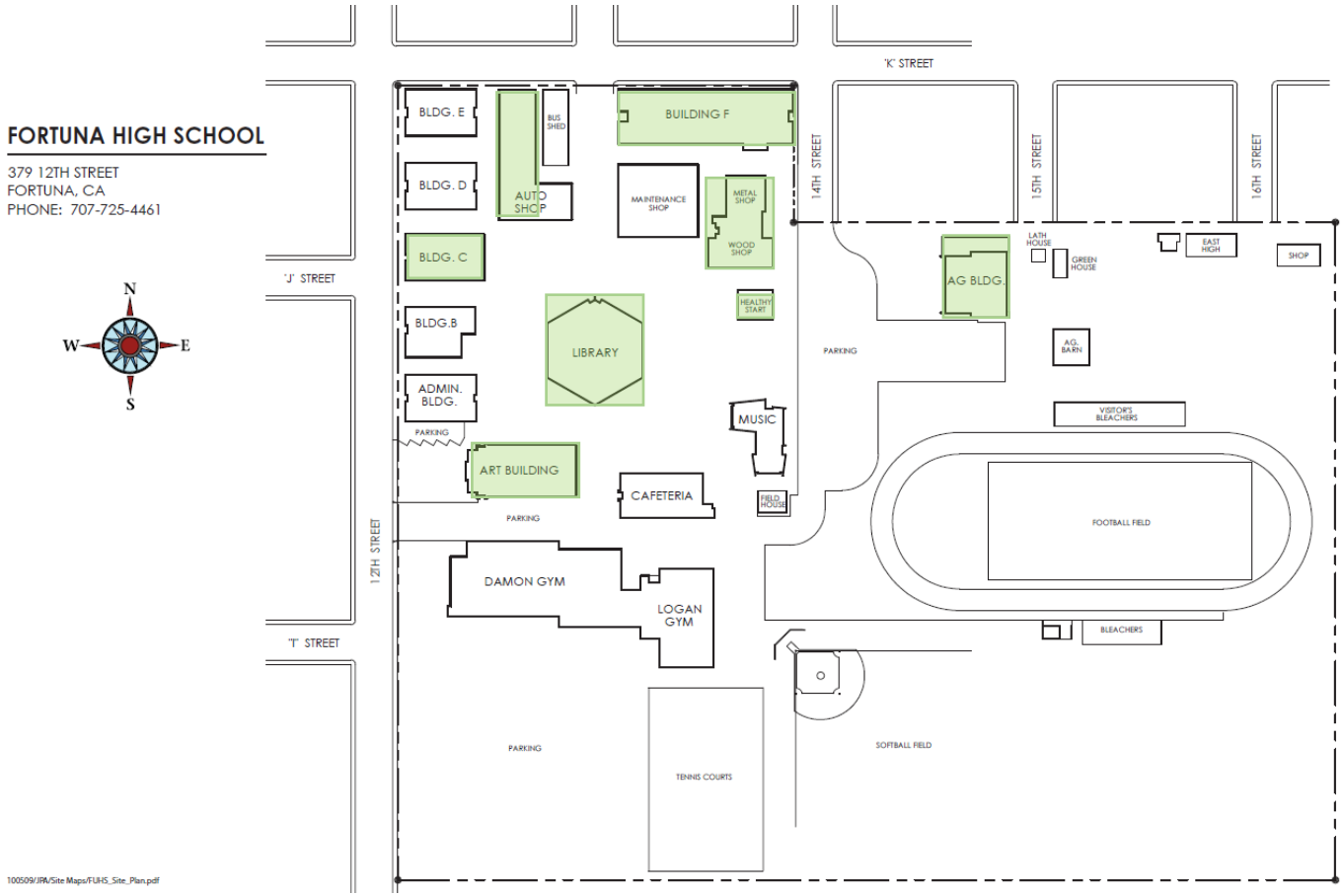
Tune Air Intakes

Table 2. Fortuna Union High School Duct Damper Installation Scope

Fortuna Union High School			
Duct Damper Installation Scope			
Building	Intake Location	OSA Allowance (% of inlet)	Quantity
Building B	Exterior Wall	16%	5
Building C	Ducted Roof Penetration	32%	6
Building D	Exterior Wall	16%	6
Building E	Exterior Wall	16%	6
Building F	Exterior Wall	16%	3
Building F	Ducted Roof Penetration	32%	7
Library Classrooms	Ducted Roof Penetration	32%	10
TOTAL			43
Total Damper Count			**43**

APPENDIX I: Ductwork Maintenance Locations

- Building C
- Auto Shop classrooms and offices
- Building F
- IT building (Wood Shop and Metal Shop)
- District Office
- Agriculture Building
- Theater Arts Building
- Library



APPENDIX J: SITE INFORMATION

The information in this technical facility profile is provided to inform the proposer about the facilities.

Site and Building Information

- Google maps
- Site Map – see next page

Screen shot from Google Maps for the Fortuna High School campus:

APPENDIX K: PROJECTED ENERGY SAVINGS

Projected energy savings and cost estimates, per Pub. Res. Code 26206. See the Scope of Work in the Invitation for Bids, Appendices 1-3 for further details about each energy efficiency measure.

Energy Efficiency Measure(s)	***Description***	***For Scoping See:***	***Projected Annual Energy Savings***	***Projected Annual Cost Energy Savings***
Window Replacement	Replace Admin Building Windows	Statement of Work p 4/Appendix I	-30 kWh/72 Therms	$72.00
Ductwork Damper Installation & Maintenance	Adjust air intakes & duct maintenance.	Statement of Work p 4/Appendix I	6,136 kWh	$20,474.00
Refrigeration	Refrigeration evaporators & Replace exhaust fan	Statement of Work p 4	13,197 kWh	$2,904.00
HVAC Controls	Install Manual Timers on Unit Heaters	Statement of Work p 4	581 kWh/1033 Therms	$1,118.00

Appendix L

ASHRAE Level 2 Energy Audit Report

Prepared for the
Fortuna Union High School District

379 12th Street
Fortuna, California 95540

September 10, 2015

ourevolution energy & engineering

Table of Contents

Definitions of Common Terms and Acronyms

1) **A/C – Air Conditioning**
2) **Benchmarking** – In order to assess the energy usage of each structure, relative to similar structure within the same climate zone, the EUI for each structure was "benchmarked" with the average energy use for similar buildings as characterized by the 2005 U.S. Energy Information Administration (EIA) Residential Energy Consumption Survey (RECS) for the Del Norte County climate zone.
3) **BTU** – Energy term; British Thermal Unit; the amount of energy required to raise one pound of water one degree Fahrenheit.
4) **BTU/hour (BTUH)** – Power term; BTU per hour
5) **CFM** – Cubic feet per minute; typical unit of air flow and/or air leakage
6) **DHW** – Domestic hot water
7) **ECM** – Energy conservation measure
8) **EER** – Energy Efficiency Rating; used for quantifying the energy efficiency of HVAC equipment.
9) **EUI -** Energy Use Index (or Energy Use Intensity) is defined as the average annual energy use per square foot of building area. This metric is used to quantify the energy usage "density" of a structure.
10) **Fenestration –** Any intended opening in the building envelope (windows and doors).
11) **H&S –** Health and safety measure
12) **HVAC –** Heating, Ventilation and Air Conditioning
13) **HVAC Cycling –** Frequent start/stop run time regimes
14) **kBTU/sq ft./year** – Measurement of energy density in annual energy use per square foot of facility.
15) **Kilowatt (kW)** –Power term; 1000 watts of electrical power
16) **Kilowatt hour (kWh)** – Energy term; 1 kW for 1 hour
17) **LPD** – Lighting power density (watts/square foot)
18) **MMBTU** – One Million BTU
19) **R-Value –** A measurement of thermal resistance BTU
20) **Standby Losses (Phantom Power) –** Energy used by appliances or equipment when it is in "idle" mode.
21) **Thermosyphoning –** A physical effect that refers to a method of passive heat exchange based on natural convection, which circulates a fluid without the necessity of a mechanical pump.
22) **Title 24 –** The California Energy Code.

Disclaimer

The intent of this energy analysis report is to estimate energy savings associated with recommended upgrades to the building energy systems at the Fortuna Union High School campus. Appropriate detail is included in this report to make decisions about planning and implementing energy efficiency measures at these facilities. However, this report is not intended to serve as a detailed engineering design document. The descriptions of existing conditions and recommended improvements are diagrammatic in nature in order to document the basis of cost estimates and savings. It should be noted that detailed design efforts may be required in order to implement some or all of the energy conservation measures detailed in this report. As appropriate, costs for these design efforts are included as part of the cost estimate for the respective measure.

While the recommendations in this report have been reviewed for technical accuracy and are believed to be reasonably accurate given the access to specific systems, available specifications and cost data, the findings are estimates and actual results may vary. As a result OurEvolution Energy & Engineering is not liable if projected estimated savings or economics are not actually achieved. All savings and cost estimates in this report are for informational purposes, and are not to be construed as a design document or as guarantees.

All information provided in this report is based on observed field conditions of building systems identified. OurEvolution engineers made a reasonable effort to identify and access all systems affecting building energy use but do not guarantee that all systems were identified, or that all deleterious conditions were observed and noted. In no event will OurEvolution Energy & Engineering be liable for failure of the customer to achieve a specified amount of energy savings, the operation of customer's facilities, or any incidental or consequential damages of any kind in connection with this report or the installation of recommended measures.

1 Executive Summary

The Fortuna Union High School District (FUHS) contracted with OurEvolution Energy & Engineering (OE) to prepare this ASHRAE Level 2 Energy Audit Report for its facilities located in Fortuna, California. The goal of the energy audit process is to identify potential high-value energy efficiency and energy conservation opportunities. Other goals of this study include identifying and documenting observed conditions that affect building performance, operation and maintenance, occupant comfort, and health and safety.

This study was completed by OurEvolution Energy & Engineering to assist the District to determine the energy savings potential and specific energy use reduction opportunities for the following locations:

- Fortuna Union High School District – 379 12th Street, Fortuna, California 95540
    - 21 Buildings encompassing 179,034 square feet of conditioned space on an approximately 29 acre site.
    - Due to an ongoing construction project at Damon and Logan Gymnasiums, these facilities were not included in building assessment portion of this report; however, in order to complete energy benchmarking for the site, the gross square footage of these facilities were included in the analyses.

1.1 Utility Billing Analysis Summary

Electricity is provided to FUHS by Pacific Gas and Electric. Natural gas is purchased from the School Project for Utility Rate Reduction (SPURR) program and delivered to the site by Pacific Gas & Electric. There is a single natural gas meter for the entire campus, two main electrical meters for the school campus, and a third electrical meter for the football field lights and irrigation pump. Two other electric meters were disregarded since their historical energy consumption is typically less than the basic meter charges. Assessment of approximately three years of electricity and natural gas data (2012 – 2014) was completed for this report. Over the 2013-2014 fiscal year, the campus consumed 778,595 kWh of electricity at a cost of $130,537 and 50,041 therms of natural gas at a cost of $44,405, for total annual energy costs of $174,942.

Fortuna Union High School has a site energy use index of 43.0 kBtu/sq/yr compared to a benchmark of 41 kBtu/sf/yr[1], or 5% more energy than would be expected from the same type and size of education building that utilizes non-electric heating fuel in the same climate zone.

1.2 On-Site Energy Assessment Summary

OE engineers spent several days throughout the summer of 2015 completing on-site assessment and load monitoring activities. A list of proposed energy conservation measures (ECM), health and safety conditions (H&S), and operation and maintenance measures (OMM) was discussed with District stakeholders at a meeting held at the District office on August 18, 2015. A general summary of the on-

[1] Source: Lawrence Berkeley Lab Energy IQ Action-Oriented Energy Benchmarking, http://energyiq.lbl.gov/benchmark.jsp

site energy assessment findings is presented below. More detailed, building specific findings are presented in Section 5 of this report.

1.3 Envelope and Insulation Assessment Summary

Some twenty-one separate, single-story structures comprise the Fortuna Union High School campus. The majority of these buildings are conventional wood frame structures constructed on above-grade slab foundations. The original Cafeteria, Theater Arts building, and Damon Gym date back to the 1950s or earlier. Most of the remainder of these structures were constructed between 1970 and 1980. Extensive modernization efforts were implemented on most buildings around the turn of the century, with the exception of the Music, Theater Arts, Auto Shop, Cafeteria, Ag, Administration, and Maintenance buildings.

1.4 Heating, Ventilation and Air Conditioning (HVAC) Assessment Summary

With a few exceptions dictated by particular occupancy types, the majority of HVAC systems throughout Fortuna Union High School are heating only gas furnaces. Provisions for cooling exist in a select few spaces, typically computer labs or other areas where high density of IT or other process equipment generates internal cooling loads.

A majority of furnaces throughout the campus have been upgraded to high efficiency condensing models. Most of these newer furnaces are in generally good condition and should be expected to provide several more years of use, although some were noted to have certain deficiencies that warrant immediate service calls to ensure they are operating at peak performance and efficiency.

Most shop areas, including the Maintenance Building, the Bus Barn, Auto Shop, and Metals Shop, as well as the Cafeteria dining hall, are served by older, natural gas unit heaters. While these systems typically have low operating efficiency, they also typically have such low hours of operation that replacement with higher efficiency systems is not warranted as cost effective.

Only a few zones throughout the entire FUHS campus were observed to have programmable setback thermostats to restrict hours of operation to periods when buildings are occupied. Several buildings have HVAC systems controlled by either mechanical 24-hour time clocks or programmable 7-day time clocks designed to limit operation to the hours the buildings are occupied, however it was observed that the majority of these timers were either bypassed, overridden, or simply set incorrectly so that they ran during off hours and were not always operating during occupied hours. These types of controls are inherently subject to error if not diligently maintained and it is common that in practice their operating parameters fail to accurately reflect their intended use.

Most of the buildings evaluated as part of the on-site assessments have some provision for outside air ventilation via furnace operation, however none were observed to have any functional controls over such ventilation. The percentage of uncontrolled outside air ventilation is estimated to be greater than 50%, which is excessive for most classroom-type applications, and results in excess energy use for pre-heating buildings before they are occupied in the mornings. A variety of issues with air filters were observed in furnaces throughout much of the campus. While a few of the newer and easiest to access

furnaces were observed to house correct filters that were serviced recently, in many cases the filters were old and very dirty, incorrectly sized, or in some cases missing altogether. Proper air filtration is an important component of furnace performance that affects air quality, energy efficiency, and equipment longevity.

Without extensive monitoring over an entire heating season that would fall outside the scope of this audit, it is impossible to calculate exactly how much excess energy is being used due to the current configuration of furnaces at FUSH. Considering inferior thermostats, improper time controls, and various other deficiencies such as duct leaks and excessive uncontrolled outside air, based on our experience, we estimate that as much as 50% of the current heating energy budget could be saved by installing proper thermostatic and ventilation controls with ancillary benefits of improving general occupant comfort and satisfaction levels and extending the useful service life of HVAC equipment.

1.5 Domestic Hot Water (DHW) Assessment Summary

The majority of domestic water heaters on the Fortuna Union High School campus are small 10-gallon electric tank heaters, the exceptions being:

- A 75-gallon commercial gas tank water heater serving the Cafeteria kitchen
- A standard efficiency 40-gallon natural gas tank heater serving the Administration building
- A residential 40-gallon tank unit serving the restrooms and janitor's closet in Building F
- An older 30-gallon gas water heater in the Ag building was observed to have both a gas leak at the natural gas shutoff valve and a water leak in the tank itself and so was taken out of service during OE's onsite evaluation
- A small, tankless on-demand natural gas water heater located in the attic of the Snack Shack

1.6 Lighting Assessment Summary

The vast majority of interior lighting systems throughout the Fortuna Union High School campus have been upgraded to relatively energy efficient T8 fluorescent fixtures. Limited, low occupancy areas retain some older T12 fluorescent fixtures, and a small number of even lower occupancy areas such as storage closets contain incandescent lamps. Steps should be taken to phase out these older luminaires and replace with higher efficiency alternatives such as LED and CFL technologies.

Exterior lighting on campus is made up of different types depending on when the most recent upgrades occurred. Many older high intensity discharge (HID) luminaires still exist but efforts have been underway to gradually replace them with either compact fluorescents, or more recently, LED fixtures, which are both highly energy efficient and typically more reliable as well.

Lighting occupancy sensors that limit lighting in areas when no occupants are present have been deployed in a minority of zones throughout the campus. A great many areas still exist where such controls would likely deliver substantial energy and cost savings. Occupancy sensor savings tend to be greatest in areas of lower occupancy, whereas more efficient lamps or luminaires that utilize low wattage LEDs tend to return greater cost savings in areas where occupancy tends to be higher.

An inventory of interior lighting systems observed by OE for this report is included as Appendix D at the end of this report. A detailed lighting energy assessment along with development of an array of lighting efficiency measures was developed separately from this audit by Redwood Energy Watch.

1.7 Other Energy Using Systems

The major energy using systems throughout all buildings at Fortuna Union High School are HVAC and lighting. Additional major loads include:

- Computers throughout the entire campus
- Refrigeration and other kitchen equipment in the Cafeteria
- Miscellaneous refrigeration throughout the campus
- Welding, saws, lathes, and other tooling in the various shop spaces
- Kilns in the Ceramics Lab
- Vending machines
- Parasitic loads from transformers
- Any loads in Damon and Logan Gyms not observed for this report

Because the buildings are not sub-metered, it is not well understood how much energy is actually consumed by welders, kilns, or other such devices, but it is quite likely that their high power requirements contribute substantially to peak demand charges on monthly utility bills regardless of the actual quantity of kilowatt hours (kWh) consumed. While it is possible to control demand charges to some extent by limiting such activities to off-peak hours (before noon and after 6pm during summer months), that may not be practical or feasible from an academic scheduling perspective.

As noted in the Site Energy Use and Costs section, a large part of Fortuna Union High School's electrical use appears to be base load that exists regardless of whether the campus is occupied or not. Sufficient monitoring to determine exactly how much all the various types of equipment deployed across campus contribute to this demand profile would fall outside the scope of this audit. However, it is clear that aggressive efforts to reduce base load by ensuring that lights, computers, refrigeration, and any other equipment that can be programmed to shut down at all times when the building is unoccupied represents one of the District's greatest opportunities to achieve both energy and cost savings on a large scale.

Using this ASHRAE Level 2 Energy Audit as a guide, OE encourages the District to consider the ECMs recommended in this report that have paybacks of less than ten years and/or savings to investment ratios of 1.05 or greater and/or can be justified due to building performance and longevity requirements. ECMs are divided into Low Cost/No Cost Measures (LCM) and Capital Intensive Measures (CIM). LCMs are defined by a capital investment of less than $1,000. The remaining measures are considered CIM. Additionally OE included a discussion of identified Health & Safety Measures (H&S) and Operation & Maintenance Measures (OMM). All of the H&S and OMM issues identified should be addressed as part of routine building operations.

1.8 Energy Savings Opportunities

Table 1 below summarizes the recommended energy savings measures identified for the FUHS campus.

Table 1. Summary of Energy Savings Opportunities

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-1	Switch PG&E Electrical Rates	-	-	-	$ 3,010	$ -	0.0	PG&E "My Energy"
ECM-2	Peak Shaving	-	-	-	$ 1,485	$ -	0.0	PG&E "My Energy"
ECM-3	Modify outside air intakes to provide only required ventilation	3,220	16,836	(4.6)	$ 15,545	$ 2,090	0.1	EnergyPro
ECM-4	Programmable Thermostats	15,960	1,512	(5.6)	$ 3,390	$ 12,600	3.7	CEC Calculator
ECM-5	Manual Timers for all Unit Heaters	581	1,083	-	$ 1,118	$ 874	0.8	EnergyPro
ECM-6	Smart Strips for Computer Plug Loads	37,781	(1,487)	-	$ 3,834	$ 6,960	1.8	CEC Calculator
ECM-7	Replace Building A windows	(30)	72	-	$ 72	$ 11,500	159.7	EnergyPro
ECM-8	Replace five furnaces in Building A	6,351	3,291	0.9	$ 4,142	$ 21,275	5.1	EnergyPro
ECM-9	Replace 2 Furnaces in Building B	750	1,814	-	$ 3,219	$ 5,750	1.8	EnergyPro
ECM-10	Replace Ice Machine in Foods Lab	3,285	-	-	$ 723	$ 1,500	2.1	FSTC
ECM-11	Duct Maintenance	2,916	5,369	0.9	$ 4,929	$ 18,000	3.7	CEC Calculator
ECM-12	IT Building Lobby Furnace	388	1,931	0.3	$ 1,796	$ 4,830	2.7	EnergyPro
ECM-13	Vending Miser in Auto Shop	1,149	(45)	-	$ 117	$ 130	1.1	CEC Calculator
ECM-14	Replace 13 Aging Furnaces	n/a	1,276	n/a	$ 1,055	$ 45,500	43.1	CEC Calculator
ECM-15	Upgrade Refrigeration Evaporator Motors	8,817	-	-	$ 1,940	$ 1,650	0.9	FSTC
ECM-16	Unplug Appliances in Snack Shack	5,174	-	1.8	$ 1,265	$ -	0.0	OE calculation
ECM-17	Relocate Walk-in Cooler Exhaust Fan to Exterior Wall	4,380	-	-	$ 964	$ 1,000	1.0	OE calculation
ECM-18	Convert 32-watt T8 fluorescent fixture to linear LED lamps	100,852	(470)	8.4	$ 16,507	$ 46,380	2.8	CEC Calculator
ECM-19	Lighting Occupancy Sensors	RCEA	RCEA	RCEA	RCEA	RCEA	RCEA	RCEA
ECM-20	Exterior LED Retrofits	RCEA	RCEA	RCEA	RCEA	RCEA	RCEA	RCEA
ECM-21	Replace Auto Shop HID Lights with 16-watt Linear LEDs	RCEA	RCEA	RCEA	RCEA	RCEA	RCEA	RCEA
TOTALS (All Recommended Measures)		71,202	31,182		$65,110	$180,039	2.77	

Excluding lighting measures to be completed by Redwood Energy Watch, it is estimated that the total energy cost savings from all energy conservation measures recommended by this audit is approximately $65,109 per year. The total cost of all measures is estimated at $180,039, for a simple payback period of approximately 2.77 years.

1.9 Health and Safety Issues

The following table summarizes the main health and safety issues identified on the FUHS campus.

Measure ID	Building	Area	Measure Name	Systems Affected	Health & Safety Measure Recommendation
H&S-1	Building A	Mechanical Room	Furnace Replacement	HVAC	Replace old furnaces, eliminate shared exhaust flue, repair air leaks in shared return plenum, provide for easily accessible air filters
H&S-2	Various	Various	Repair Natural Gas Leaks	HVAC and DHW	All gas leaks identified and listed in APPENDIX C - NATURAL GAS LEAKS should be evaluated and repaired by qualified personnel
H&S-3	Building F & Theater	Attic	Secure Fire Doors	Envelope	Remove wires from fire doors and leave doors secured in "normally closed" position
H&S-4	Building F	Janitor's Closet	Provide for adequate DHW combustion air	DHW	Install adequate ventilation in closet door to provide adequate combustion air for hot water heater
H&S-5	Bus Garage	Bus Garage	Bus Garage Exhaust Fan	HVAC	Install appropriately sized shroud around existing garage exhaust fan to ensure hazardous fumes are removed from the occupied space
H&S-6	Wayne Rogers Industrial Technology	Wood Shop	Furnace maintenance	HVAC	Note condensate dripping into combustion chambers will greatly shorten system life - Replace poorly drafting shared exhaust flues with dedicated flue for each unit.
H&S-7	Theater	All	Furnace Safety Testing	HVAC	Contract qualified service technician to pressure test heat exchanger in Furnace F-T2 to certify that it is safe to continue to operate

1.10 Operation and Maintenance Issues

The following table summarizes the main operation and maintenances issues identified on the FUHS campus.

