

Introduced 3/02/09
Public Hearing 3/16/09
Council Action 4/06/09
Executive Action 4/18/09
Effective Date 4/08/09

County Council Of Howard County, Maryland

2009 Legislative Session

Legislative Day No. 3

Bill No. 15 -2009

Introduced by: The Chairperson at the request of the County Executive

AN ACT pursuant to Section 612 of the Howard County Charter, approving a multi-year agreement between Howard County, Maryland and Energy Systems Group where Energy Systems Group will develop and implement a comprehensive energy efficiency guaranteed savings program at certain County facilities that shall include the construction and installation of certain equipment, and certain management tasks and the program will result in certain cost savings which may be used to finance the construction and installation of certain equipment.

Introduced and read first time March 2, 2009. Ordered posted and hearing scheduled.

By order Stephen M. LeGendre
Stephen M. LeGendre, Administrator

Having been posted and notice of time & place of hearing & title of Bill having been published according to Charter, the Bill was read for a second time at a public hearing on March 16, 2009.

By order Stephen M. LeGendre
Stephen M. LeGendre, Administrator

This Bill was read the third time on April 6, 2009 and Passed ☒, Passed with amendments ☐, Failed ☐.

By order Stephen M. LeGendre
Stephen M. LeGendre, Administrator

Sealed with the County Seal and presented to the County Executive for approval this 7 day of April, 2009 at 11:00 p.m.

By order Stephen M. LeGendre
Stephen M. LeGendre, Administrator

Approved/Vetoed by the County Executive April 8, 2009

Ken Ulman
Ken Ulman, County Executive

NOTE: [[text in brackets]] indicates deletions from existing law; TEXT IN SMALL CAPITALS indicates additions to existing law; Strike-out indicates material deleted by amendment; Underlining indicates material added by amendment

1 **WHEREAS**, Howard County, Maryland (the "County") has determined where energy
2 cost savings maybe realized in County facilities and the County desires to install, construct,
3 maintain and manage certain energy conservation measures; and
4

5 **WHEREAS**, Energy Systems Group, a limited liability company, ("ESG") is engaged in
6 the business of providing energy audits, performing the design, construction and installation of
7 equipment, and managing certain performance measures that will result in energy cost savings;
8 and
9

10 **WHEREAS**, the energy cost savings may, in-turn, be used to finance the purchase,
11 design and construction of certain cost saving equipment; and
12

13 **WHEREAS**, the State of Maryland issued a Request for Proposals for Indefinite Delivery
14 Contract, dated August 21, 2006, (the "State RFP"), a copy of which is attached as Exhibit A;
15 and
16

17 **WHEREAS**, ESG submitted a proposal and the State of Maryland selected ESG to
18 perform services under the State RFP; and
19

20 **WHEREAS**, the County now wishes to "piggyback", in accordance with Section
21 4.115(a) of the Howard County Code, on the State RFP based on the proposal submitted by ESG
22 to Howard County, a copy of which is attached as Exhibit B; and
23

24 **WHEREAS**, the County wishes to enter into a Energy Performance Contract ("the
25 Contract"), the form of which is attached as Exhibit C, with ESG where ESG will provide certain
26 design, construction and installation of equipment, and management services that will lead to
27 guaranteed energy cost savings; and
28

29 **WHEREAS**, the County and ESG wish to enter into the Contract for a term that will

1 extend beyond the current fiscal year and the Contract requires the County to maintain certain
2 equipment; and
3

4 **WHEREAS,** the Contract requires the payment by the County of funds from an
5 appropriation in a later fiscal year and therefore requires County Council approval as a multi-year
6 agreement pursuant to Section 612 of the Howard County Charter.
7

8 **NOW, THEREFORE,**
9

10 *Section 1. Be It Enacted by the County Council of Howard County, Maryland that in*
11 *accordance with Section 612 of the Howard County Charter, it approves the terms of a Contract*
12 *between Howard County and Energy System Groups, which shall be in substantially the same*
13 *form as Exhibit C attached to this Act.*
14

15 *Section 2. And Be It Further Enacted by the County Council of Howard County, Maryland that*
16 *the County Executive is hereby authorized to execute and deliver the Contract for such term in*
17 *the name of and on behalf of the County.*
18

19 *Section 3. And Be It Further Enacted by the County Council of Howard County, Maryland that*
20 *this Act shall be effective immediately upon its enactment.*

**STATE OF MARYLAND
DEPARTMENT OF GENERAL SERVICES**

REQUEST FOR PROPOSAL (RFP)

FOR

INDEFINITE DELIVERY CONTRACT (IDC)

**TO PROVIDE PROJECT MANAGEMENT, ENERGY AUDIT, ENGINEERING, CONSTRUCTION,
FINANCING, MAINTENANCE SERVICES AND MEASUREMENT & VERIFICATION TO DEVELOP
AND IMPLEMENT COMPREHENSIVE ENERGY EFFICIENCY AND GUARANTEED SAVINGS
PROGRAMS AT STATE FACILITIES**

I.D. NO. DGS-06-EPC-IDC-5.0

Date: August 21, 2006

SOLICITATION NO. DGSS0221073

STATE OF MARYLAND

DEPARTMENT OF GENERAL SERVICES

**Steve Cassard, Secretary
State Office Building
301 West Preston Street
Baltimore, Maryland 21201**

BOARD OF PUBLIC WORKS

**Robert L. Ehrlich, Jr., Governor
William Donald Schaefer, Comptroller
Nancy K. Kopp, Treasurer**

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APPENDIX 6: Performance Evaluation Sheet

SECTION I – PROCUREMENT OBJECTIVE

1. SUMMARY STATEMENT

- A. The primary purpose of this solicitation is to select a qualified list of Energy Service Companies (ESCOs) who have the capability to develop and implement comprehensive energy efficiency and guaranteed savings programs to assist various State agencies in achieving mandated reductions in energy consumption. The State plans to enter into indefinite delivery contracts (IDC's) pursuant to Title 12, Subtitle 3 of the State Finance and Procurement Article of the Annotated Code of Maryland. Under this approach, Phase I of each identified project, will be competitively bid between all pre-qualified ESCOs, to conduct a detailed energy audit, technical study and preliminary design to identify cost effective solutions to achieve a minimum of twenty percent (20%) reduction from the baseline in annual energy usage and a maximum project payback period of 15 years, while maintaining or enhancing existing comfort levels. Note: The 20% annual energy reduction from the baseline may be revised at the State's/Agency's discretion if the project can be accomplished within a 15-year payback period. Phase II project must be calculated on a 13-year term to allow for the fluctuation in interest rate during the construction phase.

Upon the State's approval of the recommendations of a Phase II proposal, including a determination of fair and reasonable price for capital and yearly maintenance costs, the ESCO will implement the comprehensive energy efficiency and guaranteed savings program, provide the funds necessary to cover all of the costs associated with the program and provide a guarantee of the level of energy and energy related operational cost avoidance to be achieved throughout the payback period.

- B. The State of Maryland is issuing this Request For Proposals (RFP) to establish a list of qualified ESCOs to compete on projects to:
- 1) Provide all necessary studies and analysis in the form of a detailed energy audit and engineering feasibility study (Phase I);
 - 2) Provide comprehensive energy efficiency and guaranteed savings program (Phase II) at a cost determined to be fair and reasonable by the State.
 - 3) Develop and implement a plan to reduce energy and energy related maintenance costs;
 - 4) ~~After the conclusion of feasibility study, but before the start of~~ design/construction phase, (Phase II), the ESCO shall provide acceptable performance measurements in accordance with International Performance Measurement and Verification Protocol, IPMVP 2001; see section V, Performance Measure and Verification.
 - 5) Furnish the design and installation of Energy Conservation Measures

SECTION I – PROCUREMENT OBJECTIVE

(ECMs) that are consistent with State facility master plans and future building renovation plans as specified and provided by the Using Agency. ECM's may include, but are not limited to, the replacement or repair of existing HVAC controls, HVAC equipment, chillers, boilers, and auxiliary equipment, computerized Energy Management Systems, and retrofit of existing lighting with optimum designed energy efficient lamps and electronic ballasts (Phase II);

- 6) Provide training for the facility operations and maintenance staff (Phase II);
 - 7) Provide maintenance and service of everything installed under this contract for the duration of the contract period at a cost determined to be fair and reasonable by the State (Phase II); and
 - 8) Provide monitoring of energy use and costs, and an acceptable guarantee that the total program costs shall be one hundred percent (100%) covered by the program energy and energy related operating and maintenance savings (Phase II).
- C. The State intends to solicit quotations from all qualified ESCOs selected under this IDC for Phase I for each project. Once a Phase I contract is awarded, the successful ESCO will complete the Feasibility Study/Development of Guaranteed Savings program (Phase I) within 180 calendar days following the Notice to Proceed. Upon approval of the Feasibility Study/Guaranteed Savings Program by the State and the Board of Public Works, the successful ESCO will have up to 365 calendar days to complete the design and construction of work, unless otherwise approved by the procurement officer. The offeror performing an acceptable Phase I study will be the only firm invited to perform the Phase II work implementing the Phase I plan. The Firm would be paid for the Phase I study only (1) if the Firm performs Phase II, in which case the costs of their Phase I study would be recovered under Phase II compensation, or (2) if DGS approves the Phase I study but the Using Agency for any reason elects not to implement it, in which case the Using Agency would be required to pay for the Phase I study out of the Agency's funds, subject to appropriation, at the price agreed to in the Phase I contract.
- D. The anticipated selection of ESCOs under this agreement will be within 120 days of the receipt of technical proposals.
- E. The State reserves the right to apply, before or after award of the contract, any reciprocal preference for Resident Bidders as set forth in Section 14-401 of the State Finance and Procurement Article of the Annotated Code of Maryland, at no additional cost to the State. As allowed by Section 14-401(d), a nonresident bidder or offeror submitting a bid or proposal shall attach to its bid or proposal a copy of the current statute, resolution, policy, procedures, or executive order of the resident state of the nonresident bidder or offeror that pertains to that state's treatment of nonresident bidders or offerors. A resident offeror is defined as a business enterprise that has a Maryland address, is registered to do business in

SECTION I – PROCUREMENT OBJECTIVE

the State of Maryland, employs Maryland residents, and regularly conducts business within the State. The term includes subsidiaries, divisions, and branches headquartered outside of the State of Maryland.

2. SUBMITTAL INSTRUCTIONS

- A.** This solicitation shall be conducted in accordance with and is subject to the Code of Maryland Regulations (COMAR) Title 21, and State Finance and Procurement Article, except as otherwise indicated.
- B.** Any selection made pursuant to this solicitation is tentative, and may be executed by the State only upon approval by the Board of Public Works of Maryland.
- C.** Technical Proposals will be accepted from firms that offer a qualified design team either in-house or under contract to them to provide the complete feasibility study and design services required for EPC projects, qualified maintenance personnel to provide preventive maintenance and service throughout the length of the contract, financing for all capital costs of the project, and a guarantee of energy savings throughout the life of the project financing.
- D.** Transmittal Letter: A transmittal letter must accompany the technical proposal. The purpose of this letter is to transmit the proposal and acknowledge the receipt of any addenda. The transmittal letter should be brief and signed by an individual who is authorized to commit the Offeror to the services and requirements as stated in this RFP. Only one transmittal letter is needed and it does not need to be bound with the technical proposal.
- E.** An unbound original and five (5) bound copies of the Technical Proposal must be received by the Procurement Officer, at the address listed, no later than 11:00 a.m., (local time) September 29, 2006 in order to be considered. It is the responsibility of the offeror to ensure receipt of proposal to the Procurement Officer by the due date and time. Proposals received after due date and time will be returned unopened. An electronic version (diskette or CD) of the Technical Proposal in MS Word format must be enclosed with the original technical proposal. Insure that the diskettes are labeled with the Date, RFP title, RFP number, Offeror name and packaged with the original copy of the technical proposal.
- F.** Requests for extension of this date or time will not be granted. Offerors mailing proposals should allow sufficient mail delivery time to ensure timely receipt by the Procurement Officer. ~~Except as provided in COMAR 21.05.02.10, proposals~~ received by the Procurement Officer after the due date, September 29, 2006 at 11:00 a.m. (local time) will not be considered and returned unopened. Proposals may not be submitted by e-mail or facsimile. Proposals will not be opened publicly.
- G.** Sealed Proposals must be submitted to Debbie Pecora, Department of General Services, Procurement & Logistics, 301 W. Preston Street, Room M-10, Baltimore,

SECTION I – PROCUREMENT OBJECTIVE

Maryland 21201 no later than 11:00 am on September 29, 2006

Pre-proposal conference will be held on Tuesday, August 29, 2006 at 1:00 p.m. at 301 West Preston St, 14th floor conference room. Attendance is not required but highly recommended.

- H. The Proposal, if submitted by an individual, shall be signed by the individual; if submitted by a partnership, shall be signed by such member or members of the partnership as have authority to bind the partnership; if submitted by a corporation, shall be signed by an officer, and attested by the corporate secretary or an assistant corporate secretary. If not signed by an officer, as aforesaid, there must be attached a copy of that portion of the By-Laws, or a copy of a Board resolution duly certified by the corporate secretary, showing the authority of the person so signing on behalf of the corporation.
- I. The Offeror shall review all certificates and affidavits contained in the RFP and should either execute or be prepared to execute them, as appropriate. In the event that they cannot be truthfully executed, the Offeror shall so notify the State.

3. PROCUREMENT METHOD

- A. The procurement method being utilized in the conduct of this project is Competitive Sealed Proposals in accordance with COMAR 21.05.03.
- B. Selection of ESCOs under this agreement will be made to those successful Offerors whose Technical Proposals are determined to be the most advantageous to the State. Proposals shall be evaluated based on the evaluation criteria listed in Sections VI and VII of this RFP.
- C. Proposals will not be opened publicly, but shall be opened in the presence of the DGS Proposal Evaluation Committee. The register of Proposals will be open to public inspection only after final award of the Contract.
- D. A maximum of five (5) respondents based on the highest ranked firms with a minimum score of 80% will be selected.
- D. This agreement will be effective for a period of 24 months effective April 7, 2007 following BPW approval with the unilateral option for two additional 12 month periods. If a pre-qualified ESCO completes Phase I of a project after the period has expired, the ESCO may be awarded the Phase II work for that specific project.

4. CONTRACT AWARDS

- A. Phase I Contracts will be awarded based on selection criteria as specified in Section IV, Item 2 of this RFP.
- B. Individual contracts for Phase I work (see Section IV - Scope of Work) awarded

SECTION I - PROCUREMENT OBJECTIVE

under this agreement may not exceed \$200,000. Phase II contracts have no dollar limit, but must be approved by the Board of Public Works.

- C. The State's selection of successful Offerors under this agreement does not bind the State or the Offeror to enter into any Phase I or Phase II contracts.

5. ISSUING OFFICE AND PROCUREMENT OFFICER

Issuing Office:	Office of Procurement and Logistics
Department:	General Services
Address:	301 West Preston Street, Room M-10 Baltimore, Maryland 21201
Phone:	(410) 767-4945 to request bid documents
Facsimile No.:	(410) 333-5164
Procurement Officer:	Debbie Pecora (410) 767-4945 Debbie.pecora@dgs.state.md.us

For all matters arising prior to and including final ESCO selection under this agreement and for (1) all purchases, orders, changes or modifications during performance of the contracts awarded under this agreement, and (2) all disputes arising under the contracts subsequent to final award, the sole point of contact in the state for purposes of this RFP and any contract awarded under this RFP is the Procurement Officer. No State or DGS employee, official or representative has authority to change requirements of the contract except the Procurement Officer or his or her designated Representative subject to the limits of their authority and other limitations imposed by law.

6. CONTRACT WITH GOVERNMENT ORGANIZATIONS OTHER THAN DGS

- A. Pursuant to Article 41, Section 18-201 of the Annotated Code of Maryland, except as provided in (b), the following entities may purchase materials, supplies, and equipment under this contract:

- 1) A county or Baltimore City;
- 2) A municipal corporation;
- 3) A governmental agency in the State with Primary Procurement Authority;
- 4) A public or quasi-public agency that:

 - (a) receives State money; and
 - (b) is exempt from taxation under Section 501 (c)(3) of the Internal Revenue Code;
- 5) A private elementary or secondary school that:
 - (a) either has been issued a certificate of approval from the state

SECTION I – PROCUREMENT OBJECTIVE

Board of Education or is accredited by the Association of Independent Schools; and

(b) is exempt from taxation under Section 501 (c)(3) of the Internal Revenue Code; or

6) A nonpublic institution or higher education under Section 17-106 of the Education Article.

- B. A private elementary or secondary school or a nonpublic institution of higher education may not purchase religious materials under this contract.
 - C. The right to purchase under this section shall be in addition to, but not in substitution for, the applicable purchasing power granted to any of the listed entities pursuant to any statutory or charter provision.
 - D. All purchases under this contract by any such entity which is not a unit or agency of the State of Maryland for which the State of Maryland may be held liable in contract (1) shall constitute a purchase or contract between the Contractor and that entity only, (2) shall not constitute a purchase or contract of the State of Maryland, (3) shall not binding or enforceable against the State of Maryland or any of its units or agencies, and (4) may be subject to other terms and conditions agreed to by the Contractor and the purchaser. Contractor bears the risk of determining whether or not any entity from which the Contractor receives an order under the contract is a unit or agency of the State of Maryland such that the contract may be enforced against the State of Maryland.
-

SECTION II – DEFINITIONS

1. DEFINITIONS

In this RFP, the following terms have the meanings indicated:

- A. "Approved Equal" means those supplies or services, or compatible items of construction whose quality, design, or performance characteristics are functionally equal or superior to an item specified.
- B. "Change Order" means a written order signed by the responsible Procurement Officer, directing a Contractor to make changes which the changes clause of a contract authorizes the Procurement Officer to order with or without the consent of the Contractor.
- C. "Code" means the Annotated Code of Maryland.
- D. "COMAR" means the Code of Maryland Regulations.
- E. "Consulting engineer" means the State's designed representative for design and engineering oversight.
- F. "Contract" means the written agreement executed between the State and the successful Offeror, covering the performance of the work and furnishing of labor, services, equipment, and materials, by which the Contractor is bound to perform the Work and furnish the labor, services, equipment and materials, and by which the State is obligated to compensate them, therefore at the mutually established and accepted rate or price. The Contract shall include the Technical Proposal, RFP and amendments/addenda thereto, plans and specifications developed by the Contractor, Contract forms and bonds, notice to proceed, and any written change orders and supplemental agreements that are required to complete the construction of the Work in an acceptable manner, including authorized extensions thereof. (Said documents are sometimes referred to as the "contract documents.")
- G. "Contractor" means the person or organization having direct contractual relation with the State for the execution of the "Work." If the Contractor hereunder is comprised of more than one legal entity, each such entity shall be jointly and severally liable hereunder.
- H. "Contract Documents" means this RFP, all addenda to the RFP, the successful Offerors' Technical Proposal, successful Offerors' construction drawings and specifications, other documents that may be referenced in the RFP or written contract, and the written contract.
- I. "Contract Price" means the amount payable to the Contractor under the Contract terms.
- J. "Contract Time" means the number of calendar days shown in the contract documents indicating the time allowed for the completion of the work contemplated

SECTION II – DEFINITIONS

in the Contract

- K. **"Critical Path Method (CPM)" means a scheduling/management tool showing a network or work elements or activities for a construction project.**
- L. **"Day" means calendar day unless otherwise designated.**
- M. **"Department" means the Department of General Services, State of Maryland.**
- N. **"DGS" means the Department of General Services, State of Maryland.**
- O. **"Employee" means all employees of the State of Maryland, whether classified, unclassified, or employed under a personal services contract of employment. It does not include independent contractors or successful Offerors.**
- P. **"Notice to Proceed" means a written notice to the Contractor of the date on or before which they shall begin the prosecution of the Work to be done under the Contract.**
- Q. **"OED" means the Office of Engineering and Design of the Maryland Department of General Services.**
- R. **"OPL" means the Office of Procurement and Logistics of the Maryland Department of General Services.**
- S. **"Owner" means the State of Maryland or that Agency of the State administering the contract.**
- T. **"Payback Period" means the amount of time, in years, that the State will need to pay for the cost of the project, including all planning, engineering, design, construction, start-up, training, on-going maintenance, and interest for the length of the loan period.**
- U. **"Payment Bond" means the security in the form approved by the Department and executed by the Contractor and its surety, subject to Title 17, Subtitle 1 of the State Finance and Procurement Article of the Annotated Code of Maryland.**
- V. **"Performance Bond" means the security in the form approved by the Department and executed by the Contractor and the surety, guaranteeing complete performance of the Contract.**
- W. **"Plans and Specifications" mean the official construction drawings and specifications developed by the Contractor and approved by the State.**
- X. **"Procurement Officer" means that person described by the State Finance and Procurement Article and COMAR, and designated by the Secretary to make decisions with respect to the administration of the work when a project is administered by DGS. When a project is being administered by the Using Agency, that particular Agency will designate its procurement officer. The**

SECTION II – DEFINITIONS

procurement officer will be identified at the job initiation conference.

- Y. "Energy"** means electricity, fuel, chilled water, steam and water, purchased or generated on-site.
- Z. "Operations Costs"** means costs of personnel labor, maintenance materials and contract services, directly associated with operating and maintaining building lighting, HVAC and other energy-consuming systems.

- AA. "Cost Avoidance"** means the difference between current and baseline cost, baseline cost being what current cost would have been had no energy efficiency measures been implemented. Baseline cost also reflects variation in weather severity, occupancy, equipment loads, operating patterns, and energy rates.
- AB. "Repair"** means to restore after injury, deterioration, or wear, to mend, to renovate by such means as appropriate and to supply such materials and labor as necessary to render the item to be repaired sound, solid, true, plumb, square, even, smooth, in compliance with contract or warranty, and fully serviceable; and upon completion of such repair, unless otherwise stated to be in such conditions as to present a first-class finished work, or in instances where the repaired item serves as a base for additional finish, the repaired work must be such as to permit a first-class finish to be applied without extra cost to the State. When the word "repair" is used in connection with machinery or mechanical equipment it shall mean, in addition to the above, rendering the equipment completely serviceable and efficient and ready for normal use for which it was intended originally.
- AC. "RFP"** means the Request for Proposal.
- AD. "Secretary"** means the Secretary of the Department of General Services, State of Maryland.
- AE. "State"** means the State of Maryland, which includes its agencies, departments, units, and its officials and employees when acting within the scope of their authority and in the course of their official duties.
- AF. "Subcontractor"** means only those having a direct contract with the Contractor. It includes one who furnishes material worked to a special design according to the plans and specifications for the "Work." It excludes one who merely finishes material not so worked. It also includes those supplying architectural, engineering, or other design services to the Contractor.

- AG. "Successful Offeror"** means the entity to whom a contract is awarded as a result of this RFP.
- AH. "Surety"** means the corporate body bound as required by law for the full and complete performance of the contract by the Contractor or for the payment by the Contractor to subcontractors and suppliers.

SECTION II – DEFINITIONS

- AI. "Work" means the furnishing of all labor, materials, equipment, services, utilities, Architectural/Engineering and other design services, financing, cost savings guarantee, maintenance, training, and other incidentals necessary to the successful completion of the project and the carrying out of all the duties and obligations imposed upon the Contractor by the Contract.**
- AJ. "Written Notice" means notice in writing if delivered in person to the individual or to the member of the firm or to an office of the corporation to whom it is intended, or delivered by registered mail, or other means permitted by law, including email, to the last business address. For purposes of written notice required to be delivered or served on the State, its agency(ies), department(s), unit(s), employee(s), or officer(s), delivery by electronic means, including email and facsimile, shall not be considered "written notice."**
- AK. "State's Approval" means it is approved in writing by a DGS or Using Agency.**
- AL. "ECM" means Energy Conservation Measures.**
- AM. "ESCO" means Energy Service Company.**
- AN. "MEA" means Maryland Energy Administration.**
- AO. EMM means EmarylandMarketplace**

In the RFP, such terms as "proposer", "developer", and "offeror" are used interchangeably to refer to the offeror prior to selection of the successful offeror. Similarly, such terms as "selected developer", "selected contractor", "selected offeror", or "successful offeror" are used interchangeably to refer to the successful offeror or list of approved offerors subsequent to selection.

SECTION III – GENERAL CONDITIONS

1. CANCELLATION OF RFP OR REJECTION OF OFFERS

- A. The State reserves the right to cancel this Request for Proposal at any time before the date set for receipt of offers.
 - B. The State reserves the right to reject all proposals at any time prior to final award.
-

2. DEBRIEFING AND UNSUCCESSFUL OFFERORS

- A. Unsuccessful Offerors will be notified in writing pursuant to COMAR 21.05.03.06.
- B. Unsuccessful Offerors may request, in writing, a formal debriefing. The request shall be addressed to the Procurement Officer, and received within seven (7) days, following notification of award.

3. DISCREPANCIES

- A. Additional information, clarifications, and amendments desired by a prospective Offeror regarding the RFP shall be requested only in writing from the Procurement Officer no later than ten (10) calendar days prior to the proposal due date. Requests shall include the RFP number and name of project, and shall be directed to the Procurement Officer. **ORAL EXPLANATIONS OR INSTRUCTIONS WILL NOT BE BINDING AND WILL NOT CHANGE THE TERMS OF THIS RFP.** Written addenda will be binding. Any addenda resulting from these requests or amendments will be mailed to all listed holders of the RFP. The Offeror shall acknowledge the receipt of all addenda in its Technical Proposal.
- B. The State reserves the right to amend the RFP at any time prior to preliminary award. Amendments will be incorporated into and handled as addenda. If the time and date for receipt of proposals does not permit incorporation of addenda, the due date will be delayed accordingly, and noted as such within the addenda; or, if necessary, by FAX, Certified Mail or Telephone, and confirmed by the addenda.

4. MODIFICATION AND WITHDRAWAL OF PROPOSALS

- A. Withdrawal of or modifications to proposals shall be effective only if written notice thereof is received prior to the time and the place specified for proposal due date and time in the Request for Proposal. A notice of withdrawal or modification to a proposal must be signed. If an offer is withdrawn in accordance with regulations, the bid security, if any, will be returned to the Offeror.
- B. Any proposal received at the place designated in the solicitation after the time and date set for receipt of offers is late. Any request for withdrawal or request for modification received after the time and date set for receipt of proposals at the place designated is late.
- C. A late proposal, late request for modification, or late request for withdrawal may
- D. only be considered in accordance with COMAR 21.05.02.10.

SECTION III - GENERAL CONDITIONS

5. (INTENTIONALLY LEFT BLANK)

6. POWER OF ATTORNEY

Attorneys-in-fact who sign bid bond, payment bond, and performance bond must file with each bond a certified and effectively dated copy of the power of attorney.

7. LAWS AND REGULATIONS

All applicable Federal and State laws, municipal ordinances, and the rules and regulations of all governmental authorities having jurisdiction over the performance of the work shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though therein written out in full. In addition, the ESCO shall comply with the following:

A. COMAR Provisions:

The awarded ESCO shall comply with the following COMAR provisions which are incorporated into this contract and all Phase I and Phase II contracts:

- | | |
|-----|---|
| 1) | 21.07.01.07 - Maryland Law Prevalis |
| 2) | 21.07.01.17 - Pre-existing Regulations |
| 3) | 21.07.01.19 - Financial Disclosure |
| 4) | 21.07.01.20 - Political Contribution Disclosure |
| 5) | 21.05.08.07 - Bid/Proposal Affidavit |
| 6) | 21.07.01.25 - Contract Affidavit |
| 7) | 21.07.02.05-2 - Prompt Payment of Subcontractors |
| 8) | 21.07.02.05-3 - Retainage |
| 9) | 21.05.08.09 - Mercury Content |
| 10) | 21.07.01.18 - Payment of State Obligations |
| 11) | 21.07.01.05 - Non-Hiring of Officials and Employees |
| 12) | 21.07.01.09 - Contingent Fees |
| 13) | 21.07.01.16 - Suspension of Work |
| 14) | 21.07.01.22 - Compliance With Laws |

B. Prevailing Wage Law:

Awarded Offeror performing Phase II shall comply with Prevailing Wage Law, when the specific contract value is \$500,000 or more. COMAR 21.11.11

8. OBLIGATION OF OFFEROR

At the time of the opening of Proposals, each Offeror shall be presumed to have read and to be thoroughly familiar with the RFP (including all addenda, if any). The failure or omission of any Offeror to examine any form, instruments, or document shall in no way relieve any such Offeror from any obligation in respect to its proposal.

9. NATURE OF THIS CONTRACT

SECTION III – GENERAL CONDITIONS

A. This contract is not a "construction" contract, nor is it a contract for architectural or engineering services, even if, in the course of performance, the Contractor or its subcontractors and/or sub-consultants may perform some construction or architectural/engineering services. This contract is an "energy performance contract" as defined in Section 11-101(h) of the State Finance and Procurement Article of the Annotated Code of Maryland. The State is not responsible for and make no warranty of the accuracy of any information contained in the RFP respecting the State's facilities and the State is not responsible for:

- 1) Subsurface or latent physical conditions at the site differing materially from those indicated in the RFP or otherwise indicated by the State; or
- 2) Unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work provided for in the contract.

B. Offerors acknowledge that the contract which will result from this procurement:

- 1) Is not a contract for "construction" as defined in State Finance and Procurement Article ("SF") Section 11-101(e) of the Code or as defined in COMAR 21.01.02.01b(23);
- 2) Is not a contract for "architectural services" as defined in SF Section 11-1-1(b) of the Code or as defined in COMAR 21.01.02.01B(6);
- 3) Is not a contract for "engineering services" as defined in SF Section 11-1-1(b) of the Code or as defined in COMAR 21.01.02.01B(37); Is not a contract for "maintenance" as defined in COMAR 21.01.02B(53); and
- 4) Is not a contract for "services" as defined in SF Section 11-101(s) of the Code or in COMAR 21.01.02.01b(79). The parties agree that the contract is one undefined in conditions, design, build, maintain, finance, and guarantee cost savings, as provided in the RFP. Therefore, none of the provisions required by law to be included in contracts for "architectural services," "construction," "engineering services," "maintenance," or "services" are applicable to this contract and shall not be implied or incorporated into this contract except to the extent that they are made applicable by express provisions of the contract documents.

10. (INTENTIONALLY LEFT BLANK)

11. PUBLIC INFORMATION ACT

Offerors should give specific attention to the identification of those portions of their proposals which they deem to be confidential, proprietary information or trade secrets, and provide any justification of why such materials, upon request, should not be disclosed by the Owner under the Maryland Public Information Act, State Government Article, Title 10, Subtitle 6, Annotated Code of Maryland.

12. MINORITY BUSINESS ENTERPRISE REQUIREMENTS

SECTION III – GENERAL CONDITIONS

If the project value exceeds \$50,000 based on Phase II construction cost, an overall minimum MBE goal of 25% of the total dollar value of the contract is to be provided directly or indirectly from all certified minority business enterprises. However, individual and unique goals for each project may be assigned that may be different based on potential availability of MBE's for the work and location. Enclosed is a separate package of instructions and documents.

- A. A minimum of seven percent (7%) of the total dollar value of the contract is to be provided directly or indirectly from certified minority business enterprises classified by the certification agency as African American-owned businesses:
- B. A minimum of ten percent (10%) of the total dollar value of the contract is to be provided directly or indirectly from certified minority business enterprises classified by the certification agency as women-owned businesses.

13. ARREARAGE

By submitting a response to this solicitation, a vendor shall be deemed to represent that it is not in arrears in the payment of any obligations due or owing the State of Maryland, including the payment of taxes and employee benefits, and that it shall not become so in arrears during the term of the contract id selected for contract award.

14. ANNOUNCEMENT AND NOTIFICATION OF AWARD

Announcement of award and Successful Offeror notification of award will be published on Em MarylandMarketplace for each task awarded under this contract.

15. EXECUTION OF CONTRACT

- A. After the successful Offeror has been selected, the Department shall forward the format contract and the forms for the Payment and Performance Bonds (Phase II only), Contract Affidavit, and MBE Utilization to the successful Offeror for execution. The Offeror shall execute the contract and return it with fully executed Payment Bond, Performance bond, Contract Affidavit, Guaranteed Energy Savings Insurance (if required), Certificates of Insurance, and MBE Utilization to the Department within 15 days after receipt of same.
 - B. After receipt of the properly executed contract form and other required documents, the Department will execute the Contract within 90 days and forward the successful Offeror a copy. In the event the State fails to execute the Contract within the 90-day period, the Offeror will have, as its only remedy, the option to declare the contract terminated without any liability by the State or to accept an extended period for execution by the State.
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16. FAILURE TO EXECUTE CONTRACT

Failure of the Offeror to execute the contract and file acceptable bonds within the time provided shall be just cause for the payment of the penal sum of the bid bond or other bid security.

SECTION III – GENERAL CONDITIONS

17. PERFORMANCE AND PAYMENT BONDS

The successful Offeror shall, prior to the execution of the Phase II portion of any assigned project, provide performance and payment bonds from a Surety company authorized to do business in the State of Maryland, properly executed in favor of the State of Maryland, each bond to be in an amount not less than 100% of the amount of the sum of the Net ECM cost.

18. OWNER'S RESPONSIBILITIES

- A. The Owner will furnish information and description of the physical characteristics and capacity of equipment to be affected by this project.
- B. Information or services under the Owner's control will be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Work.
- C. The Owner will confirm all verbal instructions to the Contractor in writing.
- D. The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Work by Owner or by separate Contractors, payments and completion, and insurance.
- E. Nothing in this Section shall make the State responsible to the Contractor for information furnished by the State.

19. CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall supervise and direct all phases of the work, using its best skill and attention. The Contractor shall be solely responsible for all feasibility studies, design and construction means methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the contract, including measurements and verification.
- B. The Contractor shall be responsible to the State for the acts and omissions of its employees, subcontractors, and their agents and employees, and other persons performing any of the work.
- C. The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, the contract documents, and as required to maintain building operations, and shall not unreasonably encumber the site with any materials or equipment.
- D. Cutting and Patching of Work (Phase II only):
 - 1) The Contractor shall be responsible for all cutting, fitting, or patching that may be required to complete the Work or to make its several parts fit together properly.
 - 2) The Contractor shall not damage or endanger any portion of the work or the Work of the Owner or any separate Contractor by cutting, patching, or otherwise altering any Work, or by excavation. The Contractor shall not cut

SECTION III – GENERAL CONDITIONS

or otherwise alter the Work of the Owner or any separate Contractor except with the written consent of the Owner and of such separate Contractor. The Contractor shall not unreasonably withhold from the Owner or any separate Contractor his consent to cutting or otherwise altering the Work.

- E. The Contractor shall perform all Work in accordance with the lines, grades, typical cross sections, dimensions, and other data required by the contract documents or as modified by written orders, including the furnishing of all materials, services, implements, machinery, equipment, tools, supplies, transportation, labor, and all other items necessary for the satisfactory prosecution and completion of the project in full compliance with the requirements of the contract documents.
- F. Indemnification: To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the State and its agents and employees from and against all claims, damages, losses and expenses, including but not limited to, attorney's fees arising out of or resulting from the performance of the work, *provided that any such claim, damage, loss, or expense:*
- (a) is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting there from; and
 - (b) is caused in whole or in part by any negligent act or omission or breach of contract of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this paragraph.

- 2) In any and all claims against the State or any of its agents or employees by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or any subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.
- 3) The obligations of the Contractor under this paragraph shall include the liability of its Architects, Engineers, agents, employees, subcontractors at any tier and their employees, agents and subcontractors arising out of (a) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (b) the giving of or the failure to give directions or instruction by any of the above, or the performance of any of the work required under the Contract.

SECTION III – GENERAL CONDITIONS

20. DRAWINGS AND SPECIFICATIONS

- A. **Drawings:** The Contractor shall do no Work without approved contract drawings, specifications, and/or instructions. For an approved project, drawings shall be provided by the Contractor as required in Section IV - Scope of Work. Drawings shall in general be drawn to scale with major equipment and location dimensions clearly indicated, and symbols used shall indicate materials and structural and mechanical requirements. Drawings shall be in conformance with the DGS Procedures Manual for Professional Services (latest edition). When symbols are used, those parts of the drawings are of necessity diagrammatic; and it is not possible to indicate all connections, fitting, fastenings, etc., which are required to be furnished for the proper execution of the Work. Diagrammatic indications of piping, ductwork, conduit and similar items in the Work are subject to field adjustment in order to obtain proper grading, fitting, passage over, under or past obstructions, to avoid exposure in finished rooms and unsightly and obstructing conditions. The Contractor shall make these adjustments, at no increased cost to the State.
- 1) **Copies Furnished:** The Contractor shall furnish the State five (8) copies of the drawings and specifications.
 - 2) **Copies at the Site:** The Contractor shall keep in the job site office a complete set of all drawings, specifications, shop drawings, schedules, etc., in good order and available to the State. Additionally, one set of all contract drawings shall be maintained as/built drawings. As-built drawings shall be marked upon by the Contractor in the field on a regular basis to record all changes in the Work as they occur, and the exact location of all exposed and concealed pipe runs, valves, plugged outlets, cleanouts, and other control points including electrical conduits and ducts, in such manner as will provide a complete, accurate "as-built" record. The location of pipes or control points concealed underground, under concrete, in chases or above hung ceilings shall be dimensioned. "As-built" drawings, both hard copy and on CD, shall be delivered to the State, as a condition precedent to final acceptance of Work.
 - 3) **Ownership:** All documents remain the property of the State. They must not be used on other Work. They shall be returned to the State upon its completion.
- B. **Large Scale Detail Drawings:** The Contractor shall furnish, when the State directs, additional instructions, in the form of large scale developments of the drawings used for bidding, or to amplify the specifications for the proper execution of the Work. These shall be true developments of the bidding documents and reasonably inferable there from. The Work shall be executed in conformity therewith.
- C. **Dimensions:** The Contractor shall carefully check all dimensions prior to execution of the particular Work. Dimensions for items to be fitted into construction conditions at the job will be taken at the job and will be the responsibility of the Contractor. No extra will be allowed by reason of Work requiring adjustments in order to accommodate the particular item of equipment.

SECTION III – GENERAL CONDITIONS

- D. Specifications: Proper CSI formatted construction specifications shall be produced and submitted for the State's approval.

21. SHOP DRAWINGS AND SUBMITTALS

- A. After checking and verifying all field measurements and after complying with applicable procedures specified in the contract documents, the Contractor shall submit to the State for review and approval, in accordance with the Contractor's schedule, shop drawings or other submittals which will bear a stamp or specific written indication that the Contractor has satisfied their responsibility under the contract documents with respect to the review of such submissions. The data on the shop drawing will be completed with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the State to review the information as required. These drawings shall be prepared in conformity with the best practice and standards for the trade concerned. Due regard shall be given to speed and economy of fabrication and erection.
- B. All shop drawings must show the name of the project and the Department contract number.
- C. Size of Drawings: All shop drawings and details submitted to the State for approval shall be printed on sheets of the same size as the contract drawings specified in the Department of General Services Procedures Manual for Professional Services (latest edition). When a standard of a fabricator is of such size to print more than one drawing on a sheet of the size of the required drawings, this is acceptable. Sheets large than the required drawing size will not be accepted except when specifically permitted by the Department of General Services. Shop details supplied on a sheet of letter size (8-1/2-in. by 11-in.) are acceptable for schedules and small details.
- D. Items for Which Shop Drawings Will Be Required: Shop drawings shall be required for all items which are specifically fabricated for the work or when the assembly of several items is required for a working unit. Shop drawings are required for all reinforcing and structural steel, specially made or cut masonry units, miscellaneous metal work, specially made millwork, plaster molds, or moldings, marble and slate, special rough hardware and all heating, ventilating, piping, plumbing and electrical items requiring special fabrication or detailed connections including refrigeration, elevators, dumb waiters, laboratory equipment, ducts, etc.
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- E. Copies Required: Contractor shall supply eight (8) copies, one (1) copy for the State's consulting engineer's file and two (2) copies for the Department, five (5) copies shall be returned to the Contractor after review.
- F. Examination and Approval: The State will examine and return shop drawings with reasonable promptness, noting desired corrections, or accepting or rejecting them. The Contractor shall assume a minimum review time of two (3) weeks when submitting items for the state's approval.
- G. Field Dimensions and Conditions: The State is not responsible for the check of dimensions or existing conditions in the field. This is the sole responsibility of the

SECTION III – GENERAL CONDITIONS

Contractor. No consideration will be given to change orders due to existing field conditions.

- H. **Resubmission:** When the State notes desired corrections, or rejects the drawings, the Contractor shall resubmit the drawings with corrective changes.
- I. **Contractor's Responsibility:** Unless the Contractor has, in writing, notified the State to the contrary at the time of the submission, the State may assume that shop drawings and submittals are in conformity with the contract documents and do not involve any change in the Contract price or any change which will alter the space within the structure or alter the nature of the building from that contemplated by the contract documents.
- J. **State's Notations:** Should the Contractor consider any rejection or State's notation on the shop drawings to cause a change in the cost of the work from that required by the contract documents, then the Contractor shall desist from further action relative to the item he questions and shall notify the State, in writing, within five days of the additional or less cost involved. No Work shall be executed until the entire matter is clarified and the Contractor is ordered by the State to proceed. Failure of the Contractor to serve written notice as above required shall constitute a waiver of any claim in relation thereto. Similarly, should the State's notation or change involve less Work than is covered by the contract documents, the Contractor shall allow the State an equitable credit resulting from the change in the Work.

22. COST AND PRICE CERTIFICATIONS

Cost and Price Certification, for Phase II only.

A. The Contractor by submitting cost or price information certifies that, to the best knowledge, the information submitted is accurate, complete, and current as of a mutually determined specified date prior to the conclusion of any price discussions or negotiations for:

“(1) A negotiated contract, if the total contract price is expected to exceed \$100,000, or a smaller amount set by the procurement office; or

“(2) A change order or contract modification, expected to exceed \$100,000, or smaller amount set by the procurement officer.

“B. The price under this contract and any change order or modification hereunder, including profit or fee, shall be adjusted to exclude any significant price increases occurring because the Contractor furnished cost or price information which, as of the date agreed upon between the parties, was inaccurate, incomplete, or not current.”

23. INTENT OF THE CONTRACT DOCUMENTS

It is the intent of the contract documents to require the Contractor to perform all of the work necessary to complete the project.

SECTION III – GENERAL CONDITIONS

24. ORDER OF PRECEDENCE AMONG CONTRACT DOCUMENTS

- A.** In the event of a conflict between provisions of the contract documents, the conflict shall be resolved in favor of the State in accordance with the Contractor's undertaking to be responsible for all design, investigation, site conditions, construction, financing, and maintenance, as provided in the scope of work, and in accordance with the Contractor's express agreement that Contractor shall be entitled to no payment, reimbursement, damages, costs, expenses or compensation for any reason or cause except from cost savings.
- B.** In the event of a conflict between contract provisions which cannot be resolved under Subsection A above, the provisions of the following documents shall take precedence in this order:
 - 1) the Contract form signed by the parties;
 - 2) this RFP;
 - 3) the approved drawings and specifications; and
 - 4) Contractor's Phase II Proposal for the specific project.