Measure ID	Building	Area	Measure Name	Systems Affected	Health & Safety Measure Recommendation
OMM-1	Various	Various	Peak Shaving	Various	Avoid High Electrical Demand During Peak Billing Periods
OMM-2	Various	Various	Furnace Filter Maintenance	HVAC	Develop robust filter maintenance program to inspect all furnace filters at least quarterly, replaced with correct size at appropriate intervals, with easily accessible records
OMM-3	Library	Roof	Add gravel ballast to prior roof repairs	Envelope	Engage qualified roofing contractor to apply ballast material to prior roof patches as appropriate
OMM-4	Library	Roof	Clear Roof of Debris Bi-Annually	Envelope	Annual inspection and cleaning of entire low-slope roof of Library building with focus on clearing debris from drainage scuppers
OMM-5	Library and Music Building	Exterior Walls	Install Roof Drainage System	Envelope	Install roof drainage gutters along bottom of all roof slopes to mitigate cumulative moisture damage to building envelope
OMM-6	Building D	Eaves	Repair Eave Blocks	Envelope	Repair two missing/damaged eave blocks along Building D exterior
OMM-7	Building F	F-5	Repair exhaust fan	HVAC	Repair or replace rooftop exhaust fan in Classroom F-5
OMM-8	Bus Barn/Auto Shop	Auto Shop	Furnace and Duct Replacement	HVAC	Replace Auto Shop classroom furnace and all associated ductwork
OMM-9	Bus Barn/Auto Shop	Auto Shop Offices	Duct Maintenance	HVAC	Repair damaged and/or disconnected supply and return ducts serving office areas adjacent to Auto Shop. Remove ducts serving under utilized zones . Ensure all supply and return ducts joints are well sealed and all supply ducts are adequately insulated.
OMM-10	Ag	Ag	Replace failed existing water heater	DHW	Existing natural gas tank water heater has failed as the tank is leaking and the unit was exhibiting signs of extreme exhaust spillage. Replace existing unit with similar
OMM-11	Cafeteria, Ag	Kitchen, Ag Shop	Refrigerator Maintenance	Plug Loads	Implement procedure and protocols to perform quarterly maintenance on all refrigeration units to keep condenser coils clean.
OMM-12	Snack Shack	Snack Shack	Refrigerator Maintenance	Plug Loads	Repair evaporator fan in Continental 2-door reach-in cooler, which has become separated from its shaft.
OMM-13	Cafeteria	Kitchen	Walk-in Freezer	Process Loads	Determine reason for and mitigate accumulation of ice build-up on exposed refrigerant lines associated with 3-door under-counter cooler and walk-in freezer
OMM-14	Various	Various	Evaluate Power Distribution	All Electrical	Contract with qualified professionals to perform comprehensive power distribution survey of FUHS campus to determine net electrical load of each transformer and determine whether any of them can be taken off line

2 Project Team and Facility Information

2.1 Project Contacts

Name	Role	Organization	Contact Information
Glen Senestraro	District Superintendent	Fortuna Union High School District	gsenestraro@fuhsdistrict.org
Corey Weber	Business Manager	Fortuna Union High School District	cweber@fuhsdistrict.org
Andy Sorter, P.E.	Energy Engineer/Auditor	OurEvolution Energy & Engineering	andy@ourevolution.com 707.633.4210
Scott Willits, EIT	Energy Engineer/Auditor	OurEvolution Energy & Engineering	scott@ourevolution.com 707.633.4210
Austin Corbett	Energy Engineer/Auditor	OurEvolution Energy & Engineering	austin@ourevolution.com 707.633.4210
Allison Campbell	Proposition 39 Energy Manager	Redwood Coast Energy Authority	acampbell@redwoodenergy.org 707.269.1700
Katie Koscielak	Proposition 39 Energy Manager	Redwood Coast Energy Authority	kkoscielak@redwoodenergy.org 707.269.1700

3 Fortuna Union High School – General Site Information

Fortuna Union High School is located at 379 12th Street in Fortuna, California on an approximately 29 acre site. The school is typically occupied from 7:00 a.m. to 6:00 p.m. Monday through Friday, during the normal school year, with shorter 8:00 a.m. to noon hours during a month long summer session, and frequent evening activities occurring in the gymnasiums and sporadic weekend events.

Figure 1. Fortuna Union High School Central Campus Area

Designs for significant improvements to the HVAC, lighting, and envelope conditions of the gymnasium/athletic complex are currently underway with construction expected to begin in 2016. Therefore initial energy efficiency recommendations for the high school in this report exclude the gymnasiums . However, it is important to note that the Site Energy Use and Cost analysis does include the gymnasium square footage since those buildings are not metered separately and thus their energy use cannot be isolated from the rest of the campus.

The Fortuna Union High School campus was previously audited in 2014 by the California Conservation Corps (CCC). Data from that audit were provided to University of California Davis energy auditors, who completed a "desktop audit report" in March 2015. OurEvolution Engineers found some elements of that report to be inconsistent with what we observed during our extensive fieldwork in June and July of 2015, particularly with respect to overall building dimensions, identification of specific mechanical systems, and details such as lighting fixture population and distribution. Nonetheless, in order to avoid confusion over nomenclature the following aerial map and its naming convention developed by the CCC are included here.

Figure 2. Aerial Map of Fortuna Union High School campus with CCC naming convention

The Fortuna Union High School campus has undergone significant remodel/expansion efforts since the original building now housing the Cafeteria was constructed in 1920. Currently the campus includes some 21 separate buildings comprising approximately 179,034 square feet of conditioned space. These facilities are summarized in Table 2 below.

Table 2. Fortuna Union High School Construction Dates and Building Gross Areas

CCC Building ID	Fortuna Building ID	Year Built	Building End Use	Gross Area
B1	Building A	1964	Administration offices	6,272
B2	Building B	1964	Computer labs, Foods Lab, Child Development Lab	6,026
B3	Building C	1964	Computer labs	6,998
B4	Building D	1964	Classrooms	6,289
B5	Building E	1964	Classrooms	6,272
B6	Bus Barn/Auto Shop	1964	Bus Maintenance, Auto Instruction, classrooms, offices	11,350
B7	Bus Shed	1964	Parking	3,750
B8	Building F	1964	Biology, Chemistry, & Physics Labs, Classrooms	18,415
B9	Maintenance	1961	Maintenance workshop, parts storage, warehouse, Drawings Archive	10,945
B10	Metal/Wood Shop	1964	Metal Shop & Wood Shop instruction	8,788
B11	District Office	2001	District offices	1,920
B12	Ag	1981	Ag shop, classrooms	9,830
B13	Music	1981	Music rehearsal and recording studios	4,960
B14	Fieldhouse	1978	Field support	1,240
B15	Snack Shack	2014	Athletic Complex Snack Shack	1,096
B16	Gate	1964	Athlectic Complex Gate	300
B17	Cafeteria	1920	Food service and dining	7,869
B18	Damon Gym	1952	Athletics	27,500
B19	Arts/Theater	1952	Performance venue, photography, ceramics, and arts studio/classrooms	11,100
B20	Library/CA	1978	Library, classrooms	14,614
B21	Logan Gym	1964	Athletics	13,500
TOTAL				**179,034**

4 Site Energy Use and Costs

This section provides a review of historical electricity and natural gas consumption for the Fortuna Union High School campus. Electricity is provided by Pacific Gas and Electric. Natural gas is purchased from the School Project for Utility Rate Reduction (SPURR) and delivered to the site by Pacific Gas & Electric. There is a single natural gas meter for the entire campus, two main electrical meters for the school campus, and a third electrical meter for the football field lights and irrigation pump. Two other electric meters were disregarded for this analysis since their historical energy consumption is typically less than the basic meter charges.

4.1 Energy Consumption and Expenditures

Fortuna Union High School has a site energy use index (EUI) of 43.0 kBtu/sq/yr compared to a benchmark of 41 kBtu/sf/yr[2], or 5% more energy than would be expected from the same type and size of education building that utilizes non-electric heating fuel in the same climate zone.

4.1.1 Average Annual Energy Consumption

Assessment of approximately three years of electricity and natural gas data (2012 – 2014) was completed. The figure below details the fiscal year 2013-2014 monthly energy use profile for Fortuna Union High School. Over this period, the campus consumed 778,595 kWh of electricity at a cost of $130,357 and 50,410 therms of natural gas at a cost of $44,405, for total annual energy costs of $174,942. Based on this total energy cost, the combined energy cost intensity (ECI) breaks down to $0.98 per square foot.

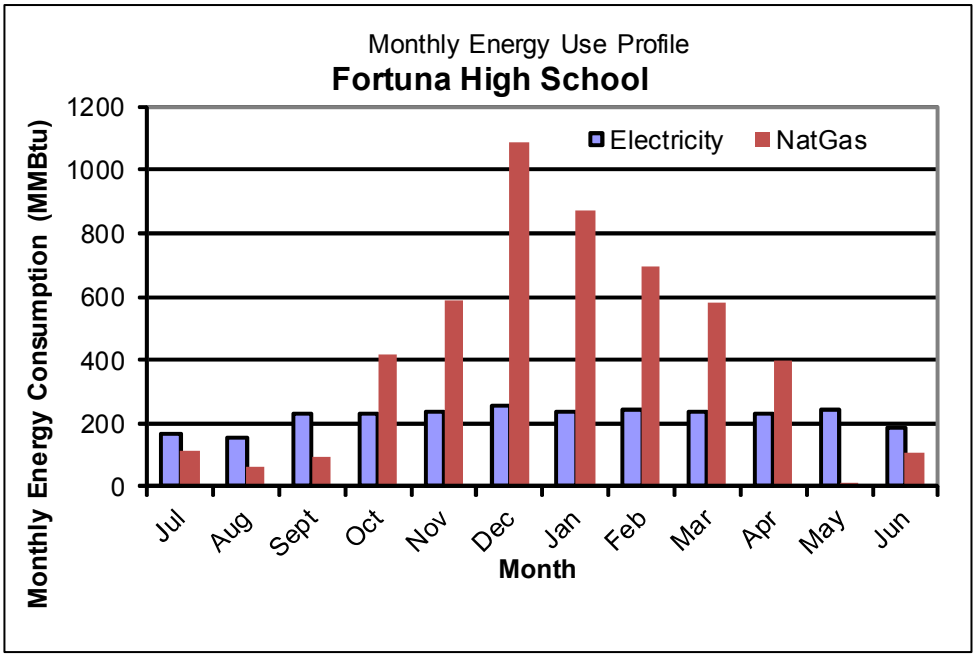


Figure 3. Fortuna Union High School 2013-2014 annual energy consumption (site)

[2] Source: Lawrence Berkeley Lab Energy IQ Action-Oriented Energy Benchmarking, http://energyiq.lbl.gov/benchmark.jsp

Figure 3 shows significant variation from month to month in natural gas use that corresponds to seasonality, with significantly greater heating energy consumed during winter. Electrical use is essentially flat throughout the entire year, with a slight decrease in consumption during summer months when the school is largely unoccupied, but appears to have static base load that is not significantly affected by lower occupancy. This indicates that electric energy use patterns for unoccupied periods do not significantly vary from occupied periods, which may be a result of timers or other building controls that are not adjusted during summer months. Note that on a Btu basis the District consumes significantly more gas than electricity; however the cost per Btu for gas is significantly lower. Consequently the District's electrical consumption accounts for a much greater share of its annual energy expenditures.

4.1.2 **Total Cost of Energy**

Based on the data acquired for this effort, the total annual energy cost for the school is approximately $174,942. Figure 4 shows illustrates how electrical costs are significantly greater than natural gas even during winter, and that they tend to be highest in the months when both the campus is fully occupied and peak pricing is in effect. Note that even the July and August billing periods, when the campus likely sees its lowest occupancy of the year, electricity costs are nearly equal to those levied in late winter and early spring.

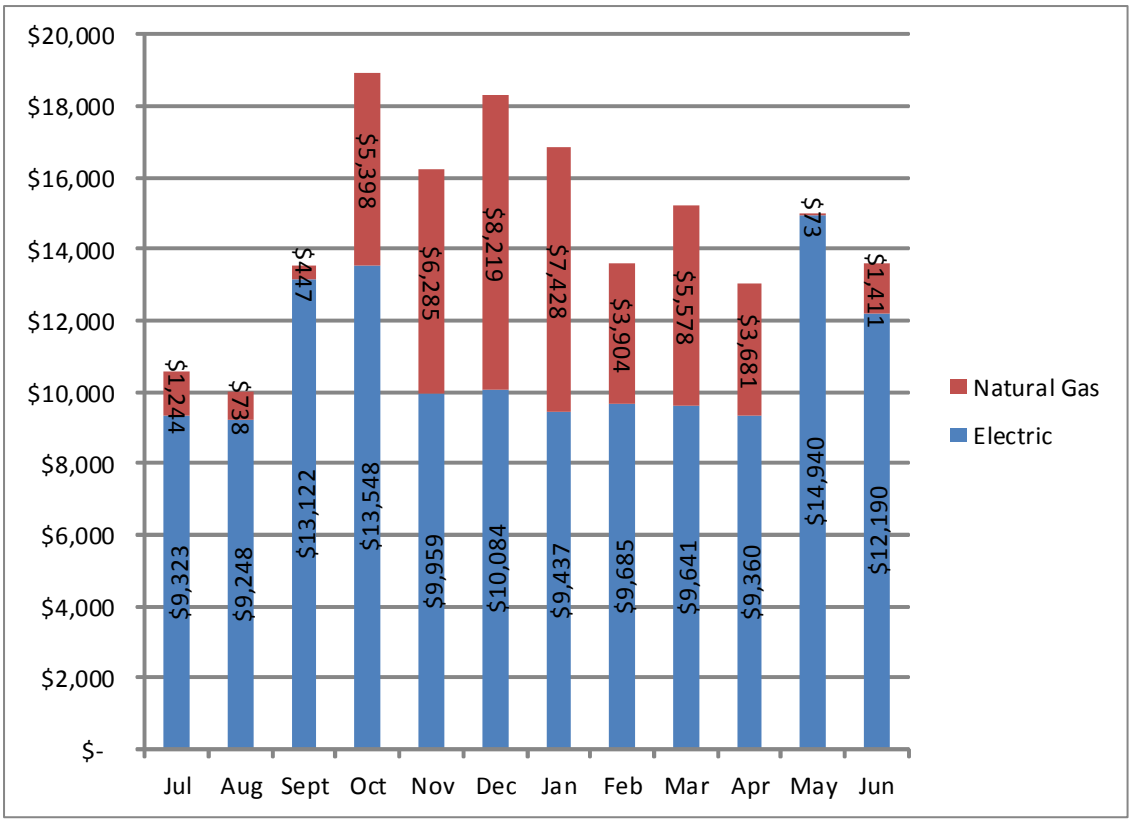


Figure 4. Fortuna Union High School Monthly Energy Costs

The pie chart in Figure 5 shows that just over three-quarters of the energy costs borne by the school are for electricity. This corresponds to both high electrical energy usage and relatively low natural gas costs.

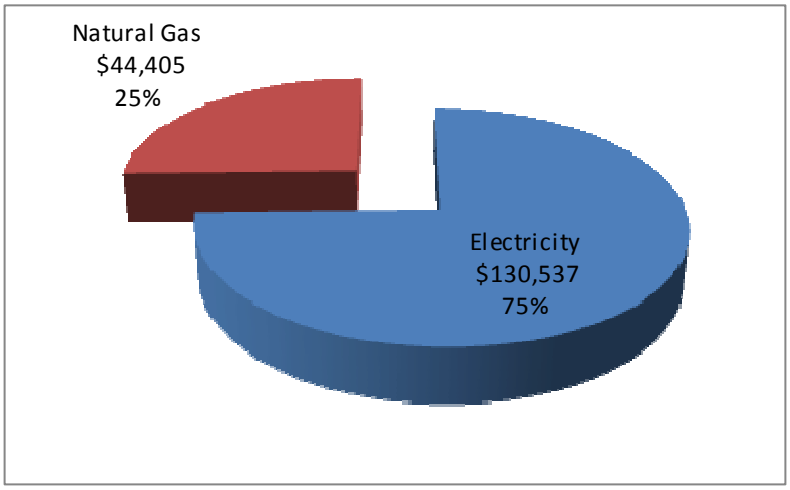


Figure 5. Fortuna Union High School Energy Annual Energy Cost By Source

Taken together, the data that these three charts represent tend to indicate that while there may be significant energy and cost savings available from addressing natural gas heating systems, the vast majority of Fortuna Union High School's energy costs are attributable to electrical energy consumption, and a significant part of that electricity appears to be baseload which is consumed regardless of whether the campus is occupied or not.

Fortuna Union High School's demand profile was evaluated by examining monthly, daily, and hourly demand curves provided by logging into the District's "My PG&E" account at https://pge.opower.com/ , complemented by natural gas billing information provided by SPURR. This analysis revealed that base loads tend to be about the same order of magnitude across the two main accounts that serve the bulk of the campus, with an average of between 50 and 60 kW of base load demand that does not subside, regardless of season or time of day. This may be indicative of timers or control systems that do not accurately reflect occupancy.

5 Building Specific Findings

This section of the report details the building specific findings as they relate to observed energy conditions.

5.1 Building A – Administration (denoted as Building B1 in the CCC report)

Figure 6. Fortuna Union High School Administration Building (Building A)

The Fortuna Union High School Administration building, originally constructed in 1964, is a single story, wood frame structure covering approximately 6,272 square feet of conditioned floor area on an above grade slab foundation. The building houses primarily offices and meeting spaces in support of the high school's administration.

5.1.1 Building A - Envelope

- Exterior Walls – Building A exterior walls are wood frame with a combination of drywall and wood paneled interior treatments and painted wood siding on the exterior. The exterior siding was observed to be in generally fair condition.
- Fenestration – Windows throughout the Administration are original single paned glass in wooden frames in generally fair condition.
- Attic – The central open office portion of the Administration building has a cathedral roof that, due to the date of construction, is assumed to have minimal insulation if any. The enclosed office sections of the building have attic space above. These areas were not accessed but assumed to have older deteriorating R-11 insulation similar to that observed in other campus buildings of similar construction.
- Roof – The roof of Building A is a standing seam metal roof that appeared to be in good condition.
- Roof drainage – The Building A roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system appeared to be in good working order at the time of the assessment, although vegetation was observed to be growing

in the gutters, indicating that they are in need of periodic cleaning before accumulated debris can cause substantial damage.

5.1.2 Building A - Heating, Ventilation and Air-Conditioning Equipment (HVAC)

All five gas furnaces serving the Administration building are located in a mechanical room at the rear of the building. This entire collection of systems was observed to be in very poor condition with a number of defects described below.

The five systems share a single exhaust flue stack connected by a horizontal duct running the length of the mechanical room, a design arrangement that is not conducive to efficient removal of combustion gases and results in condensation of highly corrosive moisture that can drain back into the furnaces' heat exchangers.

The five systems also share a single return air plenum, which was observed to be in very poor condition with a number of defects. Since the return plenum is generally under negative pressure relative to the atmosphere, any air or other gases in the mechanical room will be entrained into the return plenum and subsequently delivered to all occupied zones within the building.

Figure 7. Shared return plenum behind Building A furnaces

One result of the configuration with the shared return plenum located at the rear of the furnace is that there is no location for an air filter that can be easily accessed for regular servicing. No filters were observed in any of the five furnaces in Building A.

Four of the five furnaces, all except F-A4, were observed to have minor natural gas leaks. Systems F-A1, F-A2, and F-A3 had leaks at the shutoff valve adjacent to the flex line connecting the building supply to the furnace. Systems F-A1 and F-A5 had leaks inside the systems at the outlet from the gas regulator to the ignitor. These leaks were discovered using an electronic gas sniffer device and locations confirmed by application of soapy solution which produced bubbles at the point of the leaks. A summary table of

all gas leaks detected campus wide is included as “APPENDIX D – NATURAL GAS LEAKS” at the end of this report.

Flue gas testing was performed on all five furnaces to measure net combustion efficiency as well as carbon monoxide (CO) concentration in the exhaust. Average efficiency for all five systems was approximately 78%, compared to the rated efficiency of 80%.

Four of the five furnaces were measured to have CO levels above acceptable limits of 20 parts per million (ppm). Furnace F-A3, serving the office of the IT department, was measured to have CO levels in beyond the 2000 ppm upper limit of what the test instrument is capable of measuring. This condition represents a severe risk to the health and safety of occupants throughout the building (due to the shared return plenum described above). Consequently OE engineers immediately removed Furnace F-A3 from service by turning off both the gas supply and electrical power. Building occupants, District management, and District maintenance personnel were immediately notified of the furnace condition and the action taken to remove it from service. A service call to the local HVAC contractor was also made, and the unit was formally condemned the following week.

OE engineers believe there is a strong correlation between the shared exhaust flue stack, the corrosive condensation that often results in such a configuration, and the fact that Furnace #F-A3, located at the center of the row with its heat exchanger closest to the shared stack outlet, is the one that generated such alarming levels of measured carbon dioxide.

As stated above, the common return air plenum was observed to be in very poor condition with a number of defects, the most notable of which are several holes in severely deteriorated expansion joints. Since the return plenum is generally under negative pressure relative to the atmosphere, any air or other gases within the mechanical room will be entrained into the return plenum and subsequently delivered to all occupied zones within the building.

Given the age and poor condition of these systems, independent of the economic analysis presented In subsequent sections of this report, it is recommended that all five furnaces in Building A be replaced with modern high efficiency condensing furnaces. Care should be taken to repair any deficiencies in the ducting systems on both the supply and return side including all new expansion joints, complete duct sealing, and a minimum of R-8 duct insulation. In addition, the new systems should be installed with independent exhaust flues and as well as provision for adequate combustion air from outside the mechanical room. Provision should be made to ensure that correct air filters are easily accessible for regular periodic (quarterly) inspection/servicing.

It is also recommended that the new systems be equipped with modern programmable setback thermostats, preferably wi-fi enabled so that they can be controlled from a central location. Outside air for ventilation should be provided with damper controls that respond to carbon dioxide levels within occupied spaces so that excessive ventilation is avoided during morning warm-up before the building is occupied.

Due to the hazards associated with the condition of the furnaces in Building A, a separate Tech Memo regarding this matter was delivered to the District on July 27, 2015.

Remediation recommendations for the conditions described above are discussed in greater detail in "ECM-8: Replace Five Furnaces Serving Building A – Administration". A complete listing of the HVAC systems observed in Building A can be seen in APPENDIX A – HVAC SCHEDULE.

5.1.3 Building A – Domestic Hot Water (DHW)

Building A has its hot water supplied by a standard 80% efficiency 40-gallon residential style natural gas water heater manufactured in 2010 and located in the same mechanical room that houses the furnaces.

A detailed listing of the DHW equipment observed in Building A can be found in Appendix B.

5.1.4 Building A - Lighting

The majority of zones in Building A are equipped with a normal distribution of conventional 2-lamp, T8 fluorescent lighting fixtures resulting in a lighting power density (LPD) of approximately 0.8 watts/square foot. No occupancy sensors or other lighting controls were observed.

5.1.5 Building A - Other Energy Using Systems

The Administration building has a normal distribution of standard office computing equipment. No other significant energy using systems were observed.

5.2 Building B (denoted as Building B2 in the CCC report)

Figure 8: Fortuna Union High School Building B (View From East)

Building B, originally constructed in 1964, is a single story, wood frame structure covering approximately 6,026 square feet of conditioned floor area on an above grade slab foundation. The building houses two computer labs, a classroom, and a foods lab with complete kitchen facilities.

5.2.1 Building B - Envelope

- Exterior Walls – Building B exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally good condition.
- Fenestration –Building B windows are dual-paned glass in aluminum frames with a thermal break. Windows were observed to be in generally good condition.
- Attic – Most of Building B has sloped cathedral ceilings with no attic space. It is unknown whether any insulation was installed under the new metal roof during the modernization around 2001. There was no insulation observed in a cavity between the new roof over the corridor and the previously existing roof beneath it. There was some fiberglass batt insulation in a small attic cavity above the vestibule adjoining the Foods Lab and Child Development classroom, however much of that was observed to be compromised, rendering minimal insulating value.
- Roof – The roof of Building B is a standing seam metal roof that appeared to be in good condition.
- Roof drainage – The Building B roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system appeared to be in good working order at the time of the assessment, although vegetation was observed to be growing in the gutters, indicating that they are in need of periodic cleaning before accumulated debris can cause substantial damage.