25. CONDITIONS AFFECTING THE WORK

The Contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and location of the work and the general and local conditions which can affect the work or the cost thereof. Any failure by the Contractor to do so will not relieve the Contractor from responsibility for successfully performing the work without additional expense to the State. The Contractor agrees not to place any credence in any understanding or representation concerning conditions made by any State employee or agents prior to the execution of this Contract, unless such understanding or representations are expressly stated in the Contract.

26. CHANGES IN THE WORK

- A.** The Procurement Officer may, at any time, without notice to the sureties, if any, by written order designated or indicted to be a change order, make any change in the work within the general scope of the Contract.
- B.** Any other written order or an oral order (which terms as used in this paragraph shall include direction, instruction, interpretation or determination from the Procurement Officer) which causes any such change, shall be treated as a change order under this clause, provided that the Contractor gives the Procurement Officer written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a change order.
- C.** Except as herein provided, no order, statement, or conduct of the Procurement Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment hereunder.
- D.** Subject to paragraph "C" above, if any change under this clause causes an

SECTION III – GENERAL CONDITIONS

increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this Contract, whether or not changed by any order, an equitable adjustment shall be made and the Contract modified in writing accordingly; provided, however, that except for claims based on defective specifications, no claim for any change of method or manner of performance of the work shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as therein required; and further provided that the State shall have no liability to Contractor except from guaranteed cost savings.

- E. If the Contractor intends to assert a claim for an equitable adjustment under this clause, it shall, within 30 days after receipt of a written change order in the drawings and specifications or the furnishing of written notice of change of method or manner of performance of the work, submit to the Procurement Officer a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended by the State. The statement of claim hereunder may be included in the notice of change in the method or manner of performance of the work.
- F. No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment (100%) under this Contract.

27. MODIFICATION OF CONTRACT PRICE (Phase II Only)

When changes in the work require modification of the Contract Price by change order, which modification shall be accomplished as follows: Any modifications to Phase II work or price must be approved by Procurement Officer, within the limits of their authority, or the Board of Public Works.

- A. No modification to the contract price shall be allowed unless the Owner requests additional services, and this work is approved by the procurement officer and/or BPW. Under no circumstances shall the contract price be increased due to field conditions different than assumed by the Contractor, or additional design required due to errors or omissions of Contractor and/or architectural/engineering sub-consultants.
- B. For all changes in the work to be performed by a subcontractor, the Contractor shall furnish the subcontractor's fully-itemized breakdown of quantities, prices, man-hours and hourly rates which shall bear the original signature of a representative of the subcontractor authorized to act for the subcontractor. The Contractor shall furnish a detailed explanation and justification for the proposed change. If requested by the Owner, the Contractor shall submit proposals from suppliers or other supporting data required to substantiate costs.
- C. Modification of the Contractor Price, when required, shall be determined as follows (Phase II only):
 - 1) When unit prices are stated in the Contract, by application of such unit prices.
 - 2) A lump sum price, if agreed upon by both the State and Contractor.

SECTION III – GENERAL CONDITIONS

Payment to the Contractor shall be added to the project financed capital cost amount (unless capital funding is available). The revised capital cost amount will not be paid to the Contractor until the construction is 100% completed and accepted by the State.

- 3) If job conditions, or the extent of a nature of the change, warrant it, or if the State and the Contractor fail to agree upon a lump sum price or the application of unit prices to determine the cost of any proposed change, the work may be done at the State's option on the basis of a Force Account as hereinafter stated under Paragraph 77. Under these conditions, the State shall have the right to issue an order for the Work to be performed and the Contractor shall proceed as directed under the provisions of Paragraph 26 and 77.
- 4) If the change involves only a credit, the Contract Price will be reduced by the amount it would have cost the Contractor if the work omitted had not been eliminated; including overhead and profit, however, the Contractor and the subcontractor will be allowed to retain a sum not in excess of three percent (3%) for handling.
- 5) If the change involves both a credit and a debit, both sums shall be shown and the two sums balanced to determine the adjusted total cost or credit. No allowance to the Contractor shall be made or allowed for loss of anticipated profits on account of any changes of the work.
- 6) Unless otherwise specified, the allowable mark-up for combined overhead and profit for work performed by the Contractor with their own forces will be based upon the monetary value of the work in accordance with the following schedule (excluding items included in overhead and profit):

<u>PROFIT</u>	<u>VALUE OF WORK</u>	<u>COMBINED OVERHEAD AND</u>
	\$0 - \$25,000	15%
	Over \$25,000	Negotiated but not more than 15%

- 7) For work performed by a subcontractor with its own forces, the percentages for combined overhead and profit for a subcontractor will be as stated in subparagraph (6) above. On work partly or solely performed by a subcontractor, the Contractor will be allowed five percent (5%) of the total cost of the subcontractor's labor, materials overhead and profit, including taxes and insurance on labor required by statute. On all changes in the work defined in this RFP, no Contractor or subcontractor will be allowed any expenses, overhead or profit for employment of another Contractor to perform work for them.
- 8) On all change in the work, the Contractor will be reimbursed for its expenditures for Workmen's Compensation Insurance, Social Security Taxes, and Unemployment Compensation Taxes covering persons actually engaged upon the Work and the actual increased cost of bonds.

SECTION III – GENERAL CONDITIONS

- 9) The cost of foremen and superintendents may be added only when the change order makes necessary the hiring of additional supervisory personnel or makes their employment for time additional to that required by the basic Contract.
- 10) The Contractor shall be allowed the actual cost for rental of machine power tools or special equipment, including fuel and lubricants which are necessary to execute the work required on the change, but no percentages shall be added to this cost. The rental rate is to be agreed upon by the State and the Contractor; the rate shall relate generally to the latest as filed by the Associated Equipment Distributors.
- 11) If the Contractor and the State cannot agree as to the extent the contract time shall be increased for extra work or the extent the Contract time shall be reduced for Work omitted by the State, the increase or decrease, as the case may be, shall be determined by the Procurement Officer. Any disagreement with this decision may be appealed by the Contractor under the Disputes Clause.
- 12) Notwithstanding any provisions in the contract documents, the State shall not be liable to the Contractor, for any Phase II work, except from guaranteed cost savings.

- D. The allowable percentages of cost for overhead and profit are deemed to include, but not be limited to, the following:
Job supervision (project manager, construction foreman/supervisor) and field office expense required by the Contract, expenses for timekeepers, clerks and watchmen, cost of correspondence of any kind, and insurance not specifically mentioned herein, all expenses in connection with the maintenance and operation of the field office, use of small tools or equipment to job location, and incidental job burdens. No percentage allowances will be made for maintenance or operation of Contractor's regularly-established principal office, branch office or similar facilities.

28. UNAUTHORIZED WORK

The Contractor shall not be paid for any work not authorized in writing by the State.

29. CONFORMITY WITH CONTRACT REQUIREMENTS

- A. ~~All work performed and all materials furnished shall be in conformity with the Contract requirements.~~
- B. In the event the Owner finds the materials or the finished product in which the materials are used for the work performed are not in complete conformity with the Contract requirements and have resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.
- C. In the event the Owner finds the materials or the finished product in which the materials are used are not in complete conformity with the Contract requirements,

SECTION III – GENERAL CONDITIONS

but have resulted in a satisfactory product, the Owner shall then make a determination if the work shall be accepted. In this event, the Owner will document the basis of acceptance by a Change Order which will provide for an appropriate adjustment in the Contract price. Contractor is at risk for non-compliant work. Retroactive Change Orders are not acceptable.

30. ADJACENT WORK

- A. The State shall have the right, at any time, to contract for and/or perform work on, near, over or under the work covered by this Contract. In addition, other work may be performed under the jurisdiction of another State agency. The Contractor shall cooperate fully with such other Contractors and carefully fit their own work to such other work as may be directed by the Procurement Officer.
- B. The Contractor agrees that in event of dispute as to cooperation or coordination with adjacent Contractors the State will act as referee and decisions made by the State will be binding. The Contractor agrees to make no claims against the State for any inconvenience, delay or loss experienced because of the presence and operations of other Contractors. State will be fully cooperative with all Contractors to resolve the matter.

31. CONTROL BY THE CONTRACTOR

The Contractor shall constantly maintain efficient professional supervision of the work, using current project/construction management procedures. They shall carefully study and compare all drawings, specifications, and other instructions and check them against conditions existing or being constructed on the project. Contractor shall immediately report to the State any error, inconsistency or omission which he may discover. The Contractor's project manager shall be on site at all times during the construction period, unless otherwise directed by the Using Agency.

32. COOPERATION WITH UTILITIES

- A. It is understood and agreed that the Contractor has considered in its proposal all of the permanent and temporary utility appurtenances in their present or relocated positions and that no additional compensation will be allowed for normal delays, inconvenience, or damage sustained by them due to any interference from the said utility appurtenances, the operation of moving them, or the making of new connections thereto, if required for installation and operation of the Contractor's equipment.
- B. The Contractor shall have responsibility for notifying all affected utility companies prior to performing any work on their utilities and shall cooperate with them in achieving the desired results. All damage to utility facilities caused by the Contractor's operations shall be the responsibility of the Contractor.
- C. At points where the Contractor's operations are adjacent to properties of railway, telegraph, telephone, water and power companies, or are adjacent to other property, damage to which might result in expense, loss or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made by the Contractor. Contractor is responsible to notify the

SECTION III – GENERAL CONDITIONS

Miss Utility, prior to start of work.

- D. The Contractor shall cooperate with the owners of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication or rearrangement work may be reduced to a minimum and that services rendered by those parties will not be unnecessarily interrupted.
- E. In the event of interruption to utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with the said authority in the restoration of service. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

33. AUTHORITY AND DUTIES OF STATE INSPECTORS

- A. State inspectors and other State personnel will be authorized to inspect all work done and all material furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication or manufacture of the materials to be used. The inspector is not authorized to revoke, alter, or waive any requirements of the Contract, or to approve or accept any portion of the complete project. The inspectors are authorized to call to the attention of the Contractor any failure of the work or materials to conform to the Contract. The inspectors are authorized to reject materials or suspend the work until any questions at issue can be referred to and decided by the Procurement Officer. Inspectors will perform their duties at such times and in such manner as will not unnecessarily impede progress on the Contract.
- B. The inspector will in no case act as foreman or perform other duties for the Contractor, or interfere with the management of the work by the latter.
- C. Any advice which the inspector may give the Contractor shall not be construed as binding the State in any way, or releasing the Contractor from fulfilling all the terms of the Contract. The duty of the inspector on the project is to observe the progress of the work and to report any deviations from the requirements of the contract documents; however, should the inspector fail to report any such deviation from the Contract requirements, this does not release the Contractor from fulfilling all of the terms of the Contract. Actions of the inspectors are for the benefit of the State only.
- D. Where there is disagreement between the Contractor and the inspector, the inspector will advise the Procurement officer who will prepare and deliver in writing to the Contractor, by mail or otherwise, a written order suspending the work and explaining the reason for such shutdown. As soon as the inspector is advised of the delivery of the shutdown order, the inspector will immediately leave the site of the work and any work performed during the inspector's absence will not be accepted or paid for and may be required to be removed and disposed of at the Contractor's expense.

34. INSPECTION OF THE WORK

SECTION III – GENERAL CONDITIONS

- A. All work, including the fabrication and source of supply, is subject to observation by the Department, and those agencies required by law to inspect specific items. The State is not responsible for the actions of county, municipal, or other local officials.
 - B. The Contractor shall provide facilities for access and inspection as required by the State.
-

- C. If the specifications, the Department's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the State timely notice of its readiness for inspection, and if the inspection is by another authority, the date fixed for such inspection. Inspections by the State shall be made promptly and where practicable at the source of supply. Any work covered without approval of the Department must, if required by the Consulting Engineer or the Department, be uncovered for examination at the Contractor's expense.

35. REMOVAL OF DEFECTIVE WORK

- A. All work and materials which do not conform to the requirements of the Contract will be considered unacceptable.
- B. Any unacceptable or defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause, found to exist shall be removed and replaced by work and materials which shall conform to the Contract requirements or shall be remedied otherwise in an acceptable manner authorized by the Procurement Officer.
- C. Upon failure on the part of the Contractor to comply promptly with any order of the State, made under the provisions of this Section, the State will have the authority to cause defective or unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to cause the costs to be deducted from any monies due or to become due the Contractor under this Contract.

36. MAINTENANCE OF WORK DURING CONSTRUCTION

- A. The Contractor shall maintain the work during construction and until acceptance. This maintenance shall be continuous and effective, prosecuted with adequate equipment and forces to the end that all parts of the work be kept in satisfactory condition at all times and protected from damage of any kind from external sources.
- B. All cost of maintenance work during construction and before final acceptance shall be included in the price proposal and the Contractor will not be paid any additional amount for such work.
- D. In the event that the Contractor's work is halted by the State for failure to comply with the provisions of the Contract, the Contractor shall maintain the entire project as provided herein as may be necessary during the period of suspended work or until the Contractor has been declared in default.

SECTION III – GENERAL CONDITIONS

37. FAILURE TO MAINTAIN ENTIRE PROJECT

Failure on the part of the Contractor, at any time, to adequately maintain installed equipment shall result in the State notifying the Contractor to comply with the required maintenance provisions of the Contract. In the event that the Contractor fails to remedy unsatisfactory maintenance within 24 hours after receipt of such notice, the State will immediately proceed with adequate forces and equipment to maintain the project, and the entire cost of this maintenance will be deducted from funds due the Contractor.

38. STATE'S RIGHT TO DO WORK

If the Contractor should neglect to execute the Work properly or fail to perform any provision of this Contract, the State may make good such deficiencies and may deduct the cost thereof from the funds then or thereafter due the Contractor.

39. MATERIALS - GENERAL

- A. All materials shall meet all quality requirements of the Contract. In order to expedite the inspection and testing of materials, the Contractor shall notify the State in writing of the sources from which they propose to obtain all materials requiring approval, testing, inspection, or certification prior to incorporation into the work as soon as possible after receipt of notification of award of the Contract.
- B. Materials include all manufactured products and processed and unprocessed natural substances required for completion of the Contract. The Contractor, in accepting the Contract, is assumed to be thoroughly familiar with the materials required and their limitation as to use, and requirements for connection, setting, maintenance, and operation. Whenever an article, material or equipment is specified and a fastening, furring, connection (including utility connections), access hole, fishing closure piece, bed or accessory is normally considered essential to its installation in good quality construction, such shall be included as if fully specified. Nothing in this RFP shall be interpreted as authorizing any work in any manner contrary to applicable laws, codes, or regulations.
- C. Approval. All materials submitted in the Contractor's specifications and as required in this RFP are subject to the State's approval as to conformity with the type, quality, design, color, etc. No work for which approval is necessary shall be completed until written approval is given by the State. Approval of a subcontractor or supplier as such does not constitute approval of a material which is other than that included in the specifications.
- D. New Materials. Unless otherwise specified, all materials shall be new. Old materials must not be used as substitutes for new, regardless of condition or repair, unless approved in writing by the Procurement Officer.
- E. Quality. Unless otherwise specified, all materials shall be of the best quality of the respective kinds.
- F. Samples. The Contractor shall furnish for approval all samples as directed. The materials used shall be the same as the approved samples.

SECTION III - GENERAL CONDITIONS

G. Proof of Quality. The Contractor shall, if requested, furnish satisfactory evidence as to the kind and quality of materials either before or after installation. The Contractor shall pay for any tests or inspections called for in the specifications and such tests as may be deemed necessary for "substitutions," as set forth in these General Conditions.

H. Century Compliant. The Contractor warrants that the products (computers, controls, software, etc.) provided or systems developed under this Contract are "Century Compliant" meaning that the product

1) is able to process date data accurately - including date century recognition, calculations that accommodate same century and multi-century formulas and date values (including leap year factors), and date data interface values that reflect the century-when used either in a stand-alone configuration or in combination with other "Century Compliant" products used by the State.

2) Will not abnormally terminate its function or provide or cause invalid or incorrect results due incompatibility with the calendar year.

In addition to any other warranties applicable to this Contract or any remedies otherwise available to the State, the Contractor agreed to promptly repair or replace any product furnished under this contract that is not "Century Compliant," provided the State gives notice within a reasonable time following discovery of such failure.

I. Standard Specifications. When no specification is cited and the quality, processing, composition or method of installation of a thing is only generally referred to, then:

1) For items not otherwise specified below, the latest edition of the applicable American Society for Testing and Materials specification is the applicable specification.

2) For items generally considered as plumbing and those items requiring plumbing connections, the applicable portions of the latest edition of the Building Officials and Code Administrators code are the applicable specification.

3) For items generally considered as heating, refrigerating, air-conditioning, or ventilating, the applicable portions of the latest four editions of the ASHRAE Handbook published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., are the applicable specification.

4) For items generally considered as site work, the applicable portions of the Maryland State Highway Administration standard specifications is the applicable specification.

SECTION III – GENERAL CONDITIONS

- 5) For items generally considered as electrical, the applicable provisions of the latest edition of the National Electrical code are the applicable specification.
- 6) For items generally considered as fire protection, the applicable portion of the latest edition of the National Fire Protection Association Code is the applicable specification.

40. STORAGE AND HANDLING OF MATERIALS

- A. Materials shall be so stored as to assure the preservation of their quality and acceptability for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the project site may be used for storage purposes and for the placing of the Contractor's plant and equipment; such storage areas must be restored to their original condition by the Contractor at his expense.
 - 1) All mechanical and/or electrical equipment delivered to the job site shall be stored on pedestals, above ground and under roof or other approved covering. All enclosures for equipment shall be weatherproof. Any motors, which are not totally enclosed, and dry type transformers that are involved in the work, shall be stored in a heated area with a minimum temperature of fifty degrees Fahrenheit (50°F).
 - 2) All valves shall be stored under roof on wood pedestals, aboveground. All insulation shall be stored under roof or in trailers, adequately protected from the weather. The Contractor shall follow all written instructions and recommendations of the manufacturer on oiling, protection and maintenance of equipment during storage. It shall be the Contractor's complete responsibility for the storage and care of the equipment and materials. Material not properly stored prior to installation shall not be considered for payment.
 - 3) Materials shall be handled in such a manner as to preserve their quality and acceptability for the work.
 - 4) Contractor shall confine his tools and equipment and the storage of materials to the area delineated in the contract documents as to the "Limit of Contract."
 - 5) Contractor shall not load or permit any part of a structure to be loaded with a weight that will endanger the safety of the structure or any part thereof.
- B. Explosives. Explosives shall not be used on projects covered under this contract.
- C. Paints.
 - 1) Oil base paints and inflammable liquids shall not be stored in large

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quantities on the project. Containers shall be limited to five gallon size. Any liquid with a flash point of less than one hundred (100) degrees F shall be contained in safety cans, UL approved. Liquid with a higher flash point shall be stored in rigid cans.

- 2) Oily rags, waste, etc., must be removed from the work site at the close of each working day.

41. SUBSTITUTIONS

- A. Should the Contractor desire to substitute another material for one or more specified by name in the RFP or the approved specifications, the Contractor shall apply in writing, for such permission and state the credit or extra involved by the use of such material. The State will not consider the substitution of any material different in type of construction methods unless such substitution affects a benefit to the State.
- B. The Contractor shall not submit for approval materials other than those specified without a written statement that such a substitution is proposed. Approval of a "substitute material" by the State when the Contractor has not designated such materials as a "substitute," shall not be binding on the State nor release Contractor from any obligations of his Contract, unless the State approves such "substitution" in writing expressly acknowledging the substitution.

42. APPROVED EQUALS

The terms "Or Equal," "Equal," "Approved Equal," where used, are used as synonyms in this RFP. They are implied in reference to all named manufacturers in the RFP and specifications unless otherwise stated. Only materials fully equal in all details will be considered. The Department is the final judge of the equality. The Department does not represent or warrant under any circumstances, including by use of the words "or equal," that there exists an equal to any item specified.

43. CONTRACTOR'S OPTIONS

When several products or manufacturers are named in the specifications and approved by the State for the same purpose or use, then the Contractor may select any of those so named. However, all of the units required for, and used in, the project must be the same in material and manufacture.

44. TESTS

- A. If the contract documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the work to be inspected, tested, or approved, the Contractor shall give the State timely notice of its readiness so the State may observe such inspection, testing, or approval. The Contractor shall bear all costs of such inspections, tests, or approvals.

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- B.** If the State determines that any work requires special inspection, testing, or approval which the contract documents do not include, the State will instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided in A., above. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the contract documents, the Contractor shall bear all costs thereof, including compensation for the State's additional services made necessary by such failure; otherwise the State shall bear such costs, and an equitable adjustment will be made in the Contract price.
- C.** Required certificates of inspection, testing or approval shall be obtained by the Contractor and promptly delivered by them to the State. The work shall not be considered 100% complete until such certifications are in the possession of the State.

45. BUY AMERICAN STEEL

Contractor shall comply with the requirements of Title 17, Subtitle 3 of the State Finance and Procurement Article of the Annotated Code of Maryland.

46. LAWS TO BE OBSERVED

The Contractor hereby represents and warrants that:

- A.** It is qualified to do business in the State of Maryland and that it will take such action as, from time to time hereafter, may be necessary to remain so qualified;
- B.** It is not in arrears with respect to the payment of any monies due and owing the State of Maryland, or any department or unit thereof, including but not limited to the payment of taxes and employee benefits, and that it shall not become so in arrears during the term of this Contract;
- C.** It shall comply with all federal, State, and local laws, regulations, and ordinances applicable to its activities and obligations under this Contract; and
- D.** It shall obtain, at its expense, all licenses, permits, insurance, and government approvals, if any, necessary to the performance of its obligations under this Contract.

In addition, if the Contractor observes that the drawings and specifications are at variance with any law, they shall promptly notify the State, and make any necessary changes to the drawings and specifications to bring them into compliance with the law at no extra cost to the State. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the State, it shall bear all costs arising there from.

47. PERMITS AND LICENSES

Contractor will file with the appropriate local authorities, drawings and

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specifications and any pertinent data reasonably proper for their information. The Contractor will be required to pay all necessary fees to local authorities for inspection or for the privilege or right to execute the work as called for in the contract documents and Contractor shall include the cost of said fees in its bid.

48. PATENTED DEVICES, MATERIALS AND PROCESSES

- A. The Contractor shall pay for all royalties and license fees. They shall defend all suits or claims for infringement of any patent rights and shall save the State harmless from loss on account thereof.
- B. When a particular process or the product of a particular manufacturer or manufacturers is specified or proposed to be used that may be an infringement of a patent, the Contractor will at his option: (1) procure for the State the right to use the applicable process or product; (2) replace the process or product with a non-infringing process or product complying with the specifications; or (3) modify the process or product so it become non-infringing and performs in a similar manner to the original item.

49. LAND, AIR AND WATER POLLUTION

- A. If requested or required, the Contractor must submit evidence to the Department that the governing Federal, State, and local air pollution criteria will be, and were, met. This evidence and related documents will be retained by the Department for on-site examination.
- B. If the performance of all or any part of the work is suspended, delayed, or interrupted due to an order of a court of competent jurisdiction as a result of environmental litigation, as defined below, the Procurement Officer, at the request of the Contractor, shall determine whether the order is due in any part to the acts or omissions of the Contractor required by the State as one of the terms of this Contract. If it is determined that the order is not due in any part to acts or omissions of the Contractor required by the terms of this Contract, such suspension, delay, or interruption shall be considered as if ordered by the Procurement Officer in the administration of this Contract under the terms of the "Suspension of Work" clause of this Contract. The period of such suspension, delay, or interruption shall be considered reasonable, and an adjustment shall be made for any increase in the cost of performance of this Contract (excluding profit) as provided in that clause, subject to all the provisions thereof.
- C. The term "environmental litigation," as used herein, means a lawsuit alleging that the work will have an adverse effect on the environment or that the State has not duly considered, either substantively or procedurally, the effect of the work on the environment.

50. CONSTRUCTION INSURANCE REQUIREMENTS

- A. Insurance During Construction

SECTION III – GENERAL CONDITIONS

- 1) The Contractor and his subcontractors shall purchase and maintain comprehensive third-party legal liability insurance and other such insurance as is appropriate for the work to be performed on the project. Further, the Contractor shall be responsible of the maintenance of this insurance whether the work is performed directly by the Contractor, by any subcontractor, by any person employed by the Contractor or any subcontractor, or by anyone for whose acts the Contractor may be liable. This insurance shall include protection for:
 - (a) Claims arising from Worker's Compensation statutes or similar employee benefit acts, or third-party legal liability claims arising from bodily injury, sickness and disease, or death of Contractor's employees. The minimum limits of such coverage shall be as required by law.
 - (b) Third-party legal liability claims against the Contractor arising from the operations of the Contractor, subcontractors, and supplies with such protection extended to provide comprehensive coverage, including personal injury, completed operations, explosion and collapse hazard, and underground hazard. The minimum combined limit for personal injury and property damage liability shall be \$1,000,000 per occurrence and \$2,000,000 in the aggregate, unless higher limits are stated elsewhere in the contract documents.
 - (c) Third-party legal liability claims arising from bodily injury and/or damage to property of others from the ownership, maintenance or use of any motor vehicle, both on-site and off site. The minimum combined limit for personal injury and property damage liability shall be: \$1,000,000 per occurrence and \$2,000,000 in the aggregate.
- 2) The Contractor shall purchase and maintain property insurance (Builder's Risk) covering the project, including improvements to real property and goods and materials on the site to be incorporated into the project. Such property insurance shall be for the full insurable value of the property covered and shall be written on an "All Risk" basis covering physical loss and damage including theft, vandalism and malicious mischief, collapse, water damage, and such other perils as may be applicable to the project. Such insurance shall include the interest of the Owner, the General Contractor, and all subcontractors as their interest may appear.

- B. General: All insurance required shall be purchased and maintained with a company or companies lawfully authorized to do business in the State of Maryland. Such insurance shall be for limits of liability as specified for the project or legally required, whichever is greater. All required insurance policies shall be endorsed to provide thirty (30) days prior written notice by certified mail, or any material change, cancellation, or non-renewal to:

Department of General Services
Contract Services Division

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**301 West Preston Street, Room M-7
Baltimore, Maryland 21201**

- C. All required insurance shall be maintained until the State has fully accepted the work required under the Contract. Failure to obtain or to maintain the required insurance or to submit the required proof of insurance shall be grounds for termination of the Contract for default.**

51. ASSIGNMENTS

The Contractor shall not assign the Contract and shall not assign any monies due or to become due to him hereunder, without the previous written consent of the State.

52. SEPARATE CONTRACTS

- A. The State reserves the right to let other contracts in connection with this work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his work with theirs.**
- B. If any part of the Contractor's work depends on proper execution or results upon the work of any other Contractor, the Contractor shall inspect and promptly report to the State any defects in such work that render it unsuitable for such proper execution and results. Their failure to so inspect and report shall constitute an acceptance of the other Contractor's work as fit and proper for the reception of his work, except as to the defects which may develop in the other Contractor's work after the execution of his work.**
- C. To ensure the proper execution of his subsequent work, the Contractor shall measure work already in place and shall at once report to the Procurement Officer any discrepancy between the executed work and the drawings.**

53. RELATIONSHIP OF CONTRACTOR TO PUBLIC OFFICIALS AND EMPLOYEES

- A. In carrying out any of the provisions of the Contract, or in exercising any power or authority granted to them by or within the scope of the Contract, there shall be no liability upon the Procurement Officer or other authorized representatives of the State, it being understood that in all such matters they act solely as agents and representatives of the State.**
- ~~B. The State may terminate the right of the Contractor to proceed under this Contract if it is found by the Procurement Officer that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer or employee of the State with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such contract; the facts upon which the Procurement Officer makes such findings may be reviewed in any competent court.~~**
- C. In the event this Contract is terminated as provided in paragraph B hereof, the**

SECTION III – GENERAL CONDITIONS

State shall be entitled (1) to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the Contract by the Contractor, and (2) in addition to any other damages to which it may be entitled by law, to exemplary damages in an amount (as determined by the Procurement Officer) which shall be not less than three nor more than ten times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee.

- D. The rights and remedies of the State provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this Contract.
- E. Non hiring of State employees – No official or employee of the State of Maryland, as defined under State Government Article, §15-102, Annotated Code of Maryland, whose duties as such official or employee include matters relating to or affecting the subject matter of this contract, shall during the pendency and term of this contract and while serving as an official or employee of the State become or be an employee of the contractor or any entity that is subcontractor to this contract.

54. NO WAIVER OF LEGAL RIGHTS

- A. The State shall not be precluded or stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work and payment therefore, from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate or certificate is untrue or is incorrectly made, or from showing that the work or materials do not in fact conform to the requirements of the Contract. The State shall not be precluded or stopped, notwithstanding any such measurement, estimate, or certificate and payment from recovering from the Contractor or his sureties, or both, such damage as it may sustain by reason of his failure to comply with the terms of the Contract. Neither the acceptance by the State, or any representative of the State, nor any payment for or acceptance of the whole or any part of the work, nor any extension of time, nor any possession taken by the State shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to damages.
- B. The waiver by the State of any breach of the Contract shall not be held to be a waiver of any other or subsequent breach.

55. COVENANT AGAINST CONTINGENT FEES

The contractor, architect, or engineer (as applicable) warrants that it has not employed any person, partnership, corporation, or other entity, other than a bona fide employee or agent working for the contractor, architect, or engineer, to solicit or secure this agreement, and that it has not paid or agreed to pay any person, partnership, corporation, or other entity, other than a bona fide employee or agent, any fee or any other consideration contingent on the making of this agreement.

56. ASSIGNMENT OF ANTI-TRUST CLAIMS

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The Contractor sells, transfers, and assigns to the State of Maryland all rights, title and interest of and in and to any causes of action arising at any time before the date of this assignment or during the performance of this Contract under the anti-trust Laws of the United States, including Section 1 of the Sherman Act, and the Antitrust Law of Maryland relating to the purchase by him or the State of Maryland of any products from any supplier or source whatever that is incorporated in the structure built under the terms of this agreement. The Contractor hereby certifies that the above causes of action are lawfully owned and that no previous assignment of same has been made nor has the same heretofore been attached or pledged in any manner whatsoever.

57. FEDERAL PARTICIPATION

When the United States Government pays all or any portion of the cost of a project, the work shall be subject to the inspection of the appropriate Federal agency. Such inspection shall in no sense make the Federal government a party to this Contract, and will not interfere, in any way, with the rights of either party hereunder.

58. DISPUTES

- A. This Contract is subject to the provisions of State Finance and Procurement Article, Title 15, Subtitle 2, Annotated Code of Maryland and COMAR 21.10. (Administrative and Civil Remedies.)
- B. Except as may otherwise be provided in the Act or aforesaid regulations, all disputes arising under or as a result of a breach of this Contract which are not disposed of by mutual agreement shall be resolved in accordance with this clause.
- C. As used herein, "claim" means a written demand or assertion by one of the parties seeking, as a legal right, the payment of money, adjustment or interpretation of contract terms, or other relief, arising under or relating to this Contract.
 - 1) A voucher, invoice, or request for payment that is not in dispute when submitted is not a claim under this clause. However, where the submission is subsequently not acted upon in a reasonable time, or disputed either as to liability or amount, it may be converted to a claim for the purpose of this clause.
 - 2) A claim by a Contractor shall be made in writing and submitted to the Procurement Officer for decision in consultation with the office of the Attorney General. ~~A claim by the State shall be the subject of a decision by the Procurement Officer.~~
- D. Unless a lesser period is provided by applicable statute, regulation, or this Contract, the Contractor must file a written notice of claim with the Procurement Officer within 30 days after the basis for the claim is known or should have been known, whichever is earlier. Contemporaneously with or within 30 days of the filing of a notice of claim, no later than the date of final payment under the Contract, the Contractor must submit to the Procurement Officer its written claim containing the information specified in COMAR 21.10.04.02.

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- E. When a controversy cannot be resolved by mutual agreement, the Contractor shall submit a written request for final decision to the Procurement Officer. The written request shall set forth all the facts surrounding the controversy.**
- F. In connection with any claim under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his claim to the Procurement Officer.**
- G. The Procurement Officer will render a written decision on all claims. This decision will be furnished to the Contractor, by certified mail, return receipt requested, or by any other method that provides evidence of the receipt. The Procurement Officer's decision will be deemed the final action of the State. The decision shall be furnished to the Contractor by certified mail, return receipt requested, or by any other method that provides evidence of receipt. The Procurement Officer's decision shall be deemed the final action of the State.**
- H. The Procurement Officer's decision will be final and conclusive unless the Contractor files a written appeal with the Maryland State Board of Contract Appeals within 30 days of receipt of said decision.**
- I. Pending resolution of a claim, the Contractor shall proceed diligently with the performance of the Contract in accordance with the Procurement Officer's decision or interpretation.**

59. ENTIRE AGREEMENT

The Contract constitutes the entire agreement between the parties hereto and other communications between the parties prior to the execution of the Contract, whether written or oral, with reference to the subject matter of the Contract, are superseded by the agreements contained herein. The Contract may not be modified, amended, changed or altered except by written instrument executed by the parties hereto and approved by the Procurement Officer.

60. NOTICE TO PROCEED (Phase I and Phase II)

After the Contract has been executed, the State will issue to the Contractor a "Notice to Proceed" and this notice will stipulate that date on or before which the Contractor is expected to begin work. Any preliminary work started, or materials ordered, before receipt of the "Notice to Proceed," shall be at the risk of the Contractor.

61. PROSECUTION OF THE WORK, DELAYS AND EXTENSION OF TIME

- A. It is imperative that the Contractor complete the work within the time limits specified and agreed to in the contract.**
- B. The date of commencement of the work is the date established in a Notice to Proceed signed by the Project Manager.**
- C. The Contractor agrees to prosecute the work continuously and diligently and no charges or claims shall be made by it for any delays or hindrances from any cause whatsoever during the progress of any portion of the work specified in this**

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Contract. Time extensions will be granted only for excusable delays that arise from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the State in either its sovereign or contractual capacity, acts of another Contractor in the performance of a contract with the State, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, or delays of subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of either the Contractor or the subcontractors or suppliers.

62. PUBLIC CONVENIENCE AND SAFETY

The Contractor at all times shall conduct the work in such a manner as to create the least practicable obstruction to all forms of traffic. The convenience of the general public, tenants, and of the residents along and/or adjacent to the improvement shall be respected. Material stored upon the project shall be placed so as to cause a minimum of obstruction to the public. Sprinkling shall be performed at the direction of the Procurement Officer. The Contractor shall, unless otherwise specified, provide and maintain in passable condition such temporary access, roads and bridges as may be necessary to accommodate traffic diverted from the project under construction, or using the project under construction and shall provide and maintain in a safe condition temporary approaches to, and crossings of, the project. Existing facilities planned to be removed, but which might be of service to the public during construction are not to be disturbed until other and adequate provisions are made. Fire hydrants on or adjacent to the project shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within 15 feet of any such hydrant. Work closed down for the winter or at any other times shall be left entirely accessible at all points to fire apparatus. All footways, gutters, sewer inlets and portions of the project under construction shall not be obstructed more than is absolutely necessary.

63. BARRICADES AND WARNING SIGNS

The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other control devices, and shall take all necessary precautions for the protection of the work and safety of the agency and its employees.

64. PRESERVATION, PROTECTION, AND RESTORATION OF PROPERTY

- A. The Contractor shall continuously maintain adequate protection of all his work from damage and shall protect the State property from injury or loss arising in connection with this Contract. He shall repair and indemnify against any such damage, injury or loss, except such as may be directly due to errors in the contract documents or caused by agents or employees of the State. He shall adequately protect adjacent property as provided by law and the contract documents.
- B. The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of workmen and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, rod hoists, well holes, elevator hatchways, scaffolding, window openings, stairways, and falling

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materials.

65. PROGRESS SCHEDULE AND TIME (Phase II only)

- A. Preparation of Work Schedule. The Contractor shall prepare a Critical Path Method (CPM) schedule setting forth his dates for completing various portions of the work. ~~Included among the tasks set forth on the schedule shall be the critical design completion dates, submittal dates (to the State), and dates for return of the approved submittals.~~ The schedule shall be reviewed by the State for approval of the time within which the State must evaluate the Contractor's submittals. The State's approval of the Contractor's schedule does not constitute an approval of the entire schedule; it merely constitutes an approval of that portion of the schedule that relates to the State's review of submittals. Offeror shall assume a turnaround time of 3 weeks for submittal review by the State.
- B. Preparation of Critical Path Method Schedules. The Contractor shall submit a CPM to DGS before the Notice to Proceed is issued. The CPM will be updated at least monthly, or more often if dictated by circumstances, to reflect changes and variances in the progress of the project.

66. SUSPENSION OF THE WORK

- A. The Procurement Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for a period of time as he may determine to be appropriate for the convenience of the State.
- B. If the performance of all or any part of the work is for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Procurement Officer in the administration of the Contract, or by his failure to act within the time specified in this Contract (or if no time is specified, within a reasonable time), the Contract period may be extended for a reasonable amount of time.
- C. No request for an extension under this clause will be allowed:
- 1) for any costs incurred more than 20 days before the Contractor shall have notified the Procurement Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim, resulting from a suspension order), and
 - 2) unless the request is asserted in writing no more than 20 days after the termination of a suspension, delay, or interruption, but not later than the date of final payment under the Contract.

67. STATE'S RIGHT TO TERMINATE FOR ITS CONVENIENCE

The performance of work under this Contract may be terminated by the State in accordance with this clause in whole, or from time to time in part, whenever the State shall determine that such termination is in the best interest of the State. The State will pay reasonable costs associated with this contract that the Contractor has incurred up to the

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date of termination and all reasonable costs associated with termination of the Contract. However, the Contractor shall not be reimbursed for any anticipatory profits that have not been earned up to the date of termination. Termination hereunder, including the determination of the rights and obligations of the parties, shall be governed by the provisions of COMAR 21.07.01.12A(2).

68. TERMINATION FOR DEFAULT

If the Contractor fails to fulfill its obligations under this Contract properly and on time, or otherwise violates any provision of the Contract, the State may terminate the Contract by written notice to the Contractor. The notice will specify the acts or omissions relied upon as cause for termination. All finished or unfinished work provided by the Contractor will, at the State's option, become the State's property. The State will pay the Contractor fair and equitable compensation for satisfactory performance prior to receipt of Notice of Termination, less the amount of damages caused by Contractor's breach. If the damages are more than the compensation payable to the Contractor, the Contractor shall remain liable after termination and the State can affirmatively collect damages. Termination hereunder, including the determination of the rights and obligations of the parties, shall be governed by the provisions of COMAR 21.07.01.11B.

69. PARTIAL ACCEPTANCE

- A. If during the construction of work the State desires to occupy any portion of the project, the State will have the right, at its sole option and discretion, to occupy and use those portions of the project which is, in the opinion of the Procurement Officer, can be used for their intended purpose; provided that the conditions of occupancy and use are established and the responsibilities of the Contractor and the State for maintenance, heat, light, utilities, and insurance are mutually agreed to by the Contractor and the State.
- B. Partial occupancy shall in no way relieve the Contractor of his responsibilities under the Contract.

70. FAILURE TO COMPLETE ON TIME/LIQUIDATED DAMAGES

- A. Time is an essential element of the Contract and it is important that the work be vigorously prosecuted until completion.
- B. For each day that any work shall remain uncompleted beyond the time(s) specified elsewhere in the Contract, the Contractor shall be liable for liquidated damages in the amount(s) specified in the contract, provided, however, that due account shall be taken of any adjustment of specified completion time(s) for completion of work as granted by approved change orders.
- C. The State will deduct and retain out of the monies due to or become due to the Contractor hereunder the amount of liquidated damages, and in case the amounts due the Contractor are less than the amount of such damages, the Contractor shall be liable to the State for the difference.

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71. SUBSTANTIAL COMPLETION AND FINAL INSPECTION

- A. When the installation is substantially completed, the Contractor shall notify the Procurement Officer that the work will be ready for final inspection and test on a definite date. Sufficient notice shall be given to permit the Procurement Officer to schedule the final inspection with the State's consulting engineer.
- B. On the basis of the inspection if the Procurement Officer and consulting engineer determine that the work is substantially complete and the project can be occupied or used for its intended purpose, the Procurement Officer will establish the date of substantial completion and will state the responsibilities of the State and the Contractor for maintenance, heat, utilities, and insurance.
- C. The Procurement Officer will fix the time within which the Contractor shall complete any remaining items of work which will be indicated on a list (punch list) prepared by the State. If the Contractor fails to complete the remaining items so listed in the time stipulated, the State will have the undisputed right to complete the work and deduct any cost incurred from any monies related under the Contract.

72. CLEANING-UP

The Contractor shall at all times keep the construction area, including storage areas used by them, free from accumulations of waste material or rubbish and prior to completion of the work remove any rubbish from the premises and all tools, scaffolding, equipment, and materials not the property of the State. Upon completion of the construction, the Contractor shall leave the work and premises in a clean, neat and workmanlike condition satisfactory to the Procurement Officer.

73. GUARANTEES (Phase II only)

The Contractor guarantees for the life of the Contract, commencing on the date fixed by the parties: (normally at Master Lease Program Loan Takedown, unless otherwise noted).

- A. That the work contains no faulty or imperfect material or equipment or any imperfect, careless, or unskilled workmanship.
- B. That all mechanical and electrical equipment, machines, devices, etc., shall be adequate for the use to which they are intended, have been installed in accordance with specifications, all applicable codes and manufacturers recommendations, and shall operate with ordinary care and attention in a satisfactory and efficient manner.
- C. That the Contractor will re-execute, correct, repair, or remove and replace with proper work, without cost to the State, any work found not to be as guaranteed by this Section. The Contractor shall also make good all damages caused to other work or materials in the process of complying with this Section.
- D. That the entire work shall be water-tight and leak-proof.

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- E. That the actual adjusted cost avoidance for the life of the Contract will be no less than the guaranteed savings as defined in the Contract.

74. NOTICE TO STATE FOR LABOR DISPUTES

- A. Whenever the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this Contract, the Contractor shall immediately give notice thereof, including all relevant information with respect thereto, to the Procurement Officer.
- B. The Contractor agrees to insert the substance of this clause, including this Paragraph B., in any subcontract hereunder as to which a labor dispute may delay the timely performance of this Contract; except that each such subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify his next higher tier subcontractor, or the prime Contractor, as the case may be, of all relevant information with respect to such dispute.

75. SCOPE OF PAYMENT

- A. The State agrees to pay the Contractor on the following basis as compensation for the Contractor's services:
 - 1) Total ECM capital cost, as quoted in the Contractor's Final Phase I Report, (Phase II proposal), including engineering feasibility study, preparation of comprehensive energy plan, design, construction documents, construction, training and start-up. This amount is to be payable to the Contractor upon acceptance by the State at 100% completion of the construction phase of the project, and subject to the loan takedown schedule set by the State's Guaranteed Energy Performance Lease Line of Credit. The date the Contractor is paid constitutes the start of the guarantee period. The cost or contract value of any ECMs not operating to the expected performance levels will be the responsibility of the ESCO.
 - 2) Yearly maintenance/service costs as quoted in the Contractor's Final Phase I Report, (Phase II Proposal), for the duration of the contract, and payable by the Owner.
- B. The State's total yearly cost for the repayment of the project capital cost including interest and yearly maintenance costs, cost of M & V, cost of guarantee, and cost of Project manager shall not be greater than the guaranteed energy and energy related savings for the duration of the contract.
- C.
 - 1) Should the recommendations contained in the engineering feasibility study (Phase I) fall to meet the State's objectives for the project (as outlined in Section I and Section III of this RFP), or is deemed unreasonable, unworkable, or cost excessive by the State, the State will have no

SECTION III – GENERAL CONDITIONS

obligation to pay the Contractor the fee associated with the study.