5.2.2 Building B – Heating, Ventilation and Air Conditioning Equipment (HVAC)

Each of the five classrooms in Building B has its own HVAC system located in furnace closets within the classrooms. The two computer labs each have cooling capability as well, with air conditioning condensers located on exterior pads just outside the rooms. All of these systems have provision for outside air (OSA). The OSA systems appear to have operable dampers over both the OSA intake and the interior return air register but any former controls over these dampers appear to have been disabled and they are currently set to provide approximately 50% OSA at all times. Substantial energy savings could be achieved by implementing a control strategy to close the OSA dampers during early morning warm-up or other times when no occupants are present and so no ventilation is required. However such controls require periodic maintenance and it has been the observation of OE engineers over time that local school districts tend to lack the resources to maintain such systems so they are typically found to be in a disabled condition.

The three furnaces in the computer labs and classroom on the north side of the building are fairly new condensing furnaces in good condition. The two furnaces serving the Child Development Lab and Foods Lab are standard efficiency units both at the end of their serviceable life.

A detailed listing of the HVAC equipment observed in Building B can be found in Appendix A.

5.2.3 Building B – Domestic Hot Water (DHW)

The Building B restrooms have hot water supplied by a small tank electric water heater located in the janitor's closet next to the restrooms. When tested, hot water took more than a full minute to arrive at the tap in the boys' restroom. Several students questioned in the building were unaware that hot water was available so it is assumed any actual hot water use from this unit is attributable to building cleaning functions. It is likely that significant quantities of hot water are drawn into the pipes when hot water taps in the restrooms are turned on but never reaches the faucet.

The commercial kitchen in the Foods Lab in Building B has a dedicated 50 gallon electric tank water heater, despite the fact that it is installed next to a pair of furnaces where natural gas is available. While replacement of a fully functional water heater in good condition may not be cost effective, at such a time as the existing unit is worn out and requires replacement a gas water heater would be recommended as the cost to heat water with natural gas is a fraction of the cost to use electricity.

A detailed listing of the DHW equipment can be found in Appendix B.

5.2.4 Building B - Lighting

Building B is equipped with a mix of T8 fluorescent fixtures in 6-lamp suspended and 3-lamp surface mount configurations, resulting in an estimated lighting power density (LPD) of approximately 1.08 watts/square foot. Other than the janitor's closet, no occupancy sensors or other lighting controls were observed in Building B.

5.2.5 Building B - Other Energy Using Systems

Two computer labs in Building B have approximately 65 desktop computer workstations along with a standard assortment of peripherals such as printers and scanners.

The Child Development lab and HROP Foods Lab include an assortment of commercial kitchen equipment including refrigerators, a two door reach in freezer, a large ice machine, and multiple electric and gas stoves.

5.3 Building C (denoted as Building B3 in the CCC report)

Figure 9: Fortuna Union High School Building C (View from West)

Building C, originally constructed in 1964, is a single story, wood frame structure covering approximately 6,998 square feet of conditioned floor area on an above grade slab foundation. The building houses computer labs and classrooms.

5.3.1 Building C - Envelope

- Exterior Walls – Building C exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally good condition.
- Fenestration –Building C windows are dual-paned glass in aluminum frames with a thermal break. Windows were observed to be in generally good condition.
- Attic – Classrooms in Building C have sloped cathedral ceilings with no attic space. It is unknown whether any insulation was installed under the new metal roof during the modernization around 2001. The attic area over the central corridor was observed to have no insulation installed, nor is there opportunity to retrofit new insulation due to the high concentration of mechanical systems, electrical conduit, communications infrastructure, and fire suppression plumbing.
- Roof – The roof of Building C is a standing seam metal roof that appeared to be in good condition.
- Roof drainage – The Building C roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system appeared to be in good working order at the time of the assessment, although vegetation was observed to be growing in the gutters, indicating that they are in need of periodic cleaning before accumulated debris can cause substantial damage.

5.3.2 Building C – Heating, Ventilation and Air Conditioning Equipment (HVAC)

Building C has six furnaces located in the attic over the central corridor with ducting to the classrooms through interior walls. Each of these systems also has an evaporator with cooling provided by condenser units located on pads outside the classrooms they serve. It was observed that the furnaces deliver conditioned air through sub-standard flexible ducting that in many cases was inexpertly installed with unnecessary bends that restrict flow among other deficiencies. Infrared imaging with a FLIR camera revealed that there are many leaks both in the ducting itself and the supply plenum that feeds it.

All thermostats controlling HVAC systems in Building C are older, mechanical-type, manually operated units with no programmable setback capability. A mechanical electric timer located in a utility closet appears to be wired to limit HVAC operation to occupied hours between 7 a.m. and 3 p.m. but it was observed to be off by about 1.5 hours from the actual time. Such a system can work well as long as it is diligently maintained, however they must be reset regularly for Daylight Savings Time and planned holidays, and checked frequently since power outages of any length can throw them significantly off their desired schedule. On the day this particular part of the survey was conducted one room in the building had its furnace running at 4:50pm with the thermostat set to 73°F while the outside temperature was 65°F under sunny skies, while the room adjacent was in cooling mode with the air conditioning running at the same time.

A detailed listing of the HVAC equipment observed in Building C can be found in Appendix A.

5.3.3 Building C – Domestic Hot Water (DHW)

The Building C restrooms and janitor's closet sink have hot water supplied by a small tank electric water heater located in the janitor's closet.

A detailed listing of the DHW equipment observed in Building C can be found in Appendix A.

5.3.4 Building C - Lighting

The majority of zones in Building C are equipped with conventional T8 fluorescent lighting with a normal distribution of fixtures resulting in an estimated lighting power density (LPD) of approximately 0.8 watts/square foot. This meets current Title 24 requirements a maximum LPD of 1.0 watts/square foot. No occupancy sensors or other lighting controls were observed.

5.3.5 Building C - Other Energy Using Systems

Two computer labs in Building C have approximately 51 desktop computer workstations along with a standard assortment of peripherals such as printers and scanners. A pair of cabinets housing various pieces of IT equipment resides in the janitor's closet in Building C, alongside a large power transformer.

5.4 Building D (denoted as Building B4 in the CCC report)

Figure 10. Fortuna Union High School Building D (View from West)

Building D, originally constructed in 1964, is a single story, wood frame structure covering approximately 6,998 square feet of conditioned floor area on an above grade slab foundation. The building houses primarily classrooms.

5.4.1 Building Envelope

- Exterior Walls – Building D exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally good condition, with the exception of two eave blocks, one of which is apparently loose and one which is missing altogether, leaving exposed the rafter framing cavity between the ceiling and roof deck.
- Fenestration –Building D windows are dual-paned glass in aluminum frames with a thermal break. Windows were observed to be in generally good condition.
- Attic – Classrooms in Building D have sloped cathedral ceilings with no attic space. It is unknown whether any insulation was installed under the new metal roof during the modernization around 2001. The attic area over the central corridor was observed to have no insulation installed, nor is there opportunity to retrofit new insulation due to the high concentration of mechanical systems, electrical conduit, communications infrastructure, and fire suppression plumbing.
- Roof – The roof of Building D is a standing seam metal roof that appeared to be in good condition.
- Roof drainage – The Building D roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system appeared to be in good working order at the time of the assessment, although vegetation was observed to be growing

in the gutters, indicating that they are in need of periodic cleaning before accumulated debris can cause substantial damage.

Figure 11. Building D missing eave block

5.4.2 Building D – Heating, Ventilation and Air Conditioning (HVAC)

Building D has six furnaces, each located in a corner closet along exterior walls within the classroom it serves. All six furnaces are modern 92% efficiency, 2-speed Westinghouse condensing furnaces manufactured in 2004. These systems are installed in an essentially ductless configuration with a single large register directly off the supply plenum. Each has a single return air register as well as provision for outside air that is estimated to make up approximately 50% of supply air, or more than twice the ventilation necessary to maintain fresh air levels when the furnace is running with windows closed. Excessive levels of outside air ventilation require the furnace to use more energy since it is unnecessarily must heat up outside air rather than maintain temperature of already heated return air.

A small but detectable natural gas leak was observed at the shutoff valve in the closet housing furnace F-D2 in classroom D2. This leak was discovered using an electronic gas sniffer device and location confirmed by application of soapy solution which produced bubbles at the point of the leak. A summary table of all gas leaks detected campus wide can be found in Appendix C.

A detailed listing of the HVAC equipment observed in Building D can be found in Appendix A.

5.4.3 Building D – Domestic Hot Water (DHW)

The Building D restrooms and janitor's closet sink have hot water supplied by a small tank electric water heater located in the janitor's closet.

A detailed listing of the DHW equipment observed in Building D can be found in Appendix A.

5.4.4 Building D - Lighting

The majority of zones in Building D are equipped with conventional T8 fluorescent lighting with a normal distribution of fixtures resulting in an estimated lighting power density (LPD) of approximately 0.8 watts/square foot which meets the current Title 24 LPD requirement of no more than 1.0 watts/square foot. No occupancy sensors or other lighting controls were observed.

5.4.5 Building D - Other Energy Using Systems

Other than instructors' computers in each classroom there were no significant large energy using appliances or other equipment observed in Building D.

5.5 Building E (denoted as Building B5 in the CCC report)

Figure 12: Fortuna Union High School Building E (View from West)

Building E, originally constructed in 1964, is a single story, wood frame structure covering approximately 6,289 square feet of conditioned floor area on an above grade slab foundation. The building houses primarily classrooms.

5.5.1 Building E - Envelope

- Exterior Walls – Building E exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally good condition.
- Fenestration –Building E windows are dual-paned glass in aluminum frames with a thermal break. Windows were observed to be in generally good condition.
- Attic – Classrooms in Building E have sloped cathedral ceilings with no attic space. It is unknown whether any insulation was installed under the new metal roof during the modernization around 2001. The attic area over the central corridor was observed to have no insulation installed, nor is there opportunity to retrofit new insulation due to the high concentration of mechanical systems, electrical conduit, communications infrastructure, and fire suppression plumbing.
- Roof – The roof of Building E is a standing seam metal roof that appeared to be in good condition.
- Roof drainage – The Building E roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system appeared to be in good working order at the time of the assessment, although vegetation was observed to be growing in the gutters, indicating that they are in need of periodic cleaning before accumulated debris can cause substantial damage.

5.5.2 Building E – Heating, Ventilation and Air Conditioning (HVAC)

Building E HVAC is equipped with six 92% efficient Westinghouse condensing furnaces, manufactured in 2004, each located in a corner closet along an exterior wall within the classroom it serves, with a ventilation arrangement providing an estimated 50% outside air.

Small but detectable natural gas leaks were observed at the shutoff valves in the closets housing furnaces in classrooms E4 and E5. These leaks were discovered using an electronic gas sniffer device and locations confirmed by application of soapy solution which produced bubbles at the point of the leaks. A summary table of all gas leaks detected campus wide can be found in Appendix C.

A detailed listing of the HVAC equipment observed in Building E can be found in Appendix A.

5.5.3 Building E – Domestic Hot Water (DHW)

The Building E restrooms and janitor's closet sink have hot water supplied by a small tank electric water heater located in the janitor's closet.

A detailed listing of the DHW equipment observed in Building E can be found in Appendix B.

5.5.4 Building E - Lighting

The majority of zones in Building E are equipped with conventional T8 fluorescent lighting with a normal distribution of fixtures resulting in an estimated lighting power density (LPD) of approximately 0.8 watts/square foot which meets the current Title 24 LPD requirement of no more than 1.0 watts/square foot. No occupancy sensors or other lighting controls were observed.

5.5.5 Building E - Other Energy Using Systems

Other than instructors' computers in each classroom there were no significant large energy using appliances or other equipment observed in Building E.

5.6 Bus Barn / Auto Shop (denoted as Building B6 in the CCC report)

Figure 13. Bus Barn and Auto Shop Building

The Bus Barn and Auto Shop building, is a single story structure covering approximately 6,289 square feet of conditioned floor area on an above grade slab foundation. The building houses two large auto shop instruction and work areas, two classrooms, several offices, and the school bus maintenance garage.

5.6.1 Bus Barn / Auto Shop - Envelope

- Exterior Walls – Auto Shop, office, and classroom exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally good condition. Bus Barn exterior walls have metal siding and estimated R-13 fiberglass insulation behind exposed plastic vapor barrier. The Auto Shop has construction similar to the Bus Barn.
- Fenestration – Bus Barn / Auto Shop windows are single pane windows in wood frames in generally fair condition.
- Attic – Most spaces in the Bus Barn / Auto Shop building have sloped cathedral ceilings with no attic space. The attic area over the Auto Shop classroom and office section is open to the auto shop so is essentially part of that semi-conditioned space. The attic area over the adjacent offices is separated by a firewall but has a large open access hatch so is connected to the semi-conditioned Auto Shop space to a greater extent than desirable. The attic area over the offices and Auto Shop classroom have aging blown cellulose insulation that was observed to be in heavily degraded condition with estimated effective R-value of approximately R-7.
- Roof – The roof of the Bus Barn / Auto Shop is a standing seam metal roof that appeared to be in good condition. The roof of the Bus Barn and Auto Shop high-bay spaces has estimated R-13 fiberglass insulation behind exposed plastic vapor barrier.
- Roof drainage – The Bus Barn / Auto Shop roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system appeared to be in good working order at the time of the assessment.

5.6.2 Bus Barn / Auto Shop – Heating, Ventilation and Air Conditioning (HVAC)

The Bus Barn is heated by a single large unit heater that according to staff is only utilized during very cold weather. It was observed that the large overhead doors do not have any interlock hardware to prevent unit heater operation when the doors are open. Staff pointed out that the overhead doors are poorly fitted and do not provide much of a barrier to free movement of air from inside to outside the building. The Bus Barn has an installed high bay exhaust fan near the peak of the gable end on the north side of the building. The fan is significantly smaller than the louvered opening through which it exhausts and has no shroud, consequently its value as a means of removing contaminated air from the automotive workspace is limited.

The Auto Shop has two separate large spaces that are heated by unit heaters suspended from the ceiling. No nameplate information was accessible on these units but, based on manufacturer and conditions, they are assumed to be approximately 50 years old, having capacities on the order of 200,000 Btu/hr with efficiencies of approximately 75%. Overhead doors in the Auto Shop do not to have interlocks to prevent unit heater operation when doors are open.

The Auto Shop classroom is served by a furnace located in attic space above, which is open to and visible from the auto shop space itself. This 64,000 Btu/hr furnace is quite old and owing to its location where various items have been haphazardly stored over the years, its duct system was observed to be completely disconnected such that any heated air produced by the supply fan is being delivered into the attic space where the unit sits rather than into the classroom heat registers. The furnace combustion efficiency was not tested because the unit is so old and the installation is so compromised that complete replacement of the entire unit is recommended. Additionally, the existing furnace, when functional, was likely substantially oversized for the small zone it serves.

Figure 14. Severely compromised ducting in Auto Shop Classroom furnace

The southwest corner of the Auto Shop building housing offices is heated by a single 59,000 Btu/hr furnace that is approximately 20 years old. This unit is substantially undersized for the approximately 2,500 square feet of poorly insulated space it serves. A total of 10 individual registers were observed at the end of long duct runs connected to two main duct trunk lines manifolded to the supply air plenum.

Figure 15. Long duct runs to a total of 10 registers from a single small HVAC system

A pair of small window air conditioners are installed in two offices with south facing walls in the Auto Shop section of this building. Building occupants indicated that these units are seldom utilized.

A detailed listing of the HVAC equipment observed in Bus Barn/Auto Shop can be found in Appendix A.

5.6.3 Bus Barn / Auto Shop – Domestic Hot Water (DHW)

The Bus Barn and Auto Shop building restrooms and locker room have hot water supplied by a 30-gallon, 80% efficient natural gas water heater located in the attic. All hot water supply lines within the unconditioned space were observed to have adequate pipe insulation installed.

A detailed listing of the DHW equipment observed in Bus Barn/Auto Shop can be found in Appendix B.

5.6.4 Bus Barn / Auto Shop - Lighting

While the rest of the building has standard efficiency T8 fluorescent lighting, the Auto Shop is lit with nine high intensity discharge (HID) metal halide (MH) lamps. These lamps were not accessible to determine the exact wattage but they are assumed to be a minimum of 400 watts each. . The lights in each shop are wired to operate from a single switch so that no part of either shop can be lit without energizing all 9 of its lights. Depending on the actual size of the lamps, the lighting power density for the Auto Shop could be anywhere in the range of 1.6 up to 4.0 watts per square foot, compared to the current Title 24 allowable standard of 1.0 watts per square foot. Since HID lamps require significant cool down time before they can be restruck after shut down, occupancy sensors cannot be utilized with them, and it is typical for these types of lamps to be left on all day once they are turned on in the morning.

Figure 16. HID lights in the Auto Shop

The rest of the building including the Auto Shop classroom, staff offices, and Bus Barn, have a normal distribution of conventional 2- and 3- lamp T8 fluorescent fixture. The estimated LPD for the entire building is approximately 1.10.

5.6.5 Bus Barn / Auto Shop - Other Energy Using Systems

Both the Bus Barn and Auto Shop high bay areas are fully equipped with a wide assortment of tooling normally associate with automotive repair. Most of this equipment is idle most of the time and though some of it may impose high power demand when in use, it is assumed that generally those loads are transient. Air compressors represent one class of such equipment that can, if left to run at all hours and if there are leaks in the compressed air distribution system, consume large quantities of energy. Interviews with staff in the Bus Barn indicated that the compressor in service there has no leaks and does not cycle frequently unless it is actually in use.

The Auto Shop has a soft drink vending machine that was observed to have its compressor running approximately 75% of the time, with lights on 100% of the time. A KillaWatt energy monitoring device was deployed and it was observed that this machine draws an average of 360 watts. This is consistent with various studies concluding that soft drink vending machines typically cost up to $500 per year to operate.

5.7 Bus Shed (denoted as Building B7 in the CCC report)

Figure 17. Bus Shed

The Bus Shed, originally constructed in 1964, is a single story, wood frame structure covering approximately 3,750 square feet of unconditioned floor area on an above grade slab foundation. The building is used exclusively for parking.

5.7.1 Bus Shed - Envelope

- Exterior Walls – The bus shed exterior walls are wood frame with unfinished interior treatment and painted wood shingle siding on the exterior. The exterior siding was observed to be in generally fair condition.
- Fenestration – The Bus Shed has several large high bay overhead doors for parking buses. It also has a single uninsulated metal door for access but no other doors or windows.
- Attic – The Bus Shed has neither attic nor any interior finish beneath the exposed framing of the pitched roof.
- Roof – The roof of the Bus Shed is a membrane of unknown material that not observed directly therefore evaluation of this component could not be completed.
- Roof drainage – The Bus Shed roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system appeared to be in good working order at the time of the assessment.

5.7.2 Bus Shed – Heating Ventilation and Air Conditioning (HVAC)

The Bus Shed has no HVAC or other significant energy using systems.

5.7.3 Bus Shed – Domestic Hot Water (DHW)

The Bus Shed has no plumbing so there is no domestic water heater.

5.7.4 Bus Shed - Lighting

The Bus Shed is typically not lit so its lighting systems were not evaluated.

5.7.5 Bus Shed - Other Energy Using Systems

No energy using systems or equipment of any significance was observed in the Bus Shed.

5.8 Building F (denoted as Building B8 in the CCC report)

Building F, originally constructed in 1964, is a single story, wood frame structure covering approximately 11,350 square feet of conditioned floor area on an above grade slab foundation. The building houses primarily academic classrooms and science instruction labs.

5.8.1 Building F - Envelope

- Exterior Walls – Building F exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally good condition.
- Fenestration –Building F windows are dual-paned glass in aluminum frames with a thermal break. Windows were observed to be in generally good condition.
- Attic – Classrooms in Building F have sloped cathedral ceilings with no attic space. It is unknown whether any insulation was installed under the new metal roof during the modernization around 2001. The attic area over the central corridor was observed to have aging insulation installed but it is significantly displaced and deteriorated, and estimated to have effective value no greater than approximately R-7. Fire doors through fire walls separating sections of the attic in Building F were observed to be permanently wired open, negating any fire suppression qualities the fire walls are designed to provide.
- Roof – The roof of Building F is a standing seam metal roof that appeared to be in good condition.
- Roof drainage – The Building F roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system appeared to be in good working order at the time of the assessment, although vegetation was observed to be growing in the gutters, indicating that they are in need of periodic cleaning before accumulated debris can cause substantial damage.

5.8.2 Building F – Heating, Ventilation and Air Conditioning (HVAC)

Building F HVAC is configured similar to Buildings D and E, with mostly 92% efficient Westinghouse condensing furnaces manufactured in 2004 and 2005; however furnace location varies by classroom size. Rather than a single large supply register coming immediately off the supply plenum, most of the larger zones in Building F have ducted delivery systems that run either through the attic over the central corridor or smaller attics above small spaces that separate some of the larger classrooms.

Furnace filters throughout Building F were observed to be incorrectly sized so that they fit poorly resulting in significant bypasses around them. In addition most of these filters were dated as having been last replaced over one year ago.

All furnace controls Building F were observed to be manually operated mechanical thermostats with no setback capability. It appears at one time there was a programmable timer wired to all the furnaces in the building that would prevent operation during unoccupied hours but that system has been bypassed and the furnaces are currently capable of operating at all hours whenever building occupants fail to turn them off before leaving at the end of the school day.

While most of the supply ductwork is insulated, much of the insulation was observed to be in very poor condition, with large expanses of metal ducting completely exposed. Several leaks in the ducts were also observed, the most severe of which is a completely collapsed duct near the register closest to the attic access hatch outside Room F5. When ducts leak supply air into unconditioned spaces, not only is the amount of heated supply air that leaks completely wasted, but the situation is made worse by the fact that 100% of the air drawn out of the conditioned zone back into the furnace through the return duct must be made up by infiltration of outside air into the space through cracks around doors and windows and from any connected attic or crawlspace.

Figure 18. Collapsed duct with major leak above classroom F5

Small but detectable natural gas leaks were observed at the shutoff valves in the closets housing five separate furnaces, including in classrooms F1, F3, F8, F9, and F10. These leaks were discovered using an electronic gas sniffer device and locations confirmed by application of soapy solution which produced bubbles at the point of the leaks. A summary table of all gas leaks detected campus wide can be found in Appendix C.

Room F6 has a rooftop exhaust fan, operated by a wall switch near the door. This unit has a bearing that has failed as evidenced by an inordinately loud squeal when it is turned on.

A detailed listing of the HVAC equipment observed in Building F can be found in Appendix A.

5.8.3 Building F – Domestic Hot Water (DHW)

The Building F restrooms and some laboratory sinks have hot water supplied by a 40-gallon,80% efficient natural gas water heater located in the janitor's closet. This unit was observed to have its control in the ON position yet the pilot light was not lit so it was inoperable at the time of this survey. When lit for testing it passed the spillage test for proper drafting as long as the closet door was open, but it was observed that there is significant evidence of prior spillage from poor drafting around the top of the unit where exhaust gases enter the flue. It was further observed that there is no provision for combustion air into the closet other than a thin crack at the threshold beneath the door. It is recommended that

another inch or so be taken off the bottom of the door or else a vent installed in the door to ensure that the unit has sufficient make-up air for safe combustion available to it.

Three different gas leaks were detected in the supply to this water heater. Leaks were detected at both ends of the flex line, and a significant leak was detected at the first of two shutoff valves in the iron gas line. The ball style shutoff valve adjacent to the flex line appeared to be in good condition. A summary table of all gas leaks detected campus wide can be found in Appendix C.

A detailed listing of the DHW equipment observed in Building F can be found in Appendix B.

5.8.4 Building F - Lighting

The majority of zones in Building F are equipped with conventional T8 fluorescent lighting with a normal distribution of fixtures, except some science labs which have a slightly higher concentration, resulting in an estimated lighting power density of approximately 0.89 watts/square foot which meets current Title 24 requirements which limits LPD to a maximum of 1.0 watts/square foot. No occupancy sensors or other lighting controls were observed.