- 2) Should the recommendations, including capital cost, yearly maintenance cost, and guaranteed savings, meet or exceed the State's objectives (as outlined in Section I and Section III of this RFP) as determined by the State, and the State elects to proceed with Phase II of the project, the cost of the study shall be included in the Contractor's ECM capital cost, and financed by the State, either through the Contractor or privately. In either case, the payment to the Contractor shall be the same as noted in A1 and A2 above.
- 3) Should the recommendations contained in the engineering feasibility study/comprehensive energy efficiency and guaranteed savings program (Phase I study) meet or exceed the State's objectives and all contract requirements as determined by the State and the State, for any reason, does not proceed with the implementation phase (Phase II, design and construction, and maintenance of the ECMs), then the ESCO shall be paid the previously agreed upon cost of the Phase I engineering study. The cost of the study is to be included in the ESCO's Phase I letter of intent upon assignment of each project.

D. After completion of project phases noted above, and upon demand, the Contractor shall certify to the State in writing that, in accordance with contractual arrangements, suppliers and subcontractors:

- 1) have been paid from the proceeds of the financing arranged by the Contractor or the State, and
- 2) no liens have been filed or are pending against the installed equipment.

E. The State may withhold payment under this Contract if it determines that any part of the contract, including completion of punch list items, has not been completed satisfactorily. A letter notifying the Contractor of the outstanding work will be submitted by the State. Neither payment made to the Contractor nor partial or entire use of the work by the State shall be an acceptance of any work or materials not in accordance with this Contract.

F. The State has the right to withhold from payments due to the Contractor any amounts the State claims to be owed the State by the Contractor.

G. In applying for all payments, the Contractor shall submit in addition to the above a certificate that he has paid:

- 1) all labor to date;
- 2) all vendors and material suppliers in full for all items received;
- 3) all subcontractors in full, less the retained amount; and

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- 4) all insurance premiums.

76. FORCE ACCOUNT WORK (Phase II only)

A. When the Contractor is required to perform work as a result of additions or changes to the Contract for which there are no applicable unit prices in the Contract, the Department and Contractor shall attempt to agree to a price for the performance of such work. ~~If an agreement cannot be reached, the Department~~ may require the Contractor to do such work on a force account basis to be compensated in accordance with the following:

- 1) Labor. For all labor, including design services, and for foremen in direct charge of the specific operations, the Contractor shall receive the actual wages for each and every hour that said persons are actually engaged in such work. The Contractor shall receive the actual costs paid to, or in behalf of, workers by reason of subsistence and travel allowances, health and welfare benefits, pension fund benefits or other benefits, when such amounts are required by collective bargaining agreement or other employment contract generally applicable to the classes of labor employed on the work.
- 2) Materials. For materials accepted by the State and used, the Contractor shall receive the actual cost of such materials delivered on the work, including transportation paid by him (exclusive of machinery rentals as hereinafter set forth).
- 3) Equipment. For any machinery or special equipment (other than small tools, whether rented or owned), the Contractor shall receive the rates agreed upon in writing before such work is begun, or the Contractor shall receive those rates which may be specified elsewhere in the Contract. For purpose of definition, equipment with a new cost of \$500 or less will be considered small tools.
- 4) Materials and Supplies Not Incorporated in the Work. For materials and supplies expended in the performance of the work (excluding those required for rented equipment) and approved by the State, the Contractor shall receive the actual cost of such materials and supplies used.
- 5) Bond, Insurance, and Tax. For bond premiums, property damage, liability, and workmen's compensation insurance premiums, unemployment insurance contributions and social security taxes on the force account work, the Contractor and State shall determine an equitable percent to be applied against the labor cost (premium pay and fringes excluded).
- 6) Subcontractors. For work done solely by a subcontractor, the subcontractor's cost shall be determined as stipulated in Subparagraphs 1.) through 5.), above. The allowable percentages for combined overhead and profit for the subcontractor shall be as stipulated hereinafter under Subparagraph 8. The Contractor shall be entitled to an allowance of five percent (5%) of the subcontractor's total cost of doing the work.

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- 7) **Superintendence.** No additional allowance shall be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided.
- 8) **Contractor's Overhead and Profit.** The Contractor will be paid overhead and profit for work performed by his own forces as a percentage thereof, at the following scale:

<u>VALUE OF WORK</u>	<u>COMBINED OVERHEAD AND PROFIT</u>
\$0 - \$25,000	15%
Over \$25,000	Negotiated; maximum of 15%

- B. **Compensation.** The compensation as set forth above shall be received by the Contractor as payment in full for the work done on a force account basis in accordance with all other provisions in the Contract respecting payment. At the end of each day, the Contractor's representative and the Procurement Officer shall compare records of the cost of work as ordered on a force account basis.
- C. **Statements.** No payment will be made for work performed on a force account basis until the Contractor furnishes the Procurement Officer duplicate itemized statements of the cost of such force account work detailed as to the following:
- 1) Name, classification, date, daily hours, total hours, rate, and extension for such laborer, foreman.
 - 2) Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and equipment.
 - 3) Quantities of materials, prices, and extensions.
 - 4) Transportation of materials.
 - 5) Cost of property damage, liability and workmen's compensation insurance premiums, unemployment insurance contributions, and social security tax.
 - 6) Payments of items under Subparagraphs 3. and 4. above, shall be accompanied by original receipted invoices for materials used and transportation charges. If, however, the materials used in the force account work are not specifically purchased for such work but are taken from the Contractor's stock, then in lieu of the original invoices, the statement shall contain or be accompanied by an affidavit of the Contractor which shall certify that such materials were taken from his stock, that the quantity claimed was actually used and that the price and transportation of the material as claimed represent actual cost.

77. DEDUCTIONS FOR UNCORRECTED WORK (Phase II only)

If the State deems it inexpedient to correct work injured or done not in accordance with the Contract, an equitable deduction from the payment shall be made thereof.

SECTION III - GENERAL CONDITIONS

78. CORRECTION OF WORK NOT IN ACCORDANCE WITH THE CONTRACT (Phase II only)

- A. The Contractor shall promptly remove from the premises all materials condemned by the State as failing to conform to the Contract, whether incorporated in the Work or not. The Contractor shall promptly replace and re-execute his own work ~~in accordance with the Contract and without expense to the State and shall bear~~ the expense of making good all work of other Contractors destroyed or damaged by such removal or replacement.
- B. If the Contractor does not remove such condemned work and materials within a reasonable time, the State may remove them and may store the materials at the expense of the Contractor. If the Contractor does not pay the expense of such removal, the State may, sell such materials and shall account for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor.

79. RETENTION OF RECORDS

- A. The Contractor shall retain and maintain all records and documents relating to this Contract for three years after final payment by the State hereunder or any applicable statute of limitations, whichever is longer, and shall make them available for inspection and audit by authorized representatives of the State, including the procurement officer or designee, at all reasonable times.
- B. The Contractor further agrees to include in all their subcontracts hereunder a provision to the effect that the subcontractor agrees that the State or any of its duly authorized representatives shall, until the expiration of three years after final payment under the subcontract, have access to and the right to examine any *directly pertinent books, documents, papers, and records of such subcontractor*, involving transactions related to the subcontract.

80. EMPLOYEES AND CONSULTANTS

- A. Qualification of Employees: Only personnel thoroughly trained and skilled in the task assigned them may be employed on any portion of the work. Any employee found to be unskilled or untrained in his work shall be removed from the work.
- B. Licensed Employees: When Municipal, County, State, or Federal laws require that certain personnel (electricians, plumbers, architects, engineers, etc.) be licensed, then all such personnel employed on the work shall be so licensed.
- C. Quantity of Labor: The Contractor shall employ on the work, at all times, sufficient personnel to complete the work within the time stated in the Contract.
- D. Work Areas. The Contractor shall confine the operations of his employees to the limits as provided by law, ordinance, permits, or direction of the Department.

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E. Methods and Quality:

- 1) All workmanship shall be of good quality. Whenever the method of the work or manner of procedure is not specifically stated in the contract documents, then it is intended that the best standard practice shall be followed. Recommendations of the manufacturers of approved materials shall be considered as a part of these specifications and all materials shall be applied, installed, connected, erected, used, cleaned and conditioned as so called for thereby. This, however, does not remove any requirement in these specifications to add to the manufacturer's recommendations.
- 2) All materials shall be accurately assembled, set, etc., and when so required in good construction, shall be true to line, even, square, plumb, level and regularly spaced, coursed, etc. Under no circumstances, either in new or old work shall any material be applied over another which has not been thoroughly cleaned, sanded, or otherwise treated so as not to impair the finish, adhesion, or efficiency of the next applied item.
- 3) All methods, procedures, and results are subject to the State's approval as to finished result to be obtained.

F. Scheduling:

- 1) The Contractor shall so schedule the work as to ensure efficient and uninterrupted progress and to hold to an absolute minimum the cutting and patching of new work. All cutting, patching, and digging necessary to the execution of the work is included.
- 2) The Contractor shall so schedule the scope of work (including design, construction, maintenance, training, etc.) that each installation or portion of the work shall be properly coordinated with all other portions of the work as required for a complete installation, all according to accepted good design and construction practice, and in accordance with the project schedule.

- G. Superintendent. The Contractor shall keep on the project site, at all times during its progress, a competent, English-speaking Superintendent and any necessary assistants, all approved by the Department prior to commencement of the work. The Contractor shall submit in writing to the Department the name of the person it intends to employ as superintendent for the execution of this Contract with a statement of the proposed superintendent's qualifications. This data will be reviewed by the Department and an approval or rejection given in writing. Persons who have previously provided unsatisfactory work executed for the State of Maryland, or who are without proper qualifications, will not be approved. Should it be necessary to change the Superintendent, this procedure will be repeated. A single Superintendent will be permitted to superintend two or more jobs located at the same institution or close to each other only when approved by the Department in writing. The Superintendent shall represent the Contractor. All directions given to the Superintendent shall be as binding as if given to the Contractor. Directions shall be confirmed in writing on written request from the contractor. Should the Superintendent be complained of by the Department for cause, he shall be removed from the work and a new Superintendent obtained and approved as

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described above.

- H. **Discipline.** The Contractor shall at all times enforce strict discipline and good order among their employees and shall not employ or permit to remain on the work any unfit person. They shall enforce all instructions relative to use of water, heat, power, no smoking, and control and use of fires as required by law, and the State. Employees must not be allowed to loiter on the premises before or after working hours.

- I. **Employee Safety.** The Contractor shall designate a responsible member of his organization, on the work, whose duty it shall be, in addition to his other duties, to prevent accidents and to enforce the standards required under the Contract. The name and position of the person so designated shall be reported to the Department by the Contractor at the commencement of the work.

81. NON-DISCRIMINATION IN EMPLOYMENT

- A. Contractor agrees:

- 1) not to discriminate in any manner against an employee or applicant for employment because of race, color, religion, creed, age, sex, marital status, national origin, ancestry or disability of a qualified individual with a disability;
- 2) to include a provision similar to subsection 1), above, in any subcontract except a subcontract for standard commercial supplies or raw materials; and
- 3) to post and to cause subcontractors to post, in conspicuous places available to employees and applicants for employment, notices setting forth the substance of this subsection A.

- B. Contractor shall be subject to and shall comply with all other requirements of Section 13-219 of the State Finance and Procurement Article of the Annotated Code of Maryland.

- C. Contractor shall comply with all other applicable federal, State, and local laws, regulations and ordinances respecting illegal discrimination and civil rights.

- D. The Contractor, subcontractors, and agents of both insofar as possible, shall secure labor through the Maryland Job Service of the Maryland Department of Economic and Employment Development, except where the Contractor has entered into a collective bargaining agreement under which labor is to be provided by the union. In that case, the Contractor is not required to conform to these provisions unless the Contractor and the union arrange with the Maryland Job Service for referral of such labor as they may mutually agree shall be referred. The Contractor shall be the sole judge of the competency or fitness and for satisfactory service of any laborer referred to him by the Maryland Job Service.

82. SUBCONTRACTS

SECTION III - GENERAL CONDITIONS

- A. The Contractor shall, as soon as practicable and before the execution of the Contract, notify the Department in writing, of the name of subcontractors proposed for the principal parts of the work and for such others as the State may direct and shall not employ any that the Department may object to as incompetent or unfit.
- B. The Contractor agrees that the Contractor is as fully responsible to the State for the acts and omissions of their subcontractors at any time and of persons either directly employed by them, as it is for the acts and omissions of persons directly employed by the subcontractors.
- C. Nothing contained in the contract documents shall create any contractual relation between any subcontractor and the State, and nothing in the contract documents is intended to make the subcontractor a beneficiary of the Contract between the State and the Contractor.

83. RELATION OF CONTRACTOR AND SUBCONTRACTOR

- A. The Contractor agrees to bind every subcontractor and will see that every subcontractor agrees to be bound by the terms of the Contract documents, as far as applicable to its work, unless specifically noted to the contrary in a subcontract approved in writing as adequate by the Department.
- B. The Contractor agrees and shall incorporate by reference or otherwise include these General Conditions and the following provisions in all subcontracts and supply contracts applicable to the work. Subcontractor agrees to be bound to the Contractor by the terms of the Agreement, General Conditions, Drawings and Specifications, and to assume toward them all obligations and responsibilities that they, by those documents, assumes toward the State.
- C. The subcontractor agrees, upon completion of their work, to promptly pay all labor, material suppliers, vendors, subcontractors and others, to permit simultaneous final payment by the Contractor.
- D. The Contractor and the subcontractor agree that nothing in the Contract shall create any obligation on the part of the State to pay to or to see to the payment of any sums to any subcontractor.

84. CONSTRUCTION SAFETY AND HEALTH STANDARDS (Phase II only)

~~It is a condition of this Contract, and shall be made a condition of each subcontract~~ entered into pursuant to this Contract, that the Contractor and any subcontractor shall not require any laborer or mechanic employed in performance of this Contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to their health or safety, as determined under construction safety and health standards, laws and regulations of the locality in which the work is done, the State, and the Federal government.

85. MANDATORY CONTRACTUAL TERMS

By submitting an offer in response to this RFP, offerors, if selected for award, shall be

SECTION III – GENERAL CONDITIONS

deemed to have accepted the terms of this RFP and the Contract–Attachment A. Any exceptions to the RFP or the Contract must be clearly identified in the Executive Summary of the Technical Proposal. A proposal that takes exception to these terms may be rejected.

86. VERIFICATION OF REGISTRATION AND TAX PAYMENT

Before a corporation can do business in the State of Maryland it must be registered with the Department of Assessments and Taxation, State Office Building, Room 803, 301 West Preston Street, Baltimore Maryland 21201. It is strongly recommended that any potential offeror complete registration prior to the due date for receipt of proposals. An offeror's failure to complete registration with the Department of Assessments and Taxation may disqualify an otherwise successful offeror from final consideration and recommendation for contract award.

87. BID PROPOSAL AFFIDAVIT

Proposals submitted by offerors must be accompanied by a completed Bid/Proposal Affidavit. A copy of this Affidavit is included as Attachment B of this RFP.

88. STATE ETHICS LAW

The State Ethics Law, State Government Article §15-508, applies to persons that are involved in the drafting of specifications. In general, and with certain exceptions, such persons are prohibited from participating in the implementation of those specifications whether as a prime or subcontractor. The State Ethics Law may apply to contracts to Contractors under the RFP. Please see §15-508 for further detail.

89. ELECTRONIC FUNDS TRANSFER

Payments to Contractors by Electronic Funds Transfer (EFT):

(Pursuant to: Section 7-227.1, State Finance and Procurement Article, Maryland Code;COMAR 25.03.02.02.). Every solicitation for a contract expected to exceed \$200,000 that requires Board of Public Works approval must include the following clause:

PAYMENT TO CONTRACTORS BY ELECTRONIC FUND TRANSFER (EFT): (For bids over \$200,000)

By submitting a response to this solicitation, the Bidder/Offeror agrees to accept payments by electronic funds transfer unless the State Comptroller's Office grants an exemption. The selected Bidder/Offeror shall register using the attached form COT/GAD X-10 Vendor Electronic Funds (EFT) Registration Request Form. Any request for exemption must be submitted to the State Comptroller's Office for approval at the address specified on the COT/GAD X-10 form and must include the business identification information as stated on the form and include the reason for the exemption.

SECTION IV – SCOPE OF WORK

1. GENERAL

A. The ESCO shall, for each project:

- 1) Provide all necessary study, investigation, design, construction, training, monitoring and verification, and maintenance for the complete installation of ECM's under the conditions required in this RFP.**
- 2) Provide construction drawings, specifications, and equipment submittals for review and approval by the State of Maryland.**
- 3) Provide optional project financing, directly to the State that will allow the State of Maryland to pay all costs out of the savings resulting from the installation of the proposed system. Any third party financing arrangements must be made between the ESCO and the third party.**
- 4) Provide a program that will result in guaranteed energy cost avoidance, sufficient to finance the cost of the program over the term of the contract.**
- 5) Study all possible energy conservation measures.**
- 6) Provide Certificate of Insurance and bond prior to any funding of the projects.**
- 7) Provide training to facility maintenance/operations and DGS personnel. Training shall address the purpose, operation and maintenance of the equipment and systems installed throughout the project.**
- 8) Provide monitoring and validation of energy consumption throughout the contract period. This may also include the requirement for measurements to be recorded during the Phase I study phase.**
- 9) Provide service/maintenance, for everything installed, throughout the contract period.**

B. All engineering and design work shall be performed in accordance with the DGS Procedures Manual for Architects and Engineers (latest edition) unless noted otherwise in the RFP.

C. All energy audits, feasibility studies, plans and specifications shall be prepared by Professional Engineers licensed in the State of Maryland at the time of ESCO's submittal. ~~A certified energy manager is required on each project.~~

D. Any as-built drawings of the facility shall be made available to the ESCO upon assignment of a project. The State does not guarantee the accuracy or completeness of these documents. The ESCO shall consult with the facility maintenance/operations staff and DGS as to any conditions which might exist not shown in the drawings. The selected ESCO shall be responsible for verifying the accuracy of the information given to him by the State. The ESCO shall also field verify existing conditions as necessary to accurately design and locate the installation of new equipment and retrofit or expansion of existing systems. The State is not liable under any circumstances for differing site conditions.

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E. This RFP is a "Performance Specification" and not a "Design Specification".

2. SPECIFIC

A. Method of Project Assignment

- 1) All Phase I projects will be awarded based on competitive proposals for Phase I of an EPC by each ESCO.
- 2) All ESCO's on the IDC list will receive written notification of the intent of an agency to enter into an EPC 10 working days prior to the initial meeting with the agency, DGS and/or MEA representatives.
 - (a) Agencies interested in an Energy Performance Contract will coordinate with DGS and/or MEA, where appropriate, to gather pertinent data and establish goals.
- 3) The purpose of the initial meeting is to introduce the goals of the agency to the ESCOs as well as to discuss the facility purpose and usage patterns. ESCOs will be notified of the date of the official site visit at this meeting.
- 4) Each ESCO will have 30 days after the initial meeting to submit a proposal for Phase I services to the agency/DGS. The ESCO agrees that its Phase II project will comply with the promises made in the Phase I proposal in response to the following and evaluation factors. In this proposal for Phase I, the following information must be included. The proposal will be scored on the criteria listed below. An ESCO will be selected based on the proposal with the highest score.
 - (a) Guaranteed Cost Avoidance for the facility for a 13 year term with an amortization at an interest rate determined by the State. (This may include energy and operational savings.)
 - (b) Guaranteed percentage energy reduction.
 - (c) Proposed list of ECM's to be included in the project. This can be a generalized list. However, major equipment upgrades or replacements should be included specifically.
 - (d) Proposed overhead and profit rates on both subcontract prices and internal-ESCO prices.
 - (e) Proposal for new and/or renewable technologies as an energy conservation measure. This must include specific applications at the proposed facility. No points will be given for ESCO's representing a cursory look at the potential application of new technologies.
 - (f) Proposed Phase I schedule.
 - (g) Cost of the Phase I study.

5) Provide plan to install sub-meters for all buildings (gas, electric, water, etc.) to measure savings. Include cost and description of such equipment. Provide plan to document assumptions used for baseline creation. This may require the installation of sub-meters or data loggers during the Phase

4) Assess the feasibility of the replacement/upgrade of electrical, steam, and/or natural gas distribution systems.

3) Identify and quantify deferred maintenance items that qualify as energy cost reduction measures to be included in the project. Provide comprehensive technical analysis including but not limited to: building envelope (roofing, windows, glass, walls, insulation, etc.) automatic temperature control systems, HVAC and HVAC controls, electrical systems, energy efficient lighting retrofit, chiller and boiler operation, including distribution systems, insulation, window filming, glass replacement, ductwork cleaning, coils, etc. All systems will be evaluated and supporting documentation provided regardless of inclusion in the project. Items selected to be included in the project shall meet the requirements of the RFP and support any Master Plan for the facility.

2) Identify, recommend and provide (if approved) potential Energy Conservation/Efficiency Measures (ECM) for the facility.

1) Conduct a comprehensive energy audit, a detailed engineering feasibility study of the energy/utility systems serving the facility, and effectively analyze all existing systems, equipment, operations and utility costs. Identify technical solutions in order to maximize energy and cost savings as well as operation and maintenance savings. (Operational and maintenance savings must be clearly defined by the agency and the States' project manager. Facility labor costs savings associated with all upgrades may only be included by approval from the agency and project manager.) Further, provide a definitive estimate of all costs and savings expected to result from the proposed energy conservation/efficiency measures. The ESCO shall consult utility/fuel supply companies prior to effectively conducting analysis of existing systems and utility costs. The ESCO shall also field verify existing conditions to accurately design and locate the installation of new equipment, retrofits or expansion of existing systems.

B. Phase I: For each assigned project, ESCO shall develop the proposed comprehensive energy efficiency and guaranteed savings program. ESCO shall:

6) Once an ESCO successfully completes Phase I of an assigned project, if Phase I meets the State's objectives, and if the State elects to proceed with Phase II, the same ESCO will implement the energy efficiency program under Phase II. The Phase II scope of work, capital cost, guaranteed savings and yearly maintenance costs will require final contract approval by the Board of Public Works.

(h) Proposed method of Guaranty in accordance with Section IV.C.2.

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I study portion. This should be determined between the State and the ESCO.

- 6) Assess the feasibility and implement plans, if approved, for new energy management systems/controls.
- 7) All Phase I studies must include a comprehensive evaluation for renewable and /or innovative new technology that either justifies or quantifies that measure for inclusion or exclusion in Phase II. The Offeror's objective shall be to identify technical solutions in order to maximize energy and cost savings and provide a definitive estimate of costs and savings resulting from the proposed energy conservation measures. Upon approval of this phase of the project, the Offeror will be expected to guarantee all identified costs and savings. A project must meet minimum energy reduction requirements, meet minimum expectations of equipment replacement, acceptable costs, and be fully funded with guaranteed energy savings to proceed to Phase II.
- 8) Ensure that the project plan conforms to all requirements of applicable utility energy conservation/rebate incentive programs in order to minimize cost and payback period.
- 9) An overall project proforma shall be created to document the following costs on an annual basis, for each year of the project. The costs of financing the project shall be included. The total project costs should be amortized. The project costs shall include, but be listed individually:
 - (a) total fee for engineering and design;
 - (b) total cost of construction period interest;
 - (c) total Material and equipment costs;
 - (d) total Labor costs;
 - (e) funding interest rate;
 - (f) cost of the study; and
 - (g) cost of the guarantee.
- 10) The proforma shall include for each year:
 - (a) energy savings in dollars;
 - (b) operational and maintenance savings (if applicable);
 - (c) water savings (if applicable);
 - (d) debt service;
 - (e) maintenance costs;
 - (f) training and M&V costs;
 - (g) SALP repayments; and
 - (h) DGS costs for construction management services and annual monitoring and verification into project cash flow.
- (11) (A) Should the recommendations contained in the engineering feasibility study/comprehensive energy efficiency and guaranteed savings program (Phase I) fail to meet the State's objectives for the project, or is deemed unreasonable, unworkable, or cost excessive

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by the State, the State shall have no obligation to pay the ESCO any fee for preparation of the Phase I study.

- (B) Should the recommendations of the Phase I study meet or exceed the State's objectives and all contract requirements and if the State contracts for Phase II (Implementation of the Phase I study), the cost of the Phase I study shall be included in the ECM capital cost financed by the State, either through the ESCO or otherwise.
 - (C) Should the recommendations contained in the engineering feasibility study/comprehensive energy efficiency and guaranteed savings program (Phase I study) meet or exceed the State's objectives and all contract requirements, and the State, for any reason other than those in A above, does not proceed with the implementation phase (Phase II, design and construction, and maintenance of the ECMs), then the ESCO shall be paid the previously agreed upon cost of the Phase I engineering study. The cost of the study is to be included in the ESCO's Phase I proposal for the project.
- (12) As part of Phase I, and prior to submission by the State to the Board of Public Works (BPW) for approval of Phase II, the ESCO shall prepare a Phase II Proposal specifying the ECM recommendations approved in Phase I including, but not limited to the following:
- (a) List of all subcontractors and responsibilities and a list of the project team if it is different from the response to the IDC solicitation.
 - (b) Layout/floor plans of major equipment, (35% CDs in accordance with the Department of General Services Procedure Manual for A/E Professional Services, latest edition).
 - (c) Schematic diagrams and single line diagrams for all HVAC and electrical equipment.
 - (d) Cut sheets for major equipment, such as boilers, chillers, cooling towers, generators, air handling units, etc.
 - (e) Outline specifications for all major components, including but not limited to:

(1) **Cooling System:**

The ESCO shall provide a schematic diagram of the existing and the proposed Cooling System. The schematic diagram of the existing system shall include all the major existing equipment, along with their performance parameters, pipe sizes, flow rates, etc. Any unique control requirements should be noted as well as comments made about the acceptability of the performance of the associated equipment to remain such as Compressors, Expansion Tanks, Air Separators, Insulation, Valves, piping, or any part

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of the associated distribution system. etc. The schematic diagram of the proposed Cooling System shall provide the performance parameters of the new equipment, as well as any new appurtenances such as valves, flow meters, temperature sensors, etc. The equipment specifications for the new equipment to be installed in the Cooling System shall provide details including, but not limited to, the following:

- Chiller

- Nominal Design Efficiency at Full Load (not APLV)
- Nominal Capacity (Tons)
- Refrigerant Type
- Fluid (Chilled Water, Glycol)
- Evaporator Entering and Discharge Temperatures
- Condenser Entering and Discharge Temperatures
- Electrical Characteristics (HP, Phase, Volts, Hz)
- List of Acceptable Manufacturers

- Cooling Tower:

- Nominal Duty (tons)
- Enter Fluid Temperature
- Leaving Fluid Temperature
- Ambient Air Temperature (DB/WB)
- Electrical Characteristics (HP, Phase, Volts, HZ)
- List of Acceptable Manufacturers

- Pump:

- Pump Type (Horizontal Split-case, End Suction, etc.)
- Capacity (GPM)
- Total Developed Head
- Minimum NPSH
- Pump RPM
- Minimum Operating Efficiency
- Mounting (Base, Inertia Pad, Vibration Isolators)
- Electrical Characteristics (HP, Phase, Volts, Hz)
- List of Acceptable Manufacturers

(2) Heating System:

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The ESCO shall provide a schematic diagram of the existing and the proposed Heating System. The schematic diagram of the existing system shall include all the major existing equipment, along with their performance parameters, pipe sizes, flow rates, etc. Any unique control requirements should be noted as well as comments made about the acceptability of the performance of the equipment to remain such as Hot Water Storage Tanks, Expansion Tanks, Air Separators, Insulation, Valves, steam traps, existing piping and associated insulation and the entire distribution system, etc. The schematic diagram of the proposed Heating System shall provide the performance parameters of the new and the old equipment, as well as any new appurtenances such as valves, flow meters, temperature sensors, etc.

The equipment specifications for the new equipment to be installed in the Heating System shall provide details including, but not limited to, the following:

- Boiler:
 - Fuel (Primary/Secondary, if applicable)
 - Output Rating (MBH)
 - Maximum Firing Rate (scfh)
 - Operating Pressure or GPM
 - Boiler Type (Cast-Iron Sectional, Firetube, etc.)
 - Electrical Characteristics (HP, Phase, Volts, Hz)
 - List of Acceptable Manufacturers
- Pump:
 - Pump Type (Horizontal Split-case, End Suction, etc.)
 - Capacity (GPM)
 - Total Developed Head
 - Pump RPM
 - Minimum Operating Efficiency
 - Mounting (Base, Inertia Pad, Vibration Isolators)
 - Electrical Characteristics (HP, Phase, Volts, Hz)
 - List of Acceptable Manufacturers
 - Minimum NPSH
- Heat Exchanger:
 - Fluid Types

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- Flow Rates
- Entering Temperature for Both Fluids
- Leaving Temperature for Both Fluids
- Heat Exchanger Type (Plate & Frame, Shell & Tube, etc.)
- List of Acceptable Manufacturers

(3) HVAC System:

The ESCO shall provide a schematic diagram of the existing and the proposed HVAC System. The schematic diagram of the existing system shall include all the major existing equipment, along with their performance parameters, duct sizes, flow rates, etc. Any unique control requirements should be noted as well as comments made about the acceptability of the performance of the equipment to remain such as VAV Boxes, Coils, Diffusers, Dampers, Ductwork, Insulation, etc. The schematic diagram of the proposed Heating System shall provide the performance parameters of the new equipment, as well as any new appurtenances such as dampers, flow sensors, temperature sensors, etc.

The equipment specifications for the new equipment to be installed in the HVAC System shall provide details including, but not limited to, the following:

- **Air Handling Unit**

- Air Flow Capacity
- External Static Pressure
- Total Cooling Capacity
- Sensible Cooling Capacity
- Sensible Heating Capacity
- Entering Air Temperature
- Leaving Air Temperature
- Design Space Temperature
- Design Outdoor Air Temperature
- Minimum Outdoor Air (%)
- Electrical Characteristics (HP, BHP, RPM, Phase, Volts, Hz)
- List of Acceptable Manufacturers

- **Exhaust Fan**

- Airflow Capacity
- Fan RPM
- Electrical Characteristics (HP, BHP, Phase, Volts, Hz)
- List of Acceptable Manufacturers

(4) Block load calculations, based on existing building

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parameters supporting the selection of major HVAC equipment and new/renovated HVAC systems included in the project. Existing people and lighting densities shall be verified based on actual field surveys. (Check for accuracy) ASHRAE guidelines shall be used for ventilation standards to size primary heating and cooling equipment or latest edition in effect at the time of Phase II proposal submittal.

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- (5) Calculations and methodology of all energy savings supporting the energy guarantee; savings/year to be dollar based, based on utility time-of-day rates and estimated energy demand or unit reductions.
 - (6) Equipment warranty for all ESCO furnished equipment for life of payback period. ESCO furnished equipment warranted by ESCO shall be serviced by ESCO.
 - (7) Identification by room/area: existing light fixtures, lamps, and ballasts, and proposed new fixtures, lamps and ballasts. Where lighting renovations include alterations from existing configurations, zonal lighting calculations shall be provided. ESCO shall evaluate existing lighting conditions and recommend new lighting designs, where applicable.
 - (8) CPM schedule of Phase II work, including any outages necessary.
 - (9) Commissioning methodology/scheduling for all ECMs.
 - (10) Description of maintenance services, including but not limited to a detailed list of all equipment installed by the ESCO, type of service to be performed, specific cost of services, frequency of service, records of service and date performed and ESCO response time for each piece of equipment or system involved. Identify each entity that will be providing work. Any existing maintenance contracts to be consolidated into ESCO provided maintenance must be included for review by DGS or the Using Agency. It is the responsibility of the ESCO to ensure that all existing services currently provided under existing contracts is included in their list of services.. The ESCO proposed contract for services must also be included.
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- (11) Detailed capital cost estimate breakdown, by ECM:
 - all subcontractors quotes
 - detailed engineering fees
 - construction labor
 - materials
 - major equipment cost
 - construction cost estimate:

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Demolition Costs:

New Work listed by system Cost, including but not limited to:

- **central cooling system, central heating system, cooling and heating distribution systems (HVAC) automatic temperature controls.**

To verify that the capital cost estimate is fair and reasonable, the State will, by whatever method it considers reasonable and appropriate, base its own independent estimate. ESCO ongoing training, maintenance, and energy guarantee cost (the cost of the insurance or bond for entire project term) are considered non-capital costs by the State, and shall not be included in capital financing. Costs shall be paid annually by Using Agency and shall be included in the project's overall cash flow. Labor costs shall be based on Prevailing Wage Rates, as Issued by Maryland Department of Labor, Licensing & Regulation. All major sub-contractors (mechanical, electrical, controls, etc.) must be contracted directly to the ESCO.

- **Engineering cost breakdown: disciplines, hours per discipline, hourly rates, OH, profit, etc.**
- **Identification and inclusion of an on-line monitoring system (capital costs and annual fees).**
- **Baseline methodology and methodology of calculation of guaranteed energy savings. All energy savings to be based on time-of-day rates and are to be quoted in dollars/yr; energy unit costs shall be current rates or future rates, whichever is greater. Baseline shall include verification occupancy schedules, temperature set points, equipment runtimes, lighting burn times, utility rates of natural gas, electricity, fuel oil, water/sewer charges, as applicable.**

C. Phase II: For each assigned project, the Contractor shall implement the comprehensive energy efficiency and guaranteed savings program, which shall include:

- 1) Final Design and Specifications. Before Installation of the proposed ECMs, the ESCO shall prepare detailed construction plans and specifications for the Installation of all equipment and systems proposed under Phase I. The plans and specifications shall be prepared in accordance with the**

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Department of General Services Procedure Manual for A/E Professional Services, latest edition, and shall include, but not be limited to the following:

- (a) Within 14 days of the execution of the contract, Contractor must submit a preliminary critical path network (CPM) diagram outlining activities for the first 90 days of construction. Include a skeleton diagram for the remainder of the work with the preliminary diagram. This preliminary diagram must be approved prior to the first requisition being processed. Include each significant construction activity. Coordinate each activity in the network with other activities. Schedule each construction activity in proper sequence.
- (1) Floor plans and site plans showing equipment, equipment location, pipe routing, pipe connections to existing systems, valves and fittings, instrumentation and electric meter location, electrical connections, electrical schematics are including wire and conduit sizes, electrical equipment, and isometric diagrams showing connections to all HVAC equipment.
 - (2) Control sequence of operation, logic diagrams, and wiring diagrams.
 - (3) Equipment list with: manufacturer names, model numbers, and operating characteristics.
 - (4) Specifications indicating material, sizes, and thicknesses being used in construction components and equipment components, pressure and temperature ratings of system components, national standards or national laboratory testing standards being met (i.e. NFPA, ASHRAE, ASME, UL, NEC, ASTM, etc.), methods of installation, electrical ratings of electrical components, and any special requirements relating to this installation.
 - (5) A complete description of any modifications to existing HVAC equipment.
 - (6) Lighting retrofit plans and specifications.
 - (7) All shop drawing submittals during construction shall be in accordance with Section III- General Conditions, paragraph 21 of this RFP. All submittals must be approved by DGS prior to ordering of equipment. ESCO shall allow a three week turnaround for DGS review.
 - (8) 95% and 100% construction documents, prepared in accordance with the DGS A/E Procedures Manual, latest edition. Allow Three week turnaround for DGS review. All drawings must be approved and signed by DGS and Using

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Agency prior to initiation of construction.

2) Execution:

- (a) Furnish and install all equipment and accessories in accordance with the requirements specified in the RFP (including Section III- General Conditions), and the ESCO's approved Phase I proposal.**
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- (b) Completions of all punch list items.**
 - (c) Submittal of all applicable O&M manuals to Using Agency.**
 - (d) Completion of on-site training and education of facility maintenance and operating personnel in the functions, operations and maintenance of all equipment installed under the project.**
 - (e) Completion of all necessary commissioning.**
 - (f) Compliance with all issued change orders.**
 - (g) Electrical inspection certificate sued by State approved independent inspection company.**
 - (h) Boiler inspection by Department of Labor, Licensing, and Regulation (if applicable).**
 - (i) Detailed list of all installed and/or repaired equipment (for loan takedown).**
 - (j) Final acceptance of construction phase DGS/Using Agency.**
 - (k) Maintenance, for the term of the contract, of installed equipment including replacement of worn, failed, and doubtful components, preventive service. Emergency on-site service and component replacement must be included on a 24-hour per day basis. Specific list to include each piece of equipment and the applicable service schedule. During Phase II, ESCO shall provide DGS and/or agency, submittals of all equipment, including piping, valves, etc, in coordination with construction documents for DGS approval prior to ordering of equipment or proceeding with construction. Allow 21 day turnaround for DGS review of all construction drawings, specifications, and shop drawings.**
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- (l) All necessary support services during the period of operations and throughout the contract, including, but not limited to, the following:**

- (1) Ongoing Monitoring and Verification Services. (See section V for details).**
- (2) Periodic on-site analysis to determine whether**

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mechanical/electrical systems are operating as programmed and to assess the operational efficiencies of the systems and equipment installed.

- (3) Re-evaluation of software provided as newer versions become available and upgrade of software.
- (4) Hourly, daily, weekly, monthly, quarterly and annual operation and maintenance tasks that must be performed.
- (m) Provision of an acceptable project financing plan to cover 100% of the costs of developing and implementing the approved comprehensive energy efficiency and guaranteed savings program.
- (n) The ESCO shall recover all costs of the feasibility study, identified ECM's engineering design, equipment procurement, installation, maintenance, training, support services and finance charges over the life of the contract. Payments by the facility will be solely from the savings guaranteed and payments will never be greater than the actual savings generated.
- (o) The financing shall be severable from all other aspects of this project and is subject to the fiscal non-appropriation clause.
- (p) Conditions of Work and Job Site Visit
 - (1) Site Investigation: By submitting a Phase II Proposal, the Offeror acknowledges that it has investigated and satisfied itself as to the conditions affecting the work, including but not restricted to those bearing upon physical conditions at the site, the formation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work.
 - (2) Any failure of the Offeror to acquaint itself with the available information will not relieve it from responsibility for estimating properly the difficulty or cost of successfully performing the work. The State will not be responsible for any conclusions or interpretations made by the Contractor on the basis of the information made available in this RFP.

D. Energy Savings Guarantee/Project Financing

- 1) The ESCO shall provide an energy savings guarantee whereby the ESCO guarantees that a certain level of energy and energy related operating and maintenance savings will accrue as result of implementing the approved comprehensive energy efficiency and guaranteed savings program, and that if the actual savings achieved is less than the guaranteed savings, the ESCO will reimburse the State an amount equal to the difference between the actual savings and the guaranteed savings.

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- 2) The State requires that each ESCO provide a method of guaranteeing the energy savings promised to the State. The method will be determined by the State on a project by project basis depending on the nature of the insurance and/or the surety markets. Listed below are examples of acceptable forms of a guarantee. If self-insured, the ESCO shall provide an irrevocable letter of credit payable to the State and issued by a solid financial institution, approved by the State Treasurer. As an alternative, the ESCO shall provide, for a period mutually agreed to by the State and ESCO, a performance bond issued by a bonding agency or an insurance policy issued by a reputable insurance company who has provided similar policies for similar projects, and are approved by the State. Insurance and bonds shall provide for direct payment of the shortfall amount to the State, as well as allow the State to file a claim against the bond/insurance.
- 3) Prior to the initiation of Phase II of each project, the ESCO shall provide an indexed rate of interest which reflects the cost of the financing to be provided by the ESCO. The effective rate of interest the ESCO proposes to charge for this contract will be determined and fixed on the funding date based on the index.
- 4) The State shall, at its sole option, determine whether or not to accept the financing offered by the ESCO or arrange an alternate means of financing. No payments by the State for the capital costs (design, construction, training and startup services) shall be made to the ESCO until 100% completion and acceptance of all ECM installations by the State. Payments by the State (including capital cost principal & interest cost of the guarantee, and maintenance costs) for the duration of the project will be solely from the guaranteed cost savings.

3. CAPACITY TO PERFORM WORK

The successful ESCO shall maintain an adequate staff to provide the services required herein with the professional quality and timeliness mutually agreed upon. Preferably, the same personnel shall be utilized for the duration of each project. Failure to maintain adequate staff or to provide staff replacements with personnel of equivalent quality and experience shall be cause for Termination for default by Procurement Officer.

4. SCHEDULE

The State and the ESCO will mutually agree on the schedule for Phase I and Phase II for each assigned project. Failure of the ESCO to satisfactorily complete work assignments within the time specified may be cause for termination for default by Procurement Officer.

5. PERFORMANCE EVALUATIONS

The State of Maryland agencies utilizing this contract must submit a performance evaluation of the ESCOs at the end of Phase II for each contract awarded under the IDC. The evaluation will consist of questions relative to the ESCO's performance on the contract. Survey responses will be used to calculate an overall score for each pre-qualified ESCO listed on the IDC contract.

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Attachment I is a sample of the form (or general list of criteria) that may be used by the State to evaluate Contractor performance. The Contractor will be provided a copy of the State's evaluation of the Contractor's performance. If a conflict occurs, the State's Project Management Office (PMO) for the Contract will make the final determination. The performance evaluation will be used in evaluating future contracts awarded under this contract.

SECTION V - PERFORMANCE MEASURE AND VERIFICATION

1. GENERAL

A. Energy Reduction

It is expected that implementation of this program will result in a net reduction in energy consumption, comprising electricity, natural gas, fuel oil, water, and other utilities in State owned facilities.

B. Cost Avoidance

It is expected that implementation of this program will result in guaranteed energy cost avoidance, sufficient to finance the cost of the program over the term of the contract.

2. STANDARDS

All measurement and verification procedures shall be consistent with the following documents:

- A. International Performance Measurement and Verification Protocol (IPMVP2001)
- B. Federal Energy Management Program M&V Guidelines: Measurement and Verification for Federal Energy Projects, Ver. 2.2 (FEMP)

3. MEASUREMENT AND VERIFICATION (M&V) METHODOLOGY

A. Overview

- 1) Various measurement and verification (M&V) methodologies may be employed to document guarantee performance. All methodologies shall be consistent with the documents cited in Paragraph 2 above.
- 2) The ESCO, in consultation with the State, shall develop the appropriate M&V methodology or methodologies, during the technical feasibility study phase (Phase I). Each methodology or procedure must be approved by the State prior to implementation, and no substitutions will be permitted without explicit approval of the State.