5.8.5 Building F - Other Energy Using Systems

Most spaces in Building F contain a standard distribution of one instructors' computer and basic peripherals per classroom. Designated computer labs contain a total of approximately 43 computer workstations, for a total of approximately 53 computers in the building.

The various laboratory spaces in Building F house a variety of scientific lab equipment but the majority of it likely uses power only rarely. The most significant equipment observed was a number of standard residential style refrigerators.

5.9 Maintenance Building (denoted as Building B9 in the CCC report)

The Maintenance building, originally constructed in 1961, is a high bay, single story, wood frame structure covering approximately 10,945 square feet of mostly unconditioned floor area, about half of which is over crawlspace and half on uninsulated above grade slab foundation. About half of the building is used for storage with the remainder dedicated to various activities in support of maintenance of the entire campus.

5.9.1 Maintenance Building - Envelope

- Exterior Walls – The Maintenance Building exterior walls are wood frame with mostly unfinished interior treatment and a mix of painted wood siding and painted stucco on the exterior. Wood trim around the eaves was observed to be in poor condition in several areas around the building.
- Fenestration – The Maintenance Building has a large high bay sliding door in addition to several single solid wood doors for access. The few windows are single paned glass in wood frames.
- Attic – Most of the Maintenance Building has no attic nor any interior finish beneath the exposed framing of the pitched roof, with the exception of a few areas that have unfinished drywall ceilings. No access to any resulting attic areas was observed.
- Roof – The roof of the Maintenance Building is a torch-down composition fiberglass/asphalt roof that was not observed directly. but from ground level observation appeared to be in fair condition. .
- Roof drainage – The Maintenance Building roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system was not accessed directly for inspection. The gutters appeared to be in generally good condition from below but given observations throughout the rest of the campus it is possible they contain enough accumulated debris that periodic overflowing occurs, which would likely contribute to the observed deteriorated condition of eaves noted above.

5.9.2 Maintenance Building – Heating, Ventilation and Air Conditioning (HVAC)

The Maintenance building HVAC consists solely of large unit heaters suspended from the ceiling. Staff indicated these units are seldom used and were thus not evaluated.

A detailed listing of the HVAC equipment observed in the Maintenance Building can be found in Appendix A.

5.9.3 Maintenance Building – Domestic Hot Water (DHW)

No domestic water heater was observed in the Maintenance Building.

5.9.4 Maintenance Building Lighting

The Maintenance building has mostly T8 fluorescent fixtures with a few remaining older T12 fixtures in some locations. Occupancy sensors were observed in the rear warehouse area but no such controls appeared to be installed in any of the areas that are used on a regular basis. The wood shop and storage areas have higher concentrations of light than may be necessary, and central area has large skylights that present a good opportunity to save substantial energy by implementation of daylighting/occupancy

controls. The overall lighting power density of the Maintenance building is estimated to be approximately 0.5 watts per square foot but it varies quite a bit from zone to zone and the average is brought down substantially by the relatively low density of light in the large metal shop work area. This meets the current Title 24 standard which limits LPD to no greater than 1.0 watts/square foot.

5.9.5 Maintenance Building Other Energy Using Systems

The Maintenance building houses a wide assortment of tooling including compressors, welders, wood working tools, etc. Though this equipment contributes to the power demand profile of the campus, this type of equipment generally sits idle the majority of the time and it is not likely that its overall energy consumption is significant.

The Maintenance department also has a pair of electric utility vehicles that are used daily and charged inside the Maintenance building each night. The on-board charging systems are plugged in each night using standard 120V extension cords. It is estimated that these carts consume approximately 10 kWh per day each, at an estimated cost of approximately $1300 per year.

5.10 Wayne Rogers Complex / Industrial Technology (denoted as Building B10 in the CCC report)

Figure 19. Fortuna Union High School Wayne Rogers Complex/Industrial Technology (View from Southwest)

The Wayne Rogers Complex is a single story structure covering approximately 8,788 square feet of conditioned floor area. The building houses two large shop instruction and work areas in addition to two small offices and several storage areas. The Wood Shop sits on a perimeter foundation over a crawlspace, whereas the Metal Shop section sits on an above grade concrete slab foundation.

5.10.1 Industrial Tech Building - Envelope

- Exterior Walls – The Wayne Rogers Complex exterior walls are wood frame with mostly wood paneled interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally fair condition, with areas at the rear of the metal shop impacted by weathering and/or dry rot. No insulation was observed and it is assumed that none exists.
- Fenestration – The few windows in the Wayne Rogers Complex are primarily at the front entry way. These windows are storefront style single paned glass in wood frames and were observed to be in generally good condition. Clerestory windows at the rear of the metal shop appear to be tinted single paned glass in wood frames.
- Attic – Most spaces in the Wayne Rogers Complex have sloped cathedral ceilings with exposed framing and no attic space. The two small office areas have drywall ceilings but no attic access was observed.
- Roof – Most of the roof of Wayne Rogers Complex is a standing seam metal roof that was not accessed directly but appeared to be in good condition from ground level. The center section between the two shop areas appears to be built-up asphalt, also not observed directly but appeared to be in good condition from ground level.
- Roof drainage – The Wayne Rogers Complex has no roof drainage system, which likely contributes greatly to the poor condition of the exterior siding in many areas.

5.10.2 Industrial Tech Building – Heating, Ventilation and Air Conditioning (HVAC)

The Industrial Tech building is heated by a total of four separate HVAC systems. A pair of similar but not identical 80% combustion furnaces serves the Wood Shop. Both furnaces appear to have been installed new in early 2014. No timer or other controls were observed to prevent these furnaces from running during unoccupied hours.

The HVAC systems sit in an exterior closet and appear to operate in parallel, controlled by a single manual mechanical thermostat and sharing common return plenum located in the crawlspace. The supply plenums feed into what appears to be a single large duct that runs the length of the woodshop exterior wall. Both supply plenums have fabric expansion joints with large leaks that allow a substantial portion of the heated supply air to leak into the unconditioned space, creating lower pressure inside the building which results in increased infiltration of cold outside air into the conditioned space. Neither the supply plenum nor supply ducts are insulated.

One of the Wood Shop furnaces had a disposable air filter that was dated “4-14” so appears to have only been changed once a short time after the system was installed over a year ago. The other system has a reusable filter that does not appear to have been cleaned recently. Both filters appeared to fit poorly and were not likely the correct filters for this application.

Figure 20. Large leaks in Wood Shop furnace supply plenum

The Wood Shop furnaces share a common exhaust flue stack which exhibits signs of significant corrosion attributable to the condensation of corrosive fluids common in this configuration.

Figure 21. Corrosion of common shared flue in Wood Shop furnace closet

A third gas furnace, manufactured in 1994, is located in an interior closet outside the Metal Shop and serves the front lobby, and teachers' offices inside both the Wood and Metal shops via uninsulated ducting located in the crawlspace. This furnace shares a common flue with a natural gas water heater located in the same closet. The manual mechanical thermostat for this unit is located in a small office off the main lobby that does not contain any supply duct from the system so if that office door is closed the system will likely run non-stop if set to normally occupied temperatures. This standard 80% efficient furnace appears to have no return ducting but delivers 100% outside air drawn from a large louvered air intake along the outside wall of the closet. Between the fact that it must heat all its supply air from outside air temperatures and it delivers supply air through long runs of leaky uninsulated ducting, this furnace likely consumes on the order of three to four times more fuel per square foot of heated floor area than would a new condensing furnace properly configured with return air and insulated ducting. Couple this with the fact that the unit is beyond its useful service life and it is recommended for replacement.

The Metal Shop is heated by a single large 75% efficient unit heater with output capacity of 266,250 Btu/hr and manufactured in 1978. Unlike most unit heaters which simply circulate room air this one does have a duct to the outside and appears to ventilate at a rate of at least 50% outside air, which is appropriate given the nature of activities in this type of occupancy.

A detailed listing of the HVAC equipment observed in Industrial Tech Building can be found in Appendix A.

5.10.3 Industrial Technology – Domestic Hot Water (DHW)

Hot water for the Industrial Technology building is supplied by a 40-gallon standard 80% efficiency natural gas water heater manufactured in 2010. This unit shares a common flue with a furnace located in the same closet off the main lobby.

A detailed listing of the DHW equipment observed in Building F can be found in Appendix B.

5.10.4 Industrial Technology - Lighting

The Industrial Technology building is equipped with mostly conventional T8 fluorescent fixtures in 2, 3, and 6 lamp configurations. Areas other than the main Wood and Metal shops have normal distribution of fixtures. Concentrations in the shop areas are higher, resulting in an estimated total building lighting power density (LPD) of approximately 1.61 watts/square foot. This exceeds the current Title 24 requirements which limit LPD to no more than 1.0 watts/square feet. Occupancy sensors were observed in a few of the smallest storage and work spaces but no lighting controls appeared to be present in most of the occupied spaces in the building.

5.10.5 Industrial Technology - Other Energy Using Systems

The wood and metal shops house a large assortment of light industrial tooling including saws, shapers, lathes, mills, compressors and welding equipment. While in operation much of this tooling places significant power demand on the school's electric meters, but most of it likely runs in a very intermittent manner, generally measured in seconds rather than minutes. Without extensive monitoring that would require submetering the entire building it is not feasible to estimate the actual energy consumption of these transient loads.

A large 225 kVA transformer at the rear of the Metal shop operates 100% of the time regardless of occupancy. There are numerous variables that contribute to the efficiency characteristics of equipment, including application, number and gauge of windings, size of the iron core, and age. While no data were available for this particular transformer, the specification sheet for a similarly sized unit[3] gives standby losses of about 830 watts, so it is reasonable to estimate this particular unit consumes at least 7270 kWh per year at a cost of approximately $1,236.

[3] Source: http://www.eaton.com/Eaton/ProductsServices/Electrical/ProductsandServices/ElectricalDistribution/Transformers/LowVoltageDry-TypeDistribution/EnergyEfficientCSL-3Compliant/index.htm#tabs-2

5.11 District Office (denoted as Building B11 in the CCC report)

Figure 22. Fortuna Union High School District Office (View from Southeast)

The District Office, originally constructed in 2001, is a single story, wood frame, modular manufactured structure covering approximately 1,920 square feet of conditioned floor area. This building is constructed on a pier and post foundation and houses primarily office space.

5.11.1 District Office Envelope

- Exterior Walls – The District Office exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally good condition. Given the age and type of the structure, insulation in both the exterior walls and the floor is assumed to be R-19.
- Fenestration – The District Office windows are dual-paned glass in aluminum frames with a thermal break. Windows were observed to be in generally good condition.
- Attic – The District Office has suspended ceilings with recessed lighting and no direct access to the minimal attic space above. Based on OurEvolution engineers experience evaluating similar buildings it is assumed to have a minimum of R-13 fiberglass insulation between roof framing members.
- Roof – The roof of the District Office is a single-ply membrane surface. It was not accessed directly for observation but from ground level, appeared to be in generally good condition.
- Roof drainage – The District Office roof drainage system consists of seamless metal gutters diverting runoff via downspouts to a subsurface drainage system. This system appeared to be in good working order at the time of the assessment.

5.11.2 District Office – Heating, Ventilation and Air Conditioning (HVAC)

The District Office is served by a pair of packaged heat pumps similar to those found on nearly all portable or temporary modular buildings. The nameplates on both heat pumps were illegible, so the exact model and vintage are unknown, but based on OE experience with such systems, they are assumed to be three tons each and manufactured the same year as the building, which would indicate an energy efficiency rating (EER) of 9.0. The heat pumps are controlled by a pair of programmable

setback thermostats and their conditioned air is delivered via ducting located in above the suspended ceiling.

A detailed listing of the HVAC equipment observed in District Office can be found in Appendix A.

5.11.3 District Office – Domestic Hot Water (DHW)

Hot water for the District Office is supplied by a 10 gallon electric tank heater located in a cabinet in the break room kitchen.

A detailed listing of the HVAC equipment observed in District Office can be found in Appendix A.

5.11.4 District Office - Lighting

The District Office is lit by conventional T8 fluorescents in 2-lamp recessed fixtures in a normal distribution, resulting in an estimated lighting power density (LPD) of approximately 0.77 watts/square foot, which meets current Title 24 requirements which limit LPD to no more than 1.0 watts/square foot. No occupancy sensors or other lighting controls were observed.

5.11.5 District Office - Other Energy Using Systems

The District Office building has a normal distribution of standard office computing equipment. No other significant energy using systems were observed.

5.12 Agriculture Building (denoted as Building B12 in the CCC report)

Figure 23. Fortuna Union High School Agriculture Building (View from West)

The Agriculture Building, originally constructed in 1981, is a single story structure covering approximately 9,830 square feet of conditioned floor area. The building houses a large shop instruction and work area in addition to two classrooms, an office and storage areas. The Ag Building sits on a raised slab foundation.

5.12.1 Agriculture Building - Envelope

- Exterior Walls – The Agriculture Building exterior walls are wood framed with mostly wood paneled interior treatment in the shop area, drywall in the classrooms, and painted wood siding on the exterior. The exterior siding was observed to be in generally fair condition, with several areas significantly impacted by weathering or dry rot. No insulation was observed and it is assumed that none exists.
- Fenestration – The few windows in Agriculture Building are primarily at the front entry way. These windows are single paned glass in non-metal frames and were observed to be in generally good condition.
- Attic – The large open shop area of the Agriculture Building has exposed roof framing with no attic. The classrooms and office have drywall ceilings with attic above. Most attic areas appeared to have fiberglass insulation in good condition with estimated R-value of R-13.
- Roof – The roof of Ag Building is a standing seam metal roof that appeared to be in good condition.
- Roof drainage – The Ag Building has no roof drainage system, which likely contributes greatly to the poor condition of the exterior siding in some areas.

5.12.2 Agriculture Building – Heating, Ventilation and Air Conditioning (HVAC)

The Agriculture Building HVAC systems consist of four large, aging Janitrol furnaces with serial numbers that do not indicate their exact year of manufacture but given the history of the company it appears they are from at least 1981 or earlier. These furnaces are all located in a central semi-finished attic space with provision for outside combustion air. However, the furnace cabinets and return plenums are compromised such that the entire mechanical space is under negative pressure when supply fans are running. Consequently poor combustion drafting was observed and there is significant opportunity for exhaust gas spillage to occur, which results in potential carbon monoxide contaminated air being drawn into the supply air and delivered to the occupied zones throughout the building. One of the furnaces had an old dirty air filter that had been dislodged and pulled into the supply fan. The other furnaces had no filters at all. A small gas leak was detected at the regulator inside Furnace F-Ag1.

Complete replacement of all four furnaces serving the Agriculture building with new high efficiency condensing furnaces is recommended. The existing furnaces are likely substantially oversized for the loads they serve so any new systems should be sized based on calculated loads. The existing duct system should be restored with any expansion joints replaced and all other joints sealed with fiber tape and mastic before any ducts located in unconditioned spaces are insulated.

A detailed listing of the HVAC equipment observed in the Agriculture Building can be found in Appendix A.

5.12.3 Agriculture Building – Domestic Hot Water (DHW)

The Agriculture building has installed an older natural gas water heater in the same attic mechanical space as the furnaces. The nameplate on this unit was illegible so its exact age could not be determined. This unit was found to be in very poor condition, with evidence of exhaust spillage over a long period of time resulting in extreme buildup of galvanic scale all over the unit and the pipes connected to it. The tank was leaking as evidenced by several inches of water collected in its drain. A natural gas leak was also detected at the shutoff valve. As a precaution OE engineers took the unit out of service by shutting off the natural gas supply. The water shut off valve to the unit was seized so rather than risk breaking it, District maintenance staff were notified immediately and the plumbing was shut down by them the following day. This unit is recommended for immediate replacement after the District re-evaluates whether the building actually requires hot water service.

A detailed listing of the DHW equipment observed in the Agriculture Building can be found in Appendix B.

Figure 24. Failed water heater in Ag Building attic

5.12.4 Agriculture Building - Lighting

The Agriculture building has conventional T8 fluorescent fixtures in 2- and 6- lamp configurations with normal distribution resulting in an estimated lighting power density (LPD) of approximately 0.64 watts/square foot which meets current Title 24 requirements that limit LPD to not more than 1.0 watts/square foot. The large Ag shop has occupancy sensors but no other lighting controls were observed in the building.

5.12.5 Agriculture Building Other Energy Using Systems

The Agriculture shop area is equipped with a variety of tooling including hand power tools and welders that likely contribute to the District's electric demand charges but it is assumed their cumulative energy consumption is not significant.

The Agriculture shop also contains a large commercial 2-door glass front reach-in flower cooler by SRC. According to the manufacturer the exact date of production is not known but it was prior to 2010 and it is expected to require replacement by about 2018. This unit was observed to be empty but it was plugged in and its compressor running the majority of the time OE engineers were in the building. It was observed that the condenser coils at the bottom front of the unit were plugged with dust and debris, a condition which severely limits the capacity of any refrigeration unit to perform its heat rejection function. A KillaWatt watt hour meter was deployed to monitor its power and energy consumption over a period of 359 hours, during which time it consumed a total of 260 kWh, or an average continuous demand of 724 watts. This cooler is therefore estimated to consume an average of approximately 6,342 kWh per year at a cost of $1,078 per year, or about $3.50 per day.

Given that the SRC flower cooler in the Agriculture shop is housed in a harsh environment that is likely dusty a great deal of the time, it is recommended that a robust maintenance program be developed that requires the unit's condenser coils to be cleaned at least monthly. It is further recommended that the cooler be unplugged with its doors propped open whenever it is not planned to utilized for more than one week at a time.

5.13 Music Building (denoted as Building B13 in the CCC report)

Figure 25. Fortuna Union High School Music Building (View from East)

The Music Building, originally constructed in 1981, is a single story, wood frame structure covering approximately 4,960 square feet of conditioned floor area on an above grade slab foundation. The building houses primarily two large rehearsal halls, smaller recording studios, and several small office and storage areas.

5.13.1 Music Building - Envelope

- Exterior Walls – Music Building exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally very poor condition, with several areas noted to be significantly deteriorated, particularly those areas beneath the bottom of the roof slope where runoff is allowed to fall directly to the pavement and splash back onto the building.
- Fenestration –Music Building windows are single paned glass in wood frames. Windows were observed to be in generally good condition. Clerestory windows above the band rehearsal hall are single pane tinted glass in metal frames and appeared to be in generally good condition.
- Attic – The large rehearsal halls in the Music building have sloped cathedral ceilings with no attic space. It is unknown whether any insulation was installed above the acoustical tile ceiling. The attic area over the central corridor and offices was not accessible.
- Roof – The roof of the Music building is a standing seam metal roof that appeared to be in good condition.
- Roof drainage – The Music building roof has narrow eaves with no gutters or drainage system, which likely contributes greatly to the generally very poor condition of the exterior siding.

Figure 26. Moisture damage to siding of Music Building

5.13.2 Music Building – Heating, Ventilation and Air Conditioning (HVAC)

The music building is heated by four furnaces, two each in exterior mechanical closets located at the front and rear of the building.

The two furnaces in the closet at the front of the building are Janitrol, similar to those in the Agriculture Building and are likely from 1981 or earlier, which places them well beyond their useful service life. One of these systems serves the choir rehearsal hall and the other serves the main corridor, offices, recording studio, and other small supporting areas throughout the building.

The two furnaces in the closet at the rear of the building were inaccessible due to a locked padlock but maintenance staff indicated they are less than two years old. They appear to be standard 80% efficient units, likely about 80,000 Btu/hr each, and appear to work in parallel to heat the main band rehearsal hall, controlled by a single mechanical manual thermostat.

A small but detectable natural gas leak was observed at the shutoff valves in the closet at the front of the Music building, at the shutoff valve associated with the system on the left side serving the Choir rehearsal hall. This leak was discovered using an electronic gas sniffer device and location confirmed by application of soapy solution which produced bubbles at the point of the leaks. A summary table of all gas leaks detected campus wide can be found in Appendix C.

A detailed listing of the HVAC equipment observed in the Music Building can be found in Appendix A.

5.13.3 Music Building – Domestic Hot Water (DHW)

No water heater was observed in the Music building.

5.13.4 Music Building - Lighting

The Music building is lit with conventional T8 fluorescent fixtures in mostly 2-lamp configurations. Since the rehearsal halls have high ceilings the concentration of lighting is higher than average, resulting in an estimated LPD of approximately 2.05 watts/square foot.

5.13.5 Music Building - Other Energy Using Systems

The Music building houses two computer workstations and a variety of electric musical instruments, amplifiers, and recording equipment, all of which presumably is turned off when not in use.

5.14 Fieldhouse (denoted as Building B14 in the CCC report)

The Fieldhouse, originally constructed in 1978, is a single story, wood frame structure covering approximately 1,240 square feet of unconditioned floor area on an above grade slab foundation. The building exists solely to support activities on the football field and other outdoor athletic events.

5.14.1 Fieldhouse - Envelope

- Exterior Walls – Fieldhouse exterior walls are painted masonry brick. The building interior was inaccessible but assumed to be drywall with no insulation.
- Fenestration –The Fieldhouse exterior has no windows. The building has several hollow metal security doors and one large louvered air intake next to a zone that appears to house some type of natural gas appliance but since the building interior could not be accessed said appliance was not observed.
- Attic – The Fieldhouse has no attic.
- Roof – The Fieldhouse has a low slope roof that was not observed but assumed to be ballasted asphalt in generally good condition.
- Roof drainage – The Fieldhouse roof drainage system consists of scuppers at the corners of the roof that divert runoff via downspouts to a subsurface drainage system on the south side of the building but directly onto the surrounding pavement on the north side of the building.

5.14.2 Fieldhouse – Heating, Ventilation and Air Conditioning (HVAC)

The Fieldhouse interior was not accessible so it is unknown if it houses any HVAC equipment.

5.14.3 Fieldhouse – Domestic Hot Water (DHW)

The Fieldhouse interior was not accessible so it is unknown if it houses a hot water heater, although a roof penetration that appeared to be a combustion flue which indicates the likelihood that one does exist.

5.14.4 Fieldhouse - Lighting

The Fieldhouse interior was not accessible so its lighting configuration was not observed.

5.14.5 Fieldhouse - Other Energy Using Systems

The Fieldhouse interior was not accessible so any other energy using systems it may house were not observed.

5.15 Snack Shack (denoted as Building B15 in the CCC report)

The Husky Snack Shack, originally constructed in 2014, is a single story, concrete masonry structure covering approximately 1096 square feet of unconditioned floor area on an above grade slab foundation. The building exists solely to provide food service in support of activities on the football field and other outdoor athletic events.

5.15.1 Snack Shack - Envelope

- Exterior Walls – Snack Shack exterior walls are concrete masonry block with no interior treatment other than paint.
- Fenestration –The Snack Shack exterior has no windows other than three openings through which food is served and which are covered with corrugated roll-up doors when not in use. The building has several hollow metal security doors serving as entryways to the kitchen, two closets, and two public restrooms.
- Attic – The Snack Shack has an uninsulated attic over the entire floor area.
- Roof – The Fieldhouse has a pitched metal roof that appeared to be in good condition.
- Roof drainage – The Snack Shack roof drainage system consists of seamless metal gutters discharging via downspouts directly onto the pavement several feet away from the building's foundation.

5.15.2 Snack Shack – Heating, Ventilation and Air Conditioning (HVAC)

No HVAC equipment was observed in the Snack Shack.

5.15.3 Snack Shack – Domestic Hot Water (DHW)

Hot water for the Snack Shack is provided by what appears to be a small on demand tankless natural gas water heater. This unit is located in an attic space that was not easily accessible during this audit and so no specific nameplate data were observed but from the access hatch the unit appeared to be in good working order and given the age of the building is assumed to be less than two years old. Since the building is only used occasionally this is an ideal application for a tankless unit since it has no standby losses and uses no energy unless and until there is hot water demand.

5.15.4 Snack Shack Other - Energy Using Systems

The Snack Shack's primary purpose is food service during athletic events, consequently other than two public restrooms its entire floor area is dedicated to either storage or food preparation. Consequently it is equipped with three commercial refrigerators including a two-door reach-in, a single-door reach-in, and a single-door glass front drink cooler. All three were observed to be empty yet plugged in with their compressors running the majority of the time during when OE engineers were present. A KillaWatt watt meter was deployed on each unit and each was observed to draw approximately 700 watts continuously. Refrigeration units tend to run more of the time when empty than when they are filled with product which acts as thermal ballast. Assuming each of these coolers runs 50% of the time, the annual operating cost is estimated to be approximately $1686 for all three units based on average electricity cost of $0.22 per kWh.

The largest of the Snack Shack refrigerators, a Continental 2-door reach in, was observed to have one of its two evaporator fans broken. The fan motor appeared to be turning but the fan blades had slipped off the shaft and were immobile.

A commercial 3-burner coffee maker was observed to be plugged in to a 120V wall outlet. This unit's power switch was in the off position so the burners were not hot, however the unit is plumbed to the building's water supply and it maintains a reservoir of hot water at approximately 180°F.

Other various kitchen equipment in the Snack Shack was either unplugged or uses negligible energy when not in use.

5.16 Gate (denoted as Building B16 in the CCC report)

The athletic field Gate building is a small unconditioned structure serving only as an access point of entry through the gate enclosing the football field. No assessment of this building was completed.

5.17 Cafeteria (denoted as Building B17 in the CCC report)

The Cafeteria building, originally constructed in 1920, is a single story, wood frame structure covering approximately 7,869 square feet of conditioned floor area over a perimeter foundation. The building houses a commercial kitchen and dining hall, with a single classroom and storage areas on the west end.

5.17.1 Cafeteria - Envelope

- Exterior Walls – The Cafeteria exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally fair condition.
- Fenestration – Cafeteria windows are single pane gas in wood frames.
- Attic – There is no accessible attic in the Cafeteria building.
- Roof – The roof of the Cafeteria is either a torch-down composition fiberglass/asphalt or ballasted asphalt built up roof that was not observed directly but from the ground, appeared to be in generally fair condition.
- Roof drainage – The Cafeteria roof is surrounded by parapet and has runoff directed to scuppers with downspouts that feed into an underground drainage system, all of which appeared to be functioning normally. It is likely that there is an accumulation of debris in the rooftop scuppers that should be cleared periodically.

5.17.2 Cafeteria – Heating, Ventilation and Air Conditioning (HVAC)

The Cafeteria dining hall is heated by a large natural gas unit heater suspended from the ceiling in the dining hall. A pair of older hydronic unit heaters still exist in the dining hall, but it appears they were disabled some time ago.

The Cafeteria kitchen is equipped with a ductless mini-split heat pump with its condenser on the roof and interior unit mounted above the walk-in cooler. It appears this unit rarely if ever runs in heating mode, since heat from various process loads in the kitchen provides sufficient heat for that space. According to kitchen staff the heat pump does run in cooling mode often. It appears that this is primarily attributable to heat rejected by the walk-in cooler's compressor/condenser, which is located on top of the cooler cabinet in a separate space adjacent to the kitchen, but with an exhaust fan that draws heat from that space and pushes it directly into the kitchen. Evidently the large kitchen exhaust hoods are insufficient to keep the space from getting uncomfortably hot as a result, hence the relatively recent installation of the heat pump.

A detailed listing of the HVAC equipment observed in the Cafeteria can be found in Appendix A.

5.17.3 Cafeteria – Domestic Hot Water (DHW)

The Cafeteria has its domestic hot water needs met by a 75-gallon commercial gas tank water heater located in a small shed attached to the rear of the building. This unit was manufactured in 2012 and appeared to be in good operating condition.

Hot water for the janitor's closet at the front of the cafeteria building is supplied by a 10-gallon tank electric water heater with a 1650 watt heating element. Due to the location of its installation neither the serial number nor date of manufacture were accessible.

A detailed listing of the DHW equipment observed in the Cafeteria can be found in Appendix A.

5.17.4 Cafeteria - Other Energy Using System

The Cafeteria kitchen contains an assortment of standard commercial kitchen equipment including multiple reach in and walk-in coolers and freezers, a commercial dishwasher, an ice machine, and commercial six-burner range.

Two under-counter three-door coolers have their compressors located in the same exterior shed as the water heater. It was observed that the condenser coils on these compressors, which are located in a small shed adjacent to the building, were dirty and there was no insulation on the refrigerant lines, both of which adversely affect refrigeration performance.

The walk-in freezer has its compressor located on a small pad beneath the building, just inches above unfinished grade. This unit's condenser coils were also observed to be dirty and most of the exposed refrigerant lines uninsulated.

The walk-in cooler has its compressor located atop its cabinet in a room adjacent to the kitchen. An exhaust fan in that room pushes hot air from the compressor into the open kitchen space. Directly above this exhaust fan is mounted a 3-ton mini-split ductless heat pump condenser, which according to staff was installed to cool the kitchen because of overheating conditions.

5.18 Damon Gym (denoted as Building B18 in the CCC report)

The Damon Gym, originally constructed in 1952, is a single story, wood frame structure covering approximately 27,500 square feet of conditioned floor area over a slab on grade foundation. The building houses primarily a gymnasium and locker rooms. Since the Damon Gym is scheduled for already funded major renovations it was not included in this analysis.

5.19 Arts/Theater Building (denoted as Building B19 in the CCC report)

Figure 27. Photos of Fortuna Union High School Art and Theatre Sections of Arts/Theatre Building (View from North)

The Arts/Theater Building, originally constructed in 1952, is a single story, wood frame structure covering approximately 7,869 square feet of conditioned floor area over a perimeter foundation.

5.19.1 Arts / Theater Building - Envelope

- Exterior Walls – The Arts/Theater building exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally good condition.
- Fenestration – Windows in the Arts/Theater building are mostly single paned glass in wood frames from original construction but in generally good condition.
- Attic – The attic throughout the Arts/Theater building is quite expansive with substantial steel framing that appears to have been recently retrofitted. The entire attic has plywood floors throughout, with plywood firewalls separating several sections. Fire doors in the firewalls were observed to be wired in the open position, negating any protection against rapid spread of fire that the firewalls were designed to provide. No insulation was observed in the attic.
- Roof – The roof of the Arts/Theater building is a combination of low sloped torch-down composition fiberglass/asphalt over the central section, with standing seam metal roofing around most of the perimeter. Due to limited access, the roof was not observed directly but from ground level appeared to be in fair condition.
- Roof drainage – The Arts/Theater building roof drainage system consists of rooftop scuppers diverting runoff to an underground drainage system, all of which appeared to be in good working order.

5.19.2 Arts / Theater Building – Heating, Ventilation and Air Conditioning (HVAC)

The Ceramics and Photography lab classrooms in the Arts/Theater Building are served by two standard 80% efficiency combustion furnaces located in an unconditioned mechanical closet at the southwest corner of the building, manufactured in 1999 and 2002. A third furnace with a similar configuration, manufactured in 2004, is located in a closet inside the instructor's office in the Yearbook Lab classroom. All three of these systems are controlled by manual mechanical thermostats with no time control or setback capability.

All three of these systems appear to utilize older duct systems from prior furnaces, located in overhead chases. It is uncertain whether these ducts are insulated but it appears they are not. Both units serving the Ceramics and Photo labs have fabric expansion joints at the top of their supply plenums that are severely compromised and leaking heated supply air into unconditioned space. Both units utilize return ducting in the crawlspace, which was not easily accessible during this audit. The filters in all three of these systems were observed to be in very poor condition. While the mechanical closets within which these furnaces reside have provision for adequate combustion air through exterior wall penetrations, these systems do not appear to provide any outside air ventilation to the conditioned space.

Figure 28. Leak in supply plenum of Ceramics Lab furnace

The Theater is heated by three furnaces located in a basement mechanical room. Two of these are early condensing units manufactured in 1998 and 1999 with rated efficiencies of 90%. The third is an older, standard non-condensing unit whose nametag was missing so its characteristics and vintage are unknown. All three furnaces share a single return plenum. The return plenum has a slot for an air filter but it was observed to missing, so that not only was the supply air from all three systems unfiltered, but a substantial quantity of air is being entrained from the mechanical room itself and delivered to the occupied spaces within the Theater.

Theater Furnace F-T2 (center in the bank of three units) has evidence of substantial corrosion within and around its shrouding, which appears to have resulted from a plugged condensate line that prevented evacuation of condensate that accumulates in the PVC exhaust flue. Unlike modern condensing furnaces that utilize a small condensate pump to actively remove condensate, these systems rely on a passive gravity flow configuration that is prone to such issues if not cleaned out periodically. This can potentially result in a hazardous condition if the heat exchanger within the furnace is damaged by the highly corrosive condensate, since flue gases can then freely intermingle with supply air and be delivered in toxic concentrations to occupied spaces.

It is therefore highly recommended that Furnace F-T2 in the Theater be removed from service until such a time that it can be certified as safe by a qualified HVAC technician after pressure testing the heat exchanger to ensure that no such risk to building occupants is present.

All three of the furnaces serving the Theater appear to be approaching the end of their useful life. Given the sporadic nature of the building's occupancy it would not be cost effective on the basis of energy savings to replace them immediately but a maintenance service call is warranted to ensure they are in good operating condition and plans should be made to budget for replacements when eventual failure does occur.

A small but detectable natural gas leak was observed at the shutoff valves in the mechanical room housing the three furnaces that serve the Theater, at the pipe union just below the shutoff valve in the main gas service line. This leak was discovered using an electronic gas sniffer device and location confirmed by application of soapy solution which produced bubbles at the point of the leaks.

A detailed listing of the HVAC equipment observed in the Arts/Theater Building can be found in Appendix A.

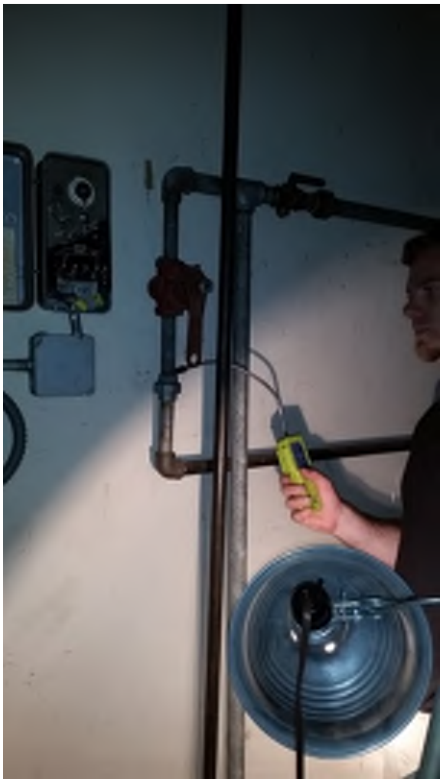


Figure 29. Detecting natural gas leak in Theater furnace room main gas supply line.

5.19.3 Arts / Theater Building – Domestic Hot Water (DHW)

No hot water heater was observed in the Art / Theater building.

5.19.4 Arts / Theater Building - Lighting

Lighting throughout the Arts side of the building is typically T8 fluorescents in 2-lamp fixtures with a normal distribution resulting in estimated lighting power density (LPD) of approximately 0.8

watts/square foot which meets current Title 24 requirements which limits LPD to a maximum of 1.0 watts/square foot.

The Theater has a variety of specialty lighting systems including stage lights, spot lights, overhead house lighting, and low wattage LED wall sconces. Given the mix of lighting elements, the difficulty to access them, and the fact that the Theater likely sees very low hours of occupancy relative to other spaces on campus, no effort was made to estimate its lighting power density.

5.19.5 Arts / Theater Building - Other Energy Using Systems

The most significant energy using systems in the Arts / Theater building are a pair of electric kilns in the Ceramics studio. These units are rated at 9984 watts, indicating they cost approximately $1.70 per hour to operate. No staff or students with knowledge of their use pattern were available to interview at the time of this audit so it is unknown how many hours per year they are actually operated.

The Photography lab contains approximately 30 Macintosh computers.

The Theater contains an elaborate lighting system but it is assumed this only utilized during rehearsals and performances that likely add up to less than 100 hours per year.

A large 225 kVA transformer behind the Theater stage operates 100% of the time regardless of occupancy. There are numerous variables that contribute to the efficiency characteristics of equipment, including application, number and gauge of windings, size of the iron core, and age. Given its vintage, no data were available for this particular transformer, the specification sheet for a similarly sized unit[4] gives standby losses of 830 watts, so it is reasonable to estimate this particular unit consumes at least 7270 kWh per year at a cost of approximately $1,236.

[4] Source:
http://www.eaton.com/Eaton/ProductsServices/Electrical/ProductsandServices/ElectricalDistribution/Transformers/LowVoltageDry-TypeDistribution/EnergyEfficientCSL-3Compliant/index.htm#tabs-2

5.20 Library Building (denoted as Building B20 in the CCC report)

Figure 30. Library / Communicative Arts Building

The Library building, originally constructed in 1978, is a single story, wood frame structure covering approximately 14,614 square feet of conditioned floor area over a slab on grade foundation. The hexagonal building houses a library and computer lab in its center, with classrooms, storage areas, and a space housing the campus information technology (IT) center around its perimeter.

5.20.1 Library Building - Envelope

- Exterior Walls – The Library building exterior walls are wood frame with drywall interior treatment and painted wood siding on the exterior. The exterior siding was observed to be in generally good condition, with the exception of an approximately three-foot high section of horizontal siding running around the perimeter of the building over the wide overhang in front of all the classrooms. This siding has a subtle slope from the vertical with no gutter, eave, or overhang above to protect it from direct contact with rainfall, and in many areas it appeared to be significantly impacted by weathering.
- Fenestration – Windows in the Library building are dual paned glass in metal frames with thermal break and in generally good condition.
- Attic – The Library building has suspended ceilings throughout. Fiberglass insulation of approximately R-13 in value was observed between rafters within the furnace closets and it is assumed the entire roof is insulated in a similar manner.
- Roof – The roof of the Library building is two tiers, with the central Library area having ceilings approximately 4 feet higher than the classrooms around the perimeter. The higher section over the Library has low sloped torch-down composition fiberglass/asphalt treatment and is in generally good condition. The roof over the classrooms around the perimeter is ballasted asphalt in generally good condition with the exception of a few small areas that were evidently

patched but not re-ballasted, so that the remaining exposed tar is unstable on warm days and has developed several blisters that may result in failures in the near term.

- Roof drainage – The Library building roof has no gutters but rather scuppers that direct flow to an underground drainage system. All the scuppers were observed to be filled with accumulated debris which should be cleared on a periodic basis.

5.20.2 Library Building – Heating, Ventilation and Air Conditioning (HVAC)

The Library and each of the classrooms that surround it contain high efficiency horizontal flow condensing furnaces, manufactured in 2003, installed in large chases suspended from the ceiling. These same chases also house flexible supply ducting that distributes heated air throughout the zones they serve. All of these furnaces were observed to have large outside air intakes connected to the return plenum. It is estimated that these units all ventilate the zones they serve at a ratio of approximately 80%, which is approximately four times greater than required for this type of occupancy. Substantial energy savings could be achieved during cold weather with no impact on air quality by installing dampers in the outside air intake ducts to limit outside air to the Title 24 Standard of 15 cubic feet per minute (CFM) per occupant, or approximately 20%, versus the approximately 60 CFM per occupant of fresh air delivered in the existing configuration.

Small but detectable natural gas leaks were observed at the shutoff valves in the closets housing furnaces in classrooms CA4, CA5, and CA7. These leaks were discovered using an electronic gas sniffer device and locations confirmed by application of soapy solution which produced bubbles at the point of the leaks. A summary table of all gas leaks detected campus wide can be found in Appendix C. An approximately 250 square foot space housing the District's servers and other information technology infrastructure is located at the north side of the Library building. Internal cooling loads generated by this equipment are rejected by a 3-ton mini-split ductless heat pump with a 14 SEER.

A detailed listing of the HVAC equipment observed in the Arts/Theater Building can be found in Appendix A.

5.20.3 Library Building – Domestic Hot Water (DHW)

No water heater was observed in the Library building.

5.20.4 Library Building - Lighting

The Library building has primarily T8 fluorescent lighting in 2-lamp configuration with a normal distribution through most of the classrooms around its perimeter and slightly higher concentration in under the higher ceilings of the central library space, resulting in an estimated lighting power density (LPD) of approximately 0.9 watts/square foot which meets current Title 24 requirements which limit LPD to a maximum of 1.0 watts/square foot.

5.20.5 Library Building - Other Energy Using Systems

The Library building contains an estimated 60 computers between computer labs and instructor's workstations.

In addition, the District's server room is located in the Library building. Based on the entire room's uninterrupted power supply it is estimated that these systems draw approximately 4kW continuously, which results in annual consumption of approximately 35,000 kWh annually at a cost of just under $6000 per year. Note that this does not include the cost to run the heat pump that cools the space.

5.21 Logan Gym (denoted as Building B21 in the CCC report)

The Logan Gym, originally constructed in 1964, is a single story, wood frame structure covering approximately 13,500 square feet of conditioned floor area over a slab on grade foundation. The building houses primarily a gymnasium and locker rooms. Along with the Damon Gym, the Logan Gym is scheduled for already funded major renovations and thus it was not included in this analysis.

6 Energy Analysis Methodology

ASHRAE Level II Energy Audit

An ASHRAE Level II Energy Audit was performed on-site to collect nameplate, operational and building performance data for energy consuming equipment and conditions, and to identify potential energy efficiency measures. During the site visit, engineers collected the following information:

- Building envelope conditions and configurations
- Lighting types, counts and controls
- Mechanical systems nameplate specifications, configurations and controls
- Significant plug or process load data
- Drawings indicating envelope and mechanical configurations of existing buildings
- Observations and photographs of adverse conditions and controls that may affect building and campus energy use

Though not specifically required by ASHRAE, the following measures are also discussed in this section:

- Health and Safety Issues (HSM)
- Maintenance Issues (MM)

Per ASHRAE guidelines, all proposed measures were discussed with building managers prior to analyses to determine if they fit with the long term planning for the building and operations.

6.1.1 Measure Order

There are interactive effects among several of the measures considered for this analysis that may over- or under-estimate the savings for an individual measure. When reviewing the results of this report, please note that actual energy savings of individual measures may be more or less than estimated for this report depending on the entire package of measures actually implemented.

6.1.2 Building Energy Performance Modeling

Building energy performance was modeled using EnergyPro version 5.1. This program uses the DOE-2.1E hourly simulation tool, distributed by the Department of Energy, as the calculation engine. The DOE-2.1E simulation engine is considered to be one of the most accurate simulation tools for this application, and evaluates energy use and peak demand requirements on an hourly basis over the course of a representative "average" weather year compiled from 20 years of climate data for the region in question. EnergyPro reports projected net annual building performance, as calculate by DOE-2.1E. Building energy performance modeling was used to estimate energy savings for most envelope and mechanical system measures.

6.1.3 Spreadsheet Models

Where building energy performance modeling could not provide adequate capabilities for estimating energy savings for specific systems or conditions, spreadsheet models were developed using best engineering practices. Where possible, OE engineers used the California Energy Commissions energy savings calculators developed for the Proposition 39 program.

6.1.4 Cost Estimating

Cost estimates were completed using best engineering practices including:

- Where possible receiving budget level cost estimates from local contractors and/or suppliers
- Receiving budget level cost estimates from manufacturers and/or regional equipment representatives
- Calculating budget level estimates using R.S. Means Construction Cost database
- Estimating costs based on past projects

7 Energy & Cost Savings Opportunities

The following sections delineate the energy savings and cost savings opportunities identified for FUHS.

7.1 ECM-1: Switch PG&E Rate Schedules

7.1.1 Observations

Rate analysis performed via the District's account at PG&E's "My PG&E" webpage indicates that energy cost savings totaling approximately $3010 per year are available by switching to different PG&E electrical utility rate schedules from those to which the District is currently subscribed. A summary of current rates, recommended rates, and potential cost savings is given in Table 3 below.

Table 3. Potential Savings from Switching Electric Rate Schedules

Area Served	Account	Current rate	recommended rate	Current Annual Cost	Projected Annual Cost	Potential Cost Savings
"Welders HS"	431540178-1	A10 TOU	E19 Peak Day Pricing	$ 75,370	$ 74,020	$ 1,350.00
"Main Classrms HS"	4273735117-3	A10 TOU	A10 Peak Day Pricing	$ 76,020	$ 74,475	$ 1,545.00
"Stadium Lights" (also irrigation pump)	2085974507-5	A1 TOU	A1 Peak Day Pricing	$ 6,535	$ 6,420	$ 115.00
Total Potential Cost Savings						**$ 3,010.00**

While this measure does not save any energy, the dollar cost savings are substantial and it is essentially a no-cost measure with an instantaneous payback.

7.1.2 Recommendations

It is recommended that the District contact PG&E at 1-800-468-4743 and request that the three accounts in Table 2 above be switched to the respective Recommended Rates listed for each account in that table.

Since electrical rates fluctuate, it is further recommended that the District log in to its "My PG&E" web page account at least bi-annually to verify that it is currently subscribed to the most cost effective rates at all times.

7.2 ECM-2: Peak Shaving

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/ year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-2	Peak Shaving	0	0.0	0.00	$1,485	$0	0.00	PG&E "My Energy"

7.2.1 **Observations**

The savings estimate of $115 per year given in ECM-1 for the PG&E electric metered football field lights and irrigation pump assumes no change in use patterns. A more in depth analysis of the most recent fiscal year's billing history on that meter indicates that the irrigation pump was operated approximately 57 times during the peak hours between noon and 6 p.m. during peak billing months, and an additional 60 times during partial peak hours between 8:30 a.m. and noon and between 6 p.m. and 9 p.m.

Under the current rate schedule, the District is charged an average of $0.22 per kWh during peak billing months, with no additional peak demand charges.

Under the recommended rate, the District would be charged an average of less than $0.17 per kWh, but with additional peak demand charges of over $16 per kW for each kW of demand that occurs during peak hours. Consumption is further discounted to less than $0.15 per kWh during off peak hours between 9:30 p.m. and 8:30 a.m.

Under the recommended rate, for each billing month when there is a single instance of the irrigation pump operating during peak hours, the District would incur a one-time charge of approximately $352 for that month.

If the District were to restrict irrigation to off peak hours so the pump never operates between 8:30 a.m. and 9:30 p.m., it would it would pay no more than $0.15 per kWh and for projected net savings of approximately $1,485 compared to the most recent fiscal year.

7.2.2 **Recommendations**

It is recommended that the District switch the football field meter account to PG&E rate schedule "A1 TOU" for most of the irrigation season, and avoid operating the irrigation pump or stadium lights between 8:30 a.m. and 9 p.m.

7.3 ECM-3: Tune Classroom Furnace Outside Air Intakes

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-3	Tune Classroom Furnace Outside Air Intakes'	3,220	16,836	(4.6)	$ 15,545	$2,090	0.1	EnergyPro

7.3.1 **Observations**

Throughout buildings across the Fortuna Union High School campus, most classroom furnaces that have any provision for outside air (OSA) provide far more than is necessary to meet the minimum requirement for the classroom occupancy type. In classroom buildings B, C, D, E, and F, most outside air intakes are approximately 50% the size of the filter where return air and outside air are mixed to enter the supply air stream. OE engineers calculate that for the average classroom furnace the OSA inlet need only be 16% of the size of the filter in order to provide 15 cfm per occupant, twice the required ventilation for the classroom occupancy type.

Ideally, an automated demand control ventilation system would adjust an operable damper to provide only the minimum OSA required at any given time in response to carbon dioxide levels measured within the classroom. While this technology is common in modern packaged cooling equipment, it is not readily available for heating only furnaces. It could be custom built but at substantial cost and with dubious reliability.

A slightly less effective but far more economic and reliable measure would be to simply block off part of the existing outside air intake openings to limit ventilation to no more than required at peak occupancy. Doing so can reduce peak heating load by about one-half while reducing annual heating energy costs by a similar fraction.

In classrooms with 2-stage furnaces, which include most of buildings D, E, and F, this measure has the added benefit of reducing heat load such that the furnaces will run at their lowest rated output a far greater percentage of the time.