B. M&V Plan and Methodology

-
- 1) The ESCO shall prepare and include, as a separate section of the final Phase I technical feasibility study, a detailed M&V plan. The plan shall indicate and describe the proposed IPMVP (2001) and/or FEMP methodology or methodologies, to be employed throughout the project, for baseline development and ongoing monitoring during the guarantee period. In accordance with Section IV, B.5.), the State requires, unless otherwise directed, as part of the M&V Plan, installation of metering, instrumentation and related software, during Phase 1 for various purposes, including to verify existing equipment performance, to refine energy reduction estimates and guarantee cost avoidance, development of performance baselines, and ongoing monitoring during the guarantee

SECTION V - PERFORMANCE MEASURE AND VERIFICATION

period.

- 2) The M&V plan shall be summarized in table format. In addition, accompanying documentation shall describe how each methodology is to be implemented.
- 3) For ECM specific methodologies, the following shall also be specified:

(a) Method A

Basis for stipulated performance parameters. (Rarely acceptable to the State. Note: stipulated measures are generally unacceptable and must be specifically approved by the State.)

(b) Method B

- (1) All parameters, which are to be measured, including units of measure, e.g.:

- Power (watts, kilowatts)
- Energy (watt-hours, kilowatt-hours, therms)
- Temperature (°F, °C)
- Flow rate (gallons per minute, cubic feet per minute)

- (2) Measurement frequency and duration, e.g.:

- One-time
- Once each 15 minutes
- 24 hours
- 60 days

- (3) Measurement method, e.g.:

- Hand held instrument
- Portable data logger
- Field mounted data collection panel

(c) Performance Baseline

- (1) Performance baseline (baseline) shall be defined as a detailed documentation of the operating characteristics of a facility during a suitably chosen recent period, prior to implementation of any ECMs. Documented operating characteristics shall include, but not necessarily be limited to:

- Electric energy consumption and demand
- Natural gas, fuel oil and water consumption
- Operating hours of heating, cooling and ventilating equipment
- Operating hours of lighting systems

SECTION V - PERFORMANCE MEASURE AND VERIFICATION

- Facility occupancy levels
- Facility square footage
- Weather severity (degree days)

- (2) The baseline period shall be chosen such that the nature, level and pattern of operations during the period are most representative of current operations, other than changes as a result of implementation of any ECMs. In the event of a significant lapse of time between project scope development (Phase I) and final completion (Phase II), the baseline period may be revised to correspond to a period ending just prior to implementation of any ECMs.
- (3) The ESCO shall develop and include, in the final Phase I technical feasibility study, documentation and detailed descriptions of baseline performance. Documentation shall indicate and describe the proposed IPMVP 2001 and/or FEMP methodology or methodologies, to be employed throughout the project, for initial baseline development, as well as on-going monitoring during the guarantee period.
- (4) During the guarantee monitoring period, the ESCO may adjust the baseline, as required, to account for changes in facility operational characteristics (see Paragraph 3, C. 1), beyond the ESCOs control, which occur after the original baseline is established.

(d) Sampling Plan

For certain ECMs, which encompass multiple units of a similar equipment type, and monitored through IPMVP 2001/FEMP Method B, the ESCO may elect to perform measurements on a random statistical sample, for the purpose of establishing baseline or guarantee performance. Prior to performing measurements, the ESCO shall prepare a detailed sampling plan, indicating sample size and measurement locations. The sampling plan must be carefully designed, based on recognized statistical techniques, in accordance with procedures set forth in FEMP M&V Guidelines: Measurement and Verification for Federal Energy Projects, Ver. 2.2., Appendix D. Prior to implementation, the Sampling Plan must be submitted to the State for approval.

(e) Energy Rates

- (1) Unless explicitly approved by the State, all performance results (baseline and guarantee period) shall be based on costs determined through application of applicable utility rate schedules to energy units. Electric costs and cost avoidance, in particular, must be based on the application of time-of-use (TOU) energy rates, where in effect, and separate demand rates, to energy and demand units,

SECTION V - PERFORMANCE MEASURE AND VERIFICATION

respectively. In addition, the application of rate schedules shall include an explicit itemization of fixed charges, such as customer charges of minimum charges, and all applicable surcharges.

- (2) The ESCO shall include, in the final Phase I technical feasibility study, applicable baseline energy rates and/or utility rate schedules, for each energy type. Where utility rate schedules are not available (e.g. fuel oil rates), the ESCO shall include documentation, supporting the baseline rate.
- (3) Where utilities are provided on a deregulated basis, the ESCO shall include separate schedules for commodity and distribution components.

(f) Energy and Cost Avoidance Calculation

- (1) Energy units avoidance during any period shall be calculated as the difference between baseline units consumed, adjusted for changes in operational characteristics, as described in Paragraph 3, C., 4), and actual units consumed, during the period.
- (2) Energy cost avoidance during any period shall be calculated as the difference between baseline energy cost, adjusted for changes in operational characteristics, as described in Paragraph 3, C., 4), and actual cost, during the period. Costs shall be calculated by applying actual utility or energy supplier rates to baseline units and actual units. Unless explicitly approved by the State, cost avoidance calculated with blended unit rates will not be acceptable.

(3) Applied Energy Rates

- For measures which achieve cost avoidance through energy units reduction, applied rates shall be the greater of baseline or actual energy rates, currently in effect.
- For measures which achieve cost avoidance through energy rate reduction (e.g. fuel switching), shall be the lesser of baseline or current energy rate differentials, during the period. (Rate differential is the difference between rates of the baseline energy source and converted energy source.)

(g) Reconciliation of Actual vs. Guaranteed Savings

- (1) At the end of each year following completion of the ECM installation, ESCO shall provide documentation verifying

SECTION V - PERFORMANCE MEASURE AND VERIFICATION

actual energy use and cost avoidance, as defined in Paragraph 3 above. If the actual cost avoidance is greater than the ESCO's guaranteed cost avoidance, then the State shall retain the difference.

- (2) If the actual cost avoidance is less than the guaranteed cost avoidance, the ESCO shall submit documentation verifying temperature set points, operating hours or other parameters agreed to in the Contract. If a deviation from Contract parameters by the State has resulted in lower than expected cost avoidance, then the amount due to the State may be reduced by an amount equivalent to the actual cost avoidance minus the expected cost avoidance.
- (3) Any payment due the State shall be made within 60 days of the yearly anniversary date of the completion of the ECM installation. Failure to submit payment during this time frame may result in Termination for Default by the Procurement Officer.

The State will not permit any provisions allowing excess cost avoidance during any annual monitoring period to be carried over to any future (or past) year, to offset future (or past) cost avoidance shortfalls. Each monitoring year following completion of ECM installation is to be evaluated and reconciled on a stand-alone basis.

The State will not allow any provisions allowing cost avoidance realized during the ECM installation period (construction period) to be applied toward the guarantee cost avoidance.

4. PRODUCTS AND SPECIAL SERVICES

A. Energy Accounting Software

- 1) If IPMVP/FEMP Whole Building Method C methodology is employed, the ESCO shall provide and use State approved, third-party commercially available energy accounting software. Such software shall accommodate a detailed inventory of energy records and shall employ linear regression analysis to model baseline performance, incorporating changes in weather severity, and other operational variations.
- 2) The State may direct the ESCO to include in the project cost, purchase of one or more licenses as directed by the State on a project by project basis of any energy accounting software, including training and product support, as the State may require.

B. Internet Data Acquisition

- 1) The State may direct the ESCO to include in the project cost, purchase of an Internet based facility energy monitoring service, including setup,

SECTION V - PERFORMANCE MEASURE AND VERIFICATION

training and product support, as the State may require.

- 2) The Internet monitoring service shall support interval storage and retrieval of utility and energy data, which will permit calculation of an approximate monthly bill, for a given utility, and creation of usage trend reports.

C. Instrumentation

1) Electric Power and Energy

- a) All devices employed to meter electric power use shall be capable of metering continuous RMS power at accuracy within $\pm 1.0\%$ of actual value, over the entire load range.
- b) Metering of polyphase loads shall include independent measurement of each phase.
- c) All devices employed to meter electric power for continuous monitoring (i.e. other than one-time measurement) shall be minimally capable of storing data in 15 minute intervals, for a minimum of 24 hours.
- d) Where required, due to voltage levels, the ESCO shall employ potential transformers.

2) Temperature

All devices employed to meter temperature of liquid media shall have accuracy within $\pm 0.1^\circ \text{F}$ of actual value, or better. Sensors such as strap on types may not be used for the purpose of verifying baseline or guarantee period performance, unless specifically approved by the State. Temperature sensors shall be suitable insertion type.

3) Pressure

All pressure sensing devices shall have accuracy within $\pm 1\%$ of full scale. Primary devices used for the purpose of providing information to a control system or energy information system, shall be provided with an accuracy/calibration certificate. Sensors needing field calibration shall be calibrated using a dead weight tester, by a qualified technician.

4) Flow Rate

- a) All devices employed to meter flow rate of liquid media shall have accuracy within $\pm 1.0\%$ of actual flow or better.
- b) Approved flow metering devices shall include orifice, venturi, turbine or ultrasonic types. Flow rates based on equipment manufacturer's specifications or performance curves (including pump curves), or operating equipment pressure differential, will not be acceptable, for the purpose of verifying baseline or guarantee

SECTION V : PERFORMANCE MEASURE AND VERIFICATION

period performance.

- c) Flow rates in constant volume flow systems shall be verified by monitoring average flow rate, for a minimum continuous period of 30 minutes.
- d) Flow rates in variable volume flow systems shall be verified by continuous monitoring, throughout the monitoring period.

5. COMMISSIONING

- A. Prior to final acceptance by the State, the ESCO shall demonstrate to the satisfaction of the State that all components, systems, and processes required to fully verify guaranteed cost avoidance, are complete and properly functioning.
- B. Prior to final acceptance by the State, the ESCO shall submit to the State for approval, a Commissioning plan. The plan will include a detailed specification of all procedures, including preliminary check-out and functional performance testing, which must be executed to demonstrate and verify proper data collection, processing, communication, and report preparation capability.
- C. The ESCO shall prepare and submit to the State for approval, detailed documentation of all conditions, requirements and the results of all final inspections and functional performance tests.
- D. The State shall be notified in advance, of the schedule of any final inspections and functional performance tests.

6. ENERGY AND COST AVOIDANCE REPORTS

- A. The ESCO shall provide a detailed report of energy and cost avoidance performance, at least once a year, or at frequency specified in the Contract. Reports must clearly indicate energy baselines, monitoring period energy performance, applicable rates and any adjustments to energy and cost baselines.
- B. All reports shall conform to the format agreed to by the ESCO and the State. Report formats shall be such that the State can easily confirm the logic, formulas, and calculation algorithms, in order to independently validate the performance results.

SECTION VI – CONTENTS OF TECHNICAL PROPOSAL

1. INTRODUCTION

This section defines the minimum material and documentation to be submitted in the Offeror's Technical Proposal. Submissions should be carefully organized in the same order as the RFP and clearly provide the information required. Clarity and conciseness are important. Technical proposals shall be classified as being either reasonably or not reasonably susceptible for award. The Technical Proposal shall consist of an original and five (5) copies of each of the following documents:

2. OFFEROR'S QUALIFICATIONS

Offerors are encouraged to submit sufficient graphic, narrative, and documentary material required to clearly demonstrate qualifications, financial responsibility, and performance capability of the Offeror's team. Qualification data will include the following:

A. Team Qualification:

Submit an organizational chart that clearly shows the responsibility and interrelationship of all key team members of the project team, including all sub-consultants and subcontractor firms. All sub-consultants and subcontractors shall be contracted directly to the Offeror. Submit qualifications and experience for the engineering design team firms and the proposed individuals and resumes and business references for the Offeror. Provide resumes for key project managers, energy engineers, design engineers (mechanical, Electrical, Structural, etc), construction managers, and operations managers, and Maintenance personnel. The Project Manager, Mechanical Engineer, Electrical Engineer and Structural Engineer must all be registered engineers in the State of Maryland at the time of proposal submittal. Designated project managers must have experience on similar size and types of projects. If identified individuals or associated firms are changed by the successful Offeror for a specific assigned project, Offeror must submit request for change to the State. The State reserves the right to reject the requested replacement. Describe how work assignments are made and how the team will be affected by additional EPC projects whether they be State or local government projects. The Offeror should present their ability to develop project tracking and reporting documents for submittals, requests for information and proposals/change orders. Therefore, offerors must include resumes that indicate qualifications of in-house staff or consultants proposed for scheduling responsibilities and tools/systems/software to be used for implementation of the scheduling effort.

All information presented should clearly demonstrate the ability of the ESCO to successfully execute energy performance projects, including analysis, engineering, construction, maintenance, and measuring and verification of energy savings.

B. Prior Project Experience:

Describe the offeror's energy performance contracting (EPC) experience in both

SECTION VI – CONTENTS OF TECHNICAL PROPOSAL

the public and private sector with emphasis on State and local governmental projects with a maximum of 15 year payback. Greater consideration shall be given to Offerors with experience in prime management of EPC's with capital costs of at least \$1,000,000. List five (5) projects within the past five years, where the construction phase is completed, indicating experience in the development, construction and implementation of comprehensive energy efficiency and guaranteed savings programs and proposed versus actual completion duration. Explain variances. Complete the form included in Appendix 1 for each reference. Failure to fully complete the form may render your proposal not reasonably susceptible of being selected for award.

1) Sample Detailed Engineering Feasibility Study

Include one detailed engineering feasibility study conducted by the Offeror's project team on a similar energy conservation project, funded by energy savings. Clearly mark "Sample Detailed Technical Study" on the cover with your firm's name. The study must include detailed energy and economic calculations, preliminary design and specifications, narrative clearly indicating scope of work. Study should be submitted for project where construction has been completed.

2) Green Building and Sustainable Design Experience:

Describe offeror's experience with the analysis, design, construction, and operation of geothermal heat pump system, solar energy, fuel cells, or other renewable energy resources. Describe in detail previous projects where these technologies were evaluated even if they were not implemented. If studied and not implemented explain why. Greater consideration shall be given to Offerors with experience in offering creative and cutting edge technology for evaluation and inclusion in projects. All ESCO's must examine renewables for all State projects as part of the Phase I study.

3) Past Performance:

The State will consider the Offeror's past performance on energy performance projects with Maryland State Agencies, or other municipalities. Ability to properly assess facilities loads, adherence to schedule, engineering, operability of installed systems, timely delivery of services and achievement of energy guarantee, creativity of Phase I study and project development, use of new or renewable technologies, compliance with IDC, ability to properly price a project, and timely response to any shortfall in guaranteed savings will all be considered.

4) List of all ECMs:

Provide Offeror's comprehensive check list of all possible ECMs.

C. Technical and Managerial Approach

SECTION VI – CONTENTS OF TECHNICAL PROPOSAL

1) Construction Schedule:

The Offeror must clearly demonstrate knowledge and means of proper scheduling and planning practices in accordance with the scheduling requirements of the General Conditions, Offeror's submission of a Critical Path Method (CPM) construction schedule that clearly indicates from the estimated start of construction the duration of the major elements of the project and how they interface sequentially. Describe Offeror's proactive management of the project's schedule and ability to recover from delays. Provide actual CPM schedule that was developed for one of the five (5) reference projects.

2) Project Management:

Describe Offeror's approach to managing the entire project, including interface with sub-consultants and subcontractors, development of a comprehensive plan, detailed design, procurement, construction, training, punch lists and start-up. Identify site members of the project team who will be responsible for the various stages of design and implementation. Describe the various responsibilities and coordination of the team members, as well as the Using Agency, facility, DGS personnel and MEA, to ensure an effective and timely completion of both Phase I and Phase II of a project.

3) Development of Project Scope:

To demonstrate expertise in identifying energy conservation measures, provide the methodology involved in the preparation of a typical detailed engineering feasibility study, and development of preliminary plans and specifications in order for the State to proceed with the approval and implementation of the facility energy efficiency program. This shall include but not be limited to site investigation, analysis of the existing HVAC, and or steam or chilled water systems in their entirety including but not limited to existing distribution systems, operations and utility costs which may be supported with measured data, fuel switching, load calculations, current system operation practices, and maintenance. The State is paying for expert advice and analysis and fully expects to receive this expertise in the form of a comprehensive energy audit and Phase II proposal. Oversights or omissions of existing conditions, systems or equipment, and/or operating routines, will not be acceptable

4) Owner Training:

Provide detailed information on the training and education programs available for facility operating and maintenance personnel, including course content, location, schedule, hours, and types of trainees that are included.

D. Financial Approach

1) Procurement:

SECTION VI - CONTENTS OF TECHNICAL PROPOSAL

Describe the proposed method of procurement of all major types of equipment and services, including those subcontracted, and the pricing policy that will be applied to provide a competitive cost environment throughout a project.

2) Financing:

Describe the sources of the funds to be acquired by the Offeror and applied to implement a project. The project financing must be directly from the Offeror to the State. Indicate the Offeror's prior use and experience with this method of financing. This section should include the acknowledgment that the State may choose to finance all or part of the funds necessary to implement this project through its own sources.

3) Energy Savings Guarantee:

Provide terms, conditions, exclusions, insurers name and source of cost savings performance guarantee including provisions for payment due to the State in the event guaranteed savings exceed actual savings. Offeror shall provide sample policy proposed for use in this project, and if self-insured, provide a complete description of how insurance is funded. Offeror shall obtain insurance or bond that will remain in effect for the term of the Contract to guarantee savings in the event the Offeror is unable or unwilling to pay any difference between actual cost savings and guaranteed savings. Policy/bond must be written such that the State is listed as an additionally insured entity which will provide the State with the ability to make a claim against the bond/policy.

4) Owner Training:

Indicate Offeror's approach to monitoring the actual energy savings associated with the project. Provide sample energy savings calculation documents which will become an attachment to the guaranteed energy savings contract. Describe the methodology, measurement, and monitoring format of actual energy savings. Also, describe the process used to adjust the energy consumption baseline throughout the contract period.

3. FINANCIAL AND LEGAL CAPABILITY

A. Financial Status

1) Financial Statement:

Offerors must demonstrate the financial soundness of their firm by submitting a certified Financial Statement from a Bank and/ or Dunn & Bradstreet.

2) Legal Proceedings:

SECTION VI - CONTENTS OF TECHNICAL PROPOSAL

List all legal or administrative proceedings involving your firm currently pending or concluded adversely within the last five years which related to procurement or performance of any public or private contracts. In addition to the information requested, the case name and docket number, as well as the issues in the case, should be provided.

3) Performance Bond or Insurance:

List the name of the agent or bonding/insurance company that will be providing the bond/policy for the guarantee. List current bonding/insurance capacity and maximum length of term for bond/policy.

SECTION VII – EVALUATION CRITERIA AND SELECTION PROCEDURES

1. CRITERIA FOR PROPOSAL EVALUATION

The technical evaluation criteria that will be used by the Evaluation Committee for each Technical Proposal are those listed in descending order of importance. A transmittal letter must accompany the technical proposal. The purpose of this letter is to transmit the proposal and acknowledge the receipt of any addenda. The transmittal letter should be brief and signed by an individual who is authorized to commit the Offeror to the services and requirements as stated in this RFP. Only one transmittal letter is needed and it does not need to be bound with the technical proposal.

The criterion is as follows:

A. Team Qualifications

- 1) Team Qualifications
- 2) Prior Project Experience
 - (a) Sample Detailed Engineering Feasibility Study
 - (b) Green Building and Sustainable Design Experience
 - (c) Past Performance
- 3) Technical and Managerial Approach
 - (a) Construction Schedule
 - (b) Scheduling and Planning Practices
 - (c) Project Management
 - (d) Development for Project Scope
 - (e) Owner Training
- 4) Financial Approach
 - (a) Procurement
 - (b) Financing
 - (c) Energy Savings Guarantee
 - (d) Savings Monitoring and Verification
- 5) Financial Status
 - (a) Financial Statement
 - (b) Legal Proceedings
 - (c) Performance Bond or Insurance

2. SELECTION

The Evaluation Committee will make recommendations to the Procurement Officer for the IDC contract to the responsible ESCOs whose proposals are determined to be the most advantageous to the State, considering the factors listed in Item (1) above. The Evaluation Committee will select a maximum of 5 respondents based on the highest ranked firms with a minimum score of 80% will be selected. Proposals will only be scored

SECTION VII - PROPOSAL EVALUATION AND BASIS OF AWARD

once by the Evaluation Committee, unless oral presentations are required. If oral presentations are conducted, the Evaluation Committee may conduct a final scoring upon completion of the oral presentations. Recommended contract awards, if any, resulting from this RFP are subject to appropriate State approvals.

3. ORAL PRESENTATION

At the discretion of the Evaluation Committee, an oral presentation may be required for this solicitation. The oral presentation, if held, will be considered to be part of the offeror's technical proposal. Eligible firms will be notified of time and date. If necessary, separate instructions regarding the conduct of oral presentations will be issued.

ESG ENERGY SYSTEMS GROUP

Phase II Proposal
for
**Energy Savings
Performance Contract
(EPC)**
Howard County

*Karen Galindo-White
Account Executive
4401 O'Donnell St.
Baltimore, MD 21224
410-522-5656*

Building Performance with ENERGY.

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Executive Summary

Howard County's commitment to and focus on energy conservation and environmental responsibility parallels Energy Systems Group's (ESG) primary tenet in the development of an Energy Performance Contract (EPC). This EPC bundles critical infrastructure upgrades and replacements with the newest advances in technology integrated with renewable components to

ENVIRONMENTAL BENEFITS

23% reduction in energy consumption

Decreased emissions by 3,281 metric tons of carbon dioxide equates to:

- 545 cars removed from the roadways
- 395 homes eliminated from the electric supply grid
- 76,324 seedlings planted over 10 years

Overall positive impact on the carbon footprint for Howard County

assist Howard County in being responsive to both the report submitted by the Commission on the Environment and Sustainability as well as the Executive Order 2007-1, which endorsed the US Mayors Climate Protection Agreement. This proposal prepared by ESG offers Howard County the opportunity to install new and renewable technology while saving energy, avoiding capital expenditures, reducing operating costs and ultimately improving the environment. This proposal provides quantifiable impact on both the Commission and County Executive's agenda.

ESG's funding strategy is to reduce utility and operating costs so that Howard County can redirect this money to fund their mission critical needs. This proposal presents Howard County with a project that will reduce energy costs by 23%, save more than \$483,000 annually which generates \$5.3 million in upgrades, improvements, major equipment replacements, and new green building technologies. These reductions in energy units correlate directly to reduced carbon dioxide emissions where every kWh of electricity and every therm of gas reduce pollution.

While the environmental benefits of this proposal are significant, at its core is a variety of newly installed assets. This proposal addresses critical equipment concerns and comfort issues, identified by Howard County Staff and from observations during the site survey. The highlights of this program provide Howard County the following capital improvements:

- New chillers
- New gas fired boilers
- Expanded DDC controls
- Upgraded lighting and associated controls
- PV system-Green Roof- Daylight Harvesting,
- Many more innovative and cost-effective energy conservation measures.



Building Performance With Energy

*Proprietary & Confidential
Howard County Phase II Proposal
August 11, 2008*

Additionally ESG has designed a more efficient boiler system to replace the two aging and failing boilers in the Detention Center. Howard County was prepared to pay for repairs which would ultimately offer only a short term solution. This new, more efficient four (4) boiler system can be installed in the Detention Center with a \$100,000 contribution from the County. These recommended upgrades are described and quantified in the following pages of this proposal. ESG has included a short description of ECMs not funded by the current program at the end of the ECM description section.

ESG has assumed a term for the project of thirteen and half years but the State of Maryland will allow for a 15 year term. Howard County could gain an additional \$500,000 towards more upgrades and repairs by using the net present value of the excess savings in the last year and half, by extending the term of the project to 15 years. This would mitigate the need for the \$100,000 down payment, provide new boilers to the Detention Center and give Howard County \$400,000 towards more repairs and new equipment.

This project offers Howard County a comprehensive solution to critical equipment issues as well as renewable energy components which will directly impact the County's new initiatives for a more sustainable future. ESG is excited to begin the implementation of this project so Howard County can begin generating energy savings today and be one of the first counties in Maryland to initiate Carbon Footprint Reduction efforts.

Project Name Howard County EPC

ENERGY PERFORMANCE CONTRACT - CASH FLOW FOR CONSTRUCTION -Phase I and Phase II Combined

Updated	2/13/2009
Interest Rate (LLC)	5.500%
Total Project Value	\$ 5,495,227
ESG Contract Amount	\$ 5,495,227
SALP	\$ -
Capital Cost Financed (Loan)	\$ 5,095,227
Downpayment/Rebates	\$ 400,000
Period (yrs)	14
Payment Frequency	Semiannual
Energy Cost Esc./yr	3%
Labor Cost Esc./yr	3%
Maintenance Cost Esc	3%



COMBINED CONSTRUCTION (PHASE I AND PHASE II)

CASH FLOW ANALYSIS - Per Year (Beginning Jan 2009)

Year	SAVINGS			COSTS				
	Guaranteed Annual Energy Savings	Maintenance Savings	Total Savings	Loan Payment	ESG Maintenance Costs	ESG M&V & Energy Bond	Total Costs	Net Savings
Construction	\$ 48,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1	\$ 482,613	\$ 5,600	\$ 538,213	\$ 461,000	\$ -	\$ 13,513	\$ 474,513	\$ 61,700
2	\$ 487,092	\$ 5,768	\$ 502,860	\$ 474,830	\$ -	\$ 13,919	\$ 488,749	\$ 14,111
3	\$ 512,004	\$ 5,941	\$ 517,945	\$ 488,075	\$ -	\$ 14,336	\$ 503,411	\$ 14,534
4	\$ 527,364	\$ 6,119	\$ 533,484	\$ 503,748	\$ -	\$ 14,768	\$ 518,514	\$ 14,970
5	\$ 543,185	\$ 6,303	\$ 549,488	\$ 518,860	\$ -	\$ 15,209	\$ 534,069	\$ 15,419
6	\$ 559,481	\$ 6,492	\$ 565,973	\$ 534,426	\$ -	\$ 15,665	\$ 550,091	\$ 15,881
7	\$ 576,285	\$ 6,687	\$ 582,952	\$ 550,459	\$ -	\$ 16,135	\$ 566,594	\$ 16,358
8	\$ 593,553	\$ 6,887	\$ 600,441	\$ 566,972	\$ -	\$ 16,619	\$ 583,591	\$ 16,849
9	\$ 611,380	\$ 7,084	\$ 618,464	\$ 583,981	\$ -	\$ 17,118	\$ 601,099	\$ 17,355
10	\$ 629,701	\$ 7,307	\$ 637,008	\$ 601,501	\$ -	\$ 17,632	\$ 619,133	\$ 17,875
11	\$ 648,582	\$ 7,528	\$ 656,118	\$ 619,545	\$ -	\$ 18,161	\$ 637,706	\$ 18,412
12	\$ 668,050	\$ 7,752	\$ 675,801	\$ 638,132	\$ -	\$ 18,705	\$ 656,837	\$ 18,964
13	\$ 688,091	\$ 7,984	\$ 696,075	\$ 657,278	\$ -	\$ 19,267	\$ 676,543	\$ 19,533
14	\$ 627,448	\$ 8,224	\$ 635,672	\$ 580,774	\$ -	\$ 17,569	\$ 598,343	\$ 37,329
15	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
AGGREGATE	\$ 8,212,800	\$ 95,653	\$ 8,308,453	\$ 7,780,579	\$ -	\$ 228,614	\$ 8,009,193	\$ 299,290

Notes: First year savings include Construction Period Savings

Project Name **Howard County EPC**

ENERGY PERFORMANCE CONTRACT - CASH FLOW FOR PHASE I CONSTRUCTION

Updated	2/8/2009
Interest Rate (LLC)	5.500%
Total Project Value	\$ 4,400,000
ESG Contract Amount	\$ 4,400,000
SALP	\$ -
Capital Cost Financed (Loan)	\$ 4,000,000
Downpayment/Rebates	\$ 400,000
Period (yrs)	14
Payment Frequency	Semiannual
Energy Cost Esc./yr	3%
Labor Cost Esc./yr	3%
Maintenance Cost Esc	3%



CONSTRUCTION PHASE I

CASH FLOW ANALYSIS - Per Year (Beginning Jan 2009)

	SAVINGS			COSTS				
Year	Guaranteed Annual Energy Savings	Maintenance Savings	Total Savings	Loan Payment	ESG Maintenance Costs	ESG M&V & Energy Bond	Total Costs	Net Savings
Construction	\$ 48,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1	\$ 371,910	\$ 5,600	\$ 425,510	\$ 357,000	\$ -	\$ 10,413	\$ 367,413	\$ 58,096
2	\$ 383,067	\$ 5,768	\$ 388,835	\$ 367,710	\$ -	\$ 10,726	\$ 378,436	\$ 10,399
3	\$ 394,559	\$ 5,941	\$ 400,500	\$ 378,741	\$ -	\$ 11,048	\$ 389,789	\$ 10,712
4	\$ 406,398	\$ 6,119	\$ 412,515	\$ 390,104	\$ -	\$ 11,378	\$ 401,483	\$ 11,032
5	\$ 418,588	\$ 6,303	\$ 424,891	\$ 401,607	\$ -	\$ 11,720	\$ 413,527	\$ 11,363
6	\$ 431,146	\$ 6,492	\$ 437,637	\$ 413,661	\$ -	\$ 12,072	\$ 425,933	\$ 11,704
7	\$ 444,080	\$ 6,687	\$ 450,767	\$ 426,277	\$ -	\$ 12,434	\$ 438,711	\$ 12,055
8	\$ 457,402	\$ 6,887	\$ 464,290	\$ 439,065	\$ -	\$ 12,807	\$ 451,872	\$ 12,417
9	\$ 471,124	\$ 7,094	\$ 478,218	\$ 452,237	\$ -	\$ 13,191	\$ 465,428	\$ 12,790
10	\$ 485,258	\$ 7,307	\$ 492,565	\$ 465,804	\$ -	\$ 13,587	\$ 479,391	\$ 13,174
11	\$ 499,816	\$ 7,526	\$ 507,342	\$ 479,778	\$ -	\$ 13,995	\$ 493,773	\$ 13,569
12	\$ 514,810	\$ 7,752	\$ 522,562	\$ 494,172	\$ -	\$ 14,415	\$ 508,567	\$ 13,975
13	\$ 530,255	\$ 7,984	\$ 538,239	\$ 508,997	\$ -	\$ 14,847	\$ 523,844	\$ 14,395
14	\$ 546,162	\$ 8,224	\$ 554,386	\$ 529,318	\$ -	\$ 15,283	\$ 544,611	\$ 9,776
15	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
AGGREGATE	\$ 6,402,574	\$ 95,683	\$ 6,498,257	\$ 6,104,971	\$ -	\$ 177,928	\$ 6,282,799	\$ 216,458

Notes: First year savings include Construction Period Savings

Project Name Howard County EPC

ENERGY PERFORMANCE CONTRACT - CASH FLOW FOR PHASE II CONSTRUCTION

Updated 2/6/2009
Interest Rate (LLC) 5.500%
Total Project Value \$ 1,095,227
ESG Contract Amount \$ 1,095,227
SALP \$ -
Capital Cost Financed (Loan) \$ 1,095,227
Downpayment/Rebates \$ -
Period (yrs) 13.5
Payment Frequency Semiannual
Energy Cost Esc./yr 3%
Labor Cost Esc./yr 3%
Maintenance Cost Esc 3%



CONSTRUCTION PHASE II

CASH FLOW ANALYSIS - Per Year (Beginning July 2009)

Year	SAVINGS			COSTS				
	Guaranteed Annual Energy Savings	Maintenance Savings	Total Savings	State Master Lease Payment	ESG Maintenance Costs	ESG M&V & Energy Bond	Total Costs	Net Savings
Construction	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1	\$ 110,703	\$ -	\$ 110,703	\$ 104,000	\$ -	\$ 3,100	\$ 107,100	\$ 3,604
2	\$ 114,024	\$ -	\$ 114,024	\$ 107,120	\$ -	\$ 3,183	\$ 110,313	\$ 3,712
3	\$ 117,445	\$ -	\$ 117,445	\$ 110,334	\$ -	\$ 3,288	\$ 113,622	\$ 3,823
4	\$ 120,968	\$ -	\$ 120,968	\$ 113,644	\$ -	\$ 3,387	\$ 117,031	\$ 3,937
5	\$ 124,598	\$ -	\$ 124,598	\$ 117,053	\$ -	\$ 3,489	\$ 120,542	\$ 4,056
6	\$ 128,335	\$ -	\$ 128,335	\$ 120,565	\$ -	\$ 3,593	\$ 124,158	\$ 4,177
7	\$ 132,185	\$ -	\$ 132,185	\$ 124,182	\$ -	\$ 3,701	\$ 127,883	\$ 4,302
8	\$ 136,151	\$ -	\$ 136,151	\$ 127,907	\$ -	\$ 3,812	\$ 131,719	\$ 4,432
9	\$ 140,236	\$ -	\$ 140,236	\$ 131,744	\$ -	\$ 3,927	\$ 135,671	\$ 4,565
10	\$ 144,443	\$ -	\$ 144,443	\$ 135,697	\$ -	\$ 4,044	\$ 139,741	\$ 4,701
11	\$ 148,776	\$ -	\$ 148,776	\$ 139,767	\$ -	\$ 4,166	\$ 143,933	\$ 4,843
12	\$ 153,239	\$ -	\$ 153,239	\$ 143,960	\$ -	\$ 4,281	\$ 148,251	\$ 4,988
13	\$ 157,836	\$ -	\$ 157,836	\$ 148,279	\$ -	\$ 4,419	\$ 152,698	\$ 5,138
14	\$ 81,286	\$ -	\$ 81,286	\$ 51,456	\$ -	\$ 2,276	\$ 53,732	\$ 27,554
15	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
AGGREGATE	\$ 1,810,226	\$ -	\$ 1,810,226	\$ 1,875,708	\$ -	\$ 50,686	\$ 1,726,394	\$ 83,832

**Howard County EPC
Comprehensive Proposal
PHASE I CONSTRUCTION**

ECMs	Guaranteed 1 st Yr		16%		10%	
	Total Cost Avoidance, \$/yr	Subcontractor Costs	Overhead	Profit	Total Costs	
Upgrade Lighting & Controls	\$ 251,917	\$ 1,354,288	\$ 216,886	\$ 135,429	\$ 1,706,403	
Optimize Vending Machine Operation	\$ 3,498	\$ 9,051	\$ 1,448	\$ 905	\$ 11,405	
Green Initiatives	\$ -	\$ -	\$ -	\$ -	\$ -	
Cooling System Upgrades	\$ -	\$ -	\$ -	\$ -	\$ -	
HVAC System Upgrades	\$ 103,026	\$ 734,278	\$ 117,485	\$ 73,428	\$ 925,191	
Heating System Upgrades	\$ 25,143	\$ 656,941	\$ 105,111	\$ 65,694	\$ 827,746	
HVAC Controls Upgrades	\$ 5,711	\$ 40,003	\$ 6,400	\$ 4,000	\$ 50,404	
Upgrade Building Envelope	\$ -	\$ -	\$ -	\$ -	\$ -	
Window Film	\$ 38,905	\$ 236,927	\$ 37,908	\$ 23,693	\$ 298,528	
Pipe Insulation	\$ 26	\$ -	\$ -	\$ -	\$ -	
M&V Setup (Monthly Construction Period)	\$ -	\$ 39,594	\$ 6,335	\$ 3,959	\$ 49,889	
TOTAL SAVINGS (Energy & Maintenance)	\$ 428,225	\$ 3,071,083	\$ 491,373	\$ 307,108	\$ 3,869,565	
Savings Trasferred to Phase II	\$ 50,715					
Energy & Maintenance Savings Reserved for Phase I	\$ 377,510				\$ -	
ESG PM CM Admin Costs		For Phase I Only				\$ 314,373
Design and Engineering	For Phases I & II					\$ 146,341
Phase I Study Cost	For Phases I & II					\$ 38,100
Payment and Performance Bond	For Phase I Only					\$ 31,621
TOTAL ESG COST						\$ 4,400,000

**Howard County EPC
Comprehensive Proposal
PHASE II CONSTRUCTION**

ECMs	Guaranteed 1 st Yr Total Cost Avoidance, \$/yr	Subcontractor Costs	16%	10%	Total Costs
			Overhead	Profit	
Upgrade Lighting & Controls	\$ -	\$ -	\$ -	\$ -	\$ -
Optimize Vending Machine Operation	\$ -	\$ -	\$ -	\$ -	\$ -
Green Initiatives	\$ 4,948	\$ 111,721	\$ 17,875	\$ 11,172	\$ 140,769
Cooling System Upgrades	\$ 41,964	\$ 599,637	\$ 95,942	\$ 59,964	\$ 755,643
HVAC System Upgrades	\$ -	\$ -	\$ -	\$ -	\$ -
Heating System Upgrades	\$ -	\$ -	\$ -	\$ -	\$ -
HVAC Controls Upgrades	\$ -	\$ -	\$ -	\$ -	\$ -
Upgrade Building Envelope	\$ 13,076	\$ 116,508	\$ 18,641	\$ 11,651	\$ 146,800
Window Film	\$ -	\$ -	\$ -	\$ -	\$ -
Pipe Insulation	\$ -	\$ -	\$ -	\$ -	\$ -
M&V Setup (Monthly Construction Period)	\$ -	\$ -	\$ -	\$ -	\$ -
TOTAL for PHASE II	\$ 59,988	\$ 827,866	\$ 132,459	\$ 82,787	\$ 1,043,111
Savings From Phase I project	\$ 50,715				\$ -
Total Available Savings for Phase II	\$ 110,703				\$ -
ESG PM CM Admin Costs	For Phase II Only				\$ 43,592
Design and Engineering	None				\$ -
Phase I Study Cost	None				\$ -
Payment and Performance Bond	For Phase II Only				\$ 8,524
TOTAL ESG COST					\$ 1,095,227

Howard County EPC Phase II Proposal

Guaranteed 1 st Yr Total Cost Avoidance, \$/yr		ECMs	
		Upgrade Lighting & Controls	\$ 251,917
		Optimize Vending Machine Operation	\$ 3,498
		Green Initiatives	\$ 4,948
		Provide Green Roof	\$ -
		Solar Thermal & PV Applications	\$ 335
		Daylight Harvesting	\$ 4,814
		Cooling System Upgrades	\$ 41,964
		Chiller replace/repair	\$ 33,992
		Cooling Tower VSD Drives	\$ 4,301
		Chilled Water valves	\$ 2,313
		Chilled water pump VSD	\$ 1,358
		HVAC System Upgrades	\$ 103,026
		EMCS Tritium upgrade	\$ -
		EMS upgrades	\$ 54,593
		Replace AHU, RTU and/or Condensing Unit	\$ 4,841
		Demand Control Ventilation CO2	\$ 6,312
		AHU, RTU VSD	\$ 31,604
		ATC controls for Unit Heaters	\$ 2,729
		Intelli-hood Controls	\$ 2,946
		Heating System Upgrades	\$ 25,143
		HW Pump retrofit	\$ 238
		Hot water pumps VSD	\$ 3,353
		Boiler Replacement	\$ 21,554
		HVAC Controls Upgrades	\$ 5,711
		DDC Controls for RTU Setback	\$ 5,711
		Upgrade Building Envelope	\$ 13,076
		Window Film	\$ 38,905
		Pipe Insulation	\$ 26
		TOTAL	\$ 488,213



Energy Conservation Measures (ECMs) Recommended in Multiple Buildings

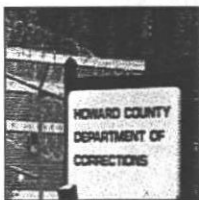


Energy Systems Group (ESG) has developed a comprehensive program for seven Howard County buildings that include a wide range of Energy Conservation Measures (ECMs). This section provides an overview of the ECMs recommended in multiple buildings. This section was created to minimize redundancy thereby decreasing time for review. The scope of work section in the appendix includes the specific details of the upgrades by building. The ECM description section that follows details the ECMs specific to each of the buildings in this project.



Lighting

Existing fluorescent fixtures will be retrofitted with a reflector kit, which will lead to greater fixture efficiency, while optimizing the lighting energy use. New lamp, ballast, socket and reflector will be provided with the kits. Ballast will be tandem wired in as much as possible, which will reduce the number of ballasts, yielding increased construction and maintenance savings. In general, we propose to replace existing four-foot 32-watt fluorescent lamps with 28-watt units with appropriately matched ballasts.



Existing incandescent lamps will be replaced with compact fluorescent lamps where feasible. Existing fluorescent fixtures that are eight foot (8') lamps will be converted to two, 4-foot lamp system. Depending on the specific application and bay height, high-intensity-discharge lamp fixtures will be retrofitted with either the pulse start energy efficient lamp and ballast kit, or T5 fluorescent, or T8 fluorescent kits.



LED lights will be installed in specified outdoor locations. These LED lights represent cutting edge technology and superior life over the existing HID lamps.



Lighting Controls

ESG proposes to install motion sensors in restrooms, conference rooms, hallways, warehouses and common areas where there is no constant traffic. Office space will have motion sensors if there are more than three fixtures and the occupant traffic showed an indication of being out of the office for long periods of time.



Daylight controllers will be installed in areas where there is daylight available through windows, glass doors or skylights. Motion sensors and daylight sensor locations are shown in the room schedule in the appendix section of the proposal.

Optimize Vending Machine Operation

ESG proposes to install VendingMiser™ on vending machines. A VendingMiser™ is a passive infrared sensor mounted to the vending machine or a nearby wall. This sensor detects movement around the general area of the machine. If after a set time period no movement is detected, then the VendingMiser™ moves into a standby mode of operation. In standby mode the machine is powered down. The display lights are disabled and the refrigeration compressor is taken off-line. The VendingMiser™ unit then monitors the ambient conditions and periodically engages the compressor to keep the product at a usable temperature. Cycle time is based on ambient temperature, meaning that the warmer the ambient temperature, the more the unit will cycle in standby mode.

The VendingMiser™ also measures the machine's current draw so that it will not place the machine in standby mode when the compressor is operating, which would eventually damage the compressor because it would restart under high head pressure. The VendingMiser™ will actually increase equipment life because the compressor cycles fewer times per day.

Tridium Upgrade

ESG proposes to install a Tridium supervisory controller. Tridium is a universal software platform that provides the ability to integrate multiple existing Energy Management Systems (EMS) regardless of the manufacturer, or communication protocol - into a unified platform that can be easily managed and controlled in real-time over the Internet.

EMS Upgrades

This scope of work includes the upgrade of the existing Metasys DDC (Direct Digital Controls) system to include additional EMS functions. This scope affects multiple ECMs and addresses the functions listed below:

Nighttime Setback – Setback space temperatures during the unoccupied time periods to reduce the runtime of the rooftop air handlers. Space temperatures during the summer months can be reset to 80°F or more during the unoccupied periods. Winter time space temperatures can be setback to 60°F or below during the unoccupied time periods.

Discharge Air Reset – The cooling discharge air temperature is set to maintain 55°F (typical) supply air temperature to the spaces. However, during periods of reduced loads, the discharge air temperature can be reset up or down to minimize the amount of reheat energy and primary cooling coil energy consumed by the HVAC system.

Economizer Control of Rooftop Units – Outdoor air can be utilized to provide free cooling to the building during time periods when outside air temperatures allow. Utilizing cooler outdoor air to cool the building reduces the need for mechanical cooling and thereby reduces energy consumption. The EMS controls will monitor the outdoor air temperature and based on the interior cooling load, will reset the outdoor air volume to meet the cooling demand.

CO2 monitoring – The demand ventilation control measure will adjust the minimum outside air introduced into the space based on occupancy. As needed, the exhaust fans associated with the air handler will be ramped up or down to maintain proper space pressurization.

ESG proposes to upgrade the existing Johnson Metasys system with new DDC control devices and programming for VSD control, and the start/stop/status of equipment. We also propose programming, commissioning, software, server communications, system engineering and system graphics for the upgrades included in the project.

Building Envelope

ESG uncovered areas where envelope upgrades will increase the performance of the existing building envelope, which in turn will create a more comfortable interior condition and reduce energy loss. Improvements to the building envelope in each of the seven (7) buildings will minimize energy losses and will help reduce leaks to and from outdoors. The energy savings calculations were performed using National Energy Audit (NEAT) software, developed at Oakridge National Laboratories (ORNL) for the Department of Energy.

The general scope of work will include adjustment and/or replacement of weather stripping, sealing penetrations, insulating exposed floor areas by adding insulation foam boards.

Window Film

Window films reduce up to 99 percent of the sun's ultraviolet rays and reject up to 79 percent of the solar heat that may otherwise come through a window. They also help reduce winter heat loss by reflecting up to 35 percent of indoor heat back into the room. ESG proposes to install window film on vertical windows and skylights of selected buildings.

Project: Howard County EPC Detention Center
Phase: Phase II Proposal

LIST OF RECOMMENDED MEASURES		
Group	ECM	Detention Center
Lighting	Upgrade Lighting & Controls	X
	Optimize Vending Machine Operation	X
Cooling System Upgrades	Chiller replace/repair	X
	Cooling Tower VSD Drives	X
	Chilled Water valves	X
	Chilled water pump VSD	X
HVAC System Upgrades	EMCS Tridium upgrade	X
	EMS upgrades	X
	AHU, RTU VSD	X
	Intelli-hood Controls	X
Heating System Upgrades	HW Reset Schedule	X
	HW Pump retrofit	X
	Hot water pumps VSD	X
	Boiler Replacement	X
Envelope Upgrades	Upgrade Building Envelope	X

The highlighted ECMs from the table above are discussed in the Section titled "ECMs Recommended in Multiple Buildings." (Gray sheets at the beginning of this section.) ECMs specific to this building are described in the following pages.

Detention Center

Centrifugal Chillers

The existing Trane centrifugal chillers are approximately twenty-one years old and are experiencing issues with their operation. The chillers are designed to operate in series and were designed with a rated efficiency of 0.89 kW per ton. However, due to age and tube fouling, it is estimated that the chillers are currently operating at a rated efficiency of 1.10 kW per ton. In addition, according to the facility staff at the Detention Center (DC), the chillers lose their vacuum once or twice each operating season and shut down on safety.



ESG proposes to replace the two existing Trane centrifugal chillers with two new Trane high-efficiency centrifugal chillers having a rated output of 150 nominal tons each. It is also recommended that the chiller plant be re-piped for parallel operation with a main chiller plant header pipe. Chiller 3 will remain and operate as the standby chiller in the new plant. The recommended chillers are Trane 3-pass water cooled Series R, Model RTHD rated at 150 nominal tons.

We propose two 150-ton units for reasons of redundancy. Based on the block load analysis of Detention Center, we estimate the design cooling demand for DC to be roughly 250 tons. By having three chillers, two units at 150 tons each, and the existing #3 chiller at 100 tons, should the biggest chiller go out of service (i.e., one of the 150 ton units), the remaining chillers can still meet the design demand.

CENTRIFUGAL CHILLER SCHEDULE (@100% LOAD)							
Evaporator Section				Condenser Section		Electrical	
Ent. Temp.	Lvg. Temp.	Flow (gpm)	PD Ft of H ₂ O	Flow @ 85/96°F (gpm)	PD Ft of H ₂ O	Volts	Unit Power (kW)
56 °F	44 °F	298	5.9	375	8.5	208	97.5

CENTRIFUGAL CHILLER PART LOAD PERFORMANCE			
% Load	Capacity (tons)	kW	Efficiency (kW/ton)
100	150	97.5	0.650
75	112.5	64.8	0.576
50	75	39.6	0.528
25	37.5	27.7	0.739

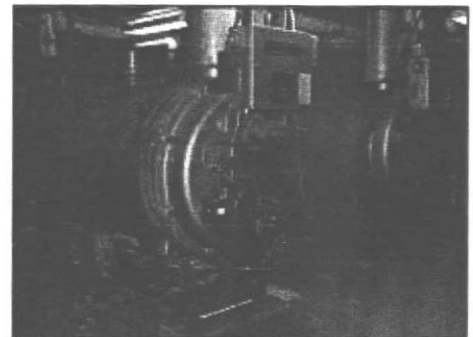
Install Variable Speed Drives on the Cooling Towers

The existing Evapco cooling tower fan operates with a 2-speed/single winding motor. The existing BAC cooling tower operates with a two-speed motor. This measure recommends the installation of variable speed drives (VSD's) on the both cooling tower fans to reduce electricity consumption during low cooling load time periods. The VSD will vary the speed of the fan in relation to the actual load on the chiller plant. Rather than cycling the cooling tower fan on and off to maintain the condenser water temperature, the VSD will vary the fan speed to maintain the temperature of the water supply. The VSD will reduce the fan horsepower as well as reduce the wear and tear on the motor and the motor drive.

Replace Two Older Boilers

Boilers 1 and 2 were installed during the original construction and are approximately twenty-one years old and experiencing problems with operation. Boiler 3 was installed during the Detention Center expansion and appears to be in good condition.

ESG recommends that new high efficiency heating water boilers be installed to replace the two older Cleaverbrooks boilers. Four Futera III boilers by RBI will be installed to replace the two existing Cleaver Brooks boilers. Each RBI boiler is rated at 1,750 MBH input with a rated output of 1,523 MBH output. The new RBI boilers will provide increased turn-down capacity for lower load operation at higher combustion efficiencies. The new boilers will be installed in the same location as the existing boilers and will be connected to the existing gas supply and make-up water.



Existing CB Boilers

The boilers were selected based on the Detention Centers expressed need for system redundancy. Adequate redundancy is based on the central heating plant being capable of meeting the peak demand of the building without the largest boiler on line. The peak heating load of the building is estimated at 5,000 to 5,500 MBH. The new boiler plant consists of four (4) 1,523 MBH output boilers. With the largest boiler offline (Cleaver Brooks CB100), the total boiler plant capacity is 6,092 MBH. The existing CB Boiler will provide back-up to the new boilers and should only be operated when needed during peak load periods.

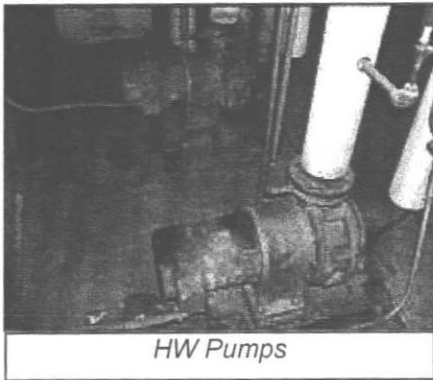
Variable Speed Drives

This scope of work includes the installation of variable speed drives (VSDs) on specific mechanical systems to control the speed of the fan or pump to reduce electrical consumption. ESG proposes to install Variable Speed Drives on the Cooling Tower, AHU-1, chilled water pump and heating water pump.

Chilled Water Valves

In conjunction with installing VFDs on chilled water pumps, we propose to replace the existing 3-way valves on AHU cooling coils with 2-way valves, so the chilled-water flow through the coil can be varied in proportion to the cooling demand, determined by measuring the coil leaving discharge air temperature.

Replace Old Heating Water Pumps



Several heating water pumps located in the older section of the Detention Center are original and are in poor condition. Howard County Government has started replacing several pumps already. Two remaining pumps serving the heating system will be replaced with new pumps and premium efficiency motors.

We propose to replace the two hot-water pumps with two new similar units.

Kitchen Hood Controls

ESG proposes to install Intelli-Hood® controls on existing kitchen exhaust hoods. These variable-speed controls for commercial kitchen ventilation systems can save fan energy by improving the efficiency of the hoods. When the cooking appliances are turned on the fan speed increases based on exhaust air temperature as well as the level of smoke. During actual cooking, the speed increases to 100% until smoke/vapor is removed.

Please see Scope of Work Section in the appendix for details on this proposal and also refer to the Building Description Section for thorough descriptions of existing conditions.

Project:

Howard County EPC Scaggsville PSC

Phase:

Phase II Proposal

LIST OF RECOMMENDED MEASURES

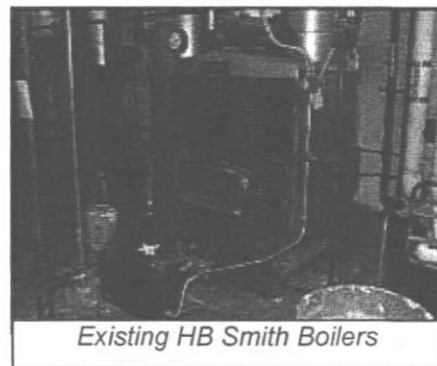
Group	ECM	Scaggsville PSC
Lighting	Upgrade Lighting & Controls	X
	Optimize Vending Machine Operation	X
Cooling System Upgrades	Chilled Water valves	X
HVAC System Upgrades	EMCS Tridium upgrade	X
	EMS upgrades	X
	Demand Control Ventilation CO2	X
Heating System Upgrades	HW Reset Schedule	X
	Boiler Replacement	X
Envelope Upgrades	Upgrade Building Envelope	X
Miscellaneous	Pipe insulation	X

The highlighted ECMs from the table above are discussed in the Section titled "ECMs Recommended in Multiple Buildings." (Gray sheets at the beginning of this section.) ECMs specific to this building are described in the following pages.

Scaggsville Public Safety Complex

Replace Central Boilers

The two existing, oil-fired HB Smith boilers were installed when the building was originally constructed. These boilers are operating with a reduced efficiency due to their age and in comparison to current boiler standards. We propose to replace the existing HB Smith boilers with high-efficiency non-condensing boilers. We propose to install two gas-fired, Futura III boilers by RBI to replace the two existing oil-fired HB Smith boilers. Each RBI boiler is rated at 1,500 MBH input with a rated output of 1,305 MBH output. The new RBI boilers will provide increased turn-down capacity for lower load operation at higher combustion efficiencies. Our scope includes extending a new natural gas service to the building and extending the gas lines to the boiler room. The new boilers will be installed in the same location as the existing boilers and will be connected to the newly extended gas supply and existing make-up water, electrical and other boiler infrastructure. New flue exhaust stacks will be installed to prevent condensing within the larger existing exhaust stacks since the existing stacks are larger than required for the new boilers.



Existing HB Smith Boilers

Chilled Water Isolation Valve and Insulation Replacement



Exterior Chilled Water Piping Insulation

This scope of work includes the replacement of the two pneumatic isolation valves within the chilled water distribution lines outside by the air-cooled chillers. The installation and proper operation of the isolation valves will prevent chilled water from the operating chiller from blending with the return water going through the non-operating chiller.

We also propose to replace the exterior chilled water pipe insulation as part of this measure.

Please see Scope of Work Section in the appendix for details on this proposal and also refer to the Building Description Section for thorough descriptions of existing conditions.

Project:

Howard County EPC East Columbia Library

Phase:

Phase II Proposal

LIST OF RECOMMENDED MEASURES

Group	ECM	East Columbia Library
Lighting	Upgrade Lighting & Controls	X
	Optimize Vending Machine Operation	X
Green Initiatives	Provide Green Roof	X
HVAC System Upgrades	EMCS Tridium upgrade	X
	EMS upgrades	X
	Demand Control Ventilation CO2	X
	AHU, RTU VSD	X
Heating System Upgrades	Hot water pumps VSD	X
Envelope Upgrades	Upgrade Building Envelope	X
Miscellaneous	Window Film	X

The highlighted ECMs from the table above are discussed in the Section titled "ECMs Recommended in Multiple Buildings." (Gray sheets at the beginning of this section.) ECMs specific to this building are described in the following pages.

East Columbia Library

Install Variable Speed Drives

- AHU's-1, 3 and 4

AHU's-1, 3 and 4 are variable air volume (VAV) units that utilize inlet guide vanes (IGV) to vary the flow of air to the VAV boxes. We propose to replace the IGV function through variable speed drives. The IGVs will either be locked in the full-open position or removed entirely, where feasible, and be replaced by a variable speed drive (VSD). The VSD will vary the speed of the fan directly by varying the motor speed and reduce the amount of electricity used by the fan motors. The required speed of the VSD will be determined by the existing differential pressure sensor.

- HW Pumps

Currently, the heating water pumps operate at a constant speed. As the 2-way valves close, a pressure by-pass in the piping opens to maintain constant flow through the system. Energy can be saved by varying the flow of the heating water pumps in relation to the pressure in the system. As the 2-way valves on the VAV boxes close, the pressure in the piping system will increase. The control system will reduce the speed of the pump(s) via the variable speed drives to maintain a constant system pressure. As the speed of the pump is reduced, the electrical consumption is reduced, resulting in energy savings.

Green Roof

A green roof is a roof substantially covered with vegetation. Green roofs improve the energy performance of buildings, reduce storm water runoff, and contribute to a healthier environment. ESG proposes to install 1200 square feet of modular green roof. In the modular system, the modules are composed of recycled plastics and can be placed directly on the roofing membrane or on any other surface. The modules are composed of 60% post-industrial, recycled, high molecular weight polyethylene. The modules come in a variety of sizes and are available in three depths. ESG and Howard County staff will work together to determine the planting scheme and layout of the modules. This proposed system can absorb up to 99% of a 1-inch rainfall. Runoff potential is reduced, lessening the risk of flooding and sewer overflows. By slowly percolating through the specialized growing media, roof runoff occurs several hours after peak flows. This provides additional time for sewer systems to handle other uncontrolled runoff.

We propose the green roof at East Columbia Library because the building already has a photovoltaic system in place, and a green roof at the same location provides a great opportunity to the County for a community education and awareness type program.

Please see Scope of Work Section in the appendix for details on this proposal and also refer to the Building Description Section for thorough descriptions of existing conditions.

Project:

Howard County EPC Central Library

Phase:

Phase II Proposal

LIST OF RECOMMENDED MEASURES

Group	ECM	Central Library
Lighting	Upgrade Lighting & Controls	X
	Optimize Vending Machine Operation	X
Cooling System Upgrades	Cooling Tower VSD Drives	X
HVAC System Upgrades	EMCS Tridium upgrade	X
	EMS upgrades	X
	Demand Control Ventilation CO2	X
Envelope Upgrades	Upgrade Building Envelope	X
Miscellaneous	Window Film	X

The highlighted ECMs from the table above are discussed in the Section titled "ECMs Recommended in Multiple Buildings." (Gray sheets at the beginning of this section.) ECMs specific to this building are described in the following pages.

Central Library

Variable Speed Drive on Cooling Tower Fan

The existing Baltimore Air Coil (BAC) cooling tower fan operates at a constant speed. Currently, the tower fan cycles on and off to maintain the condenser water temperature at the preset 85°F. A variable speed drive (VSD) will vary the speed of the fan automatically to maintain the condenser water temperature. The fan laws dictate that as the speed of the fan is reduced, the power consumed by the fan motor is reduced at the 'cube' rate. Therefore, ESG proposes to install a VSD to reduce the energy consumption at the cooling tower. In addition, the VSD employs a soft-start feature that slowly ramps up the speed of the fan motor to reduce stress and wear to the motor, fan drive and belts. This will reduce maintenance costs for the cooling tower fan motor as well.

Please see Scope of Work Section in the appendix for details on this proposal and also refer to the Building Description Section for thorough descriptions of existing conditions.

Project: Howard County EPC Recs & Parks HQ
Phase: Phase II Proposal

LIST OF RECOMMENDED MEASURES		
Group	ECM	Recs & Parks HQ
Lighting	Upgrade Lighting & Controls	X
	Optimize Vending Machine Operation	X
Green Initiatives	Solar Thermal & PV Applications	X
	Daylight Harvesting	X
HVAC System Upgrades	EMCS Tridium upgrade	X
	EMS upgrades	X
	Replace AHU, RTU and/or Condensing Unit	X
	ATC controls for Unit Heaters	X
Controls & Re-CX HVAC	DDC Controls for RTU Setback	X
Envelope Upgrades	Upgrade Building Envelope	X
Miscellaneous	Window Film	X

The highlighted ECMs from the table above are discussed in the Section titled "ECMs Recommended in Multiple Buildings." (Gray sheets at the beginning of this section.) ECMs specific to this building are described in the following pages.

Recreation and Parks Headquarters

This building is heated and cooled by multiple single zone type rooftop air handlers and split systems A/C units. The rooftop air handlers are manufactured by York and serve single zones with multiple spaces in the building. Single zone programmable thermostats control the operation of the rooftop units. However, inspection of the programmable thermostats during the facility audit revealed that many of them are not programmed properly.

Install Controls for RTU Setback

This measure involves installation of DDC controls to manage the operation of the existing rooftop air handlers. We propose to provide energy management controls such as unoccupied setback and temperature averaging between the first and second floors. The existing thermostats will be replaced with Honeywell Lonworks communicating programmable thermostats. The existing wiring between the existing thermostat and RTU will be reused.

Replace Existing Rooftop Units

In this measure we propose to replace the existing seven York rooftop units with seven new York (or equal) energy-efficient rooftop air units. The new rooftop units will operate with a 9.0 SEER (Seasonal Energy Efficiency Ratio) or 13.5 SEER depending on the unit's capacity.

The new RTUs will be self contained, direct gas-fired units similar to the existing units, and will reduce the electricity use by approximately 25% to 30% compared to the existing older units. The new rooftop units would be installed with curb adaptors that will permit reuse of the existing roof curb to limit changes to the roof. We will retain existing gas, electrical and other infrastructure and reuse them for the proposed units.



Existing Rooftop Air Handler

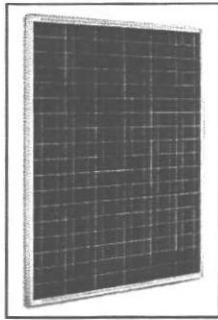
Install Automatic thermostats to Control Unit Heaters in Shop Room



Shop Unit Heater

The existing unit heaters operate based on a manual dial setting on the unit heater. We propose to install Honeywell Lonworks programmable thermostats to setback the space temperature during unoccupied periods.

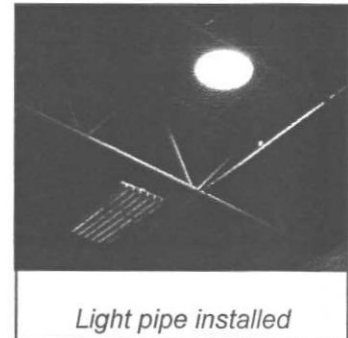
Solar Photovoltaic System



Photovoltaics (PV), solar electric technology features large arrays of collectors made up of silicon-coated cells. When sunlight strikes the surface of a PV cell, the incident solar light is converted to electrical energy. The energy generated by the PV system is direct current, and an inverter needs to be used to convert the direct current to an alternating current at 60 Hz, for use at the building. The proposed PV measure includes a 3 kW (AC) PV system, an inverter and electrical hardware that will synchronize with the electrical grid. The system will also include a utility-grade electrical kWh meter where the PV system will be connected before of the building's existing electrical utility meter.

Daylight Harvesting

ESG proposes to install light pipes in the warehouse area and in buildings B and C. A light pipe is a lens-based device that collects and focuses renewable daylight, bringing natural light indoors without using electricity. The light pipe is designed and manufactured to maximize light collection during times of low sun angles, such as those that occur during early morning and late afternoon. Since it maximizes available natural light output in lowlight conditions the facility can turn off lights during the day and thereby generate energy savings. Because we recommend this measure, we do not propose any retrofit for the existing high intensity discharge fixtures.



Light pipe installed

Please see Scope of Work Section in the appendix for details on this proposal and also refer to the Building Description Section for thorough descriptions of existing conditions.

Project: Howard County EPC Dorsey Building
Phase: Phase II Proposal

LIST OF RECOMMENDED MEASURES		
Group	ECM	Dorsey Building
Lighting	Upgrade Lighting & Controls	X
	Optimize Vending Machine Operation	X
HVAC System Upgrades	EMCS Tridium upgrade	X
	EMS upgrades	X
Envelope Upgrades	Upgrade Building Envelope	X

The highlighted ECMs from the table above are discussed in the Section titled "ECMs Recommended in Multiple Buildings." (Gray sheets at the beginning of this section.) ECMs specific to this building are described in the following pages.

Dorsey Building

All ECMs recommended for the Dorsey building are described in the section titled "ECMs Recommended in Multiple Buildings", on the gray sheet at the front of this section.

Recommended but not funded

The existing Mammoth rooftop air handling units are approximately 25 years old and are approaching the end of their useful life. One of the smaller units was replaced several years ago with a new rooftop unit. Four of the five remaining Mammoth units are showing signs of degradation including multiple air leaks from section seams, water leaks from rain and refrigerant leaks in the condenser section. The units are variable air volume with inlet guide vanes to vary the air flow.

The remaining Mammoth units should be replaced with new rooftop air handlers. This measure has not been included in this project due to uncertainty about the future of the building. However, if Howard County anticipates keeping this building in service for the next several years, this upgrade should be considered.

Please refer to Scope of Work section and Building Description Section in the appendix for specific details relevant to this building.

Project: Howard County EPC Gateway Building
Phase: Phase II Proposal

LIST OF RECOMMENDED MEASURES		
Group	ECM	Gateway Building
Lighting	Upgrade Lighting & Controls	X
	Optimize Vending Machine Operation	X
Cooling System Upgrades	Cooling Tower VSD Drives	X
HVAC System Upgrades	EMCS Tridium upgrade	X
	EMS upgrades	X
	AHU, RTU VSD	X
Envelope Upgrades	Upgrade Building Envelope	X
Miscellaneous	Window Film	X

The highlighted ECMs from the table above are discussed in the Section titled "ECMs Recommended in Multiple Buildings." (Gray sheets at the beginning of this section.) ECMs specific to this building are described in the following pages.

Gateway Building

Install Variable Speed Drives

The existing five air handlers are variable-air-volume (VAV) units that utilize inlet guide vanes (IGVs) to vary the flow of air to the VAV boxes. We propose to replace the function of the IGVs with variable speed drives (VSDs). The IGVs will either be locked in the full-open position or removed entirely, if feasible, their function replaced by VSDs. The VSD will vary the speed of the fan motor and reduce the amount of electricity consumed by the fan motors. The existing static pressure sensor will be used to control the speed of the VSD.

Cooling Tower Fan

The existing cooling tower operates with two speeds to provide additional stages of operation for the cooling tower. In this measure we propose to disconnect and abandon in place the smaller motor and install a variable speed drive on the main tower fan to control tower operation. As the load decreases on the cooling tower (i.e., reduced airflow), the controls (temperature of water leaving the tower) will reduce the speed of the fan and reduce the amount of electricity consumed by the fan motors.



Exterior of Gateway building, illustrates glass where window film will be installed

Please see Scope of Work Section in the appendix for a detailed list of locations and associated upgrades.

Energy Conservation Measures (ECMs)

Evaluated but Not Funded

The primary requirement of an Energy Performance Contract (EPC) is that the recommended measures be paid for with the energy and operational savings achieved through the upgrades. In every EPC there are always ECMs which cannot be included because they generate insufficient energy savings to justify the cost. The following measures were evaluated but were not included as part of this project. However, many of these ECMs could be included in this project if Howard County chooses to extend the term of the project from 13.5 years to 15 years.

Replacement of Rooftop Units at the Dorsey Building

Three (3) existing, self-contained, direct gas-fired Mammoth rooftop units are in poor condition and should be replaced with energy-efficient, appropriately-sized new units with variable speed drives installed. This measure was excluded because of the less-than-desirable economics of the measure, as well as due to the uncertain nature of the future of the building. However, if it is determined that the building will remain in the ownership of Howard County for next several years, then this upgrade should be considered.

Re-Commissioning and Repair of VAV Boxes

The VAV boxes at the Detention Center (DC), Central Library (CL), Scaggsville Public Safety Complex (SPSC) and East Columbia Library (ECL) were considered in the scope of this measure. At the DC, the cell block area contains VAV boxes with pneumatic controls and pneumatic damper actuators. An inspection above the ceiling within the cell block area revealed that conditioned air was blowing into the ceiling space (see "Duct Leakage" measure discussed later in this section). This is most likely due to ductwork that has been blown open by over pressurization caused by the non-functioning inlet guide vanes on the air handlers. The VAV Boxes within the Administrative area of DC contain electric controllers and 2-way valves on the reheat coils. The facility staff also indicated that they have problems with reheat coils overheating the spaces. The VAV boxes, controllers and reheat coil valves should be checked for proper operation and fully re-commissioned. We propose a similar re-commissioning approach at the other three buildings listed above. This measure has not been included at this time and if ESG were to propose this to Howard County it would be structured as a cost-per-VAV-box scenario.

Upgrade VAV boxes to DDC

We examined replacing the VAV boxes at the DC with similar new DDC (Direct Digital Controls) units. The measure was considered in lieu of the measure discussed above, *Re-Commissioning and Repair of VAV Boxes*. The measure was excluded due to lack of excess savings.

Re-commission Pneumatic Controls

The pneumatic controls in several of the buildings are older and some of the components are in need of repair/replacement and calibration. ESG considered including an allowance for the purposes of surveying to identify the deficiencies and recommend appropriate corrective actions for the re-commissioning of pneumatic controls, actuators, valve actuators and controllers. The measure was considered at the Dorsey building but was excluded due to lack of excess savings.

Duct Leaks in Detention Center

It was noted during the field survey at the DC that the space between the ceiling and the roof was very well conditioned which is indicative of significant duct leaks. ESG recommends that the County investigate this further to determine the source and extent of the leaks and then make the necessary repairs. There were not sufficient savings to provide an allowance in this project for the purposes of this study.

Energy Cap

Howard County requested that ESG evaluate the purchase of the Energy Cap program to generate a database and historical reference for energy usage in the government buildings. This measure has not been included due to lack of excess savings.

Water

Most EPCs include water conservation measures. ESG did evaluate the conversion of toilets, urinals and sink aerators to low-flow fixtures as well as rainwater harvesting and some laundry upgrades. However, the payback period was too long for inclusion in this project. If Howard County initiates a Phase II project for an EPC on all remaining buildings this measure would most likely be included due to the economies of scale.

Premium Efficiency Motors

We considered installing newer, more efficient electric motors on pumps and air handlers. The cost to replace currently functioning motors is high and the payback is typically longer than desirable. Hence the measure is not included in this project. We recommend that Howard County replace existing motors with premium-efficiency motors as the units fail.

Infrared Heaters at Scaggsville PSC

The fire engine portion of the Scaggsville Public Safety Complex (SPSC) building is heated by hot-water unit heaters. There are large amounts of heat loss each time the garage doors are opened for the emergency vehicles. High bay work shop spaces with intermittent garage door openings can utilize infrared heaters to reduce the amount of heat loss each time the doors are opened in the winter. An infrared heater does not heat the air, but instead warms only people through direct radiation. This measure is not included due to the lack of excess savings. The measure would require bringing new natural gas service to the building, which is included with the proposed boiler replacement measure. However, additional expenditure incurred from extending the gas supply from the boiler mechanical room to the fire engine garage, makes the measure's economics rather marginal, so it is not included.

Thermal Equalizers

The Central Library contains a high peak roof on the upper level. During the winter months, heat rises from the floor level and collects in the high peak, which reduces the effectiveness of the air heating system due to thermal stratification. We considered installing thermal equalizers, which are fans that mix warm air with the colder air, thus improving the overall comfort and the heating system's effectiveness. The measure is excluded due to lack of excess savings.

Electrical power correction

The electric power enhancing device, USES[®], is a device that uses magnetic fields to manage power consumption by holding voltage up during short duration brown-outs, and preventing voltage spiking, by rapidly absorbing energy in its magnetic choke system. This Measure has not been included due to lack of excess savings.

Energy Demand Response

The electrical grid in the Northeast corridor is greatly burdened and the Independent System Operator, PJM (Pennsylvania, Jersey, Maryland) has initiated a financial rebate program that is based on reducing the electrical demand on peak days. We examined this program, and recommended it to the County for further action. The measure is not included as part of the project

**Howard County EPC
Phase II Proposal**

Measurement and Verification Plan

ECMs		Proposed M&V Method - Whole Program ^a	Proposed M&V Overview
Upgrade Lighting & Controls		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Optimize Vending Machine Operation		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Provide Green Roof		Not an ECM	No savings are attributed to the measure, no M&V is proposed
Solar Thermal & PV Applications		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Daylight Harvesting		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Chiller replace/repair		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Cooling Tower VSD Drives		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Chilled Water valves		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Chilled water pump VSD		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
EMCS Tridium upgrade		Not an ECM	No savings are attributed to the measure, no M&V is proposed
EMS upgrades		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Replace AHU, RTU and/or Condensing Unit		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Demand Control Ventilation CO2		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
AHU, RTU VSD		C	Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.

**Howard County EPC
Phase II Proposal**

Measurement and Verification Plan

ECMs		Proposed M&V Method - Whole Program ^a	Proposed M&V Overview
ATC controls for Unit Heaters	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Intelli-hood Controls	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
HW Reset Schedule	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
HW Pump retrofit	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Hot water pumps VSD	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Boiler Replacement	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
DDC Controls for RTU Setback	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Upgrade Building Envelope	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Window Film	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.
Pipe Insulation	C		Based on utility meter reconciliation with adjustments to: (1) number of billing days, (2) weather, (3) occupancy changes, (4) operational changes, (5) area (square foot) changes, etc.

^a Proposed Option C is not building specific, but it is for the whole program

Performance Guarantee Monitoring

M&V Plan Overview

Implementing measurement and verification (M&V) strategies in energy performance contracts is required for the contractor to verify the achievement of energy cost savings "guaranteed" in the contract. Beyond satisfying the law, properly applied M&V can accurately assess energy savings, allocate risks to the appropriate parties, reduce uncertainties to reasonable levels, monitor equipment performance, find additional savings, improve operations and maintenance, verify cost savings guarantee is met, and allow for future adjustments as needed.

This M&V plan is prepared by Energy Systems Group (ESG) for Howard County to help both parties agree on the methodologies to justify savings for the Energy Conservation Measures (ECMs) proposed. The International Performance Measurement & Verification Protocol (IPMVP, Revised April 2007) is used as the basis of determining energy savings in this M&V plan. This M&V plan specifies the approach to monitor the actual energy savings associated with the project, provide sample energy savings calculation documents, describe the methodology, measurement, and monitoring format of actual energy savings, and define the conditions to adjust the energy consumption baseline throughout the contract period.

M&V Approach Summary

IPMVP Option C¹ is the approach used in this M&V process with consideration of the characteristic of the overall impact of the project at the utility meter. Lighting retrofits, chiller, RTU and boiler plant retrofits, AHU, RTU and other mechanical system upgrades, control system upgrades and renewable energy technology are the significant ECMs proposed in this project.

The option C compares annual baseline utility meter data with comparable performance-period meter data to calculate the energy savings. The approach makes adjustments for weather, number of billing days and other parameters that vary from the baseline to the specific performance-period year. The proposed Option C methodology is for the whole program and is not building specific. The offered energy and cost guarantee applies to the total electrical (kWh and kW), thermal (natural gas and oil) and associated cost reductions.

Global Assumptions

Risk & Responsibility

Performance of equipment, both before and after a retrofit, can be measured with varying degrees of accuracy. However, it is important to allow for changes in energy cost savings that may result from factors outside either party's control. All key risk and responsibilities will be identified and clarified in this M&V plan.

¹ Excludes operational and construction-period savings; and the water measure is proposed as Option A

Major Changes in Facilities

ESG will not be responsible for any changes in the facility. The actual savings will be adjusted according to the changes if applicable.

Operating Hours

The Howard County generally has control over the operating hours. Increases and decreases in operating hours can show up as increases or decreases in "savings" depending on the M&V methods. ESG and Howard County will determine and agree on the operating hours. Any changes of that afterwards would result in the adjustment of the contractual savings.

Equipment Performance

ESG will have control over the selection of any equipment installed and is responsible for its proper installation and performance.

Operation and Maintenance

Operation and Maintenance activities can impact the equipment performance. The responsibilities will be negotiated between both parties and specified in the contract.

Equipment Replacement

Responsibility for replacement of contractor-installed equipment is negotiable; however, it is often tied to an ECMs performance. Howard County is responsible to inform ESG about any replacement of such equipment.

Utility Rate

Baseline Utility Rate

The utility rates used to develop the baseline model for the verification activities are the most current rate applied to the facilities, which will be in the final contract. These baseline utility rates will be used to adjust the historical billing data (12 to 24 months) if there are any changes during that period. The utility rates used for the post-installation report and the following annual report will be those defined in the new energy policy affected by the retrofits.

Schedule & Reporting for Verification Activities

After the approval of the M&V plan by Howard County, the M&V procedure and schedule are accepted by both parties. The measurement activities will be done under the witnessing of a representative of Howard County and all collected data need to be reviewed and accepted by Howard County. The data will be used for the baseline development and the verification report. Howard County is responsible to facilitate such processes and any delays will result in the corresponding delay about the reporting activities.

ECM Specific M&V Plan

Overview of ECM and M&V Plan

Scope of Work

ESG will implement the lighting retrofits, mechanical system retrofits, control system upgrades and other ECMs as outlined in the Scope of work at the Howard County buildings.

M&V Guideline and Option Used

International Performance Measurement and Verification Protocol (IPMVP 2007) is the guideline to develop this M&V plan. With consideration of the characteristic of the specific ECMs, acceptable accuracy, reasonable cost, and Howard County's demand, Option C is used to verify the energy savings for this project.

Option C involves comparison of annual baseline utility meter data with comparable performance-period meter data to calculate the energy savings. The approach makes adjustments for weather, number of billing days and other parameters that vary from the baseline to the specific performance-period year. The adjustments are discussed in detail elsewhere in the M&V section.

Intent of M&V Plan

This M&V plan is prepared by ESG for Howard County to help both parties agree on the methodologies to justify savings for energy conservation measures (ECMs) proposed for the project. This M&V plan specifies the approach to establish the baseline models, define the performance conditions that are currently in place and those required once the ECMs are in place and the conditions to adjust the energy consumption baseline throughout the contract period, and test statistical validity of regression models.

Energy Baseline Development

Variables Affecting Baseline Energy Use

- Lighting systems and operating hours: Fixtures type and quality with the ballast information, foot-candle value, operating hours, actual occupancy from the data loggers, and a count of burned out lamps.
- HVAC systems and operating hours: Efficiency (kW/ton), kW, actual volts and amps information from the nameplate for chillers and air conditioners, temperature and humidity setting for each unit, control sequence, quantity of minimum ventilation air and total air, and operating hours by installation of data loggers.
- Fans and operating hours: Efficiency (%), kW, actual volts and amps information from the nameplate for motors, static pressure set point for fans, and operating hours by installation of data loggers or consistence with that for the corresponding equipment
- Pumps systems and operating hours: Efficiency (%), kW, actual volts and amps information from the nameplate for motors, static pressure set point for pumps from the gauges, and operating hours by installation of data loggers or consistence with that for the corresponding equipment.



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- Hot water systems: Efficiency (%), kbtu/h, and GPH information from the nameplate of hot water heaters, supply hot water temperature setpoint, and average monthly hot water amount by installation of data loggers.
- Electrical systems: measurement of voltage, amperes, measured power factor, electrical power (kW), electrical apparent power (kVA) and electrical reactive power (kVAR) values

Requirement for Howard County's Witness of Pre-Measurements

Howard County should provide necessary information, and facilitate and witness the pre-installation measurement processes defined in this M&V plan which will be conducted by Energy Systems Group. All measured/collected data and calculation procedures need Howard County's review and acceptance.

Post--Installation M&V Activities

Variables Affecting Post--Installation Energy Use

This is similar to the baseline condition.

Requirement for the Howard County's Witness of Post-Measurements

Howard County should provide necessary information, and facilitate and witness the post-measurements processes defined in this M&V plan which will be conducted by Energy Systems Group.

Post--Installation Data Collected

This is similar to the baseline data collection.

Schedule of Periodic Verification Activities and Inspections

Periodical on-site surveys will be conducted by ESG to verify any changes in the site data.

Energy Savings Calculations

The energy savings calculations are based on a comparison of pre and post installation consumption loads for the specific measures. In General:

Pre-installation energy usage – Post-installation energy usage = Energy Savings (for M&V Option A)

Option C methodology incorporates adjustments for weather, number of billing days, and other variables listed else where in the report. For Option C:

Adjusted Baseline – Current Usage = Energy Savings

Total Annual Energy Cost Savings for ECMs

Total annual energy cost savings for ECMs is the sum of the calculated dollar value of energy savings.

Energy Savings Guarantee and M&V Plan

DEFINITIONS

When used in this Agreement, the following capitalized words shall have the meanings ascribed to them below:

"Acceptance of Installation" means an authorized representative of the CLIENT has inspected and accepted that ESG installed Energy Conservation Measures are operational and comply with contract performance requirements and specifications. The CLIENT's acceptance shall not relieve ESG from responsibility for continued compliance with contract requirements during the contract term. The Acceptance of Installation shall occur after Substantial Completion.

"Approval" means the CLIENT has completed review of submittals, deliverables or administrative documents (e.g., insurance certificates, installation schedules, planned utility interruptions, etc.) and has determined that the documents conform to contract requirements. The CLIENT's approval shall not relieve ESG from responsibility for complying with contract requirements.

"Baseline Period" is defined as the twelve month period beginning February 1, 2007 and ending January 31, 2008.

"Energy Baseline" shall be the energy consumption and costs prior to the installation of the energy conservation measures at the facilities. The baseline will consist of all base year energy bills applicable to the meters in the project. It may also consist of any estimated usage for unmetered energy consumption.

"Energy Conservation Measure (ECM)" is defined as the installation of new equipment/facilities, modification and/or alteration of existing equipment/facilities or rate structures or revised operations and maintenance procedures intended to reduce energy consumption of facilities/energy systems, improve equipment efficiency or provide equipment that complies with existing standards.

"Energy and Operational Savings" is the sum of the Energy Savings and Operational Savings as defined herein.

"Energy Costs" shall mean charges for fuel adjustments, base services, transmission, tariffs, and distributions. The Energy Costs will normally be derived or imputed from the facility's utility bills. This method allows for updating savings calculations with changing rate schedules. In the event of a utility rate decrease, the utility rate(s) used to assign dollar cost will not drop below that of the base year.



"Facilities" shall mean those buildings and equipment from which the energy and operational cost savings will be realized.

"Final Acceptance Date" shall mean the date all of the ECMs or Measures comprising the Project (as defined in the Agreement) have been delivered, installed, and accepted by the CLIENT.

"First Guarantee Year" is defined as the period beginning on the first (1st) day of the month following the Final Acceptance Date and ending on the day prior to the first (1st) anniversary thereof.

"Guarantee Period" is defined as the period beginning on the first (1st) day of the First Guarantee Year and ending on the last day of the Term.

"Guarantee Year" is defined as each of the successive twelve (12) month periods commencing on the anniversary of the commencement of the First Guarantee Year throughout the Term of this Agreement.

"Guaranteed Savings" is defined as the amount of Energy and Operational Cost Savings.

"Installation Period" is from the date of award to Substantial Completion.

"Operational Costs" shall include the costs associated with operating and maintaining the Facilities. Examples include the cost of inside and outside labor to repair and maintain systems and equipment, the cost of replacement parts, the cost of deferred maintenance, the cost of lamp and ballast disposal, and the cost of new capital equipment.

"Retrofit Isolation Method" (if applicable to this Project) refers to energy audit methodologies that require pre-retrofit and post-retrofit measurements to isolate energy consumption and costs of specific facility equipment and systems impacted exclusively by this Agreement.

"Term" shall be 13.5 years.

"Total Guarantee Year Savings" is defined as the amount of Energy and Operational Savings realized by Facilities in each Guarantee Year as a result of the Work.

TERM AND TERMINATION

The Term of this Guarantee shall commence on the first (1st) day of the first month following the date of Substantial Completion of the Work installed pursuant to this Agreement, unless terminated earlier as provided for herein.

Guarantee: ESG guarantees to the CLIENT that the Facilities will realize in each Guarantee Year savings in Energy and Operational Costs (the "Energy and Operational Savings") collectively equal to the amounts shown on Table A below. At the end of each year ESG will present the CLIENT with an Energy Savings Audit Report within ninety (90) days. If there is a shortfall of the Energy Savings in any year, ESG shall provide settlement within sixty (60) days of the acceptance of the report by the CLIENT.



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Savings Report: Within ninety (90) days following the end of each of the Guarantee Years, ESG will provide the CLIENT with an annual report ("Energy Services Guarantee Report"). The CLIENT will assist ESG in generating the Energy Services Guarantee Report by authorizing ESG to contact utility companies directly for true copies of all bills pertaining to Energy Costs and Consumption together with access to the CLIENT's relevant accounting records, and facilities to monitor any installed equipment relating to such Energy Costs, Consumptions, and Savings pertaining to the Energy Guarantee. Data and calculations utilized by ESG in the preparation of its Cost Savings Energy Services Guarantee Report will be made available to the CLIENT, along with such explanations and clarifications as the CLIENT may reasonably request. In the event that ESG is not provided immediate access to utility bills from the Utility, ESG will contact a Representative from the CLIENT to obtain this information. If there is a delay in receiving the information the ninety (90) day period will be reasonably extended to gain said access.

Operational Savings: Operational savings have been reviewed and accepted by the CLIENT and are described in Table A - Savings Guarantee. Operational savings will begin to accrue on the date of completion and acceptance of each ECM.

Additional Savings: ESG may identify other Energy and Operational Savings opportunities during the construction period or during any Guarantee Year. Additional Energy and Operational Savings that can be demonstrated as a result of ESG efforts that result in no additional costs to the CLIENT beyond the costs identified in this Agreement will be included in the annual Energy Services Guarantee Report for the applicable Guarantee Year(s).

Savings Prior to Final Acceptance Date: All Energy and Operational Savings realized by the CLIENT that result from activities undertaken by ESG prior to Final Acceptance Date, including any utility rebates or other incentives earned as a direct result of the installed energy conservation measures provided by ESG, will be applied toward all savings shortfalls before payment is made. Energy savings that are achieved by the upgrades and modifications in the Agreement prior to completion of the entire retrofit project (or construction savings) will be added to the first year actual energy savings amount.

ESG and the CLIENT also agree that if the actual annual energy savings amount exceeds the energy guarantee amount, such excess energy savings amounts will be either:

- Added to the savings for any future year before calculating the savings amount; or
- Billed back to the CLIENT up to any amounts paid by ESG for savings shortfalls in a previous year.