7.3.2 **Recommendations**

It is recommended that the OSA intake openings located along exterior walls be partially blocked so that the effective remaining inlet is no more than 16% of the surface area of the filter. This measure would affect approximately 26 furnaces in buildings B, D, E, and F.

For buildings with furnaces installed in attics and that take their OSA through ducted roof penetrations, it is recommended that manually operated duct dampers be installed at the point where OSA enters the return plenum of each furnace, and that those dampers be set to allow no more than 32% OSA. This measure would affect approximately 20 furnaces in buildings C, F, and the classrooms in the Library Building (although the two furnaces serving the library itself should be excluded as that space will often have higher ventilation requirements).

7.4 ECM-4: Programmable Remote Controlled Thermostats

Replace manual thermostat with programmable/smart thermostat	Fill in your answers
Quantity of old thermostats to be replacd?	84
What is the total installed cost?	$ 12,600
What is the utility rebate for this measure?	

Adjusted Energy Savings Summary			
This project saves	(5.6)	kW peak demand	
and	15,960	kWh electricity use.	
and	1,512	therms natural gas	
or	0.0	gallons of	Fuel Oil
or	**$ 3,389.5**	**energy cost annually.**	
Simple Payback is	**3.7**	**years.**	
Saving to Investment Ratio	3.02		

7.4.1 Observations

- A majority of thermostats controlling furnaces throughout Fortuna High School are older mechanical manually operated units that cannot be programmed and have no setback feature that ensures heating systems are not operating during unoccupied hours.
- Many of these thermostats also lack any "fan only" setting, consequently the HVAC systems serving those zones are not capable of providing ventilation air for building occupants unless the heat is actually running.
- Many thermostats are installed too close to the furnaces they control, which causes "short cycling" since the thermostat senses the room getting warmer much sooner than room occupants who sit farther away. Short cycling often results in both reduced system efficiency and accelerated wear and tear.

7.4.2 Recommendations

It is recommended that all non-programmable thermostats be replaced with new wi-fi enabled programmable thermostats with 365-day programming capability. These thermostats can be programmed and controlled from a single remote location by a qualified energy manager, while still allowing building occupants to have a modicum of control within a pre-defined set of temperature parameters for short periods of time, after which the unit defaults back to its pre-programmed settings.

Due to the fact that it is impossible to accurately model human behavior across such a large array of classrooms in multiple buildings, no attempt to calculate savings for this measure was attempted in EnergyPro. Consequently, savings for this measure were estimated using the CEC Prop 39 Energy Savings Calculator, which is very conservative and likely underestimates natural gas savings by a significant margin.

7.5 ECM-5: Install Manual Timers on Unit Heaters

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/ year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-5	Manual Timers for all Unit Heaters	581	1,083	-	$ 1,118	$ 874	0.8	EnergyPro

7.5.1 **Observations**

Shop spaces in the Auto Shop, Bus Barn, Maintenance Building, and Metal Shop, as well as the Cafeteria, are all controlled by conventional manual mechanical thermostats with no programming or setback capability. If left in heating mode at normal occupied temperatures, these large combustion heaters can be left to run all hours of the night when no occupants are present. This can result in significant energy loss considering that most of the spaces that utilize unit heaters are neither well sealed nor well insulated.

7.5.2 **Recommendations**

Given the widely variable occupancy patterns in the various shop spaces served by unit heaters it is difficult to estimate their annual hours of operation. An EnergyPro model of a generic shop space with attributes similar to those found in the Auto Shop and Bus Barn would typically consume approximately 1,083 therms per year if operated from 8 a.m. to 4 p.m. weekdays. Assuming Fortuna Union High School's shop spaces are only heated at most half that time, then they would consume on the order of about 500 therms per year each. If the unit heaters were automated to turn themselves off after no more than one hour of operation if no occupants are present, we might further assume operation could be cut in half to approximately 250 hours per year.

It is recommended that all unit heaters have a manual 1-hour timer switch installed so that when occupants desire heat, they can turn the dial to get up to one hour of operation, after which the unit will shut itself off. If occupants are still present and still desire heat, they can simply turn it on again. Otherwise empty spaces will remain unheated. While it is estimated that up to 50% of heating energy in some spaces can be saved with this relatively low cost measure, the savings estimate reported here is limited to 25% in order to remain conservative.

7.6 ECM-6: Computer Workstation Smart Strips

ECM 19	Install smart strip/PC management to control computers/printers	Fill in your answers
Measure 19	How many smart strips or PC management tools will be installed?	300
	What is the proposed computer control?	Smart strip
	What is the total installed cost?	$ 6,960
	What is the utility rebate for this measure?	$ -

Adjusted Energy Savings Summary			
This measure saves		**-**	**kW peak demand**
	and	**37,781**	**kWh energy use.**
	and	**(1,487)**	therms natural gas
	or	0.0	gallons of NA
	or	**$ 3,834**	**energy cost annually.**
Simple Payback is		**1.82**	**years.**
Saving to Investment Ratio		2.25	

7.6.1 Observations

OE engineers observed approximately 85 staff computers in classrooms, offices, and other work areas throughout the Fortuna High School campus. Most of these computers were connected to various peripherals including monitors, printers, and scanners. While only a fraction of computers were observed to be left with power after hours, most peripherals were noted to be on at all times during the audit period.

OE engineers observed approximately 197 computers in computer labs in Buildings B, C, and F and the Library and Ag building. Most of these computers were not connected directly to any peripheral other than monitors but nearly all monitors were observed to be powered on when computers were off.

7.6.2 Recommendations

It is recommended that all non-Apple desktop computers be connected to power through "Smart Strip" power strips that sense when the computer is turned off and respond by shutting off power to any connected peripherals.

Note that modern Apple desktop computers employ integrated power management that already reduces idle power consumption sufficiently that most power strips do not work well with them, therefore the Macintosh computers in the Photography lab are excluded from this measure.

7.7 ECM-7: Replace Windows in Building A – Administration

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-9	Replace Building A windows	-30	72	0	$ 72	$11,500	159.7	EnergyPro

7.7.1 **Observations**

The existing windows in Building A are single pane glass in wood frames and appear to be from original construction.

7.7.2 **Recommendations**

It is recommended that the windows in Building A be replaced with more energy efficient dual pane vinyl windows. While the modeled energy savings from this measure are modest, the long term benefits with respect to both occupant comfort and reduced maintenance are significant. It is often the case with new windows that occupants are equally as comfortable at slightly lower winter indoor air temperatures because they do not feel the sensation of radiant heat escaping their bodies toward exposed single pane glass as dramatically. Other benefits include reduced air leakage and condensation which results in lower likelihood of undesirable contaminants such as mold to accumulate on and around the window frames. Better windows also affect net building heating loads, consequently smaller more efficient furnaces can be selected when replacing mechanical systems. For these reasons the modeled savings attributable to replacement windows are often conservative compared to the actual savings realized.

7.8 ECM-8: Replace Five Furnaces Serving Building A – Administration

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms /year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-9	Replace five furnaces in Building A	6351	3291	0.9	$ 4,142	$21,275	5.1	EnergyPro

7.8.1 **Observations**

- The five furnaces serving Building A were installed in 1978, rendering a service life nearly twice what they were designed for.
- These systems use outdated combustion technology that is far less efficient and less safe than most products currently available.
- These five units were installed with a shared exhaust flue, which presents certain hazards that are enumerated in the Health & Safety section below.
- These old furnaces have very inefficient fans.
- At 80,000 Btu/hr each, the furnaces are oversized for the loads they serve, which leads to "short cycling", further decreasing overall heating efficiency.
- The shared return plenum is in poor condition, allowing air from the unconditioned mechanical room to be drawn into the supply air stream.
- The existing configuration has no provision for easily serviceable air filters.

7.8.2 **Recommendations**

It is recommended that all five existing furnaces in Building A be removed and replaced with modern 95% or higher efficiency condensing furnaces. The projected savings are based on appropriately sizing the furnaces to meet the actual heating loads of the building, compared to the existing furnaces which are substantially oversized. Note that any new system selection should take into account other measures such as window replacement which may affect heating loads. This analysis assumed replacement windows and new furnaces with 62,000 Btu/hr capacity each, approximately 25% smaller than the existing systems.

These furnaces should be installed with independent exhaust flue and combustion air intake plumbing. The shared return plenum should be reconditioned with care taken to seal all leaks within the mechanical room. Provisions for outside air should be designed so that minimum ventilation requirements are met for the building's occupancy without bringing in excess outside air that must be heated, reducing system efficiency. The new installation should make provision for easily accessible filters so that they can be maintained on a regularly scheduled basis.

7.9 ECM-9: Replace 2 Aging Furnaces in Building B

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/ year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-9	Replace 2 Furnaces in Building B	750	1814	0	$ 3,219	$5,750	1.8	EnergyPro

7.9.1 **Observations**

While mechanical systems serving classrooms and computer labs on the north side of Building B have been upgraded already, the two furnaces serving the Child Development Lab and HROP Foods Lab on the south side of the building are over ten years old, standard 80% efficient. Like other systems throughout this wing of the campus, they are configured to provide outside air ventilation well in excess of that which is required, which means they are sized for much greater loads than actually exist as a function of the building envelope. Unlike the upgraded systems however, they are not 2-stage furnaces so cannot modulate their output when faced with more favorable conditions. Consequently, after the outside air measure in ECM-3 is implemented, it will become cost effective to replace these furnaces with modern high efficiency condensing furnaces more appropriately sized to meet the loads they serve.

7.9.2 **Recommendations**

It is recommended that the two furnaces in labs on the south side of Building B be removed and replaced with modern 95% or higher efficiency condensing furnaces. The projected savings are based on appropriately sizing the furnaces to meet the actual heating loads of the building, compared to the existing furnaces which are substantially oversized. Note that any new system selection should take into account other measures such as modifications to outside air intakes, which may affect heating loads.

7.10 ECM-10: Replace Ice Machine in Building B

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/ year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-10	Replace Ice Machine in Building B	3285	0	0	$ 723	$1,500	2.1	FSTC

7.10.1 Observations

A large commercial ice machine was observed in the Child Development Lab in Building B. It is assumed this unit provides ice primarily for the HROP Foods Lab located next door. It was observed that the ice machine's compressor ran nearly continuously during the entire time OE engineers were present. The nameplate energy efficiency rating on this unit is 7.3 kWh/100 pounds ice, compared to the modern standard of 7.6 kWh/100 pounds ice, or the minimum efficiency for EnergyStar rating of just 5.6 kWh/100 pounds ice.

According to information provided by the Food Service Technology Center, an industry leader in commercial kitchen energy efficiency and appliance testing, based on a 75% duty cycle, an EnergyStar certified ice machine will save up to $415 per year in energy, water, and sewer costs compared to a standard efficiency model, based on $0.10 per kWh. Given that FUHSD pays electric rates more than twice that amount, it is reasonable to assume that even at a fraction of the duty cycle a new EnergyStar ice machine might save as much as $500 annually.

Table 4. Ice Machine Efficiency Characteristics

Performance	Standard Water-Cooled Model	Standard Air-Cooled Model	Energy (& Water) Efficient Air-Cooled Model
Energy Consumption (kWh/100# ice)	6	7.6	5.6
Water Consumption (gal/100	156	28	20
Annual Energy Use (kWh) [a]	9855	12483	9198
Annual Water Use (gal) [a]	256230	45990	32850
Annual Energy Cost [b]	$986	$1,248	$920
Annual Water & Sewer Cost [c]	$1,713	$307	$220
Total Annual Utility Cost	$2,699	$1,555	$1,140

[a] Annual energy use is based on a 75% duty cycle, 365 days per year.
[b] Energy costs are based on $0.10/kWh.
[c] Water and sewer costs are based on $2.00/ccf and $3.00/ccf, respectively.

http://www.fishnick.com/savewater/appliances/icemachines/

PG&E offers a variety of rebates for EnergyStar certified kitchen appliances, including up to $100 back on commercial ice machines.

7.10.2 Recommendations

It is recommended that the ice machine located in Building B is replaced with a new EnergyStar certified ice machine.

7.11 ECM-11: Duct Sealing and Duct Insulation

Seal existing HVAC leaky duct	Fill in your answers
How many total tons of AC where ducts will be sealed?	120
What is the total installed cost?	$ 18,000
What is the utility rebate for this measure?	$ -

Adjusted Energy Savings Summary			
This project saves	0.9	kW peak demand	
and	2,916	kWh electricity use.	
and	5,369	therms natural gas	
or	0.0	gallons of	Fuel Oil
or	**$ 4,929.0**	**energy cost annually.**	
Simple Payback is	**3.7**	**years.**	
Saving to Investment Ratio	3.07		

7.11.1 **Observations**

Well sealed and well insulated ducts are a critical component of any furnace system and when these elements fail, overall heating efficiency can be dramatically affected.

Many HVAC duct systems throughout the FUHS were observed to suffer from an assortment of deficiencies, most of which revolve around leaky seals at joints between duct fittings; and missing, deteriorating, or otherwise deficient duct insulation. It is estimated that approximately 40 furnaces are affected by these conditions, mostly with duct systems located in attics and other remote spaces. Furnaces located in closets within the classrooms they serve tend to have far simpler duct systems with only a single register are not affected. It is estimated that approximately 40 furnaces have deficient ducts.

Systems with particularly notable deficiencies including ducts that are completely collapsed and/or disconnected with heated air blowing directly into unconditioned spaces have been called out individually in the sections above discussing HVAC systems for each building.

7.11.2 **Recommendations**

It is recommended that duct systems throughout the Fortuna Union High School campus be inspected by a qualified service technician and that appropriate measures be implemented to ensure that all duct joints are adequately sealed with fiber tape and mastic, and that all duct systems are adequately insulated to a level of R-8. Particular attention should be paid to any return or supply plenums with fabric expansion joints as the majority of such equipment observed is of an advanced age with notable wear at the corners.

It would be impossible to estimate how much heat loss can be attributed to deficient duct systems at FUHS without extensive testing and monitoring that would fall outside the scope of this audit, however experience with many such systems leads OE engineers to suggest that the savings potential by addressing these conditions is substantial. As a rule of thumb, the CEC Calculator for this measure suggests that a $450 investment in repairing leaky ducts serving a single 3-ton air conditioner will save $136 annually with a payback period of 3.3 years.

7.12 ECM-12: Replace Industrial Tech Lobby Furnace

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms /year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-13	Replace IT Building Lobby Furnace	388	1931	0.3	$ 1,796	$4,830	2.7	EnergyPro

7.12.1 **Observations**

The furnace serving the Industrial Technology building lobby and instructors' offices is over 20 years old, its ducts are located in an unconditioned crawlspace and completely uninsulated, and it appears to have no provision for return air but rather takes 100% of its supply air directly from the outside. Consequently this furnace is modeled to utilize approximately five times the gas energy than would a modern condensing furnace with a properly configured duct system.

7.12.2 **Recommendations**

It is recommended that the furnace serving the Industrial Technology building lobby be replaced with a modern condensing furnace and that its entire duct system be sealed and insulated to a level of R-8. It is further recommended that a return air system be installed so that outside air to the intake is limited to no more than 30% of the net area of the cross section of the return plenum. Assuming these duct measures are implemented, the new furnace can be appropriately sized at 20% smaller than the existing system.

The savings estimates given above assume the spaces served by this system are only heated at an average of 60°F during cold weather. If the thermostat is actually set to normal occupied temperatures the realized savings will be significantly greater.

7.13 ECM-13: Vending Miser in Auto Shop

Vending Miser	Fill in your answers
Quantity of vending machine misers to be installed in beverage machines?	1
Quantity of vending machine misers to be installed in snack machines?	0
What is the total installed cost?	$ 130
What is the utility rebate for this measure?	$ -

Adjusted Energy Savings Summary			
This measure saves		**-**	**kW peak demand**
	and	**1,149**	**kWh energy use.**
	and	**(45)**	therms natural gas
	or	0.0	gallons of NA
	or	**$ 116.6**	**energy cost annually.**
Simple Payback is		**1.12**	**years.**
Saving to Investment Ratio		4.50	

7.13.1 **Observations**

A soft drink vending machine in the Auto Shop was observed to be directly connected to the building power supply with no Vending Miser installed. Vending Misers are occupancy sensors which shut off lights and most other functions in vending machines if no occupants are detected in the vicinity, while still maintaining product at appropriate temperatures. These devices are installed for free by some vending companies. Even in absence of rebates or other support, these devices have proven to be highly cost effective, typically paying back the investment in under one year.

7.13.2 **Recommendations**

It is recommended that the soft drink vending machine in the Auto Shop be equipped with a Vending Miser. FUHSD should check first with the vendor to see if they will supply one for free. If not, Redwood Coast Energy Authority may be able to point to other sources of assistance for this measure.

7.14 ECM-14: Replace Aging Furnaces

Replace furnace with high efficiency condensing furnace	Fill in your answers		Adjusted Energy Savings Summary				
Quantity of furnace to be replaced with AFUE 92-94 unit?			This project saves	-	kW peak demand		
Quantity of furnace to be replaced with AFUE 95-97 unit?	13		and	-	kWh electricity use.		
What is the total kBtu/hr of the new AFUE92-94 units?	-		and	1,276	therms natural gas		
What is the total kBtu/hr of the new AFUE95-97 units?	1,450		or	0.0	gallons of	Fuel Oil	
What is the IOU (or nearest IOU)area the unit is installed?	PGE	choose your utility	or	$ 1,055.4	energy cost annually.		
What is the total installed cost for this measure?	$ 45,500		Simple Payback is	43.1	years.		
What is the utility rebate for this measure?	$ -		Saving to Investment Ratio	0.57			

7.14.1 **Observations**

While the majority of furnaces throughout the FUHS campus have been replaced with modern condensing furnaces, there are several that remain which are at or well beyond the end of their useful life. Some of these units may present certain health hazards that have been discussed elsewhere. All of them will require maintenance in the coming years that will be less cost effective than simply replacing them. Specifically, the furnaces in question include:

- 4 furnaces in the Agriculture building
- 2 furnaces at the front of the Music building
- 2 furnaces serving the Ceramics and Photography labs in the Art building
- 3 furnaces serving the Theater
- 2 furnaces serving the Auto Shop

Together these systems have total capacity in excess of one million Btu/hr. Each of these systems also suffers from other conditions described above including ducts in poor condition, excess outside air, and other issues that contribute to poor performance.

7.14.2 **Recommendations**

It is recommended that the above systems be replaced with modern condensing furnaces with care taken to recondition, seal, and insulate any associated existing duct systems. Provisions should also be made, consistent with ECM-3, to limit outside air to the systems to no more than necessary to maintain adequate ventilation levels for the areas served by each system. Assuming these two measures are prioritized, a comprehensive heating load calculation should be performed for each zone to ensure that systems selected are appropriately sized.

7.15 ECM-15: Upgrade Refrigeration Evaporator Motors

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-11	Upgrade Refrigeration to ECM Fan Motors	8817	0	0	$ 1,940	$ 1,650	0.9	FSTC

Source: http://www.fishnick.com/publications/appliancereports/refrigeration/GE_ECM_revised.pdf

7.15.1 **Observations**

It was observed that, with a few exceptions in newer units, evaporator fan motors in most refrigeration units in the Cafeteria kitchen, Snack Shack, and Ag Shop are all the older shaded-pole (SP) or permanent split capacitor (PSC) induction type motors. These motors are not only inefficient with respect to how much energy they use for the work they do, but because of that inefficiency they also run hot, putting heat into the refrigerator cabinets that then must be rejected.

7.15.2 **Recommendations**

It is recommended that all existing SP and PSC evaporator motors in the Cafeteria Kitchen, Snack Shack, and Ag Shop (approximately 11 motors) be replaced with energy efficient electronically commutated motors (ECMs). ECMs do the same work while consuming approximately one-third as much power, typically returning savings of approximately $176 per year based on average electrical costs of $0.22/kWh. High quality commercial grade replacement units typically cost between $100 to $150, which results in a payback of less than one year.

7.16 ECM-16: Unplug Appliances in Snack Shack When Not In Use

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/ year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-16	Unplug Snack Shack Refrigerators when not in use	5174	0	1.8	$ 1,265	n/a	0.0	OE

7.16.1 **Observations**

It was observed that three commercial refrigerators in the Snack Shack were plugged in and operating while empty during summer months when no activity was scheduled. The three refrigerators were measured to draw a combined 1,750 watts and were observed to run continuously during the hour OE engineers were present in the building. Assuming these units run 50% of the time throughout the year they would consume an average of approximately 7,665 kWh at an annual cost of $1,686.

Other appliances including a coffee maker that maintains a reservoir of water at approximately 180°F were also observed to be plugged in while the building was unoccupied with no activities scheduled.

7.16.2 **Recommendations**

It is recommended that the District establish a protocol for shutting down and unplugging all electrical appliances in the Snack Shack when no activities are scheduled for more than a few days at a time if no product is being stored in the refrigerators during that down time. Commercial refrigerators can safely be put into an idle state if kept clean with the doors propped open while unplugged. They can also reliably be brought back to desired operating temperatures within a few hours when necessary. Assuming the refrigerators only run half the time now, if those hours can be reduced by 75% it will result in annual cost savings of $1,265.

7.17 ECM-17: Relocate Walk-In Cooler Exhaust Fan to Exterior Wall

Measure I.D.	Measure Description	Annual Energy & Cost Savings				Estimated Capital Costs/Payback		
		Electrical Energy Savings (kWh/yr)	Natural Gas Savings (therms/ year)	Demand Savings (kW)	Total Energy Cost Savings ($/year)	Net Measure Cost ($)	Simple Payback (years)	Calculation Reference
ECM-17	Relocate walk-in cooler compressor exhaust fan to exterior wall	4380	0	0	$ 964	$ 1,000	1.0	OE

7.17.1 **Observations**

A through-wall exhaust fan above the walk-in cooler in the Cafeteria kitchen rejects heat from the cooler's compressor into the kitchen space, where a mini-split ductless heat pump is then necessary to maintain the kitchen at acceptable ambient temperatures.

7.17.2 **Recommendations**

It is recommended that the exhaust fan be relocated to an exterior wall so that the cooler's compressor heat is rejected directly to the outside rather than into the kitchen. This should dramatically reduce the hours the heat pump is required to operate to cool the space. When relocating the exhaust fan care should be taken to install a backdraft damper so that it is only open when the fan is running.

Extensive monitoring over a period of months would be required to estimate savings for this measure, but according to manufacturer's specifications the heat pump draws approximately 5 kW when operating at full load so it is reasonable to assume that every hour it runs costs the District approximately $1.10, so if the heat pump in fact runs even 10% of the time in response to the cooler compressor, the potential savings are on the order of approximately $964 per year.

7.18 ECM-18: Convert 32-watt T8 Fluorescent Fixtures to Linear LED lamps

Convert 32 Watt T8 fluorescent fixture to LED lamps	Fill in your answers
This ECM is for 4-foot linear fluorescent. If 8-foot fluorescent is converted to two 4-foot, multiply the quantity of lamp by two.	
Quantity of 32 watt T8 lamps to be replaced with LED lamps?	3092
What is the total installed cost for this measure?	$ 46,380
What is the utility rebate for this measure?	$ -

Adjusted Energy Savings Summary			
This measure saves		**8.42**	**kW peak demand**
	and	**100,852**	**kWh energy use.**
	and	-469.7	therms natural gas
	or	0.0	gallons of Fuel Oil
	or	**$ 16,729**	**energy cost annually.**
Simple Payback is		**2.77**	**years.**
Saving to Investment Ratio		5.32	

7.18.1 **Observations**

OE engineers inventoried approximately 3,092 4-foot T8 fluorescent lamps in buildings throughout Fortuna Union High School. It was noted that a significant percentage of fixtures in areas throughout the campus either required service, and throughout the period during which this audit was conducted school maintenance staff were observed performing such service, replacing either lamps or ballasts.

Direct-fit linear LED replacement lamps that require no modification to existing fixtures or ballasts and consume less than half the wattage have become widely available. These lamps have established a track record of occupant satisfaction with the quality of lighting they provide. Many manufacturers not only provide a warranty on lamp life, but will also warranty the existing ballast for up to 5 years if it fails after the new lamps are installed.