Accumulation of Savings: The Guaranteed Savings in each Guarantee Year are considered satisfied if the Total Guarantee Year Savings for such Guarantee Year equals or exceeds the amount identified and determined as set forth in Section 4.0 – Table A. Energy savings that are achieved by the upgrades and modifications in the Agreement prior to completion of the entire retrofit project (or construction savings) will be added to the first year actual energy savings amount. ESG and the CLIENT also agree that if the actual annual energy savings amount exceeds the energy guarantee amount, such excess energy savings amounts will be either:

- Added to the savings for any future year before calculating the savings amount; or
- Billed back to the CLIENT up to any amounts paid by ESG for savings shortfalls in a previous year

Hours and Practices: To achieve these energy savings, ESG and the CLIENT agree upon the building operating hours listed below:

Facility	Week Days	SAT/SUN	Holidays
Detention Center	24 hours per day	24 hours per day	24 hours per day
East Columbia Library	09:00 to 21:00 ^a	Sat: 09:00 to 18:00 Sun: 13:00 to 17:00	None
Central Library	09:00 to 21:00 ^a	Sat: 09:00 to 18:00 Sun: 13:00 to 17:00	None
Recreation & Parks HQ	07:00 to 17:00	None	None
Scaggsville PSC	24 hours per day	24 hours per day	24 hours per day
Gateway Building	07:00 to 17:00	None ^b	None
Dorsey Building ^c	07:00 to 17:00	None	None

^a Friday is 09:00 to 18:00

^b Howard Community College Section is open 07:00 to 17:00 on Saturdays

^c The sheriff's department and the County Business and Technology Office Center sections are open 24 hours a day

Activities and Events Adversely Impacting Savings: The CLIENT shall promptly notify ESG of any activities known to the CLIENT, which adversely impact ESG's ability to realize the Guaranteed Savings. If this type of situation occurs over the Guarantee Period ESG shall be entitled to reduce its Guaranteed Savings, or make necessary adjustments to the energy baseline in order to quantify the changes in the facility. This will allow ESG and the CLIENT to recognize and document any such adverse impact to the extent that such adverse impact is beyond ESG's reasonable control.

SAVINGS GUARANTEE

ESG guarantees that the Work will result in the following sum of Total Guaranteed Year Savings over the Term as outlined in Table A on the following page:



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Table A – Guaranteed Savings

Year	Agreed Upon Savings	Annual Option A Savings	Annual Option C Savings	Annual Operational Savings	Total Annual Savings
Construction	\$ 48,000	\$ -	\$ -	\$ -	\$ 48,000
1	\$ -	\$ -	\$ 482,613	\$ 5,600	\$ 488,213
2	\$ -	\$ -	\$ 497,092	\$ 5,768	\$ 502,860
3	\$ -	\$ -	\$ 512,004	\$ 5,941	\$ 517,945
4	\$ -	\$ -	\$ 527,364	\$ 6,119	\$ 533,484
5	\$ -	\$ -	\$ 543,185	\$ 6,303	\$ 549,488
6	\$ -	\$ -	\$ 559,481	\$ 6,492	\$ 565,973
7	\$ -	\$ -	\$ 576,265	\$ 6,687	\$ 582,952
8	\$ -	\$ -	\$ 593,553	\$ 6,887	\$ 600,441
9	\$ -	\$ -	\$ 611,360	\$ 7,094	\$ 618,454
10	\$ -	\$ -	\$ 629,701	\$ 7,307	\$ 637,007
11	\$ -	\$ -	\$ 648,592	\$ 7,526	\$ 656,118
12	\$ -	\$ -	\$ 668,050	\$ 7,752	\$ 675,801
13	\$ -	\$ -	\$ 688,091	\$ 7,984	\$ 696,075
14^a	\$ -	\$ -	\$ 354,368	\$ 4,112	\$ 358,480
Totals	\$ 48,000	\$ -	\$ 7,891,720	\$ 91,572	\$ 8,031,291

^a Only half year values shown

Escalation Rates

The annual escalation rates listed in the following table are stipulated as part of guaranteed energy and operational savings listed in Table A and for M&V and O&M costs listed in the financial section of the project. ESG and the CLIENT agree to the escalation rates listed below:

Table A-1 – Escalation Rates

Energy Cost Esc./yr	3%
Labor Cost Esc./yr	3%
Maintenance Cost Esc	3%

The actual escalation of calculated savings that will be applied in the M&V Report will be the highest of:

- (1) 3% (see Table A-1 above)
- (2) CPI (Consumer Price Index) for the geographical region, or
- (3) Other rate changes that may apply.

The escalation rates include the general inflation rates.

The following is the baseline utility information for the seven buildings.

Table B-1 – Baseline Energy Use Information

Baseline Utility Summary

Building	Electric	Gas	Oil	Water / Sewer ^a	
	Baseline Energy Use, kWh/yr	Baseline Gas Use therms	Baseline Oil Use gallons	Baseline Water Use, kgal	Baseline Sewer Use, kgal
Detention Center	2,391,300	170,870	-	13,961	13,961
East Columbia Library	1,232,400	18,571	-	1,113	1,113
Central Library	1,440,600	-	-	533	533
Recreation & Parks HQ	818,800	18,189	-	358	358
Scaggsville PSC	1,081,800	-	17,637	340	340
Gateway Building	3,563,700	-	-	2,365	2,365
Dorsey Building	5,447,700	25,404	-	877	877
TOTAL	15,976,300	233,034	17,637	19,547	19,547

^a Estimated from partial utility data for all of the buildings except the Gateway building



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Table B-2 – Baseline Unit Utility Costs

IGA Baseline Utility Costs						
Facility	Electric Rates		Gas	Oil	Water	Sewer
	\$/kWh	\$/kW	\$/therm	\$/gal	\$/kgal	\$/kgal
Detention Center	\$ 0.1070	\$ 2.67	\$ 1.40	\$ -	\$ 1.62	\$ 2.35
Scaggsville PSC	\$ 0.1150	\$ 2.67	\$ -	\$ 2.00	\$ 1.62	\$ 2.35
East Columbia Library	\$ 0.1090	\$ 2.67	\$ 1.40	\$ -	\$ 1.62	\$ 2.35
Central Library	\$ 0.1080	\$ 2.67	\$ -	\$ -	\$ 1.62	\$ 2.35
Recs & Parks HQ	\$ 0.1080	\$ 2.67	\$ 1.35	\$ -	\$ 1.62	\$ 2.35
Dorsey Building	\$ 0.1080	\$ 2.67	\$ 1.25	\$ -	\$ 1.62	\$ 2.35
Gateway Building	\$ 0.1070	\$ 2.67	\$ -	\$ 2.03	\$ 1.62	\$ 2.35

Adjustments To The Guarantee: The Guaranteed Savings will be adjusted to account for material changes, where material is defined as any change or changes that may increase or decrease the energy consumption of the Facilities by more than 1% annually, including, but not limited to the following

- a. Changes in the hours of operation of any buildings constituting any part of the Facilities.
- b. Changes in the occupancy of the buildings constituting any part of the Facilities.
- c. Changes in the structure of buildings constituting any part of the Facilities, such as architectural features or building components.
- d. Modifications or renovations to the buildings constituting any part of the Facilities, which may or may not change the conditioned space.
- e. Changes to the ECMs.
- f. Changes in utility prices and/or rate structure.
- g. Change in utility suppliers
- h. Change in the method of utility billing or purchasing with respect to the Facilities.
- i. Addition or deletion of energy consuming equipment at the site.
- j. Weather variance from base year to current year.
- k. CLIENT's failure to adhere to operating and maintenance responsibilities as defined by the equipment manufacturer.
- l. Adjustments necessary to account for lighting burnouts as documented before retrofit.
- m. New outside air ventilation needed to bring any buildings constituting any part of the Facilities up to applicable building code.
- n. Required increases in light levels to bring any buildings constituting any part of the Facilities up to the applicable code or requirement.
- o. Any condition, which affects the energy demand or consumption of Facilities, caused by CLIENT or its agents.

CLIENT will be responsible for providing ESG notice of actual or proposed material changes to the site and its anticipated effect on energy usage and consumption. CLIENT must notify ESG no less than thirty (30) days before a planned material change occurs, or within seventy-two (72) hours of an emergency or unplanned material change.

CLIENT agrees to:

- a. Not make any changes to the initial building control's system program without prior notice to ESG.
- b. Not place the building control system in a permanent 'on' status, nor will CLIENT manually operate or override any part of the building control system except upon equipment failure or emergency conditions.
- c. Provide access for the **COMPANY** to adjust the ECMs to ensure optimal operation and maximum energy savings.
- d. Maintain the space temperature settings between 68°F and 72°F during occupied hours, with a heating setback temperature of 60°F during non-occupied hours.

BASELINE UNIT ENERGY COSTS – Are outlined in Section 4.0 – Table B-2 and were used for all calculations made under this Exhibit.

HOURS OF USE

The hours of building equipment operation for the Guarantee are set forth below and were used for all calculations made in this Attachment. These hours were agreed upon between the CLIENT and ESG.

Table C – Hours of Use and Baseline Area

Facility	Gross Area ft ²	Annual Operating Hours	
		Baseline	Post Retrofit
Detention Center	95,000	8,760	8,760
East Columbia Library	46,000	5,840	5,840
Central Library	46,000	5,840	5,840
Recreation & Parks HQ	57,000	8,760	4,480
Scaggsville PSC	42,000	8,760	8,760
Gateway Building	93,000	5,840	5,840
Dorsey Building	197,518	8,760	4,480

M&V APPROACH

IPMVP (April 2007) Option C is the approach used in the M&V process for verifying savings related to this project. Options C is being used with consideration of the characteristics of the specific ECMs, acceptable accuracy, and reasonable cost.

Option C

The purpose of Option C, "Whole Facility Measurement" or in this project, "Whole Program Measurement" is to provide systematic savings analysis for utility consumption, comparing a base year to a current year that has similar operational and environmental parameters. The required information is taken directly from each of building's utility bills and regional weather data. The software system utilized in this tracking will be EnergyCAP™, which is the industry preferred audit software.

STEP 1: ESTABLISH A BASELINE PERIOD

A) PRORATE BILLING PERIODS

The number of days in the billing month being audited is compared to the base month billing period. Base year energy bills are prorated to obtain calendar month consumption. This is done to smooth out varying billing periods and to match bills to weather data.

B) DETERMINE WEATHER SENSITIVE CONSUMPTION

How warm or cool it is determines the load requirements of HVAC related equipment. It is, therefore, essential that weather be tracked so variances can be determined. Any variances from the base to current year will be adjusted so a true "apples to apples" comparison is provided.

A certain portion of each month's energy consumption is due to base load not related to weather such as lighting, computers, and office equipment. This non-weather sensitive consumption will be present no matter what the weather conditions are; therefore, they will be separated from the weather-sensitive consumption. Using standard logic and the assumption that the energy consumption-to-weather relationship is linear, ESG along with the EnergyCAP™ software, is able to statistically determine the weather and non-weather sensitive consumption.

STEP 2: APPLY CURRENT YEAR CONDITIONS

The base year is adjusted to reflect current year environmental and operational conditions. Energy consumption savings are then calculated by comparing current year consumption to adjusted base year consumption. These are as follows:

- Billing Period Length
- Weather
- Changes In Facility Occupancy Or Use
- Additions Or Deletions Of Energy Using Equipment
- Additions Or Deletions Of Building Square Footage
- Changes In Energy Prices and or Rate Structures

STEP 3: GUARANTEED SAVINGS

Utility bill cost avoidance is how energy conservation measures are measured after project completion. By subtracting the Current Year Energy Cost from the Adjusted Base Year Energy Cost, the overall cost avoidance associated with that energy type is calculated. Cost avoidance is directly associated to the Energy Savings Guarantee.

Energy Audits will be based upon the environmental and operating conditions for the facility during the time periods specified in the Baseline.

Each billing period during the term will be compared to a Base Period. The actual energy use and savings will be analyzed and compared to the guaranteed energy savings amount using the IPMVP, along with the acceptable energy monitoring equipment and an industry standard



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energy accounting software program. The results of this analysis will be presented to the CLIENT on an annual basis.

METHODOLOGY FOR ASSIGNING DOLLAR VALUES TO SAVINGS

An average cost per unit will be used. Charges for fuel adjustments, annual escalation rates in Table A-1, base services, transmission, tariffs, and distributions will be included. In the event of a utility rate decrease, the utility rate(s) used to assign dollar cost will not drop below that of the base year.

APPLY CURRENT YEAR CONDITIONS

The measurement of energy consumption and the cost savings associated with installed energy management equipment is a comparison between the energy consumed during the current calendar period and the respective baseline calendar period.

The first step in cost avoidance calculations is the creation of a baseline. The baseline reflects the facility's energy use and energy costs before the installation of the energy conservation measures. The baseline calendar period will typically be a consecutive twelve month period for which reliable data exists before contract execution. The baseline will consist of all energy bills applicable to the meters in the Project. Once the program is in place, actual energy use is recorded from current utility bills. The costs the facility incurs after implementation of the measures are compared to the baseline in order to determine if savings projections—and guarantees—have been met.

BASELINE PERIOD ADJUSTMENTS

Proper analysis and comparison can only be achieved if the environmental and facility parameters are equal to those of the base year. Examples of factors that affect the environment and facility parameters are weather, energy rates, facility schedules, and changes in equipment. The baseline may need to be adjusted to equalize the parameters of the current year so that an accurate analysis can be performed and valid savings can be measured. In essence, the adjustment process shows what the costs and usage would have been in the base year, under the current conditions, for an 'apples to apples' comparison. These adjustments typically cover:

- Standardize for the Number of Days in a Billing Period
- Normalize the Differences in Outdoor Temperature Through Degree Days
- Changes In Facility Occupancy and Use
- Additions or Deletions of Energy Using Equipment
- Additions or Deletions of Square Footage
- Changes in Energy Prices and / or Rate Structures

Savings calculations may also be adjusted for new outside air ventilation requirements; changes in operational modes (i.e. – addition of air conditioning); and changes to comfort levels. The CLIENT will notify ESG within fifteen (15) business days of any significant changes in facility operations, occupancy levels, hours of operation, structure, equipment or any other changes that are reasonably expected to affect energy use by more than 1%. The impact of such

changes on the guaranteed energy savings amount will be monitored through the energy monitoring systems and savings calculated through engineering analysis by ESG.

The consumption energy unit cost for each specific energy type is the total consumption related cost found on the respective utility bill, including charges for consumption, service, power factor, fuel adjustment, etc., divided by total consumption OR the stipulated energy cost given in Table B-2 – Unit Energy Costs . Late payment charges will not be included in this calculation.

GLOBAL ASSUMPTIONS

Energy Prices

The greater of base period utility unit cost or the current period utility unit cost, escalated at the annual escalation rates provided in Table A-1, will be used in determining the adjusted base period utility cost. In no case, however, shall the rate used to calculate the Guaranteed Energy Savings be lower than base year utility rate.

Performance Period Utility Rate Adjustment Factors, if applicable.

ESG is not responsible for any utility rate changes other than those defined in the post-installation energy policy. A rate adjustment factor will be applied to calculate actual savings regarding the changes of the utility rates. The actual energy cost savings will be the product of the calculated energy savings from defined rates and the utility adjustment factor when applicable. In no case, however, shall the rate used to calculate the Guaranteed Energy Savings be lower than base year utility rate.

Schedule of Verification Reporting Activities:

Item	Time for Submission	Owner's Review & Acceptance Period
Annual Report	90 days after annual performance period	30 days ^(*)

^(*) Owner's Acceptance becomes automatic if not provided by the end of the Owner's Review & Acceptance Period.

Content and Format of Reports

ESG is responsible for the periodic Energy Services Guarantee Report.

OPERATIONAL SAVINGS

The operational cost savings for this project are negotiated and agreed upon by ESG and accepted by the CLIENT. There is no need to verify the agreed upon operational savings.



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DOCUMENTATION FOR SECTION 179D TAX DEDUCTION

As a result of the implementation of this Project, certain tax deductions under Section 179D of the Internal Revenue Code may be available because of the energy efficient improvements to the Owner's buildings. The Owner agrees to allocate these Section 179D tax deductions to ESG to the extent such deduction arises from the technical specifications developed by ESG and the implementation of this Project.

Upon job completion, the Owner agrees to execute the required written allocation including the declaration related to this tax code provision. ESG will be responsible for preparing the declaration and all accompanying documentation for Owner's signature. ESG will be designated the Section 179D beneficiary.

ASSIGNMENT OF ENVIRONMENTAL ATTRIBUTES

As a result of the implementation of this Project, certain Environmental Attributes may be available, either now or in the future. This section specifies the process whereby the Owner will assign such Environmental Attributes to ESG.

"Environmental Attributes" means any and all credits, deductions, benefits, emission reductions, incentives, offsets, and allowances, howsoever entitled, attributable to and arising from the implementation of this Project, whether such Environmental Attributes now exist or are developed in the future. Environmental Attributes include but are not limited to: (1) Any avoided emissions of pollutants to the air, soil, or water; (2) Any avoided emissions of carbon dioxide (CO₂), methane (CH₄) and other greenhouse gases (GHGs); (3) Section 45 credits; (4) green tags; (5) renewable energy credits; and (6) The reporting rights to these avoided emissions such as White Tag Reporting Rights. Environmental Attributes also include any energy, capacity, reliability, or other energy reduction attributes that result from the implementation of this Project.

All Environmental Attributes arising from the implementation of this Project shall be owned by ESG. Owner agrees to execute all required documentation to assign all Environmental Attributes to ESG. If any filings are required with the Internal Revenue Service or some other governmental entity to obtain the benefits of the Environmental Attributes, Owner hereby instructs ESG to prepare and file such documents.

PROJECT INFORMATION:

CLIENT NAME: Howard County

ESCO Name: Energy Systems Group (ESG)

ESG Contact Person for M&V: Donna Wicks

Street Address: 4655 Rosebud Lane, Newburgh, IN 47630

Phone: (812) 492-3714 **Fax:** (812) 475-2544 **E-mail:** dwicks@EnergySystemsGroup.com

Client Contact for M&V : Richard Lee

Address of Client: Bureau of Facilities, Department of Public Works, Howard County
Maryland, 9250 Bendix Road, Columbia, MD 21045

Phone: (410) 313-7548 **Fax:** (410) 313-5777 **E-mail:** rylee@howardcountymd.gov

DISPUTE RESOLUTION

The M&V plan has been reviewed and accepted by CLIENT. It is the primary document for the M&V process. If a dispute arises under this M&V agreement, the parties shall promptly attempt in good faith to resolve the dispute by negotiation. If not settled by negotiation, this M&V plan will be referred to as the means to solve related disputes.

POST-INSTALLATION DATA COLLECTED

Owner will provide access to site locations at reasonable times to perform on-site tests to verify performance, changes in use, and to verify modification of facilities as necessary. ESG will not unreasonably interfere with CLIENT's operation on the site.

ESG will collect the appropriate monthly utility billing data from CLIENT or appropriate Utility Providers for all ECMs being measured in accordance with IPMVP Option C.

ESG will collect before and after construction measurements for applicable Option A ECMs. In the case of lighting, pre and post measurements will be taken on sample fixtures determined in line with FEMP's Statistical Sampling plan. This data will be used verify the calculated energy savings, based on agreed upon hours of operation and baseline utility rates.

All devices employed to meter electric power use shall be capable of metering continuous RMS power at accuracy of +/-1.0% actual value, over the entire load range; Metering of polyphase loads shall include independent measurement of each phase.



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COST OF M&V ACTIVITIES

For **CLIENT's** project, the M&V plan is intended to continue throughout the term of financing. **CLIENT**, at their discretion may choose to discontinue the M&V plan. The cancellation of the M&V plan will negate the energy guarantee. Proper notification procedures must be followed if such action is considered. Refer to Support Services exhibit for details on cancellation option.

The amount to be paid annually by **CLIENT** for the M&V services provided by **ESG** is outlined in the Support Services exhibit with details on invoicing and payment procedures.



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Commissioning

Upon completion of construction, ESG will ensure proper operation of the installed systems through a systematic start-up and testing. The final piece of the installation phase is the system commissioning phase. All equipment and systems in the scope of the project will be tested through the entire length of their operating ranges to confirm their energy efficiency. A draft commissioning plan specific to the Howard County (HC) project will be developed and finalized during the Design Phase.

ESG believes that a well-executed commissioning program is essential to ensure that systems operate at their optimum level not only when they are first started up, but over the life of the system. ESG has established a rigorous commissioning program for all ECMs to ensure that equipment and systems are operating as designed before ECM acceptance.

ESG develops its commissioning process in order to achieve a number of goals:

1. To protect our investments in the improvements we make to HC facilities. The future earnings depend on each ECM meeting the guaranteed savings targets; therefore, the *completed installation must perform efficiently over the long term.*
2. To supplement the training of client O&M staff and to complete the documentation (as-built) process, e.g., *design/build or build/own/operate projects.*
3. To meet conditions imposed by financing sources, government agencies, and our parent company regarding quality assurance standards.

Commissioning Team

Effective commissioning requires a team effort. ESG assembles each commissioning team based on the needs of the specific project. ESG's commissioning team includes ESG's Project Manager, Construction Manager, design engineers, contractors, equipment manufacturers and other appropriate client (site) representatives.

ESG's Project Manager (PM) facilitates the commissioning process by reviewing and approving commissioning plans, managing commissioning schedules and client communication, assigning commissioning resources, resolving problems, and approving final equipment performance test reports, as-built documentation, and O&M manuals.

ESG's PM is the presiding onsite commissioning/start-up "authority." The PM is responsible for communicating with the client's commissioning agent (if applicable) and onsite operations personnel regarding all commissioning and start-up activities. ESG's PM or a person assigned by him will sign off on applicable testing documents, final equipment performance, as-built documentation, and O&M manuals. ESG has tentatively selected Andrew Miller, Branch Operations Manager, as the PM for the HC project. ESG's Construction Manager provides logistical support to the CA by coordinating onsite start-up activities.



The other members of the team contribute as follows:

- ESG's Design Team is responsible for the design verification of each system and component after installation. The Design Team also provides support as needed to resolve design issues and answer design-related questions.
- Contractors include the general contractor, mechanical contractor, electrical contractor, instrumentation and controls contractor, etc. Contractors are responsible for scheduling and implementing pre-functional testing of all systems and equipment installed by them. Contractors also provide ESG with start-up and full commissioning activities and support as needed.
- Manufacturers provide equipment installation and start-up documentation. For large or complex equipment, manufacturer representatives are responsible for installation inspection, start-up, commissioning, and performance verification for their equipment.

The client's commissioning agent, project manager, or engineer facilitates the commissioning process, acts as a liaison with onsite operating personnel, approves the commissioning plans, witnesses commissioning activities, and signs off on functional and equipment performance tests.

While ESG will utilize internal resources for the commissioning of the HC project, as noted above, our subcontractors play a critical role in installing the equipment and, as such, they will also be involved in its commissioning. However, ESG will retain complete control and responsibility for the commissioning of each proposed ECM.

ESG anticipates that HC, as our client, will also be an integral part of the commissioning process, both as an observer and a participant.

Operations & Maintenance Support Services

The IDC, which governs the energy performance contracting process, mandates that the user agency incorporates a comprehensive maintenance program for all assets installed under the Phase II agreement. The purpose of this stipulation is to insure the installed assets achieve their full life-cycle so the energy reduction strategies remain achievable. While the IDC states that the ESCO must provide the preventive maintenance (PM) on all new assets as part of the overall program, the final scope of the support services is selected by the owner.

Based on discussions with facilities maintenance and the energy manager, ESG has not included any maintenance services at this time. The maintenance services will be provided for the new assets by the existing facilities and maintenance staff. Should Howard County elect to Contract for new preventative maintenance services, ESG will provide an annual cost estimate for these services. However, based on the current financial model there is no excess energy savings available to pay for these services. Therefore the additional costs would become the responsibility of Howard County.

ESG will provide training on newly installed assets to ensure that existing staff can provide the preventative maintenance. Please refer to the Training Section for further details.

Staff Training

Training and education are very important elements of every ESG Energy Performance Contract. The initial facility improvement measures implemented to save energy and improve comfort will only achieve the desired results when coupled with proper training of operations staff. The Howard County (HC) staff must first have a fundamental understanding of how the facility uses energy and how they can affect energy usage. Then, these same staff must be trained how to use the newly installed equipment as a tool to manage energy and building systems.

Training provides education and education changes behavior and breaks outdated paradigms. As a result a properly trained and motivated staff of employees will enhance both HC's and ESG's efforts to meet our mutual savings goals. In addition, training supports the goal of increased productivity in the workplace through increased knowledge, communication and understanding. This can lead to improved facility operation.

The following table lists the training to be provided by each Energy Conservation Measure (ECM). Most training will occur on site as we believe that the training that occurs on your specific equipment is always more meaningful than classroom work. The training helps staff members to continually improve and sustain operating efficiency as a proactive operation-and-maintenance function. The training will be conducted by the equipment installer and HC staff is invited to observe all installations for a step by step visual on the process to gain a better understanding of how things work. In all cases detailed operations and maintenance manuals will be given to operations staff for future reference.

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Training Matrix

ECMs	Proposed Training
Upgrade Lighting & Controls	O&M Manual
Optimize Vending Machine Operation	O&M Manual
Provide Green Roof	O&M Manual
Solar Thermal & PV Applications	O&M Manual and Optional system demonstration by installer
Daylight Harvesting	O&M Manual
Chiller replace/repair	One-time training for HC Staff by installer and O&M Manual
Cooling Tower VSD Drives	O&M Manual
Chilled Water valves	O&M Manual
Chilled water pump VSD	O&M Manual
EMCS Tridium update	One-time training for HC Staff by installer and O&M Manual
EMS upgrades	One-time training for HC Staff by installer and O&M Manual
Replace AHU, RTU and/or Condensing Unit	O&M Manual
Demand Control Ventilation CO2	O&M Manual
AHU, RTU VSD	O&M Manual
ATC controls for Unit Heaters	One-time training for HC Staff by installer and O&M Manual
Install-hood Controls	One-time training for HC Staff by installer and O&M Manual
HW Reset Schedule	One-time training for HC Staff by installer and O&M Manual
HW Pump retrofit	O&M Manual
Hot water pumps VSD	O&M Manual
Boiler Replacement	One-time training for HC Staff by installer and O&M Manual
DDC Controls for RTU Setback	One-time training for HC Staff by installer and O&M Manual
Electrical Power Conditioner	O&M Manual
Reduce Water Use & Cost	O&M Manual
Upgrade Building Envelope	O&M Manual
Energy Demand Response	Not part of the EPC Project; none
Window Film	O&M Manual
Pipe Insulation	O&M Manual

Building Descriptions

- **Detention Center**
- **Scaggsville Public Safety Complex**
- **East Columbia Library**
- **Central Library**
- **Recreation & Parks Headquarters**
- **Dorsey Building**
- **Gateway Building**

Detention Center

The Detention Center is operated under the Howard county Department of Corrections. The facility is a two-story building consisting of approximately 95,000 gross ft² of building space.

The Detention Center is the County's correctional rehabilitation facility housing inmates in multiple cell blocks and includes laundry, kitchen and administrative offices within the facility. The building is operational 24 hours a day throughout the year.

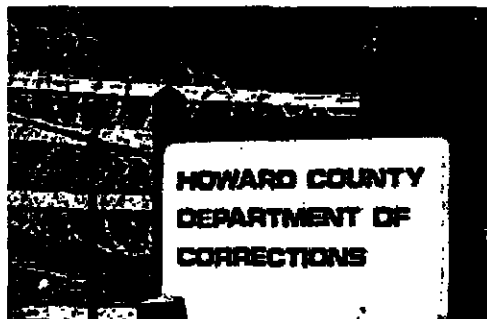


Figure 1: Detention Center

The building was constructed in two stages. The original facility was constructed in 1983 with a major building addition in 1993. The HVAC and electrical systems serving the 1983 section are all mostly original. New HVAC systems including a central chiller and boiler were added as part of the 1993 building addition.

Lighting:

Offices and restrooms were found to contain 4 lamp 2x4 fixtures, hallways contain 3-T8 32 Watt lamp 2X4 fixtures. These fixtures were in relatively good condition. Storage areas contained pendant-mounted 250-Watt Metal Halide fixture mounted at about 24 feet height.

The outside fixtures consisted of parking lot pole lights, and wall-mounted architectural lighting around the perimeter of the building.

Cooling:

Three water cooled Trane chillers provide cooling to the Detention Center. Chillers 1 and 2 are rated at nominal 100 tons each and were installed with the 1983 original construction. These chillers provide the primary cooling for the building. The chillers were designed to operate in series, with each chiller providing 6°F of chilled water temperature reduction. Chiller 3 was installed during the 1993 building expansion. Chiller 3 is rated at 100 tons nominal, but is piped in parallel with the other two chillers. Chiller 3 appears to be in good condition.

CENTRAL CHILLER SUMMARY						
Unit ID	Type	Capacity (Tons)	Model #	Serial #	Refrig.	Evap (gpm)
CH-1	Centrifugal	100	CVHA-011B-HE	L81G25823	R113	220
CH-2	Centrifugal	100	CVHA-011B-HE	L81G25822	R113	220
CH-3	Recip	100	CGWCD106RHN	U93B04145	R22	190

According to facility staff, the chillers go off line several times during each cooling season due to a loss of vacuum. Beyond this issue, the chillers appear to be in good condition given that they are 24 years old. Two cooling towers are located on the roof of the building and provide heat rejection for the three chillers. The larger tower, manufactured by Evapco and connected to the CH-1 and CH-2, is rated at 900 gpm of condenser water flow. A smaller cooling tower manufactured by BAC is connected to CH-3. The Evapco tower uses a constant speed induced draft fan and the BAC tower uses a two-speed horizontal cross flow forced draft fan. Both towers appear to be in good condition.

Chilled water and condenser water pumps are located within the main mechanical room located on the ground floor level below the cooling towers. The chilled water and condenser water pumps all operate with E-Plus energy efficient motors. The following table summarizes the chilled water and condensing water pumps.



Figure 2: Existing Trane Centrifugal Chiller

CENTRAL COOLING SYSTEM PUMPS				
Unit ID	Capacity (gpm)	Motor HP	Motor Eff. %	Motor Frame
CHW-1	440	10	89.3	D215T
CHW-2	440	10	89.3	D215T
CHW-3	190	7 ½	85.5	184T
CHW-4	300	7 ½	85.5	184T
CND-1	300	7 ½	88.7	E213T
CND-2	300	7 ½	88.7	E213T
CND-3	300	7 ½	84.0	213T

The central chillers are set to provide chilled water at 44°F to the building air handling units. Chiller 1 is designed to reduce the chilled water temperature from 56 to 50°F. Chiller 2 is designed to reduce the chilled water temperature from 50 to 44 °F. However, the Detention Center is not always operating both chillers and therefore does not supply the design CHW supply temperature to the building. During the facility audit, Chiller 2 was off line due to an overload and Chillers 1 and 3 were operating. Chiller 1 was delivering 52 °F CWS. Chiller 3 was delivering 44 °F CWS. However, the CWS to the building was blending to a supply temperature of approximately 48 to 49 °F. At this same time, the building was experiencing difficulty maintaining the building temperature set point.

CENTRIFUGAL CHILLER SCHEDULE (@100% LOAD)							
Evaporator Section				Condenser Section			
Ent. Temp.	Lvg. Temp.	Flow (gpm)	PD Ft of H ₂ O	Flow @ 85/96°F	PD Ft of H ₂ O	Volts	Unit Power (kW)
56 °F	44 °F	298	5.9	375	8.5	208	97.5

CENTRIFUGAL CHILLER PART LOAD PERFORMANCE			
% Load	Capacity	kW	Efficiency (kW/ton)
100	150	97.5	0.650
75	112.5	64.8	0.576
50	75	39.6	0.528
25	37.5	27.7	0.739

NPLV = 0.568 kW/ton

Heating:

Three Cleaverbrooks fire-tube, gas-fired, water boilers provide hot water for heating and reheat needs in the building. Two boilers were installed in 1983 and the third boiler was installed in 1993 when the building was expanded. All three boilers are Cleaverbrooks model #CB700-100A with a rated output of 100 boiler HP or approximately 3,348 MBH capacity. The boilers operate using natural gas. One boiler must remain operational year round to provide hot water to the variable air volume box reheat coils and to the domestic hot water storage tanks. According to the facility staff, two boilers are

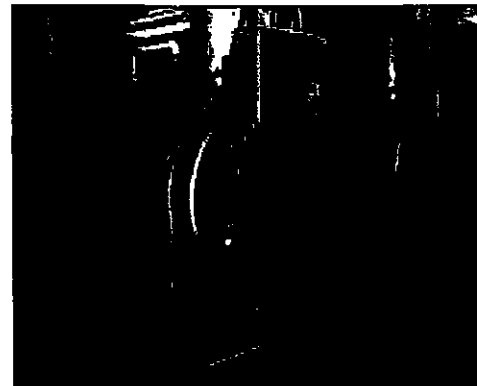


Figure 3: Existing CB Boilers

typically operated during the winter months and one boiler is operated during the summer months.

The boilers utilize modulating burners rated with an input of 4,184 MBH. The burner controls are standard Cleaverbrooks units with multi-point cam shaft control. A test of the boiler combustion efficiency yielded no definitive results due to large amounts of air infiltrating into the boiler exhaust stack.

Heating water is distributed through a primary and secondary pumping system. Two primary pumps are used to maintain water circulation through the Cleaverbrooks boilers and the main air handlers. At the time of the facility audit, one primary pump was being replaced by the facilities group. A secondary pumping system delivers heating water to the to the radiation / terminal VAV units.

A Robertshaw pneumatic control panel controls the operation of the secondary pumps and the supply water temperature for the VAV reheats and the radiation heating system. The control panel is capable of providing temperature reset for the supply water temperature. However, during the facility audit the Robertshaw panel was leaking control air at the panel. The supply water temperature was 180°F on a day when the outside air temperature was 60°F. According to the reset schedule at the panel, the supply water temperature should have been closer to 120 to 130°F supply temperature indicating that the reset controller was not functioning.

CENTRAL HEATING SYSTEM PUMPS					
Unit ID	System Served	Capacity (gpm)	Motor HP	Motor Eff. %	Motor Frame
P-1	Primary	280	5	87.5	184T
P-2	Primary	280	5	87.5	184T
P-3	Secondary	160	3	82.0	184T
P-4	Secondary	160	3	82.0	184T
P-5	Primary	280	5	85.5	184T
P-6,6A	Secondary	60	1 ½	80.0	145T
P-7,8	VAV Reheat	65	3	82.0	Unk.
P-9	Radiation	25	¾ HP	82.0	Inline

The heating water pumps appear to be in poor condition and are in need of replacement. One heating water pump is in the process of being replaced by the County and can be seen in the background of the photo to the left.

The heating water pumps are original and are approximately twenty-six years old.

Air Handling Equipment:

The original section of the Detention Center is served by a large variable air volume air handling unit, AHU-1. The Trane Climate Changer contains a heating coil and cooling coil with 3-way temperature control valves on each. The supply and return fans utilize inlet guide vanes to vary air flow to the VAV boxes. AHU-1 controls are all pneumatic. The supply air fan for AHU-1 is a 50 HP premium efficiency motor. The return air fan contains a premium efficiency 7 ½ HP motor.

Conditioned air is delivered from AHU-1 to Titus VAV boxes that are controlled by pneumatic single zone thermostats. Each box contains a pneumatic 2-way hot water valve to control water flow through the reheat coil. A pneumatic actuated damper is used to modulate air flow to the conditioned space.

The facility staff indicated that the inlet guide vanes on AHU-1 were not operating properly to vary the air flow to the VAV boxes. This may cause over pressurization of the supply ductwork and create duct air leaks. Inspection above the ceiling revealed that conditioned air is blowing above the hard corridor ceiling space. In fact, on the day of the audit, the area above the ceiling was cooler than the occupied space. Air handlers 2 and 3 are located in a small mechanical space near the work release program area. These units are newer fans installed during the addition in the early 1990's.

AHU-4 is located in the mechanical room addition near the main mechanical room. AHU-4 serves the newer addition spaces within the Detention Center. AHU-4 supplies variable volume air to the newer section and uses variable speed drives to vary the air flow. AHU-4 contains a 7 ½ HP supply air fan and a 5 HP return air fan. Both motors are energy efficient E-Plus motors with efficiency's above 88.5%.

Two heat-recovery air handlers are used to provide preconditioned air to the kitchen area. Both units are manufactured by Gaylord heat recovery systems and provide heat recovery from exhaust air in one self-contained unit. One unit was installed during the original building construction and is located near AHU-1. The second unit was installed in the early 1990's as part of the building addition and is located on the roof over the kitchen area.

Domestic Hot Water:

The Cleaver Brooks boilers provide hot water to large storage tanks with heat exchangers to generate domestic hot water for use in the building. Three large storage tanks are located in the original building section and two tanks are located in the new section of the building.

The domestic water tanks provide hot water to the kitchen, laundry, showers and toilet rooms throughout the Detention Center. The boilers provide 180°F water to the storage tanks to generate 120°F water to the building.

Controls System:

The control system is a combination of pneumatic and DDC controls. The pneumatic controls are mainly Johnson Controls with a Robertshaw pneumatic panel controlling the reheat water temperature.

During the facility audit, evidence of issues with the control system was observed that are impacting the operation of the mechanical systems and the comfort in the building. Control air was leaking within the Robertshaw panel that prevented the reheat system from resetting the heating water temperature to the VAV boxes. The space temperature in the Administration section overheated due to the control system requiring reset of the controls by the facility group. The temperature within the Administration section was above 80°F during the morning hours.

Electrical:

The building electrical system was tested in the field and indicated the Main feed being 208 volt, 520 Amp system having a 91% Power Factor (PF) and 78 average KVAR.

Water:

A survey of the staff and inmate bathrooms identified a total of 174 stainless steel penal toilets/sink combinations, 32 stainless steel penal toilets, 30 porcelain toilets, 4 stainless steel penal urinals, 4 porcelain urinals, 22 stainless steel penal sinks, 31 porcelain sinks, and 40 showers. The toilets use an average of 4.0 gallons per flush, as reported by Howard County personnel. The urinals are using an average of 1.5 gallons per flush. The sink faucets in inmate and staff bathrooms are high flow and use an average of 2.2 gallons per minute (gpm).

Domestic Fixture Summary - Existing Conditions		
Toilets	Urinals	Sinks
236	8	227

Building Envelope:

The building exterior has 9 glass doors, 4 garage doors and 18 steel doors are in need of adjustment and weather stripping.

Scaggsville Public Safety Complex

The Scaggsville Public Safety Building houses County police and fire services within the one building. The one story facility was constructed in several phases and consists of approximately 42,000 ft² of space. The first phase was constructed in 1993 and the second phase was constructed in 1995. The second phase added building space to the original police station section. The building houses offices, meeting and conference room spaces, fire engine house, exercise room, kitchenette and locker/shower area.

The building is operated and occupied 24 hours each day year round. The police station area once housed a small detention area. However, these spaces have been converted into offices and the station is no longer used for short term detention.



Figure 4: Public Safety Building

Lighting:

Offices and restrooms were found to contain 4 lamp 2x4 fixtures, hallways contain 3-T8 32 Watt lamp 2X4 fixtures. These fixtures were in relatively good condition. Storage areas contained a pendant mounted 250 Watt Metal Halide fixture mounted at 24 feet.

The outside fixtures consisted of parking lot pole lights, and wall mounted architectural lighting around the perimeter of the building.

Cooling:

Two Dunham-Bush air cooled chillers are located behind the building and provide chilled water to the primary air handler for cooling. The units are approximately 13 and 15 years old and appear to be in good condition. Chilled water is piped outside to each of the chillers with a 40% ethylene glycol solution by design for freeze protection.



Figure 5: Air-cooled Chillers

Pneumatic isolation valves are in place to provide shut-off of the non-operational chiller to prevent blending of the chilled water. However, during the audit the actuator on one control valve was found disconnected and chilled water was blending through both chillers. Therefore, as the operating chiller is

generating 44°F supply water, return water from the non-operational chiller is blended with the chilled water supply for a building loop supply temperature of 50 to 52°F. Chiller-1 was installed during the original construction and Chiller-2 was installed during the addition to the building.

CHILLER EQUIPMENT SUMMARY				
Unit ID	Model #	Serial #	Capacity (tons)	Voltage
Chiller-1	AC80B	143040193H	75	460
Chiller-2	ACDR70A	4436601A95C	70	460

Two constant speed chilled water pumps circulate 165 GPM of chilled water to the primary air handler. Both pumps are 3 HP with premium efficiency motors.

Heating:

Two HB Smith cast iron sectional boilers provide heating water to the building for primary heat at the air handler and reheat on the VAV boxes. The boilers are designed to provide water at 180°F with a reset schedule based on the outdoor air temperature. During the audit, a check of the heating water supply temperature showed that the reset schedule was not operating properly. This is discussed more in the controls section of the write-up.

BOILER EQUIPMENT SUMMARY				
Unit ID	Model #	Serial #	Capacity (MBH)	Fuel
B-1	350 Mills	109364086	1,200	No. 2 Oil
B-2	350 Mills	109364085	1,200	No. 2 Oil

The boilers are piped in a header arrangement without automatic isolation valves. Therefore, return water is blended through the non-operational boiler and mixed with the supply from the operational boiler. This is common for boilers since it allows the non-operational boiler to remain in the warm stand-by mode and prevents thermal shock to the boiler when it is required to operate. Therefore, standby losses from the boiler shell are large as evidenced by the heat build-up within the mechanical room.



Figure 6: Existing HB Smith Boilers

Two hot water pumps provide 100 GPM flow of heating water to the air handler and the VAV box reheat coils. One pump operates while the other pump remains in the stand-by mode. A 3-way control valve is located on the main piping to the boilers and is used to reset the heating water supply temperature to the building.

Air Handling Equipment:

One main air handler located within the boiler room provides air to the Public Safety Building. The unit supplies preconditioned air at 55°F to the VAV boxes throughout the building. AHU-1 operates as a Variable Air Volume unit with VSD's on the supply air fans.

AIR HANDLER SUMMARY					
Unit ID	SAF (HP)	Supply Air (CFM)	Outside Air (CFM)	Cooling Cap. (MBH)	Pre-Heat Cap. (MBH)
AHU-1	25	32,000	9,000	1,160	655

AHU-1 contains two 25 HP supply air fans. The fans are each sized to supply ½ of the total system air flow. When the building load requires less than 50% of the air flow, only one fan is designed to operate. The control system modulates the VSD's in response to static pressure in the duct supply. A 3-way control valve located on the cooling coil provides temperature control to maintain the leaving air temperature. The VAV system is designed with a supply air temperature of 55°F year round. The control system will modulate the discharge air temperature based on the outdoor air temperature by modulating the 3-way valve. The pre-heat coil is used during the winter months to pre-heat the mixed air to maintain 55°F. During the facility audit, the outdoor air damper was closed almost 100% with only a small amount of outdoor air leaking through the damper vanes.

Control Systems:

The control system serving the Public Safety building is a mix of pneumatic and DDC controls. A Johnson Controls Metasys DDC system has been installed on top (supervisory) of the pneumatic controls. The pneumatic components are used to operate dampers, valves and space thermostats throughout the building. The VAV boxes also use pneumatics to modulate the air damper as well as the reheat coil valve. The Metasys DDC provides basic start/stop and energy management functions such as reset control. In addition, the DDC system reports building status back to the central computer front-end located at the County maintenance building.

During the site survey, several control issues were noted:

1. Heating Water Reset Control: The outside air temperature was 65 °F during the site audit. However, the heating water supply temperature was 180°F to the building loop. According to the control sequence of operations, the heating water supply temperature should be reset based on the following schedule:

Outside Air Temp.	HW Supply Temp.
0°F	180°F
70°F	100°F

Therefore, based on the reset schedule shown above, the heating water supply temperature should have been closer to 100 °F instead of 180 °F. The lack of proper reset control will waste energy and potentially cause comfort issues within the building.

2. Space Temperature Conditions: Temperature readings were taken within the building spaces to confirm operation of the VAV boxes and pneumatic thermostats. Many areas within the building are maintained at temperatures below 74 °F to provide improved comfort for the public safety personnel that wear heavy gear and clothing. The police officers wear heavy vests and the cooler space temperatures are needed for them to remain comfortable. However, during the space temperature inspection, many of the pneumatic thermostats were set at a different temperature very different than the temperature within the space. The thermostat in the photo to the right was set at 85 °F. However, the space temperature was measured at 74 °F. The following table provides a summary of the thermostat set points versus the actual room temperature measured during the site audit.

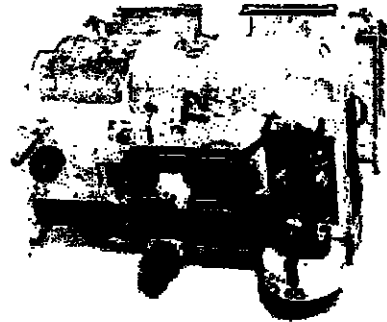


Figure 7: JCI Thermostat

Space Temperature Set Points vs. Actual Temps		
Space	Stat Set-Pt.	Space Temp.
Office	85 °F	74 °F
Office	68 °F	72 °F
Cell Block Ofc 1	70 °F	74 °F
Cell Block Ofc 2	70 °F	75 °F
Watch Commander	65 °F	74 °F
Meeting Rm.	70 °F	75 °F
K-9	70 °F	69 °F
Crime Investigation	70 °F	72 °F
Firehouse Workout	72 °F	70 °F

3. **Chilled Water Blending:** The pneumatically controlled isolation valves located on the chillers were not functioning at the time of the facility audit. This permitted chilled water return from the idle chiller to blend with the colder chilled water from the operating chiller. The result was a chilled water supply temperature of approximately 50 to 52 °F to the building air handler. The air handlers cooling coil is designed for an entering water temperature of 44 °F. The facility engineer from the County reconnected the pneumatic actuator. However, the actuators do not appear to be functioning since the other actuator was still connected and controlled flow to the idle chiller. Therefore, the other valve that was connected should have been closed.

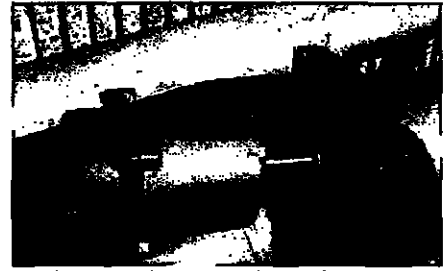


Figure 8: Disconnected Isolation Valve

4. **Outdoor Air Damper Position:** The outdoor air damper on the Air Handler was almost 100% closed at the time of the audit. The building was occupied and according to the design drawings, the minimum outdoor air setting for the unit is 9,000 CFM or approximately 28% of the total airflow. Per current ASHRAE standards, the 9,000 CFM of outdoor air would support approximately 450 people within the building. The occupancy of the building is much less than this level. It appears that the large amount of outdoor air is due to the exhaust fan make-up requirements for the cells, kitchenette, toilet rooms and locker areas. The building was under a slight negative pressure relative to the outside at the time of the audit.

Electrical:

The building electrical system was tested in the field and indicated the Main feed being 480 volt, 160 Amp system having a 85% Power Factor (PF) and 60 average KVAR.

Water:

The bathrooms have toilets using an average of 3.5 gallons per flush. The urinals are using an average of 1.5 gallons per flush. The sink faucets are high flow and use an average of 2.2 gallons per minute (gpm).

Building Envelope:

The building envelope has 28 glass doors and 10 garage doors in need of adjustment and weather stripping. There are also 15 penetrations in the mechanical room that need to be sealed as well as 32 foot long crack in the wall.

The roof and wall intersections have 1215 linear feet to be sealed.

East Columbia Library

The East Columbia Library is a one-story building with approximately 46,000 sq. ft. of building space. The Library facility is open Monday through Thursday 9 AM to 9 PM, Friday/Saturday 9 AM to 6 PM, Sunday 1 PM to 5 PM. The East Columbia Library building houses Library spaces, meeting rooms and a senior center with multipurpose room.

Overall, the building and mechanical systems appear to be in good condition.



Figure 9: East Columbia Library

Lighting:

Offices and restrooms were found to contain 4 lamp 2x4 fixtures, hallways contain 3-T8 32 Watt lamp 2X4 fixtures These fixtures were in relatively good condition. Storage areas contained a pendant mounted 250 Watt Metal Halide fixture mounted at 24 feet height.

The outside fixtures consisted of parking lot pole lights, and wall mounted architectural lighting around the perimeter of the building.

Cooling:

Central Cooling Equipment:

The building is cooled by a central York chiller located in the main mechanical room operating with two large reciprocating compressors.

CHILLER EQUIPMENT INFORMATION	
Model #	Serial #
YCRJ77V0-46PE	YFBM92801973

The chiller is connected to a BAC DX cooling evaporative tower (Model#C1844-MPUR, Serial# 92101403). Refrigerant lines from the chiller are connected directly to the cooling tower to reject heat from the refrigeration cycle.

Chilled water pumps circulate the water to the main air handlers serving the building. The pump motors are standard efficiency.

CHILLED WATER PUMP SUMMARY			
Pump ID	Motor HP	Motor Eff.	Pump Frame
P-1,2	20	88.5%	256T

Heating:

Hot water is provided by five high efficiency Hydrotherm Multipulse boilers (Model#AM-300). The boilers are each sized for 299,000 BTUH input and operate using natural gas. Hot water is provided to the main air handler AHU-1 and AHU-2 for preheat. Hot water is also circulated to VAV boxes throughout the building for reheating of supply air to the spaces.

Hot water is circulated by two pumps that operate with standard efficiency motors.

HEATING WATER PUMP SUMMARY			
Pump ID	Motor HP	Motor Eff.	Pump Frame
P-3,4	10	86.5%	215T

The pumps operate at a fixed speed regardless of the valve position on the VAV box reheat coils. A pressure bypass is used to maintain constant pressure and flow through the system.

Air Handler Systems:

The building is conditioned by four main air handlers. The primary air handler, AHU-1, serves the majority of the Library space. This unit is a large built-up air handler with preheat and cooling coils. The unit is manufactured by Mammoth, (Model#DH60, Serial#54934). The air handler is a variable air volume unit operating with inlet guide vanes to vary the air flow in response to changes within the VAV boxes. The VAV boxes are controlled by electric thermostats located on the wall of the individual spaces. Hot water reheat coils are used to maintain the supply air temperature within the space or to provide heat. A 2-way electric control valve controls the flow of hot water to the reheat coil. The 2-way valve is connected to the JCI VAV controller and wall thermostat. The VAV boxes are manufactured by Titus, Model#DQFP-C-3000 and appear to be operating well.

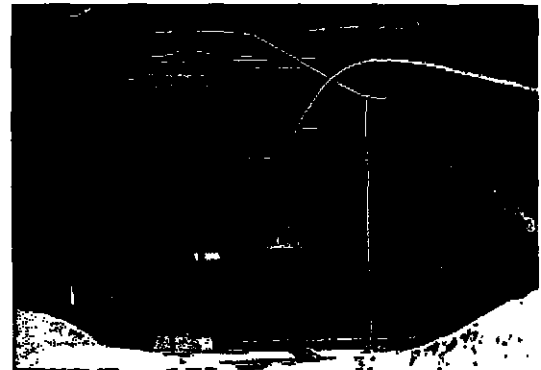


Figure 10: Titus VAV Box

AIR HANDLER EQUIPMENT SUMMARY				
AHU ID	Area Served	Manufacturer	Model #	SAF HP
AHU-1	Main Library	Mammoth	DH60	40
AHU-2	Office/Storage	Trane	N/A	N/A
AHU-3	Main Office	York	CS74SH	10
AHU-4	Meeting Room	York	CS74SH	5

Air handlers 3 and 4 are cooling only units. Both units are VAV units operating with inlet guide vanes. Air handler 4 also contains a supplemental DX cooling coil for cooling of the meeting room space when the large central chiller is not operational due to the winter season. Hot water for reheat with the VAV boxes is supplied from the central boiler plant in the main mechanical room.

Control Systems:

The building contains a Johnson Controls Metasys DDC system in addition to electric controls and actuators on VAV boxes and reheats coils. The Metasys system reports information to the County front-end computer.

Electrical:

The building electrical system was tested in the field and indicated the Main feed being 480 volt, 160 Amp system having a 90% Power Factor (PF) and 67 average KVAR.

Water:

The bathrooms have toilets using an average of 3.5 gallons per flush. The urinals are using an average of 1.5 gallons per flush. The sink faucets are high flow and use an average of 2.2 gallons per minute (gpm).

Building Envelope:

The building envelope has 4 glass doors and 9 steel doors in need of adjustment and weather stripping. There are also emergency exit doors that need to be insulated and 3226 square feet of opaque windows in glass walls that need to be insulated as well.

The roof and wall intersections have 1095 linear feet to be sealed.

Central Library

The Central Library is a one story building with approximately 46,000 sq. ft. of building space. The Library facility is open Monday through Thursday 9 AM to 9 PM, Friday/Saturday 9 AM to 6 PM, Sunday 1 PM to 5 PM. According to the facility staff, the building temperatures are maintained at 78°F cooling and 68°F heating.

The building mechanical systems were recently renovated in 2000 with new mechanical systems and automation system. The building appears to be in very good shape overall.



Figure 11: Central Library Building

Lighting:

Offices and restrooms were found to contain 4 lamp 2x4 fixtures, hallways contain 3-T8 32 Watt lamp 2X4 fixtures. These fixtures were in relatively good condition. Storage areas contained a pendant mounted 250 Watt Metal Halide fixture mounted at 24 feet height.

The outside fixtures consisted of parking lot pole lights, and wall mounted architectural lighting around the perimeter of the building.

Heating and Cooling:

Central Cooling and Heating Equipment:

The Library is cooled by multiple water source heat pump systems that serve single zone areas within the core of the building. Smaller water source heat pump units are used around the perimeter of the building. Both the air handlers and perimeter units provide cooling and heating.

A BAC cooling tower is located on grade behind the Library building, (Model #15146, Serial# U012749901). The cooling tower operates with a constant speed fan to maintain the primary condenser water loop for the building. The primary loop is piped between the cooling tower and a Tranter plate and frame heat exchanger within the main basement mechanical room. The heat exchanger connects the primary and secondary condenser water loops to keep the outside loop separate from the inside loop.

The condenser water is distributed by primary and secondary water pumps. All pumps operate at constant speed with premium efficiency motors.

PUMP SUMMARY			
Pump ID	Motor HP	Motor Eff.	Frame
1 & 2	25	91.7%	284T
3 & 4	15	91.0%	234T

An AO Smith electric boiler (Model# NW60-210) provides heating to the condenser water loop during the winter months to maintain the loop temperature at 60°F. The boiler is rated at 210,000 watts total with a 60 gallon storage capacity.

Central Air Handling Equipment:

The building is heated and cooled by Trane water source heat pumps. The central water source heat pumps are located within the lower level mechanical room. These units were all installed during CY 2000 renovation project. The main heat pump units serve single zone spaces within the Library.

Smaller perimeter heat pump units are located throughout the Library along the exterior wall of the building. These units are self-contained units with fans, compressors and controls on each unit.

MAIN HEAT PUMP UNIT SUMMARY				
Unit ID	Model #	Serial #	Fan HP	Area Served
HP101	WPVD15041P00BB	W01B71047	3	Lower Level
HP107	GEHA06041B021	W01A69568	1	Unknown
HP108	WPVD25041P00AA	W01871367	5	1 st Flr Main
HP113	WPVD25041P00AA	W01B71368	7 ½	2 nd Flr Main
HP117	GEVA04041B0210	W01A69562	1/2	Unknown

The cabinet heat pumps operate independently and maintain the temperature in the area around the unit. Temperature readings were taken around the units to determine the cooling effectiveness of the cabinet units.

Perimeter Heat Pump Temperatures		
Unit Location	Space Temperature (°F)	Discharge Temperature (°F)
Main Floor	75	69
Children's	71	65
2 nd Flr Front	74	69
2 nd Flr Back	73	43
2 nd Flr Side	72	48

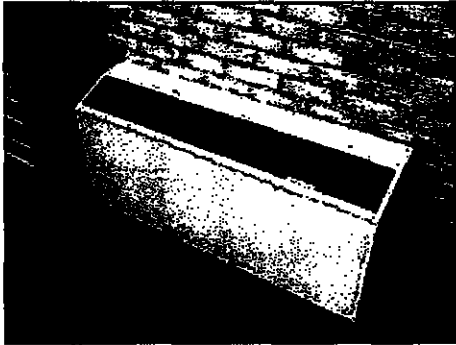


Figure 12: FCU

At the time of the audit, several perimeter heat pump units were discharging air at very low temperatures. The area around those units felt very cold due to the low discharge air temperature.

The perimeter cabinet units were installed as part of the 2000 building renovation and update.

Control Systems:

The mechanical systems are controlled by a Johnson Controls Metasys DDC system. The system is connected to the air handlers and perimeter cabinet heat pump units. The cooling tower, pumps and heat pump boiler are connected to the control system.

Overall, the DDC control system appears to be in good condition.

Electrical:

The building electrical system was tested in the field and indicated the Main feed being 480 volt, 270 Amp system having a 91% Power Factor (PF) and 97 average KVAR.

Water:

The bathrooms have toilets using an average of 3.5 gallons per flush. The urinals are using an average of 1.5 gallons per flush. The sink faucets are high flow and use an average of 2.2 gallons per minute (gpm).

Building Envelope:

The building envelope has 6 glass doors, 4 steel doors and 1 garage door in need of adjustment and weather stripping. 125 square feet in the front entrance soffit area needs insulation

There are 232 square feet of insulation needed in the interior side of the weather panels in the children's section of the first floor

1,875 linear feet of openings were found around window frames, wood beams, seams, joints and connections of the wood ceiling as identified using the blower door and Infrared camera.

The roof and wall intersections have 860 linear feet to be sealed above the drop ceiling in the office area on the second floor.

Recreation & Parks Headquarters

The Recs and Parks headquarters office is a two story building consisting of just over 57,000 sq. ft. of office and warehouse space. The building houses the main offices for the Recreation and Parks program for the County. The building is typically occupied Monday through Friday between the hours of 7 AM to 5 PM. Some of the warehouse buildings and maintenance buildings are occupied from 6 AM to 5 PM Monday through Friday.

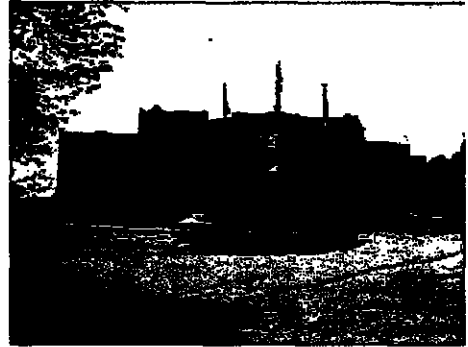


Figure 13: Recreation & Parks HQ

The building was constructed approximately in 1994. The mechanical equipment, with the exception of two rooftop units, is original. The building contains an open floor area that allows heat to rise from the first floor to the second floor. This creates areas of warmer temperatures on the second floor and cold drafts during the winter months on the first floor due to the lobby doors. Three large skylights are used to provide ambient light to the office areas on the second floor.

Lighting:

Offices and restrooms were found to contain 4 lamp 2x4 fixtures, hallways contain 3-T8 32 Watt lamp 2X4 fixtures. These fixtures were in relatively good condition. Storage areas contained a pendant mounted 250 Watt Metal Halide fixture mounted at 24 feet.

The outside fixtures consisted of parking lot pole lights, and wall mounted architectural lighting around the perimeter of the building.

Heating and Cooling:

Central Cooling and Heating Equipment:

This building does not contain a central heating plant. All cooling and heating is provided by multiple, self-contained (DX) air cooled rooftop units with gas-fired heating.

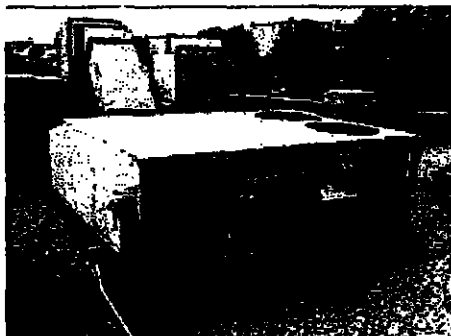


Figure 14: Existing Rooftop Air Handler

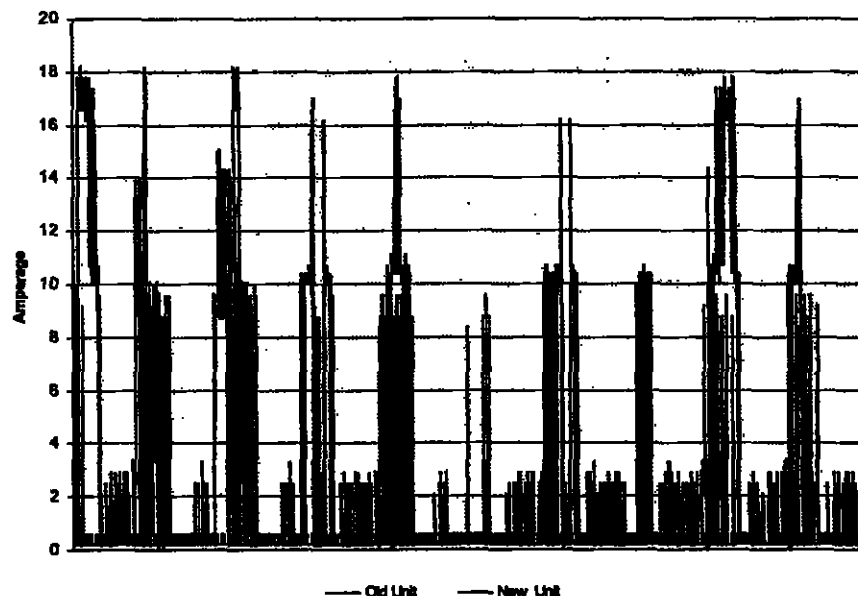
Air Handling Equipment:

The building is heated and cooled by multiple single zone type rooftop air handlers and split systems A/C units. The rooftop air handlers are manufactured by York and serve single zones with multiple spaces in the building. Single zone programmable thermostats control the operation of the rooftop units. However, inspection of the programmable thermostats during the facility audit revealed that many of them are not programmed properly or lack the correct time on the thermostat clock.

AIR HANDLING UNIT SUMMARY						
Unit ID	Model #	Serial #	Serves	SAF HP	Cooling MBH	Heating MBH
RTU-1	D2GA030	NMBM088670	Ed Bromley Area	1/3	30	41
RTU-2	D2GA030	NMBM079027	Front 1 st & 2 nd Floor	1/3	30	41
RTU-3	D3CG12	NDCM031586	Left Skylight	2	105	161
RTU-4	D3CG090	NDCM034739	2 nd Floor Back Loop	2	90	129
RTU-5	D4CG036	NDCM034810	1 st Floor Back	2	36	41
RTU-6	D3CG102	NDCM033172	Center Skylight	3	102	129
RTU-7	ZH102N15A	NOH7181449	1 st and 2 nd Floor Front	3	102	161
RTU-8	D3CG120N	NDCM033732	Right Skylight	3	120	161
RTU-9	D2NP030N0	NOL7382823	Offices	3/4	30	120

* Cooling load estimated from Model number and York website.

Two of the rooftop air handlers have been replaced by the newer York Predator series rooftop air cooled unit. During the audit, current loggers were utilized to determine the amperage draw for a sample of the rooftop units. The amperage draw for several older units and one of the newer Predator units were logged for a week to verify the energy consumption of the units. The following graphs provide a summary of the data logging on similar sized RTU's:



From the graph on the preceding page, it is clear that the newer York air handler draws a lower amperage than the older units. On average the newer unit draws approximately 4 to 6 kW less than the older units while operating in the cooling mode.

The warehouse shop building was reviewed during the site audit. These maintenance office house storage space, maintenance offices and maintenance shop areas. The spaces are cooled by small split system A/C units and heated by electric unit heaters. The electric unit heaters are controlled by a manual temperature dial located on the side of the unit heater. During the audit, several of the spaces were found to be overheated by the unit heaters because they lack automatic control. Each shop bay

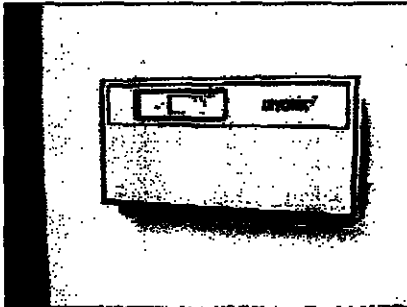


Figure 16: Programmable Thermostat

contains two 10 kW unit heaters that operate independently.

Control Systems:

The rooftop air handlers and split systems are all controlled by single zone programmable thermostats. The thermostats were found to contain incorrect times and day schedules. Most thermostats are operating in the occupied mode continuously 24 hours per day.

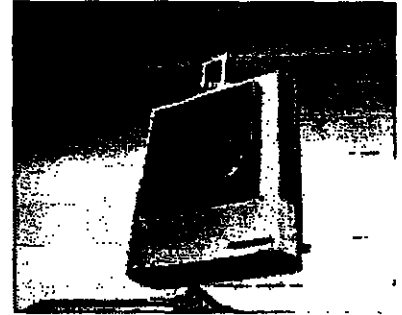


Figure 15: Shop Unit Heater

Several thermostats located on the 2nd floor control units that provide cooling and heating to offices on both the 1st and 2nd floors. Space temperature samples were taken throughout the office areas to determine temperature consistency. The following table provides a summary of the temperature samples.

RECREATION AND PARKS TEMPERATURE SURVEY	
Location	Temp.
2 nd Floor Near West Skylight	77 °F
Inside West Skylight	85 °F
Back 2 nd Flr Office	71 °F
2 nd Flr Conference Room	67 °F
Inside East Skylight	100 °F
1 st Flr Lobby	72 °F
1 st Flr Office	73 °F

The space temperature varied between the first and second floor. A large open area allowed heat from the first floor to rise into the second floor area. In addition, the area under the skylights was much warmer than the surrounding office areas due to the solar heat gain from the skylights. Some thermostats control one unit that serves both the second and first floors of the building. Therefore, temperature and comfort issues are a problem within this building.

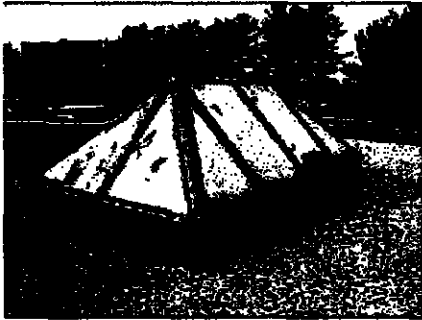


Figure 17: Skylight with Old Solar Film

Miscellaneous Building Issues:

The building contains three skylights that provide ambient light to the office spaces on the second floor. The skylights are constructed of aluminum frames and solid single pane glass with a slight green tint. Solar film was applied to the exterior of the skylights some time in the past. However, the solar film is now peeling and is no longer effective. As documented during the temperature survey, the temperature within the skylight area reached 100°F on a day when the outside air was no more than 72°F.

Electrical:

The building electrical system was tested in the field and indicated the Main feed being 480 volt, 160 Amp system having a 92% Power Factor (PF) and 51 average KVAR.

Water:

The bathrooms have toilets using an average of 3.5 gallons per flush. The urinals are using an average of 1.5 gallons per flush. The sink faucets are high flow and use an average of 2.2 gallons per minute (gpm).

Building Envelope:

The building envelope have 4 glass doors, 20 steel doors and 19 garage door in need of adjustment and weather stripping.

640 square feet on the interior side of the opaque weather panels needs insulation in the glass wall section of the first floor and second floor.

The roof and wall intersections have 1160 linear feet to be sealed above the drop ceiling in the office area on the second floor.

Dorsey Building

The Dorsey Building is operated by Howard County Government as a one story office building. The facility is the former commercial business site that was purchased by Howard County Government in the 1980's. The building houses office space for the County Facilities and Engineering Group, County Sheriffs, County Government TV in addition to other Government agencies. The building also houses the Counties Business and Technology office space where the County leases office space to small technology based businesses.

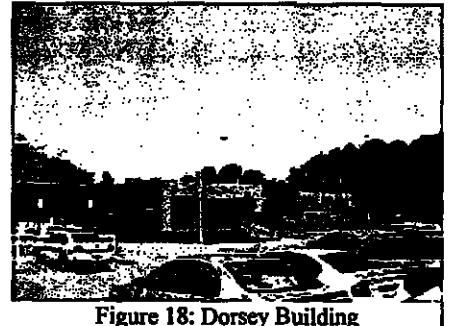


Figure 18: Dorsey Building

The Dorsey Building is approximately 197,500 square feet of building space. The facility was constructed in several stages with the oldest portion dating back over 50 years. The County has renovated the interior of the building and replaced some systems as part of the renovations.

Lighting:

Offices and restrooms were found to contain 4 lamp 2x4 fixtures, hallways contain 3-T8 32 Watt lamp 2X4 fixtures These fixtures were in relatively good condition. Storage areas contained a pendant mounted 250 Watt Metal Halide fixture mounted at 24 feet height.

The outside fixtures consisted of parking lot pole lights, and wall mounted architectural lighting around the perimeter of the building.

Heating and Cooling:

Many of the building HVAC systems are original with the exception of several rooftop units that were recently replaced. The entire building is heated and cooled by multiple, self-contained air-cooled rooftop units with natural gas heating.

This building does not contain central cooling and heating plants. All cooling and heating is provided by multiple air cooled rooftop units with gas-fired heating.

The building is heated and cooled by a total of twenty-one (21) rooftop air handlers. The rooftop units are a combination of single zone, multizone and variable air volume units. The units were installed at various times over the last thirty years. The Mammoth rooftop air handlers were installed in 1984 during a building renovation project.

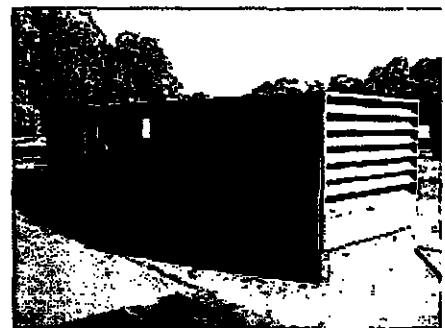


Figure 19: Existing Rooftop Air Handler

The units operate with inlet guide vanes for variable air volume operation. These units appear to have reached the end of their life-cycle since repairs are being made to condenser coils and air and water leakage are evident with the units. All of the units except one have multiple air leaks through seams in the unit that permit conditioned air to leak to the outdoors. Condenser coils have multiple repairs due to refrigerant leaks in the condenser coils.

The following table summarizes the units:

ROOFTOP UNIT SUMMARY						
Unit ID	Manuf.	Model #	Serial #	SAF HP	RAF HP	Notes:
1	Mammoth	CEBP-351	20238-04-01	40	7 ½	VAV – IG. Many air leaks @ seams, Refrig Leaks, Water Leaks from rain. <u>Replace Unit.</u>
2	York	Y13AE44M5 K	NELM048830	10	7 ½	New unit. Replaced smaller Mammoth unit. Good condition.
3	Mammoth	CESBP-251	20238-03-01	10	5	VAV – IG. Some air leaks. Fair Condition. <u>Replace Unit.</u>
4	Mammoth	CEBP-351	20238-01-01	15	7 ½	VAV – IG. Refrig. Leaks, Air Leaks @ Seams. <u>Replace Unit.</u>
5	Mammoth	CEBP-351-C	20238-05-01	15	7 ½	VAV – IG. Unit appears to be in good condition. <u>Keep Unit, Add VSD.</u>
6	McQuay	RPS040BA	3SD0031213	15	5	CV, Unit appears to be in good condition.
7	McQuay	RPS040BA	3SD0031413	10	5	CV, Unit appears to be in good condition.
8	McQuay	RPS040BA	3SM0060413	10	2	CV, Unit appears to be in good condition.
9	McQuay	RPS040BA	3SD0031313	10	5	CV, Unit appears to be in good condition.
10	McQuay	RPS040BA	3SM0060513	7 ½	1 ½	CV, Unit appears to be in good condition.
11	McQuay	RPS040BA	3UL0068919	7 ½	1 ½	CV, Unit appears to be in good condition.
12	McQuay	RPS040BA	3TL0029119	15	3	CV, Unit appears to be in good condition.
13	McQuay	RPS040BA	3TL0029219	15	3	CV, Unit appears to be in good condition.
14	McQuay	RPS041BA	3TL0029019	15	5	Previous problems with compressors failures. Serves area that is not utilized due to Server Room cooling units.
15	McQuay	RPS041BA	3UJ0053019	15	7 ½	CV, Unit appears to be in good condition.
16	McQuay	RPS041BA	3UJ0053119	15	7 ½	CV, Unit appears to be in good condition.
17	McQuay	RPS041BA	3UJ0053219	15	7 ½	CV, Unit appears to be in good condition.
GTV	Snyder General	R160ETLC	5TL89034-00	7 ½	-	Serves Government TV station. Station shutting down and will no longer be used.
H&V	Unk.	-	-	-	-	No Longer Operating. H&V Unit serving Kitchen/Café. Not Used.
Lob	Carrier	48TJF012	1594G02384	-	-	Small unit serving the Lobby. New Unit.

* Yellow highlighted rows indicate rooftop units that are in fair or poor condition.

The McQuay rooftop units are newer and appear to be in good condition. These units operate as constant volume units serving a single zone with multiple spaces.

Control Systems:

Buildings temperatures are managed by various types of systems from single zone thermostats to McQuay zone temperature control management systems. The central energy management and control systems have been disconnected at the panels. The rooftop air handlers operate twenty-four hours a day according to the building staff at the facility. The central control systems no longer function properly and lack the proper scheduling features to setback the building temperatures during unoccupied periods.

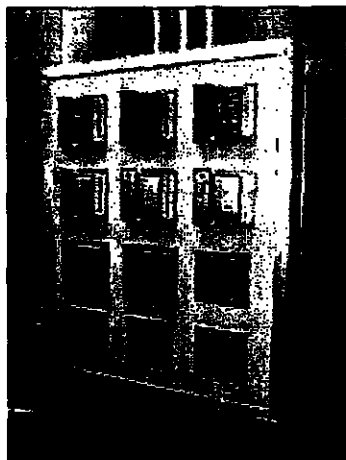


Figure 20: Existing Control System

All control systems connected to the McQuay units are electronic. The variable air volume boxes are controlled by electronic thermostats located in the occupied spaces. Pneumatic controls are used on the VAV boxes and actuators to provide modulation of the VAV actuator as well as control of the electric reheat coil on the VAV box. The VAV boxes appear to be maintaining temperatures within the spaces, but do not set back at night or on weekends during unoccupied periods.

Wiring within the control panels has been disconnected or cut and rendered the control systems inoperative as energy management systems. The temperature control capability remains so that space conditions are maintained.

The Mammoth units utilize electric controls to modulate the inlet guide vanes. The interior and fan section of each Mammoth unit was inspected during the survey. The inlet guide vanes were all open 100%.

Ventilation:

Domex type rooftop exhaust fans are used for general building exhaust and restroom exhaust. A total of sixteen exhaust fans were identified on the roof of the building. These fans operate twenty-four hours each day regardless of building occupancy.

Electrical:

The building electrical system has two service entrances, both services were tested in the field and indicated the Main feed #1 being 480 volt, 445 Amp system having a 78% Power Factor (PF) and 245 average KVAR, Main feed #2 was 480 volts, 880 Amp system having a 83% Power Factor (PF) and 404 average KVAR.

Water:

The bathrooms have toilets using an average of 3.5 gallons per flush. The urinals are using an average of 1.5 gallons per flush. The sink faucets are high flow and use an average of 2.2 gallons per minute (gpm).

Building Envelope:

The building envelope has 22 regular doors and 5 garage door in need of adjustment and weather stripping.

1,962 linear feet need to be sealed around windows.

390 square feet of panels need insulation on the bottom glass panels of the front glass wall.

The roof and wall intersections have 2,420 linear feet to be sealed.

Gateway Building

The Gateway Building is a five story office building owned and occupied by Howard County Government located near Columbia Gateway Parkway. The building was originally constructed in 1989 and renovated by the County when they took over the facility in 1994. This building is relatively new and is overall appears to be in very good condition.



Figure 21: Gateway Building

Lighting:

Offices and restrooms were found to contain 4 lamp 2x4 fixtures, hallways contain 3-T8 32 Watt lamp 2X4 fixtures. These fixtures were in relatively good condition. Storage areas contained a pendant mounted 250 Watt Metal Halide fixture mounted at 24 feet.

The outside fixtures consisted of parking lot pole lights, and wall mounted architectural lighting around the perimeter of the building.

Heating and Cooling:

This building is heated and cooled by water-cooled heat pump units located on each floor. The only central plant equipment is the cooling tower located on the roof of the building. The cooling tower, manufactured by BAC (Model #T1463-QC) provides heat rejection for the condenser water loop serving the water source heat pumps on each floor. The cooling tower contains two motors for two speed operation of the fan. Condenser water pumps and heat exchangers are located on the roof mechanical room next to the cooling tower.

The cooling tower is rated at 1,100 gpm with a 50 HP motor for full speed operation. Total heat rejection is 5,550,000 BTU per hour.

Air Handling Equipment:

Five McQuay variable air volume water-cooled heat pump units provide heating and cooling throughout the building. One unit is located on each floor. The units contain inlet guide vanes on the fan to vary the flow from the air handler in response to the load within the building. Variable air volume boxes provide temperature control for the spaces by varying the flow of air into the space in response to the space thermostat. The VAV boxes are fan powered and contain a small electric reheat coil.

AIR HANDLER SUMMARY				
Unit ID	CFM	OA CFM	Fan HP	Cooling (Btuh)
AC-1, 2, 3, 4	18,000	1,300	20	811,000
AC-5	21,600	1,580	25	757,000

Each air handler contains an electric heating coil to maintain a 55°F supply air temperature year-round. Refrigerant compressors are located within each air handler that provides primary cooling to the unit. Free cooling was added to the air handlers by connecting the condenser water to a separate water coil within the air handler. When outside weather conditions permit, the cooling tower can provide the necessary cooling for the building without using the refrigerant compressors.

Controls Systems:

A central JCI control system provides temperature control and energy management of the building systems. The Metasys EMS controls are connected to each air handler and provide basic EMS functions such as night setback and start/stop of the equipment. The cooling tower and pumps are also controlled by the Metasys controls. Electronic thermostats by EnviroTech, are located with the office spaces and provide control of the VAV boxes and electric reheat coils. During the facility audit, several building occupants indicated that the building is over cooled during the summer months. Space temperatures were measured to verify proper settings and operation of the thermostats. The following list provides a summary of the findings:

BUILDING TEMPERATURE READINGS			
1 st Floor	72°F	4 th Floor Hall	71 °F
AC-1 RA 1	68 °F	4 th Floor East Conf.	69 °F
AC-1 RA 2	72 °F	5 th Floor Hall	71 °F
2 nd Floor	73 °F	5 th floor Atrium	114 °F
3 rd Floor Risk Mgmt	73 °F	5 th Floor East	72 °F
3 rd Floor East	75 °F		

Electrical:

The building electrical system was tested in the field and indicated the Main feed being 480 volt, 750 Amp system having a 80% Power Factor (PF) and 380 average KVAR.

Water:

The bathrooms have toilets using an average of 3.5 gallons per flush. The urinals are using an average of 1.5 gallons per flush. The sink faucets are high flow and use an average of 2.2 gallons per minute (gpm).

Building Envelope:

The building envelope has 25 regular doors in need of adjustment and weather stripping.

Six hundred eighteen (618) linear feet need to be sealed around windows and masonry gap.

One hundred eighty four (184) square feet need insulation in the soffit areas at the overhangs.

Three hundred sixty eight (368) square feet of insulation is needed on the exposed floor in the soffits.

Detention Center Specific Scope of Work

Lighting

The following upgrades are typical:

Provide new lamp, ballast, sockets and reflector kits for fluorescent fixtures in the project scope.

Fixtures are to be de-lamped going from four (4) and three (3) lamps to two (2) lamps in the 2X4 fixtures included in the project scope. Reflectors are to be used in the fixtures that are being de-lamped.

Fixtures that are 1x4 shall be de-lamped to one (1) lamp with a reflector and 2X2 fixtures are to be de-lamped to two (2) straight lamps.

Ballast to be typically tandem wired, except when not feasible. No dimming ballast has been specified in this project due to the cost.

Wherever feasible, non-dimmable incandescent lamps will be replaced with compact Fluorescent lamps.

Fixtures in the project scope having 8 foot Fluorescent lamps will be converted to two 4 foot lamp system.

For actual counts and additional scope of work see table on following page:

Detention Center		
Type of Fixture	Qty	Retrofit description
2x4 4-Lamp Troffer	191	Delamp T8 - 2 Lamp 28w, Ballast w/reflector
1x4 2-Lamp Strip	100	Delamp T8 - 1 Lamp 28w, Ballast w/reflector
1x4 2-Lamp Wrap	637	Delamp T8 - 1 Lamp 28w, Ballast w/reflector
1x4 2-Lamp Troffer	205	Delamp T8 - 1 Lamp 28w, Ballast w/reflector
2x2 2-Lamp U-6 Troffer.	24	Retro w/T8 2 - lamp F17 w/Reflector Kit
1x8 1-Lamp Strip F96	8	Retro w/ T8 2-lamp 28W 4ft Kit Ballast no reflector
1x8 2-Lamp Strip	7	Retro w/ T8 2-lamp 28W 4ft Kit Ballast w/ reflector
1x2 2-Lamp F20 Strip	1	Retro T8 1x2 1-Lamp (Std) Ballast w/reflector.
R100W Inc. Flood Indoor	1	NEW CFL 1R3023 23W
Inc. 60w	448	NEW CFL 28915 Mini lamp 15W
R30w Inc. Flood Indoor	2	NEW CFL 1R3016 16W
250 Watt MH Fixture	6	Retro 200 Watt Pulse Start MH kit
100 Watt MH Wall Pack	14	NEW 42W CFL WALL PACK
175 Watt MH Fixture	186	NEW T5 2x4 3Lamp HO w/ Reflector & cage
400 Watt MH & HPS HID fixture	52	NEW T5 2x4 4Lamp HO w/ Reflector & cage
400 Watt HPS Wall Pack	11	Retro 320 Watt Pulse Start Metal Halide
T12 2x2 2-Lamp U-Tube	2	NEW 2' 2-Lamp Wrap
9 Watt CFL Biax Tube 2-Lamp Can	1	NEW 2' 2-Lamp Wrap
TOTAL	1896	

Lighting Controls

Lighting controls are designed based on the space use and the surrounding environment. The attached table provides a summary of the scope of work.

Detention Center	
Qty	Motion Sensors
1	New Wall Switch Occupancy Sensor
4	New Dual Tech Ceiling Sensor
2	New Dual Tech Wall Switch Occ. Sensor-2P
8	New Dual Tech Wall Switch Occ. Sensor
4	Power Pack to be used w/ CM & WV
19	TOTAL

Chiller Retrofit

This scope of work includes the replacement of the two existing 100-tons Trane centrifugal chillers with two new 150-tons Trane chillers. Current chilled water piping within the plant is arranged in series through Chillers 1# and 2. The chilled water piping will be revised to permit parallel flow through the chiller plant including the installation of a chilled water header to connect the two new chillers with the existing Chiller #3. The scope of work includes the following:

- Demolition and removal of two existing Trane chillers including existing valves, pipe connections and electrical connections.
- Provide and install two new 150 ton Trane chillers, water-cooled series RTHD or equal. Chillers include:
 - ASHRAE 90.1 compliant
 - Refrigerant isolation valves
 - Factory insulation
 - Standard safety devices
 - Refrigerant 134a
 - 3 pass evaporator
 - Standard grooved pipe
 - Wye-Delta Closed transition starter
 - 598 Max RLA unit mounted starter
 - 208 volt electrical
 - Mechanical disconnect
 - NEMA 1 enclosure with MRLA 598
 - Dyna-view English
 - Programmable relays
 - Chilled water reset
 - Two flow switches
 - LON communication card
 - Factory start-up
- Chiller Schedule information:

CENTRIFUGAL CHILLER SCHEDULE (@100% LOAD)							
Evaporator Section				Condenser Section			
Ent. Temp.	Lvg. Temp.	Flow (gpm)	PD Ft of H₂O	Flow @ 85/96°F	PD Ft of H₂O	Volts	Unit Power (kW)
56 °F	44 °F	298	5.9	375	8.5	208	97.5

CENTRIFUGAL CHILLER PART LOAD PERFORMANCE			
% Load	Capacity	kW	Efficiency (kW/ton)
100	150	97.5	0.650
75	112.5	64.8	0.576
50	75	39.6	0.528
25	37.5	27.7	0.739

NPLV = 0.568 kW/ton

- Existing housekeeping pads to remain and be re-used with new chillers.
- Provide and install new automatic isolation valves on the chiller inlet piping. (One valve per chiller)
- Modify chilled water piping to permit parallel chiller operation. Provide and install 8" schedule 40 steel pipe headers (welded) with 6" branch piping to new chillers.
- Modify existing Chiller #3 connection to permit parallel operation with the new Chillers #1 and 2.
- Provide and install 1 ½ inch fiberglass insulation with white all-service jacket on new piping. Black painted flow arrows and pipe ID on new pipe.
- Provide new electrical power wiring in existing conduit from switchgear to two new chillers. New circuit breakers in switchgear for chillers. Unless specified, existing electrical infrastructure will be reused.
- Provide and install manufacturer supplied refrigerant monitoring system and interlock with chillers and boilers.
- Provide and install new ventilation fans and ductwork for chiller room ventilation in conjunction with refrigerant monitor.
- Disassemble and reassemble chillers for rigging into the mechanical room. Coordinate disassembly and reassembly with manufacturer to maintain full warranty coverage.
- Existing condenser water piping and cooling towers to remain and be re-used with new chiller plant.
- Existing chilled/condenser water pumps to remain and be re-used with the new chiller plant.
- Connect new energy management temperature controls to chillers, pumps and cooling towers to permit communication with Tridium EMS frontend.