7.18.2 **Recommendations**

It is recommended that all 4-foot T8 fluorescent lamps located in areas where they are used on a regular basis be replaced with new direct-fit linear LED replacement lamps. In most areas including classrooms, hallways, and offices, 12-watt lamps are recommended. In specialized areas requiring higher lighting levels having high ceilings, such as shop spaces, laboratories, and art studios, higher powered linear LED lamps up to 16 watts should be evaluated.

Converting exterior lighting fixtures to LEDs should have similar or better cost effectiveness metrics. A comprehensive lighting audit along with recommended lighting measures was performed separately by Redwood Energy Watch.

7.19 ECM-19: Lighting Occupancy Sensors

7.19.1 **Observations**

With few exceptions, most areas of FUHS were observed to lack lighting occupancy sensors. These devices automatically turn off lights when no occupants are detected after a programmable period of time. They have proven to be highly cost effective in many applications, particularly in areas with highly variable use patterns. It should be noted that their cost effectiveness does decline somewhat when coupled with other lighting measures that reduce overall lighting system wattage.

7.19.2 **Recommendations**

Since Redwood Energy Watch conducted an extensive lighting audit separate from this effort, it is recommended that the District work with RCEA to develop a lighting occupancy sensor measure.

7.20 ECM-20: Exterior Lighting LED Retrofits

7.20.1 **Observations**

It was observed that while many exterior lighting fixtures have been upgraded from a variety of HID, incandescent, and compact fluorescent units to LED fixtures, total penetration of this effort is probably less than half the FUHS campus so far. Particularly in outdoor applications, LED fixtures have proven to be robust, reliable, and far more cost effective than other lighting types.

7.20.2 **Recommendations**

Since Redwood Energy Watch conducted an extensive lighting audit separate from this effort, it is recommended that the District work with RCEA to develop a program to complete retrofitting the balance of remaining existing exterior lighting fixtures to LED equivalents.

7.21 ECM-21: Auto Shop HID Lighting LED Retrofits

7.21.1 **Observations**

It was observed that the Auto Shop is lit by a total of 9 high intensity discharge (HID) metal halide (MH) fixtures. The lamps were inaccessible to determine wattage but they are estimated to be 400 watts each. It is unknown how many hours these lights are operated annually.

7.21.2 **Recommendations**

Since Redwood Energy Watch conducted an extensive lighting audit separate from this effort, it is recommended that the District work with RCEA to develop a program to complete retrofitting the Auto Shop HID lighting fixtures to LED equivalents.

8 Health & Safety Measures (H&S)

The following section details health & safety issues noted during the field assessments at Ferndale High School.

8.1 H&S-1: High Carbon Monoxide Levels in Building A Furnace Exhaust

8.1.1 Observations

During evaluation of the furnaces in Building A abnormally high levels of carbon monoxide were detected in the exhaust flue of Furnace F-A3. Given other conditions in the mechanical room, there exists a very high probability of toxic exhaust gases from Furnace F-A3 spilling out of the flue and ultimately being entrained into the heated supply air being delivered to occupied zones within the building.

More detailed information on this condition is provided in the section on Building A - Heating, Ventilation and Air-Conditioning Equipment (HVAC above.

8.1.2 Recommendation

Since all five of the existing furnaces in Building A are well beyond their useful service life, it is recommended that they all be replaced with premium efficiency condensing furnaces. This project should include complete reconditioning of the shared return plenum to eliminate air leaks and provide for easy access to readily changeable filters. Economic analysis of the furnace replacement measure is included in ECM-6.

8.2 H&S-2: Natural gas leaks noted at furnaces and water heaters

8.2.1 Observations

During evaluation of the furnaces and gas water heaters throughout the Fortuna Union High School campus, natural gas leaks were detected in a number of locations. All gas leaks reported here were detected with an electronic gas sniffer and verified by application of a soapy solution which produced bubbles at the site of the leak. A complete list of leak locations and the equipment with which they are associated is found in Appendix C.

8.2.2 Recommendations

These leaks should be evaluated and repaired as necessary by qualified personnel.

8.3 H&S-3: Attic Fire Doors in Theater and Building F Wired Open

8.3.1 Observations

The fire doors in the attic above the attics over the Theater and Building F have been wired to remain in an open position. This condition renders the fire walls ineffective at containing fire within the attic space.

8.3.2 Recommendations

Remove wires from fire doors and leave doors secured in “normally closed” position.

8.4 H&S-4: Provide Adequate Combustion Air for Water Heater Closet

8.4.1 Observations

The natural gas water heater located in the Building F janitor's closet exhibits significant signs of exhaust spillage around the bottom of the flue. This is likely attributable to a lack of adequate combustion air in the space where the unit is located. Exhaust spillage from combustion appliances has been documented to increase risk of introduction of hazardous carbon monoxide gas into occupied spaces.

8.4.2 Recommendations

Install sufficient ventilation in the closet door to provide for adequate combustion air so that the water heater's combustion gases can be properly drafted into the flue and evacuated from the building.

8.5 H&S-5: Bus Garage Exhaust Fan

8.5.1 Observations

The Bus Garage has an existing exhaust fan that is installed against an operable louvre high on the north wall. The fan lacks any form of shroud to direct air flow out of the space, limiting its ability to eliminate air contaminants and draw fresh air into the building.

8.5.2 Recommendations

It is recommended that a correctly sized shroud be installed around the existing fan.

8.6 H&S-6: Eliminate Shared Flue Between Wood Shop Furnaces

8.6.1 Observations

Significant corrosion from condensation of acidic moisture was observed along the length of the common flue shared by the two gas furnaces serving the wood shop. Over time this condition can contribute to premature failure of the heat exchangers in one or both of the furnaces, potentially resulting in commingling of exhaust gases including carbon monoxide into the supply air delivered to occupied spaces.

8.6.2 Recommendations

It is recommended that a separate flue be installed for each furnace to minimize the cooling of exhaust gases and the condensation of corrosive fluids.

8.7 H&S-7: Safety Test Theater Furnace F-T2

8.7.1 Observations

Theater Furnace F-T2 (center in the bank of three units) has evidence of substantial corrosion within and around its shrouding, which appears to have resulted from a plugged condensate line that prevented evacuation of condensate that accumulates in the PVC exhaust flue.

Unlike modern condensing furnaces that utilize a small condensate pump to actively remove condensate, these systems rely on a passive gravity flow configuration that is prone to such issues if not cleaned out periodically. This can potentially result in a hazardous condition if the heat exchanger

within the furnace is damaged by the highly corrosive condensate, since flue gases can then freely intermingle with supply air and be delivered in toxic concentrations to occupied spaces.

8.7.2 **Recommendations**

It is recommended that Furnace F-T2 in the Theater be removed from service until such a time that it can be certified as safe by a qualified HVAC technician after pressure testing the heat exchanger to ensure that no such risk to building occupants is present.

9 Operation & Maintenance Measures (OMM)

The following sections detail operation and maintenance issues identified for this report.

9.1 OMM-1: Avoid High Demand Loads During Peak Hours

9.1.1 Observations

Several systems within the District's portfolio impose substantial kW demand on the grid at various points throughout the day. Analysis of 15-minute demand interval data provided by PG&E show that the District has an inconsistent pattern of use relative to high demand equipment, with many fluctuations from a base load of approximately 50 kW up to peak loads in excess of 200 kW. While there does exist a fairly regular daily and weekly pattern that shows loads peak during normal school operating hours and drop in the evenings and weekends, there are a great many irregular variances within those periods that cannot easily be accounted for due to the fact that individual buildings are not sub-metered.

During Peak Demand Billing hours that occur between noon and 6:00 p.m. and Partial Peak hours from 6 a.m. to noon and 6 p.m. to 9 p.m., the utility imposes demand charges from between $13 to $16, depending on time of year, for each kW of load that lasts for more than 15 minutes. This means if there is a single instance of a 10 kW kiln operated in the Ceramics Lab during Peak Demand Billing hours, a charge of as much as $160 can be levied against the school. This charge can be avoided by simply ensuring that the kiln is not fired until after 6pm and its cycle is completed before noon the following day.

In addition to peak demand charges, the energy use charge during peak demand billing hours is higher at $0.17891 per kWh, compared to $0.14642 per kWh for energy consumed during Off Peak hours.

During a typical month between May and October, demand charges make up on the order of 25% of each month's electrical bill.

Without significant monitoring activities that fall outside the scope of this audit it is impossible to estimate the savings potential from peak demand shifting efforts but it appears the potential savings are significant and, Like ECM 1, the costs of implementation may be negligible, rendering the payback nearly instantaneous.

9.1.2 Recommendations

It is recommended that the District endeavor to avoid operation of high demand equipment during Peak Demand billing hours. Target equipment includes but is not limited ceramic kilns, welders, and electric utility vehicle charging.

9.2 OMM-2: Furnace Filter Maintenance

9.2.1 Observations

In furnaces throughout the campus, OE engineers observed, including missing filters, dirty filters, and improperly sized and installed filters. Each of these conditions contributes to poor indoor air quality and, over time, reduced furnace performance and reliability, ultimately leading to higher maintenance costs while reducing furnace service life.

9.2.2 Recommendations

It is recommended that a robust furnace filter maintenance program be developed and implemented, ensuring that:

- All furnace filters are inspected at least quarterly;
- Replacement filters are the correct size and type;
- Replacements occur at appropriate intervals;
- An easily accessible record of filter maintenance activities is maintained at the location of each furnace; and
- A master database is updated whenever filters are serviced

9.3 OMM-3: Add Gravel Ballast to Prior Library Roof Patches

9.3.1 Observations

OE Engineers observed two areas where the built-up ballasted roof over the Library have been patched with asphalt but not re-ballasted. On warm days the material over these patches gets very soft and forms blisters that will result in premature failure of the roof system if not remediated.

9.3.2 Recommendations

It is recommended that a qualified roofing contractor be engaged to evaluate the roof repairs and apply the proper ballast material to ensure that premature failure does not occur.

9.4 OMM-4: Clear Library and Cafeteria Roof of Vegetation and Debris Bi-Annually

9.4.1 Observations

OE engineers observed debris collecting near scuppers and in low areas on the roof on the Library. This condition can lead to inadequate roof drainage and premature degradation of roofing materials. The Cafeteria roof was not accessible but it is a likely condition exists there.

9.4.2 Recommendations

The Library and Cafeteria roof should be inspected and excess debris and vegetation should be cleared bi-annually.

9.5 OMM-5: Install Rain Gutters on Library and Music Buildings

9.5.1 Observations

OE engineers observed areas of siding around both the Library and Music buildings that are adversely affected by weathering attributable to the fact that there is no roof drainage system.

9.5.2 Recommendations

Install rain gutters around the Music Building and the Library.

9.6 OMM-6: Repair/Replace Missing/Damaged Eave Blocks on Building D

9.6.1 Observations

Observation of Building D's exterior revealed one missing eave block and another that is damaged, creating an avenue of easy entry for birds, rodents, insects, or other undesirable building inhabitants.

9.6.2 Recommendations

It is recommended that the missing eave block be replaced and the damaged eave block be repaired.

9.7 Repair Exhaust Fan in Classroom F5

9.7.1 Observations

A rooftop exhaust fan in Building F classroom F4, was observed to have a loud bearing squeal when operated, an indicator of incipient failure of the fan.

9.7.2 Recommendations

The fan should be inspected by qualified personnel and either repaired or replaced.

9.8 OMM-8: Replace Auto Shop Classroom Furnace

9.8.1 Observations

The furnace serving the Auto Shop classroom was manufactured in 1978 and appears to have failed. The supply ducts to its occupied zones are completely disconnected. The unit is well beyond its useful service life and there is no point in repairing any part of it.

9.8.2 Recommendations

It is recommended that the Auto Shop classroom furnace be replaced with a similarly sized modern condensing furnace with new ducts that are well sealed and insulated. Energy savings for this measure were not calculated because it appears the existing unit appears inoperable.

9.9 OMM-9: Repair Ducts Serving Staff Offices in Auto Shop Building

9.9.1 Observations

The ducts serving the staff offices in the Auto Shop building are compromised in several ways. OE engineers observed collapsed ducts, one return duct nearly disconnected, and extremely long runs of duct with more divisions to more registers than normally recommended for the capacity of the furnace in question. Most of the areas served by these ducts appear to be unoccupied most of the time.

9.9.2 Recommendations

It is recommended that either registers in unoccupied areas be sealed off, or preferably the ducts to those registers be disconnected altogether so that the heating load served by the furnace more accurately reflects its capacity. It is further recommended that all the remaining existing ducts be reconditioned with fresh seals and repairs to insulation where appropriate to minimize heat loss to the attic.

9.10 OMM-10: Replace Water Heater in Agriculture Building

9.10.1 Observations

The water heater located in the Agriculture Building attic is well beyond its useful service life and has failed completely, with a leaky tank and ample evidence of very poor combustion drafting.

9.10.2 Recommendations

It is recommended that the Ag Building water heater be replaced with a similarly sized natural gas water heater. If it is to be installed in the same location, measures should be taken to ensure that it has ample combustion air available to prevent back drafting or exhaust spillage from the flue.

9.11 OMM-11: Maintain Flower Cooler in Ag Building

9.11.1 Observations

The 2-door reach in flower cooler in the Ag Shop was observed to run nearly continuously during the audit of that building. A KillaWatt watt hour meter was deployed to monitor its power and energy consumption over a period of 359 hours, during which time it consumed a total of 260 kWh, or an average continuous demand of 724 watts. This cooler is therefore estimated to consume an average of approximately 6,342 kWh per year at a cost of $1,078 per year, or about $3.50 per day.

It was observed that the condenser coils visible at the bottom front of the cooler were completely plugged with dust and debris, which is likely the main reason why the unit runs continuously.

9.11.2 Recommendations

Since the Ag Shop is an environment that is often dusty, it is recommended that a regularly scheduled maintenance procedure be developed to clean the flower cooler's condenser coils at least monthly.

It is also recommended that the cooler be unplugged with its doors propped open whenever it is anticipated that it will not be utilized for more than two weeks. As long as the condenser coils are kept

clean the unit should be easily able to bring itself back to desired temperature in a matter of hours when it is required to be put back in service.

9.12 OMM-12: Repair 2-Door Reach-in Cooler in Snack Shack

9.12.1 **Observations**

A 2-door reach-in cooler in the Snack Shack was observed to have an evaporator fan blade disconnected from its shaft.

9.12.2 **Recommendations**

Repair the evaporator fan in the 2-door reach in cooler in the Snack Shack.

9.13 OMM-13: Repair Cafeteria Refrigerant Systems

9.13.1 **Observations**

Severe icing of refrigerant lines was observed inside the north side 3-door under-counter cooler in the cafeteria kitchen as well as near the compressor serving the walk-in freezer beneath the building. Whether inside or outside the cooler cabinet, icing of refrigerant lines is always a sign of a poorly tuned refrigerant system that is operating well below its optimal efficiency.

9.13.2 **Recommendations**

Contract a qualified refrigeration technician to evaluate the 3-door cooler and walk-in freezer compressor systems to determine the reason(s) for refrigerant line icing. Ensure that all refrigerant lines are maintained with adequate insulation.

9.14 OMM-14: Transformer Replacement/Reconfiguration

9.14.1 **Observations**

A number large transformers were observed distributed throughout the FUHS campus, including several 75 kVA units and a pair of 225 kVA units. These transformers convert grid-supplied 480V, 3-phase power to 240V and 120V single phase power for use by most electrical devices. Originally installed when virtually all lighting was incandescent, the power consumption characteristics of the campus have changed considerably over time and even with widespread use of computers these transformers are likely oversized for the loads they serve.

Even when idle, large transformers consume substantial parasitic power, estimated at between 500 to 750 watts for a typical 75 kVA unit, up to several kW of continuous static load for 225 kVA transformers such as those found in the Welding Shop and backstage in the Theater. These static, 24/7/365 parasitic loads add up to thousands of dollars per year in the Districts annual energy expenses.

9.14.2 **Recommendations**

It is impractical to switch off transformers when not in use, mostly because the switching infrastructure does not likely exist to do so, but frequent power cycling may also cause damage to such equipment. It is recommended that the District consider conducting a robust power monitoring analysis and power distribution survey to identify peak electrical loading throughout the campus on a building-by-building

basis which would fall outside the scope of this energy audit. The outcome of such an effort may identify transformers which could be consolidated or removed entirely, resulting in substantial annual energy savings.

10 APPENDIX A – HVAC SCHEDULE

10.1 Building A HVAC

Unit I.D.	Unit Location	Thermostat Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-A1	Mechanical Room	Manual	BDP	3946AW000100		1978	n/a	ZONE 1 PER MAP IN CLOSET	COMBUSTION TEST: CO 51 PPM EFF. 78.4%	100,000	80,000	80.0%
F-A2	Mechanical Room	Manual	BDP	3946AW000100		1978	n/a	ZONE 2 PER MAP IN CLOSET	COMBUSTION TEST: CO 9 PPM EFF. 76.7%	100,000	80,000	80.0%
F-A3	Mechanical Room	Manual	BDP	3946AW000100		1978	n/a	ZONE 3 PER MAP IN CLOSET	COMBUSTION TEST: CO >2000 PPM EFF. 80.3%	100,000	80,000	80.0%
F-A4	Mechanical Room	Manual	BDP	3946AW000125		1978	n/a	ZONE 4 PER MAP IN CLOSET	COMBUSTION TEST: CO 25 PPM EFF. 77.6%	125,000	100,000	80.0%
F-A5	Mechanical Room	Manual	BDP	3946AW000100		1978	n/a	ZONE 5 PER MAP IN CLOSET	COMBUSTION TEST: CO 34 PPM EFF. 77.6%	100,000	80,000	80.0%

10.2 Building B HVAC

Unit I.D.	Unit Location	Thermostat Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-B1	Closet	Manual	Lennox Elite	G61-MP-35B-070-06		2006	Lennox M/N: AC13-036-230-2 S/N: 5807B29162 Feb-2007	B1	Filter dirty and improperly installed. "Economizer" set up with dampers but no controls, ~50% OA.	66,000	61,000	92.4%
F-B2	Closet	Manual	Lennox Elite	G61-MP-35B-070-06	5906G13012	2006	Lennox M/N: AC13-036-230-2 S/N: 5807B29161 Feb-2007	B1	Similar set-up as B-1 but OA intake in closed position (~0% OA).	66,000	61,000	92.4%
F-B3	Closet	Manual	Lennox Elite	G61-MP-35B-070-06		2006	n/a	B3	Similar set-up as B-1 but no cooling. Filter Dated 12/14, Return Register broken, closet full of trash	66,000/ 45,000	62,000/ 43,000	93.9%
F-B4	Closet	Manual	American Standard Freedom 80	AUD100C948J0	P362J7S1G	2004	n/a	B4	Ducted, serves office also.	100,000	80,000	80%
F-B5	Closet	Manual	American Standard Freedom 80	AUD100C948K4	439363H1G	2004	n/a	B5	Ducted.	100,000	80,000	80%

10.3 Building C HVAC

Unit I.D.	Room	Thermostat Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-C1	Attic	Manual	Bryant Plus 90i	355MAV042060FHKA	1403A13364	2003	Bryant 533APX036-B S/N 4202E15505	C1		60,000 / 39,000	56,000 / 36,000	94%
F-C2	Attic	Manual	Bryant Plus 90i	355MAV042060FHKA	1403A13362	2003	Bryant 533APX036-B S/N 3201E05967	C2		60,000 / 39,000	56,000 / 36,000	94%
F-C3	Attic	Manual	Bryant Plus 90i	355MAV060080FHKA	2003A13344	2003	Bryant 533APX036-B S/N 3201E05972	C3		80,000 / 52,002	75,000 / 49,002	94%
F-C4	Attic	Manual	Bryant Plus 90i	355MAV042060FHKA	2303A14078	2003	Bryant 533APX042-B S/N 3902E12473	C4		60,000 / 39,000	56,000 / 36,000	94%
F-C5	Attic	Manual	Bryant Plus 90i	355MAV060080FHKA	2303A13366	2003	Bryant 533APX042-B S/N 3902E12491	C5		80,000 / 52,004	75,000 / 49,004	94%
F-C6	Attic	Manual	Bryant Plus 90i	355MAV060080FHKA	2003A13343	2003	Bryant 533APX042-B S/N 3902E12474	C6		80,000 / 52,005	75,000 / 49,005	94%

10.4 Building D HVAC

Unit I.D.	Unit Location	Thermostat Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-D1	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111137	2004	n/a	D1		60,000 / 39,000	56,000 / 36,000	94%
F-D2	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111153	2004	n/a	D2		60,000 / 39,000	56,000 / 36,000	94%
F-D3	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111152	2004	n/a	D3		80,000 / 52,002	75,000 / 49,002	94%
F-D4	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111147	2004	n/a	D4		60,000 / 39,000	56,000 / 36,000	94%
F-D5	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111167	2004	n/a	D5		80,000 / 52,004	75,000 / 49,004	94%
F-D6	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111142	2004	n/a	D6		80,000 / 52,005	75,000 / 49,005	94%

10.5 Building E HVAC

Unit I.D.	Unit Location	Thermostat Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-E1	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111168	2004	n/a	E1		60,000 / 39,000	56,000 / 36,000	94%
F-E2	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111148	2004	n/a	E2		60,000 / 39,000	56,000 / 36,000	94%
F-E3	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111138	2004	n/a	E3		80,000 / 52,002	75,000 / 49,002	94%
F-E4	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040212370	2004	n/a	E4	Gas leak	60,000 / 39,000	56,000 / 36,000	94%
F-E5	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040212367	2004	n/a	E5	Gas leak	80,000 / 52,004	75,000 / 49,004	94%
F-E6	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGA040111142	2004	n/a	E6		80,000 / 52,005	75,000 / 49,005	94%

10.6 Bus Barn / Auto Shop HVAC

Unit I.D.	Room	Thermostat Location/Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
UH-BB1	Bus Barn	Manual	Reznor	Unit Heater		1964	n/a	Bus Barn		125000	100000	70.0%
UH-BB2	Bus Barn	Manual	Reznor	Unit Heater		1964	n/a	Bus Barn		125000	100000	70.0%
Fan-BB1	Bus Barn	Manual	Dayton	Room Exhaust		1990	n/a	Bus Barn	Fan installation lacks required shroud to function properly	n/a	n/a	n/a
UH-AS1	Auto Shop	Manual										
UH-AS2	Auto Shop	Manual										
UH-AS3	Auto Shop	Manual										
UH-AS4	Auto Shop	Manual										
UH-AS5	Auto Shop	Manual										
UH-AS6	Auto Shop	Manual										
F-AS1	Auto Shop Classroom	Manual	Gaffers & Sattler	S 80-OFB	378 46	1978	n/a	Auto shop classroom	Ducts completely disconnected in attic	80000	64000	80%
F-AS2	Offices	Manual	American Standard	GNJ075M12A1	L953224052	1995	n/a	Offices	Undersized, ducts in poor condition	75000	59000	78%

10.7 Building F HVAC

Unit I.D.	Unit Location	Thermostat Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-F1	Closet	Manual	Westinghouse	FG6TC 060N-VB		2004	n/a	F1	Gas Leak; improperly fitted filter	60,000 / 39,000	56,000 / 36,000	93.3%
F-F2	Closet	Manual	Westinghouse	FG6TC 060N-VB	FGD50205444	2005	n/a	F2	wrong size filter	60,000 / 39,000	56,000 / 36,000	93.3%
F-F3	Closet	Manual	Westinghouse	FG6TC 080N-VB	FGD040814612	2004	n/a	F3	wrong size filter	80,000 / 52,002	75,000 / 49,002	93.7%
F-F4	Closet	Manual	Westinghouse	FG6TC 080N-VB	FGD041008501	2004	n/a	F4	Gas Leak; improperly fitted filter	80,000 / 52,002	75,000 / 49,002	93.7%
F-F5	Closet	Manual	Westinghouse	FG6TC 060N-VB	Illegible	2004	n/a	F5	wrong size filter; severely compromised duct at register	60,000 / 39,000	56,000 / 36,000	93.3%
F-F6	Closet	Manual	Trane XR95	TUH1D120A9601 AA	13024YT82G	2013	n/a	F6	wrong size filter	80,000 / 52,005	75,000 / 49,005	93.7%
F-F6 Alcove	Closet	Manual	Westinghouse	FG6RC 040N-08A	FGD050311568	2005	n/a	Alcove	wrong size filter	40,000	36,000	90.0%
F-F7	Hallway Closet	Manual	Westinghouse	FG6TC 060N-VB	FGD050204854	2005	n/a	F7	wrong size filter	60,000 / 40,000	56,000 / 37,000	93.3%
F-F8	Hallway Closet	Manual	Westinghouse	FG6TC 060N-VB	FGD050205464	2005	n/a	F7	wrong size filter	60,000 / 40,000	56,000 / 37,000	93.3%
F-F9/10	Hallway Closet	Manual	Westinghouse	FG6TC 080N-VB	FGD041008489	2004	n/a	F9 & F10	wrong size filter	60,000 / 39,000	56,000 / 36,000	93.3%

10.8 Library HVAC

Unit I.D.	Room	Thermostat Location/Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-CA1	CA1	Manual	Bryant	355MAV042060F	1703A12081	2003	n/a	CA1 & SIDE-ROOMS		60,000/ 39,000	56,000/ 36,000	93.3%
F-CA2	CA2	Manual	Bryant	355MAV042060F	1703A12084	2003	n/a	CA2 & BREAK-		60,000/ 39,000	56,000/ 36,000	93.3%
F-CA3	CA3	Manual	Bryant	355MAV042060F	1703A12072	2003	n/a	CA3		60,000/ 39,000	56,000/ 36,000	93.3%
F-CA4	CA4	Manual	Bryant	355MAV042060F	1403A10638	2003	n/a	CA4	GAS LEAK FOUND	60,000/ 39,000	56,000/ 36,000	93.3%
F-CA5	CA5	Manual	Bryant	355MAV042060F	1403A13344	2003	n/a	CA5		60,000/ 39,000	56,000/ 36,000	93.3%
F-CA6	CA6	Manual	Bryant	355MAV042060F	2303A14091	2003	n/a	CA6	GAS LEAK FOUND	60,000/ 39,000	56,000/ 36,000	93.3%
F-CA7	CA7	Manual	Bryant	355MAV042060F	1703A12082	2003	n/a	CA7	GAS LEAK FOUND	60,000/ 39,000	56,000/ 36,000	93.3%
F-CA8	CA8	Manual	Bryant	355MAV042060F	1703A12068	2003	n/a	CA8	GAS LEAK FOUND	60,000/ 39,000	56,000/ 36,000	93.3%
F-CA9	CA9	Manual	Bryant	355MAV042060F	1703A12070	2003	n/a	CA9		60,000/ 39,000	56,000/ 36,000	93.3%
HP-CA10	IT closet	Programmable	Mitsubishi	PKA-A36KA4	41M00497	2003	Mitsubishi Model PKA-A36KA4 S/N PKA-36KA4	IT CLOSET	SPLIT-SYSTEM HEAT PUMP FOR COOLING THE IT CLOSET/SERVER RACKS, ~4kW connected load		3-ton	14 SEER
F-Lib1	Library	Manual	Bryant	355MAV042060F	1703A10312	2003	n/a	Library		60,000/ 39,000	56,000/ 36,000	93.3%
F-Lib2	Library	Manual	Bryant	355MAV042060F	1703A12092	2003	n/a	Library		60,000/ 39,000	56,000/ 36,000	93.3%

10.9 Maintenance Building HVAC

Unit I.D.	Room	Thermostat Location/Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
UH-M1	Welding	Manual	Reznor	Unit Heater		1961	n/a	Welding		125000	100000	70.0%
UH-M2	Woodshop	Manual	Reznor	Unit Heater		1961	n/a	Woodshop		125000	100000	70.0%

10.10 Industrial Tech Building A HVAC

Unit I.D.	Room	Thermostat Location/Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-wood1	Exterior Closet	Manual	Trane XB	TUE1D120A9601AD	13323TWB1G	2013	n/a	Woodshop	Poorly fitted filters, not changed in over a year, leaks at expansion joints of RA and SA plenums	120000	96000	80.0%
F-wood2	Exterior Closet	Manual	Tran XV80	TUD2D120B9V5BVA	134260C51G	2013	n/a	Woodshop	Condensate dripping down shared flue	120,000 / 78,000	96,000 / 62,400	80.0%
F-IT Lobby	Lobby closet	Manual	American Standard	ADD120C960C5	N394PCC2G	1994	n/a	Offices	100% OSA, shares exhaust with DHW	120,000	96,000	80.0%
UH-IT1	Metal Shop	Manual	SJC unit heater	OH-355-E1	B1E10460	1978	n/a	Metal shop	T-stat in office outside shop, ducted to provide some OSA	355,000	284,000	80.0%

10.11 District Office HVAC

Unit I.D.	Room	Thermostat Location/Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
HP-DO1	Exterior Wall	Manual	Eubank	Illegible	99C-P80898	1999	heat pump	East side			3 ton	10 EER
HP-DO2	Exterior Wall	Manual	Eubank	Illegible	Illegible	1999	heat pump	West side			3 ton	10 EER

10.12 Music Building HVAC

Unit I.D.	Room	Thermostat Location/Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-M1	Exterior Closet	Manual	Janitrol	28-100-0	illegible	1981	n/a	Choir Rehearsal		100,000	80,000	80.0%
F-M2	Exterior Closet	Manual	Janitrol	28-100-0	illegible	1981	n/a	Offices, Studios, support		100,000	80,000	80.0%
F-M3	Exterior Closet	Manual	inaccessible	inaccessible	inaccessible		n/a	Band Rehearsal Hall	inaccessible			80.0%
F-M4	Exterior Closet	Manual	inaccessible	inaccessible	inaccessible		n/a	Band Rehearsal Hall	inaccessible			80.0%

10.13 Arts / Theater Building HVAC

Unit I.D.	Room	Thermostat Location/Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
F-A1	SW closet	Manual	York	P4HUD20N1040 1A	WHLM008012	2002	n/a	Ceramics	no filter, hole in supply plenum expansion joint	130,000	104,000	80.0%
F-A2	SW closet	Manual	York	P3HUD20N1040 1C	EMHM874307	1999	n/a	Photograp hy	No filter	130,000	105,000	80.8%
F-A3	NW closet	Manual	Bryant	310JAV066110A AJA	3804A4283	2004	n/a	Art Studio		110,000	89,000	80.9%
F-T1	Basement	Manual	verify	verify			n/a	Theater	No filter	100,000	80,000	80.0%
F-T2	Basement	Manual	American Standard	AUC100C948B6	P232M9M7G	1999	n/a	Theater	No Filter, Condensate drain line plugged, unit has been flooded	100,000	90,000	90.0%
F-T3	Basement	Manual	American Standard	AUC100C948B6	N442S7K7G	1998	n/a	Theater	No filter	100,000	90,000	90.0%

10.14 Cafeteria Building HVAC

Unit I.D.	Room	Thermostat Location/Type	Make	Model	S/N	Vintage	A/C	Areas Served*	Notes	Input (Btu/h)	Output (Btu/h)	Efficiency
UH-Caf1	Dining	Manual	Gaffers & Sattler	inaccessible	inaccessible		n/a	Dining		100,000	80,000	80.0%
HP-Kitchen-1	Kitchen	Programmable	Mitsubishi	PKA-A36KA4	41M00497	2003	Mitsubishi Model PKA-A36KA4 S/N PKA-36KA4	Kitchen	Rejects heat from walk-in cooler compressor		3 ton	14 SEER
WH-Caf2	Classroom/ lobby	Manual						Classroom /lobby	wall heater	40,000	32,000	80%

11 APPENDIX B - DOMESTIC HOT WATER HEATERS

BUILDING	Location	Make	Model	S/N	Fuel	Rating	Vintage	Notes
A	Exterior mechanical room	Reliance	640G0RT 200	0951A002276	Gas	INPUT: 35500 BTU/HR RECOVERY: 36.33/GAL/HR CAPACITY: 40.0 GAL/HR	Dec-09	
B	Janitor's Closet	Rheem	81VP10S	RH 1004244744	Electric	10 Gal, 2000 Watts	Oct-04	Took over 1 minute to get HW to boys restroom sink.
B	Foods Lab	Rheem Ruud Commercial	ES50-18-G-1	RR 0404E00883	Electric	50 Gal, 18,000 Watts	Apr-04	Unit is located right next to a gas source, but is all electric.
C	Janitor's Closet	Rheem	81VP10S	RH 0603264934	Electric	10 Gal 2000 Watts	Jun-03	
D	Janitor's Closet	Rheem-Ruud	EGSP 10	CS0808RR0104XXX75	Electric	10 Gal, 1500 Watts	Aug-04	
E	Janitor's Closet	Rheem-Ruud	EGSP 10	CS0804RR0204245773	Electric	10Gal, 1500 Watts	Feb-04	
F	Janitor's Closet	Rheem	42VR40-40F	RHLN 0205V08919	Gas	40 GAL, 33.9 GPH, INPUT:40,000 Btu	Feb-05	
Cafeteria	Outside Shed	Rheem	42V75F	RHLMN37108708	Gas	75 GAL INPUT: 75100 BTUH	Sep-12	
Cafeteria	closet at west end of building	A.O. Smith	inaccessible	inaccessible	Electric	10 Gal, 1650 watts	inaccessible	Serves RR only, not kitchen
Ag	Attic	A.O. Smith	illegible	illegible	Gas	32.8 gal/hr	UNK	Tank corrosion has led to complete tank failure, unit was shut-off by OE staff, Maintenance
District Office	Under break room sink	Rheem	PROE6 1 RH POU	RH Q141434145	Electric	6 GAL, 2000W	Apr-14	
Auto Shop	Attic	Rheem	22V30F	RHLNM031315574	Gas	29 Gal, 32,000 BTU/HR	13-Jan	
Industrial Tech	Closet next to lobby	Reliance	640G0RT 200	1028J004811	Gas	INPUT: 35500 BTU/HR RECOVERY: 36.33/GAL/HR CAPACITY: 40.0 GAL/HR	Jul-10	Shares exhaust with furnace
Snack Shack	Attic	inacessible	inaccessible	inaccessible	Gas	inaccessible	inaccessible	Appears to be tankless on-demand unit, no pipe insulation
Library	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Theater	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Music	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Fieldhouse	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Gate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

12 APPENDIX C – OBSERVED LIGHTING SCHEDULE

12.1 Building A Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
A1	2L 4' T-8 SM	32	2	4		256		
A2	2L 4' T-8 SM	32	2	2		128		
A3	2L 4' T-8 SM	32	2	4		256		
A4	2L 4' T-8 SM	32	2	6		384		
A5	2L 4' T-8 SM	32	2	3		192		
A6						0		
A7						0		
A8	2L 4' T-8 SM	32	2	2		128		
A9						0		
A10						0		
A11						0		
A12						0		
A13/A/Security	2L 4' T-8 SM	32	2	1		64		
A14/B	4L 4' T8	32	4	1		128		
A15/C	2L 2' T8	17	2	1		34		
A16/D	4L 4' T8	32	4	1		128		
A17/E	4L 4' T8	32	4	1		128		
A-Mens BR	2L 4' T8	32	2	1		64		
A-Women's BR	2L 4' T8	32	2	1		64		
A-Main Hallway/Offices	2L 4' T8	32	2	28		1792		
A-MR1	2L 4' T8	32	2	2		128		
A-CopyRoom	2L 4' T8	32	2	1		64		
A-Technology	2L 4' T8	32	2	13		832		
						4770	6,272	0.76

12.2 Building B Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
B1	4', T-8, Linear Fluorescent Suspended	32	6	4	Manual 4-circuits direct/indirect	768	1004	0.76
B2	4', T-8, Linear Fluorescent Suspended	32	6	4	Manual 4-circuits direct/indirect	768	1004	0.76
B3	4', T-8, Linear Fluorescent Suspended	32	6	4	Manual 4-circuits direct/indirect	768	1004	0.76
B4	4', T-8, Linear Fluorescent Surface Mounted	32	3	21	Manual, 2-circuits, 14/7	2016	1004	2.01
B5	4', T-8, Linear Fluorescent Surface Mounted	32	3	22	Manual, 3-circuits, 14/7/1	2112	1004	2.10
B-Hallway						0		
B-Bathroom, Boys						0		
B-Bathroom, Girls						0		
B-Supply/Bathroom DHW Closet	4', T-8, Linear Fluorescent, Surface Mounted	32	2	1	Occupancy Sensor (Pointed at Duct, working?)	64		
						6496	6,026	1.08

12.3 Building C Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
C1	2L, 4', T-8, Linear Fluorescent Surface Mounted	32	2	8	Manual	512		
C2	(no lighting)							
C3	2L, 4', T-8, Linear Fluorescent Surface Mounted	32	2	16	Manual, 2-circuits, 8/8	1024		
C4 & C5	2L, 4', T-8, Linear Fluorescent Surface Mounted	32	2	16	Manual, 4circuits, 4/4/4/4	1024		
C6?	2L, 4', T-8, Linear Fluorescent Surface Mounted	32	2	8	Manual, 2-circuits, 4/4	512		
C7	2L, 4', T-8, Linear Fluorescent Surface Mounted	32	2	8	Manual, 2-circuits, 4/4	512		
C-Hallway	3L, 4', T-8, Linear Flourescent Surface Mounted	32	3	14	Manual	1344		
C-Closet	2L, 4', T-8, Linear Fluorescent Surface Mounted	32	2	2	?	128		
C-Boys Bathroom								
C-Girls Bathroom								
						5056	6,998	0.722492141

12.4 Building D Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
D1	2/4L, 4', T-8, Linear Fluorescent	32	2	12	Manual (6,6)	768		
D2	2/4L, 4', T-8, Linear Fluorescent	32	2	12	Manual (6,6)	768		
D3	2/4L , 4' , T-8 Linear Fluroescent	32	2	12	Manual (6,6)	768		
D4	2/4L, 4', T-8, Linear Fluorescent (6 surface mounted, 6 suspended	32	2	12	Manual (6,6)	768		
D5	? Assumed TYP	32	2	12	Manual (6,6)	768		
D6	2/4L, 4', T-8, Linear Fluorescent (6 surface mounted, 6 suspended)	32	2	12	Manual (6,6)	768		
D-Hallway						0		
D-Closet						0		
D-Boys Bathroom						0		
D-Girls Bathroom						0		
						4608	6,289	0.732707903

12.5 Building E Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
E1	2/4L, 4', T-8 Linear Fluorescent (6 surface mounted, 6 suspended)	32	2	12	Manual (6,6)	768		
E2	2/4L, 4', T-8 Linear Fluorescent (6 surface mounted, 6 suspended)	32	2	12	Manual (6,6)	768		
E3	2/4L, 4', T-8 Linear Fluorescent (6 surface mounted, 6 suspended)	32	2	12	Manual (6,6)	768		
E4	2/4L, 4', T-8 Linear Fluorescent (6 surface mounted, 6 suspended)	32	2	12	Manual (6,6)	768		
E5	2/4L, 4', T-8 Linear Fluorescent (6 surface mounted, 6 suspended)	32	2	12	Manual (6,6)	768		
E6	2/4L, 4', T-8 Linear Fluorescent (6 surface mounted, 6 suspended)	32	2	12	Manual (6,6)	768		
E-Closet	2L, 4', T-8, Linear Fluorescent	32	2	1	Occupancy Sensor	64		
E-Boys/MensBR	2L, 4' T-8 Linear Fluorescent	32	2	6	?	384		
E-Girls Bathroom								
						5056	6,272	0.806122449

12.6 Building F Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
F1	4L 4' T8	32	2	24	Manual (8,8,8)	1536		
F2	4L 4' T8	32	2	22	Manual (6,8,8)	1408		
F3	4L 4' T8	32	2	42	Manual (14,15,13)	2688		
F4	4L 4' T8	32	2	16	Manual (4,6,6)	1024		
F5	4L 4' T8	32	2	30	Manual	1920		
F5	1L 4' T8	32	1	3	Manual	96		
F-Closet	2L 4' T8	32	1	1	Manual	32		
F-Closet	60W Incandescent	60	1	1	Manual	60		
F6	4L 4' T8	32	2	21	Manual	1344		
F-Alcove	4L 4' T8	32	2	7	Manual	448		
F-Connecting Room	4L 4' T8	32	2	6	Manual	384		
F7	4L 4' T8	32	2	21	Manual	1344		
F8-Lifeskills	4L 4' T8	32	2	21	Manual(7,7,7)	1344		
F9	4L 4' T8	32	2	21	Manual(7,7,7)	1344		
F10	4L 4' T8	32	2	21	Manual(7,7,7)	1344		
						16316	18,415	0.89

12.7 Agriculture Building Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
Ag-Classroom 1	2/4L , 4' , T-8 Linear Fluroescent	32	2	28	Manual(14,14)	1792		
Ag-Classroom2	2/4L , 4' , T-8 Linear Fluroescent	32	2	28	Manual(14,14)	1792		
Ag-Office 1	2L 4' T8	32	2	2		128		
Ag-Office 2	2L 4' T8	32	2	4		256		
Ag-Main Room	6L 4' T8	32	6	12	Occupancy Sensors	2304		
Ag-BR	2L 4' T8	32	2	1		64		
						6336	9,830	0.64

12.8 Music Building Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
Music-Piano Room	2L 4' T8	32	2	3		192		
Music- A	2L 4' T8	32	2	2		128		
Music-Hallway	2L 4' T8	32	2	8		512		
Music-Closet	2L 4' T8	32	2	1		64		
Music-Piano Closet	2L 4' T8	32	2	2		128		
Music-File Storage	2L 4' T8	32	2	2		128		
Music-Rec Studio 1	2L 4' T8	32	2	2		128		
Music-Choir Room	2L 4' T8	32	2	43		2752		
Music-Library	2L 4' T8	32	2	4		256		
Music-Rec Studio 2	2L 4' T8	32	2	10		640		
Music-Rehearsal Room	2L 4' T8	32	2	76		4864		
Music-Office	2L 4' T8	32	2	4		256		
Music-Bathroom	1L 4' T8	32	1	1		32		
Music-Listening Room	2L 4' T8	32	2	1		64		
Music-Storage Closet	15W Compact Fluorescent	15	1	1		15		
						10159	4,960	2.05

12.9 District Office Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
District Office	2L 4' T8	32	2	23	Bilevel Switch	1472		
						1472	1,920	0.77

12.10 Cafeteria Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
Cafeteria-Dining Area	3L 4'T8	32	3	84		8064		
Cafeteria-Kitchen	2L 4' T8	32	2	15		960		
Cafeteria-Classrooms in Back?						0		
						9024	7,869	1.15

12.11 Arts & Theater Building Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
A&T-Pottery/art room	2L 4' T8	32	2	20		1280		
A&T-Bathrooms	2L 4'T8	32	2	4		256		
A&T-Computer Lab						0		
A&T-Hallway	4L 4' T8	32	2	2		128		
A&T-ArtRoom	2L 4' T8	32	2	17		1088		
A&T-Closet	2L 4' T8	32	2	2		128		
A&T-Office	2L 4' T8	32	2	2		128		
A&T-Theatre						0		
						3008	11100	0.27

12.12 Maintenance Building Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
Maintenance-Woodshop	2L 4'T8	32	2	13		832		
Maintenance-Woodshop-Storage	2L 8' T12	75	2	1		150		
Maintenance-Breakroom/Auditor	2L 4' T8	32	2	4		256		
Maintenance-Mainroom	2L 4' T8	32	2	6		384		
Maintenance-Mainroom	4L 4' T8	32	4	8		1024		
Maintenance-Mainroom	2L 8' T12	75	2	6		900		
Maintenance-Tool Room	2L 8' T12	75	2	3		450		
Maintenance-Tool Room	6L 4' T8	32	6	1		192		
Maintenance-Tool Room-Hardware	4L 8' T12	75	4	1		300		
Maintenance-Tool Room-Hardware	2L 4' T8	32	2	1		64		
Maintenance-Conduit/Elec room	6L 4' T8	32	6	4		768		
Maintenance-Conduit/Elec room-Closet	2L 4' T8	32	2	1		64		
Maintenance-Upstairs	2L 4' T8	32	2	2		128		
						5512	10945	0.50

12.13 Industrial Technology Building Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
Industrial Technology-Wood	3L 4' T8	32	3	46	Manual	4416		
Industrial Technology-Wood-Office	2L 4' T8	32	2	4	Manual	256		
Industrial Technology-Wood-Supply Room	2L 4' T8	32	2	2	Occupancy Sensor	128		
Industrial Technology-Wood-Project 1	2L 4' T8	32	2	2	Occupancy Sensor	128		
Industrial Technology-Wood-Project 2	2L 4' T8	32	2	2	Manual	128		
Industrial Technology-Wood-Lumber	2L 4' T8	32	2	4	Manual	256		
Industrial Technology-Wood-Finish	6L 4' T8	32	6	4	Manual	768		
Industrial Technology-Metal-Shop	3L 4'T8	32	3	72	Manual	6912		
Industrial Technology-Metal-Offices	2L 4' T8	32	2	4	Manual	256		
Industrial Technology-Metal-Tools	2L 4' T8	32	2	2	Manual	128		
Industrial Technology-Metal-Storage	2L 4' T8	32	2	2	Manual	128		
Industrial Technology-Metal-Break	2L 4' T8	32	2	8	Manual	512		
Industrial Technology-Metal-Metal Storage	2L 4' T8	32	2	2	Manual	128		
						14144	8788	1.61

12.14 Bus Barn/Auto Shop Lighting

Location	Lamp/Fixture Type	Lamp Power (W)	Lamps per Fixture	Number of Fixtures	Controls	Total Power (W)	SF	LPD (w/sf)
Bus Garage - Transportation Services	12L 4' T8	32	12	3		1152		
Bus Garage - Transportation Services	6L 4' T8	32	6	4		768		
Bus Garage - Transportation Services	4L 4' T8	32	4	5		640		
Bus Garage - Autoshop-A	2L 4' T8	32	2	32	Manual(32)	2048		
Bus Garage - Autoshop-A	Metal Halide	400	1	8		3200		
Bus Garage - Autoshop-A	2L 4' T8	32	2	4		256		
Bus Garage - Autoshop-B	4L 4' T8	32	4	4		512		
Bus Garage - Autoshop-C	4L 4' T8	32	4	6		768		
Bus Garage - Autoshop-D	Metal Halide	400	1	1		400		
Bus Garage - Autoshop-D	2L 4' T8	32	2	2		128		
Bus Garage - Autoshop-E	2L 4' T8	32	2	4		256		
Bus Garage - Autoshop-Restroom	2L 4' T8	32	2	1		64		
Bus Garage - Autoshop-Independent Study	4L 4' T8	32	4	18	(4,4,6,2,2)	2304		
						12496	11350	1.10

13 APPENDIX D – NATURAL GAS LEAKS

Building	Room	Unit	Location
Building A	Mechanical Room	Furnace F-A1	Shutoff Valve
Building A	Mechanical Room	Furnace F-A1	Regulator outlet to ignitor
Building A	Mechanical Room	Furnace F-A2	Shutoff Valve
Building A	Mechanical Room	Furnace F-A3	Shutoff Valve
Building A	Mechanical Room	Furnace F-A5	Regulator outlet to ignitor
Building D	Classroom D2	Furnace F-D2	Shutoff Valve
Building E	Classroom E4	Furnace F-E4	Shutoff Valve
Building E	Classroom E5	Furnace F-E5	Shutoff Valve
Building F	Classroom F1	Furnace F-F1	Shutoff Valve
Building F	Classroom F3	Furnace F-F3	Shutoff Valve
Building F	Classroom F8	Furnace F-F8	Shutoff Valve
Building F	Classroom F9	Furnace F-F9	Shutoff Valve
Building F	Classroom F10	Furnace F-F10	Shutoff Valve
Ag Building	Attic Mechanical Room	Furnace F-Ag1	Regulator
Arts/Theater Building	Theater Basement Mechanical Room	n/a	Union beneath large red shutoff valve in main gas supply