Boiler Retrofit

This scope of work includes the replacement of the two existing Cleaver Brooks CB100 boilers with four (4) new non-condensing boilers manufactured by RBI Boilers or equal. The scope of work is as follows:

- Demolish and remove two existing Cleaver Brooks CB 100 boilers including modified piping, electrical wiring and exhaust flues.
- Provide and install the new boilers (model #MB/MW 1750 or equal) with input of 1,750 MBH and net output of 1,523 MBH each.
- Modify hot water piping to connect the existing boiler #3 to the new boilers to provide one operating boiler plant.
- Provide and install fiberglass pipe insulation with all-service jacket on new piping. Label piping with painted black flow direction and pipe ID.
- Disconnect and reconnect existing natural gas line to new boilers.
- Provide new power wiring to serve newly installed boilers including CSD-1 wiring of boilers for safety shut-off and combustion air interlock.
- Provide and install new boiler exhaust flue sized for new boiler service.
- Existing hot water pumps to remain and be re-used with new boiler plant.
- Existing electrical infrastructure to remain and be reused for the proposed scope

Hot Water Pump Retrofit

This scope of work includes the following:

Isolate system and disconnect piping and electrical connections.

Remove existing two (2) hot-water pumps and motors

Furnish and install two (2) new pumps and premium-efficiency motors. Pumps and motors sized to match existing

Reconnect piping, electrical and provide start-up service

The existing concrete pad and other infrastructure will be retained and reused

Variable Speed Drive Installation

This scope of work includes the installation of variable speed drives on specific mechanical systems to control the speed of the fan or pump to reduce electrical consumption.

The scope of work is as follows:

- Provide and install variable speed drives with drive bypass as manufactured by Honeywell or equal. Provide 208 volt Honeywell NBX series variable speed drives with cool blue drive by-pass for the following:

System ID	Drive Size
Cooling Tower Fan	10 HP
Cooling Tower Fan	5 HP
AHU-1 SAF	50 HP
AHU-1 RAF	7 ½ HP
Chilled Water Pump 1	10 HP
Chilled Water Pump 2	10 HP
Heating Water Pump 7	3 HP
Heating Water Pump 8	3 HP

- Mount variable speed drive and by-pass on the mechanical room wall or on rack near mechanical device. Reconnect existing 208 volt electrical power wiring from existing circuit breaker to new drive.
- Provide appropriate control device (pressure differential sensor) in duct or piping to control variable speed drive.
- Provide control communication wiring between variable speed drive and EMS control panel. Provide programming and control points.
- For Air Handlers Only: Replace existing 3-way valves with 2-way control valves to vary the hydronic flow.

Energy Management System Upgrades

This scope of work includes the upgrade of the existing DDC system and selected pneumatic controls with new DDC control devices and programming. Please note that this scope below applies to multiple Energy Conservation Measures (ECMs).

- Upgrade existing Metasys DDC controls with three (3) Tridium supervisory controllers. Replace one Metasys five slot and two Metasys two slot panels for Tridium upgrade.
- Implement EMS programming: Heating water reset control, discharge air temperature reset control, VSD control, start/stop/status of equipment.
- Provide programming, commissioning, software, server communications, system engineering and system graphics.

Kitchen Hood Controls

Install I/O processor above the ceiling within 100 feet from any hood in the Kitchen and 50 feet from the keypad. Wire 115 Volt to a dedicated circuit.

Install VFD drives in Mechanical room with 3 phase input power from circuit breaker and output wiring to be connected to respective fan motor. Energize make-up air (MUA) controls from separate circuit.

Install Intelli-Hood sensors in each Hood according to manual and meeting applicable state and county codes.

Controls to be installed are 4 channel I/O processor, Keypad, Optic Sensor, 4 - Exhaust Temperature sensor 3 – 5HP VFD 230V 3 PH and 1 – 7.5HP VFD 230V 3 PH and associated cabling and wiring to be a turn key system

Includes start-up and one-time training.

Building Envelope

Adjust and/replace weather stripping as required for:

9 glass doors;

4 garage doors

18 steel doors.

DETENTION CENTER VARIABLE SPEED DRIVE AHU-1 and 4

AHU VSD	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one each for SAF and RAF	Existing	2
Status		x			one each for SAF and RAF	Existing	2
CW/HW valves			x		one each for CC and HC valves	Existing	2
Dampers			x		one each for OA and RA	Existing	2
SA Temp				x	SA temp	Existing	1
RA Temp				x	RA temp	Existing	1
MA Temp				x	MA temp	Existing	1
Smoke Detector		x				Existing	1
Duct static				x		Existing	1
Fan speed			x			New	1
Enable	x					Existing	1
TOTAL							15

Notes:

1. The generic point list above provides a summary for AHU-1 and 4.
2. Existing points are contained within the existing Metasys system and will be transferred to the Tridium.

DETENTION CENTER CONSTANT SPEED AHU

							w/ RAF
AHU CS	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one each for SAF and RAF	Existing	2
Status		x			one each for SAF and RAF	Existing	2
CW/HW valves			x		one each for CC and HC valves	Existing	2
Dampers			x		one each for OA and RA	Existing	2
SA Temp				x	SA temp	Existing	1
RA Temp				x	RA temp	Existing	1
MA Temp				x	MA temp	Existing	1
Smoke Detector		x				Existing	1
TOTAL							12

Notes:

1. This generic points list summarizes points on AHU-2 and 3 near the work release area.
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

DETENTION CENTER CHILLER AND COOLING TOWER

Chiller/Tower	DO	DI	AO	AI	Comments	Existing/New	Points
Status		x			one each per chiller	Existing	1
Enable	x				start/stop	Existing	1
CHS Temp				x	chilled water supply temp	Existing	1
CHR Temp				x	chilled water return temp	Existing	1
CWS				x	condenser water supply	Existing	1
CWR				x	condenser water return	Existing	1
CHS Setpoint			x		chilled water temp setpoint (new)	New	1
CT Start/Stop	x				tower start/stop	Existing	2
CT status		x			tower status (new)	Existing	1
CT fan speed (VSD)				x	tower fan speed (new)	New	1
Enable	x					Existing	1
TOTAL							12

1. The generic point list is per chiller and cooling tower.
2. Additional points not shown are CHS and CHR main temperatures. (2 points)
3. Points shown are existing within the Metasys and will be transferred to the Tridium.

DETENTION CENTER CHILLED, HEATING AND CONDENSER WATER PUMPS

Applies to CHW, CDW, HW pumps

Pumps	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one per pump	Existing	1
Status		x			one per pump	Existing	1
CHW/HW valves			x		one for each valve	Existing	1
TOTAL							3

Notes:

1. Points shown are existing within the Metasys and will be transferred to the Tridium.

DETENTION CENTER BOILERS

Boiler	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one per boiler	New	1
Status		x			one per boiler	New	1
HWS				x	supply water temperature	Existing	1
HWR				x	return water temperature	Existing	1
HWS Temp Setpoint			x		supply temperature setpoint	New	1
3-way valve			x		reset temp control	Existing	1
TOTAL							6

Notes:

1. New boilers added require additional start/stop points. Existing start/stop for two boilers increased to four.
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

DETENTION CENTER KITCHEN VENTILATION HEAT RECOVERY UNITS

RTU	DO	DI	AO	AI	Comments	Existing/New	w/ RAF Points
Start/Stop	x				one each for SAF and RAF	Existing	2
Status		x			one each for SAF and RAF	Existing	2
Preheat valve			x		controls preheat	Existing	1
Dampers			x		one each for OA and RA (say)	Existing	2
SA Temp				x	SA temp	Existing	1
RA Temp				x	RA temp	Existing	1
Smoke Detector		x					1
TOTAL							10

Notes:

1. Gaylord air units for 100% outdoor air make-up and heat recovery from exhaust.
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

Scaggsville Public Safety Complex Specific Scope of Work

Lighting

The following upgrades are typical:

Provide new lamp, ballast, sockets and reflector kits for fluorescent fixtures in the project scope.

Fixtures are to be de-lamped from four (4) and three (3) lamps to 2 lamps in the 2X4 fixtures included in the project scope. Reflectors are to be used in the fixtures that are being de-lamped.

Fixtures that 1x4 shall be de-lamped to one (1) lamp with a reflector and 2X2 fixtures are to be de-lamped to two (2) straight lamps.

Ballast to be typically tandem wired, except when not feasible. No dimming ballast has been specified in this project due to the cost.

Wherever feasible, non-dimmable incandescent lamps will be replaced with a compact fluorescent lamp.

Fixtures in project scope that are 8 foot fluorescent lamps will be converted to two 4 ft lamp system.

For actual counts and additional scope of work see table on following page:

Scaggsville Public Safety Complex		
Type of Fixture	Qty	Proposed Scope of Work
2x4 3-Lamp Troffer	477	Delamp T8 - 2 Lamp 28w, Ballast w/reflector
2x4 3-Lamp Wrap	26	Delamp T8 - 2 Lamp 28w, Ballast w/reflector
1x4 2-Lamp Wrap	1	Delamp T8 - 1 Lamp 28w, Ballast w/reflector
1x4 2 & 3Lamp Strip	27	Delamp T8 - 1 Lamp 28w, Ballast w/reflector
1x4 2-Lamp Troffer	12	Delamp T8 - 1 Lamp 28w, Ballast w/reflector
1x3 3-lamp Strip	8	Retro T8 2 - Lamp F25W, Ballast w/ reflector
2x2 40 Watt 2-Lamp CFL Biax & U tube	25	Retro w/T8 2 - lamp F17 w/Reflector Kit
400 Watt MH Fixture	18	Retro 320 Watt Pulse Start M.H.
250 Watt MH Fixture	44	Retro 200 Watt Pulse Start MH kit
2 Lamp 25W Inc. Exit	31	New LED Exit Fixture
2 Lamp 6w Plug in CFL kit	3	New LED Exit Fixture
Inc. 90w Par 38 Dimmable	16	New CFL 23w BR40 Dimmable Flood
Inc. 100W	1	New CFL 28923 23W
Inc. 60w	14	New CFL 1R3016 15W
T8 2x4 3-Lamp Troffer	7	Remove fixture, patch, paint and repair... room over lit
TOTAL		710

Lighting Controls

Lighting controls are designed based on the space use and the surrounding environment. The attached table provides a summary of the scope of work.

Scaggsville Public Safety Complex	
Qty	Scope of work
15	New Dual Tech Ceiling Mount Sensor
17	New Wall Switch Occ. Sensor
18	New Dual Tech Wall Switch Occ. Sensor
3	Dual Tech Corner Mount Sensor
18	Power Pack to be used w/Ceiling and wall mount
71	TOTAL



Boiler Retrofit

This scope of work includes the replacement of the two existing HB Smith 350 Mills boilers with two new higher efficiency non-condensing boilers as manufactured by RBI Boilers or equal.

- Demolish and remove two existing HB Smith 350 Mills, oil-fired boilers including existing isolation valves and electrical connections.
- Provide and install two (2) RBI Boilers model #MB/MW 2000 or equal with input of 2,000 MBH and net output of 1,739 MBH each.
- Provide and install fiberglass pipe insulation with all-service jacket on new piping. Label piping with painted black flow direction and pipe ID.
- Disconnect and remove existing fuel oil piping serving the existing boilers. Fuel oil tank is to remain. Howard County is responsible for fuel oil remaining in existing tank.
- Provide new power wiring to serve newly installed boilers.
- Existing electrical and other heating-system infrastructure will be reused, as applicable
- Provide and install new boiler exhaust flue sized for new boiler service.
- Existing hot water pumps to remain and be re-used with new boiler plant.
- Provide and install natural gas piping from newly installed BGE gas meter. Pricing is based on BGE gas meter being installed on exterior wall outside of the boiler room. This measure is contingent on BGE installation of natural gas to the Scaggsville PS building.

Chilled Water Isolation Valve and Insulation Replacement

This scope of work includes the replacement of the two pneumatic isolation valves within the chilled water distribution lines outside by the air-cooled chillers. In addition, the exterior chilled water pipe insulation will be replaced.

- Check and verify operation of the automatic isolation valves in the chilled water piping. Replace pneumatic actuator and linkage on two exterior valves.
- Remove and dispose of existing aluminum jacket and insulation on the exterior piping. Re-install 1½ inch insulation with aluminum jacket. Seal jacket edges and openings to prevent water penetration to insulation.
- This scope does not include replacement of the existing piping, valves or fittings.

Energy Management System Upgrades

This scope of work includes the upgrade of the existing Metasys DDC system and selected pneumatic controls with new DDC control devices and programming. Please note that the scope presented below may apply to multiple ECMs.

- Upgrade existing Metasys DDC controls with one (1) Tridium supervisory controller. Replace one Metasys five slot panel for Tridium upgrade and communication.
- Implement EMS programming: Heating water reset control, discharge air temperature reset control, VSD control, start/stop/status of equipment.
- Provide and install CO₂ sensor in the return air duct of AHU-1 for control of ventilation air. Provide programming, graphics and communication wiring between device and panel.
- Provide programming, commissioning, software, server communications, system engineering and system graphics.

Building Envelope

Adjust exterior and mechanical door's weather stripping or replace weather stripping as required in 28 doors and 10 garage doors.

Seal 15 penetrations in main mechanical room.

Seal 32 foot long crack in wall in mechanical room.

Seal 1,215 linear feet of roof/wall intersection

SCAGGSVILLE PS VARIABLE SPEED DRIVE AHU-1

AHU VSD	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one each for SAF and RAF	Existing	2
Status		x			one each for SAF and RAF	Existing	2
CW/HW valves			x		one each for CC and HC valves	Existing	2
Dampers			x		one each for OA and RA	Existing	2
SA Temp				x	SA temp	Existing	1
RA Temp				x	RA temp	Existing	1
MA Temp				x	MA temp	Existing	1
Smoke Detector		x				Existing	1
Duct static				x		Existing	1
Fan speed			x			New	1
Enable	x					Existing	1
TOTAL							15

Notes:

1. The generic point list above provides a summary for AHU-1.
2. Existing points are contained within the existing Metasys system and will be transferred to the Tridium.

SCAGGSVILLE CHILLERS

Chiller	DO	DI	AO	AI	Comments	Existing/New	Points
Status		x			one each per chiller	Existing	1
Enable	x				start/stop	Existing	1
CHS Temp				x	chilled water supply temp	Existing	1
CHR Temp				x	chilled water return temp	Existing	1
CHS Setpoint			x		chilled water temp setpoint (new)	New	1
Isolation Valve	x				control isolation valve	Existing	1
TOTAL							6

1. The generic point list is per chiller and cooling tower.
2. Additional points not shown are CHS and CHR main temperatures. (2 points)
3. Points shown are existing within the Metasys and will be transferred to the Tridium.
4. Chillers are air-cooled.

SCAGGSVILLE CHILLED AND HEATING WATER PUMPS

Applies to CHW, CDW, HW pumps

Pumps	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one per pump	Existing	1
Status		x			one per pump	Existing	1
CHW/HW valves			x		one for each valve	Existing	1
TOTAL							3

Notes:

1. Points shown are existing within the Metasys and will be transferred to the Tridium.

SCAGGSVILLE BOILERS

Boiler	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one per boiler	New	1
Status		x			one per boiler	New	1
HWS				x	supply water temperature	Existing	1
HWR				x	return water temperature	Existing	1
HWS Temp Setpoint			x		supply temperature setpoint	New	1
3-way valve			x		reset temp control	Existing	1
TOTAL							6

Notes:

- Existing two boilers replaced with two new boilers.
- Points shown are existing within the Metasys and will be transferred to the Tridium.

East Columbia Library Specific Scope of Work

Lighting

The following upgrades are typical:

Provide new lamp, ballast, sockets and reflector kits for fluorescent fixtures in the project scope.

Fixtures are to be de-lamped from four (4) and three (3) lamps to two (2) lamps in 2X4 Fixtures. Reflectors are to be used in the fixtures that are in the scope of delamping.

1X4 Fixtures shall be de-lamped to 1 lamp with a reflector and 2X2 Fixtures are to be de-lamped to 2 straight lamps.

Typically, ballasts in the project scope are to be tandem wired, except when not feasible. No dimming ballast have been included.

Non-dimmable incandescent lamps in the project scope will be replaced with compact fluorescent lamps.

Fixtures in project scope that are 8 foot fluorescent lamps will be converted to two 4 ft lamp system.

For actual counts and additional scope of work see table on following page:

East Columbia Library		
Type of Fixture	Qty	Proposed Scope of Work
amp Wrap	8	Delamp T8 - 2 Lamp 28w, Ballast w/reflector
2x4 3-Lamp Troffer Bi-level	161	Delamp to T8 '2x4 2L Troffer 28w (STD)Bal. w/reflector
2x2 -2 40W Biax Lamps & U tubes	96	Retrofit w/ 2x2 2-F17 T8 lamps, ballast & reflector Kit
1x4 2-Lamp Wrap	50	De-Lamp to T8 1-Lamp Wrap 28w Ballast w/reflector
1x4 2-Lamp Strip	15	De-Lamp to T8 1-Lamp Wrap 28w Ballast w/reflector
T12 1x3 2-Lamp Strip	2	Retro to T8 1 Lamp F25 Ballast w/ reflector.
1x8 -8 - 4' Lamp Wrap 4up/4down	9	Delamp to T8 4 lamp 28w, Ballast. down only
1X8' tube 6 4' Lamp Bi-level	108	Delamp to T8 2 - Lamp 28 W w/reflector & Standard Ballast
250 Watt MH Fixture	11	Retro 200 Watt Pulse Start MH kit
400 Watt MH Fixture	52	Retro 320 Watt Pulse Start M.H.
Pendant mounted 2x 40 Watt 2 - Biax Lamps	32	Remove & replace with NEW T8 4-lamp 2x4 T8 w/Reflector
Inc. 100W	1	New CFL 25W SI
MR 16 -50 Watt Low Voltage Flood	14	New LED 8 Watt MR 16 replacement lamp
100W Quartz Lamp	14	Remove Fixture, patch, paint and Repair
250 Watt MH Fixture	27	Remove Fixture, patch, paint and Repair
250W Quartz flood uplight	8	Remove Fixture, patch, paint and Repair
9 Watt CFL Flood	6	Remove Fixture, patch, paint and Repair
TOTAL		614

Lighting Controls

Lighting controls are designed base on the space use and the surrounded environment. The attached table provides a summary of the scope of work.

EAST COLUMBIA LIBRARY	
Qty	Sensor scope of work
17	New Dual Tech Ceiling Sensor
3	New Dual Tech Ceiling Sensor W/ photo cell
6	New Ceiling mounted Photo Control Sensor w/ Dual Zone Technology
30	Power Pack to be used w/ all CM & WV
4	New Wall Switch Occupancy Sensor
12	New Wall Switch Occupancy Sensor - 2P
5	New Dual Tech Wall Switch Occ. Sensor
8	New Dual Tech Wall Switch Occ. Sensor 2 POLE
85	TOTAL

Variable Speed Drive Installation

This scope of work includes the installation of a variable speed drives on air handlers and heating water pumps serving the VAV reheat coils. The scope of work is as follows:

- Provide and install variable speed drive with bypass as manufactured by Honeywell or equal. Provide 460 volt Honeywell NBX series variable speed drives with cool blue drive by-pass for the following:

System ID	Drive Size
AHU-1	40 HP
AHU-3	10 HP
AHU-4	5 HP
Heating Water Pump 1	10 HP
Heating Water Pump 2	10 HP

- Mount variable speed drives and by-pass on the mechanical room wall or on rack near the electrical distribution for the equipment. Reconnect existing 460 volt electrical power wiring from existing circuit breaker to new drive. Remove existing disconnect and replace with drive.
- Provide static pressure sensor in duct and pipe to control drives.
- Provide control communication wiring between variable speed drive and EMS control panel. Provide programming and control points.

Energy Management System Upgrades

This scope of work includes the upgrade of the existing Metasys DDC system to include additional EMS functions such as CO₂ ventilation control. This scope affects multiple ECMs.

- Upgrade existing Metasys DDC controls with one (1) Tridium supervisory controller. Replace one Metasys two slot panel for Tridium upgrade and communication.
- Implement EMS programming: chilled water reset, heating water reset, discharge air reset, start/stop/status and CO₂ control of ventilation.
- Provide and install one (1) CO₂ sensor in the return air duct of AHU-1, 3 and 4 for control of ventilation air. Provide programming, graphics and communication wiring between devices and panel.
- Provide programming, commissioning, software, server communications, system engineering and system graphics.

Building Envelope

Adjust exterior and mechanical door's weather stripping or replace weather stripping as required in 4 glass doors and 9 steel doors.

Seal 1,095 linear feet of roof/wall intersection.

Window Film

Install VE35 film continuously. Install with no gaps or overlaps.

Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt and other foreign materials.

Protect window frames and surrounding conditions from damage during installation.

If seamed, install with no gaps or overlaps. Install seams vertical and plumb. No horizontal seams allowed.

Do not remove release liner from film until just before each piece of film is cut and ready for installation.

Install film with mounting solution and custom cut to the glass with neat, square corners and edges to within 1/8 inch of the window frame.

Remove air bubbles, wrinkles, blisters, and other defects.

After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, banding, thin spots or pinholes.

If installed film does not meet these criteria, remove and replace with new film.

Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

Proper access to the windows is to be facilitated by the County. Providing access means moving furniture and other materials that are impeding the window film installation. The impediments need to be moved such that there is sufficient clearance for the film installation. Our scope does not include providing access to windows.

Green Roofs

Install 1200 square feet of modular Green roof on top of a protection layer. Green roofs trays to have 3/8" predrilled holes, 17-20 lbs per square feet of saturated dead load. System designed to seamlessly integrate with standard roof paver.

Capable of being pre-planted or planted in place with maximum storm water capacity for the area.



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Howard County Phase II Proposal

August 11, 2008

EAST COLUMBIA LIBRARY VSD AHU

VSD AHU	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one each for SAF	Existing	1
Status		x			one each for SAF	Existing	2
Dampers			x		one each for OA and RA	Existing	2
SA Temp				x	SA temp	Existing	1
RA Temp				x	RA temp	Existing	1
Fan Speed			x	x		New	2
Duct Static				x		Existing	1
Smoke Detector		x				Existing	1
TOTAL							11

Notes:

1. The generic point list above provides a summary for AHU-1, 3 and 4
2. Existing points are contained within the existing Metasys system and will be transferred to the Tridium.
3. AHU-3 contains a supplementary DX coil and condensing unit for non-cooling season operation.
Add 3 points for start/stop and status of condensing unit. (existing)

EAST COLUMBIA LIBRARY CONSTANT VOLUME AIR HANDLER

AHU CS					Comments	w/ RAF	
	DO	DI	AO	AI		Existing/New	Points
Start/Stop	x				one each for SAF and RAF	Existing	2
Status		x			one each for SAF and RAF	Existing	2
CW/HW valves			x		one each for CC and HC valves	Existing	2
Dampers			x		one each for OA and RA	Existing	2
SA Temp				x	SA temp	Existing	1
RA Temp				x	RA temp	Existing	1
MA Temp				x	MA temp	Existing	1
Smoke Detector		x				Existing	1
TOTAL							12

Notes:

1. This generic points list summarizes points on AHU-2
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

EAST COLUMBIA LIBRARY CHILLER AND COOLING TOWER

Chiller/Tower	DO	DI	AO	AI	Comments	Existing/New	Points
Status		x			one chiller pt.	Existing	1
Enable	x				start/stop	Existing	1
CHS Temp				x	chilled water supply temp	Existing	1
CHR Temp				x	chilled water return temp	Existing	1
CHS Setpoint			x		chilled water temp setpoint (new)	Existing	1
CT Enable	x				cooling tower enable (start/stop)	Existing	1
TOTAL							6

1. The generic point list is per chiller and cooling tower.
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

EAST COLUMBIA LIBRARY BOILERS

Boiler	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one per boiler	Existing	1
Status		x			one per boiler	Existing	1
HWS				x	supply water temperature	Existing	1
HWR				x	return water temperature	Existing	1
HWS Temp Setpoint			x		supply temperature setpoint	Existing	1
3-way valve			x		reset temp control	Existing	1
TOTAL							6

Notes:

1. Pulse boilers are existing. (five units)
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

EAST COLUMBIA LIBRARY CHILLED AND HEATING WATER PUMPS

Applies to CHW, CDW, HW pumps

Pumps	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one per pump	Existing	1
Status		x			one per pump	Existing	1
CHW/HW valves			x		one for each valve	Existing	1
TOTAL							3

Notes:

1. Points shown are existing within the Metasys and will be transferred to the Tridium.

Central Library Building Specific Scope of Work

Lighting

The following upgrades are typical:

Provide new lamp, ballast, sockets and reflector kits for fluorescent fixtures in the project scope.

Fixtures are to be de-lamped from four (4) and three (3) lamps to two (2) lamps in the 2X4 fixtures included in the project scope. Reflectors are to be used in the fixtures that are being de-lamped.

Fixtures that are 1x4 shall be de-lamped to one (1) lamp with a reflector and 2X2 fixtures are to be de-lamped to two (2) straight lamps.

Ballast to be typically tandem wired, except when not feasible. No dimming ballast has been specified in this project due to the cost.

Wherever feasible, non-dimmable incandescent lamps will be replaced with compact Fluorescent lamps.

Fixtures in the project scope having 8 foot Fluorescent lamps will be converted to two 4 foot lamp system.

LED lamps to replace outside parking lot light lamps.

For actual counts and additional scope of work see table on following page:

Central Library		
Type of Fixture	Qty	Proposed Scope of Work
T8 2x4 3-Lamp Troffer	147	Delamp to 2 - 28 W lamps, reflector & tandem ballast.
T8 & T12 1x4 Wrap Fixtures with 2-Lamps	1221	Delamp to 2 - 28 W lamps, reflector & tandem ballast.
1x4 1-Lamp Strip	6	Re-Lamp & Re-Ballast T8 '1x4 1-Lamp Strip 28w (STD)Bal.
1x3 1-Lamp Strip	6	Retro T8 '1x3 1-Lamp F25 (STD)Bal.
2x2 3-Lamp F17 T8 Troffer w/Elec. Bal	6	Retro T8 '2x2 2lamp F17 T8 Silver Reflector Kit
400 Watt MH Fixture	3	Retro 320 Watt Pulse Start M.H.
175 Watt MH Wall Pack	30	Remove fixture, Patch and Repair
300W Quartz uplight	11	Remove fixture, Patch and Repair
150 Watt MH Wall Pack	4	Retro 100 Watt Pulse Start MH kit
250 Watt HPS Wall Pack	3	Retro 200 Watt Pulse Start MH kit
250 Watt HPS Shoe Box Pole	20	New 4 Light Bar LED fixture
150 Watt HPS Wall Pack	3	Retro 100 Watt Metal Halide
Inc. 100W	2	New CFL 28923 23W
	1462	TOTAL

Lighting Controls

Lighting controls are designed base on the space use and the surrounded environment. The attached table provides a summary of the scope of work.

Central Library	
Qty	Proposed Scope of Work
5	New Ceiling Mounted Photo Sensor
20	Power Pack to be used w/ all CM & WV
7	New Dual Tech Ceiling Sensor
3	New Wall Switch Occupancy Sensor
8	New Dual Tech Wall Switch Occ. Sensor
43	TOTAL

Variable Speed Drive Installation

This scope of work includes the installation of a variable speed drive on the central cooling tower fan to reduce electricity consumption. The scope of work is as follows:

- Provide and install one (1) variable speed drive with bypass as manufactured by Honeywell or equal. Provide 460 volt Honeywell NBX series variable speed drives with cool blue drive by-pass for the following:

System ID	Drive Size
Cooling Tower Fan	7 ½ HP

- Mount variable speed drive and by-pass on the mechanical room wall or on rack near the electrical distribution for the cooling tower. Reconnect existing 460 volt electrical power wiring from existing circuit breaker to new drive. Reuse existing fan disconnect located at cooling tower.
- Provide temperature sensor in condenser water piping to control variable speed drive.
- Provide control communication wiring between variable speed drive and EMS control panel. Provide programming and control points.

Energy Management System Upgrades

This scope of work includes the upgrade of the existing Metasys DDC system to include additional EMS functions such as CO₂ ventilation control. The ECM applies to multiple EMS.

- Upgrade existing Metasys DDC controls with one (1) Tridium supervisory controller. Replace one Metasys five slot panel for Tridium upgrade and communication.
- Implement EMS programming: Condenser water loop control, start/stop/status of connected heat pump units.
- Provide and install one (1) CO₂ sensor in the return air duct of HP101, 108, 113 for control of ventilation air. Provide programming, graphics and communication wiring between devices and panel.
- Provide programming, commissioning, software, server communications, system engineering and system graphics.

Building Envelope

Adjust exterior and mechanical door's weather stripping or replace weather stripping as required
6 glass doors; 4 steel and 1 garage door

Install 125 square feet of energy wall in soffit area at front entrance.

Seal 1,875 linear feet of cracks around window frames, wood beams, seams, joints and connections of the wood ceiling as identified using the blower door and Infrared camera.

Seal approximately 860 linear feet of roof/wall intersection above the drop ceiling in the office area on the second floor.

Window Film

Install VE35 film continuously in vertical windows and RK20 film in skylights. Install with no gaps or overlaps.

Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt and other foreign materials.

Protect window frames and surrounding conditions from damage during installation.

If seamed, install with no gaps or overlaps. Install seams vertical and plumb. No horizontal seams allowed.

Do not remove release liner from film until just before each piece of film is cut and ready for installation.

Install film with mounting solution and custom cut to the glass with neat, square corners and edges to within 1/8 inch of the window frame.

Remove air bubbles, wrinkles, blisters, and other defects.

After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, banding, thin spots or pinholes.

If installed film does not meet these criteria, remove and replace with new film.
Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

Proper access to the windows is to be facilitated by the County. Providing access means moving furniture and other materials that are impeding the window film installation. The impediments need to be moved such that there is sufficient clearance for the film installation. Our scope does not include providing access to windows.

CENTRAL LIBRARY HEAT PUMP AHU

HP AHU	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one each for SAF	Existing	1
Status		x			one each for SAF	Existing	2
Dampers			x		one each for OA and RA	Existing	2
SA Temp				x	SA temp	Existing	1
RA Temp				x	RA temp	Existing	1
Smoke Detector		x				Existing	1
TOTAL							8

Notes:

1. The generic point list above provides a summary for all water-cooled heat pump air handlers.
2. Existing points are contained within the existing Metasys system and will be transferred to the Tridium.

CENTRAL LIBRARY PERIMETER HEAT PUMP UNITS

						w/ RAF	
Heat Pump	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one for fan	Existing	1
RA Temp (cabinet mtd)				x	SA temp	Existing	1
TOTAL							2

Notes:

1. This generic points list summarizes points for the perimeter cabinet heat pump units.
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

CENTRAL LIBRARY COOLING TOWER

Cooling Tower	DO	DI	AO	AI	Comments	Existing/New	Points
Status		x			one each per chiller	Existing	1
Enable	x				start/stop	Existing	1
CWS				x	condenser water supply (tower)	Existing	1
CWR				x	condenser water return (tower)	Existing	1
CWS				x	condenser water supply (HX)	Existing	1
CWR				x	condenser water return (NX)	Existing	1
CT fan speed (VSD)				x	tower fan speed (new)	New	1
TOTAL							7

1. The generic point list is per cooling tower.
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

CENTRAL LIBRARY CONDENSER WATER PUMPS

Applies to Condenser water pumps

Pumps	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one per pump	Existing	1
Status		x			one per pump	Existing	1
TOTAL							2

Notes:

1. Points shown are existing within the Metasys and will be transferred to the Tridium.

CENTRAL LIBRARY ELECTRIC BOILER

Boiler	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one per boiler	Existing	1
Status		x			one per boiler	Existing	1
HWS				x	supply water temperature	Existing	1
HWR				x	return water temperature	Existing	1
TOTAL							4

Notes:

1. Boiler used for heating condenser water temp during cooler months.
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

Recreation and Parks Headquarters Specific Scope of Work

Lighting

The following upgrades are typical:

Provide new lamp, ballast, sockets and reflector kits for fluorescent fixtures in the project scope.

Fixtures are to be de-lamped from four (4) and three (3) lamps to two (2) lamps in the 2X4 fixtures included in the project scope. Reflectors are to be used in the fixtures that are being de-lamped.

Fixtures that are 1x4 shall be de-lamped to one (1) lamp with a reflector and 2X2 fixtures are to be de-lamped to two (2) straight lamps.

Ballast to be typically tandem wired, except when not feasible. No dimming ballast has been specified in this project due to the cost.

Wherever feasible, non-dimmable incandescent lamps will be replaced with compact Fluorescent lamps.

Fixtures in the project scope having 8 foot Fluorescent lamps will be converted to two 4 foot lamp system.

For actual counts and additional scope of work see table on following page:

Parks and Recreation Headquarters		
Type of Fixture	Qty	Proposed Scope of Work
2x4 2-Lamp Troffer	270	Delamp T8 '2x4 2-Lamp 28w, tandem ballast w/reflector
1x8 4-Lamp Strip	89	Retro 2-32 W T8 Lamp, tandem ballast with reflector
1x4 2-Lamp Strip	106	Delamp T8 1-Lamp Strip 28w (STD)Bal. w/reflector
2x2 2-Lamp U-6 Troffer	70	Retro 2x2 2lamp F17 T8 w/ Reflector Kit
1x8 2-Lamp Industrial strip	31	Retro 4-lamp 4ft Kit with reflector
1x3 2-Lamp Strip	2	Retro to 1 lamp T8 F25 Ballast with reflector
175 Watt MH Wall Pack	6	Retro w/125 Watt Pulse Start MH kit
250 Watt MH & HPS Fixture	27	Retro w/200 Watt Pulse Start MH kit
400 Watt MH & HPS Fixture	50	Retro w/320 Watt Pulse Start M.H.
100 Watt MH Wall Pack	18	NEW 23w wall pack w/photocell
1-90W. Halogen Flood - outdoor	2	NEW Par 38 23W CFL Lamp
Inc. 100W	18	NEW 23 WATT BR40 DIMMABLE 27K
JJ Inc. 60w	4	NEW CFL 28923 15W
Inc. 60w	5	NEW 15 WATT BR30 DIMMABLE 27K
Inc. 90w indoor screw in	6	NEW 23 WATT R40 Flood 27K
2 Lamp 6w Plug in CFL kit	38	NEW LED Exit Fixture
T8 1x4 2-Lamp Vapor Tight	14	Remove fixture from operation
T8 1x8 4-Lamp Vapor Tight	12	Remove fixture from operation
100 Watt MH wall Pack	52	Remove fixture, patch, paint and repair
TOTAL	820	

Lighting Controls

Lighting controls are designed based on the space use and the surrounding environment. The attached table provides a summary of the scope of work.

Recreation & Parks Headquarters	
Qty	Scope of Work
6	Wide Bay Sensor
19	Individual High Bay Motion Sensor
9	Ceiling Mounted Dual Technology Sensor
2	Large Wall Switch
1	New Dual Tech Wall Switch Occ. Sensor
4	New Dual Tech Wall Switch Occ. Sensor / 2 pole
18	Power Pack to be used w/ all CM & WV
59	TOTAL

Replacement of Rooftop Units

This scope of work includes the replacement of seven (7) rooftop units. The scope of work is as follows:

- Demolish and remove from site, seven (7) existing York rooftop units as follows:

Unit ID	Model #	Serial #	Serves	SAF HP	Cooling MBH	Heating MBH
RTU-1	D2GA030	NMBM088670	Ed Bromley Area	1/3	30	41
RTU-2	D2GA030	NMBM079027	Front 1 st & 2 nd Floor	1/3	30	41
RTU-3	D3CG12	NDCM031586	Left Skylight	2	105	161
RTU-4	D3CG090	NDCM034739	2 nd Floor Back Loop	2	90	129
RTU-5	D4CG036	NDCM034810	1 st Floor Back	2	36	41
RTU-6	D3CG102	NDCM033172	Center Sklight	3	102	129
RTU-8	D3CG120N	NDCM033732	Right Skylight	3	120	161

- Provide and install new York Predator or equal rooftop air handlers with curb adaptors as needed to fit new unit to existing roof curb. Disconnect and reconnect existing electrical power wiring. Disconnect and reconnect existing natural gas piping. Provide new units as follows:

Packaged Rooftop Unit Schedule									
SA CFM	OA CFM	ESP (in)	Fan HP	EAT clg	LAT clg	Cap MBH	Htg MBH	Qty	Model #
4,000	400	0.60	3	80	59.4	124	192	1	DM120N20P4AAA3
3,400	340	0.60	3	80	59.7	103	144	2	DM102N15P4AAA4
1,000	100	0.43	.75	80	60.1	28.4	36	1	D2NP030N03606
1,200	120	0.60	1.5	80	59.9	37.0	40	3	DJ036N04P4AAA2

Based on 95 deg F outdoor air temperature.

DDC Control of Rooftop Units and Tridium Upgrade

This scope of work includes the installation of Lonworks communicating/programmable thermostats for ten (10) rooftop units and the installation of Tridium software for central communications and control. The scope of work is as follows:

- Replace existing programmable thermostats with Honeywell LONWORKS communication and programmable thermostat. Total of ten (10) programmable thermostats for RTU's. Existing wiring between the thermostat and the RTU's will be re-used.
- Provide and install four (4) Honeywell LONWORKS programmable thermostats for control of unit heaters within the shop bays. Remove and dispose of existing manual thermostats.
- Provide and install a Tridium supervisory controller and connect the controllers for central communication.
- Provide programming, engineering, start-up and commissioning of installed equipment.

Building Envelope

Adjust exterior and mechanical door's weather stripping or replace weather stripping as required in 4 glass doors; 20 steel doors and 19 garage door

Seal approximately 1,160 linear feet of roof/wall intersection above the drop ceiling in the office area on the second floor.

Window Film

Install R20 film and RK20 film continuously. Install with no gaps or overlaps.

Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt and other foreign materials.

Protect window frames and surrounding conditions from damage during installation.

If seamed, install with no gaps or overlaps. Install seams vertical and plumb. No horizontal seams allowed.

Do not remove release liner from film until just before each piece of film is cut and ready for installation.

Install film with mounting solution and custom cut to the glass with neat, square comers and edges to within 1/8 inch of the window frame.

Remove air bubbles, wrinkles, blisters, and other defects.

After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, banding, thin spots or pinholes.

If installed film does not meet these criteria, remove and replace with new film.

Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

Proper access to the windows is to be facilitated by the County. Providing access means moving furniture and other materials that are impeding the window film installation. The impediments need to be moved such that there is sufficient clearance for the film installation. Our scope does not include providing access to windows.

Daylight Harvesting

Install 45 - 22.25-inch Light Pipe fully assembled to be securely attached to flashing with no stress concentration in dome or fastening systems

Dome to be sealed and to be water resistant to the outside. Seamless one piece with counter flashing and anti- bird protection

25 pipes are to be installed in the main Headquarter's building and 20 are to be installed in buildings B and C.

Solar Photovoltaic System

Install Solar collectors with absorber plates having ultrasound weld, copper fins and risers with thermal connectivity. Coating to be black chrome on nickel having 0.95 Absorbability. Risers to be copper 3/8" and 1" manifolds

Install fully integrated inverted for grid-connected commercial with state of the art control techniques including space vector PWM a precision MPT algorithm with peak inverter power efficiency over 98%

RECREATION & PARKS HEADQUARTERS ROOFTOP UNIT CONSTANT VOLUME AIR HANDLER

RTU CV	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one SAF	Existing	1
Zone Temp				x	SA temp	Existing	1
TOTAL							2

Notes:

1. This generic points list summarizes points on rooftop units.
2. RTU's will be controlled by the Honeywell communicating programmable thermostats.
3. Programmable thermostats will be connected to Tirdium allowing viewing of zone temperatures.

RECREATION & PARKS ELECTRIC UNIT HEATERS

Electric UH	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one SAF	New	1
Space Temp				x	space temp	New	1
TOTAL							2

Notes:

1. This generic points list summarizes points on each unit heater within the shop area.
2. Unit Heaters are currently controlled by manual dial thermostats.

Dorsey Building Specific Scope of Work

Lighting

The following upgrades are typical:

Provide new lamp, ballast, sockets and reflector kits for fluorescent fixtures in the project scope.

Fixtures are to be de-lamped from four (4) and three (3) lamps to two (2) lamps in the 2X4 fixtures included in the project scope. Reflectors are to be used in the fixtures that are being de-lamped.

Fixtures that are 1x4 shall be de-lamped to one (1) lamp with a reflector and 2X2 fixtures are to be de-lamped to two (2) straight lamps.

Ballast to be typically tandem wired, except when not feasible. No dimming ballast has been specified in this project due to the cost.

Wherever feasible, non-dimmable incandescent lamps will be replaced with compact Fluorescent lamps.

Fixtures in the project scope having 8 foot Fluorescent lamps will be converted to two 4 foot lamp system.

For actual counts and additional scope of work see table on following page:

Dorsey Building		
Type of Fixture	Qty	Proposed Scope of Work
2x4 4-Lamp Wrap	21	Delamp to 2-Lamp 28w tandem ballast w/reflector kit
2x4 4-Lamp Troffer	1540	delamp to 2-Lamp 28w, tandem ballast w/reflector kit
2x2 4-Lamp F17 T8 Troffer	108	Retro with 2lamp F17 T8 tandem ballast w/Reflector Kit
1x4 2-Lamp Wrap	77	Delamp to 1-Lamp Wrap 28w tandem ballast w/reflector
1x4 2-Lamp Strip	57	Delamp to 1-Lamp Strip 28w tandem ballast w/reflector
1x2 2-Lamp F20 Strip	6	Retro w/ 2-Lamp, tandem ballast w/reflector
1x8 2-Lamp Industrial strip	23	Retro w/2-lamp, tandem ballast w/ 4ft reflector Kit
250 Watt MH Fixture	36	New Wrap Wall Mounted T8 1x4 2-lamp 28w (STD)Bal.
250 Watt MH Fixture	14	Retro w/175 Watt Pulse Start MH kit
175 Watt MH Wall Pack	3	Retro w/ 125 Watt Pulse Start MH kit
250 Watt MH Fixture	44	New T8 2x4 32W 4Lamp pendant wrap fixture (HP) bal
400 Watt MH Fixture	45	Retro w/320 Watt Pulse Start M.H.
Inc. 100W	15	New CFL 25W SI
Inc. 50w	24	New CFL R20 FLOOD 7W
JJ Inc. 60w	7	New CFL 28923 23W
Inc. 65w Par 30	40	New CFL 15w BR30 Flood
Inc. 90w Par 38	14	New CFL 23w BR40 Flood
250 Watt MH Fixture	1	Remove Fixture
2 Lamp 6w Plug in CFL kit	8	New LED Exit Fixture
Old Style LED exit sign	34	New LED Exit Fixture
Old Style LED exit sign	15	Remove Exit Sign
TOTAL	2132	

For actual counts and additional scope of work see following page:



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Lighting Controls

Lighting controls are designed based on the space use and the surrounding environment. The attached table provides a summary of the scope of work.

Dorsey Building	
Qty	Sensor Type
19	New Wall Switch Occupancy Sensor
27	New Dual Tech Wall Switch Occ. Sensor
1	New Dual Tech Wall Switch Occ. Sensor 2 POLE
3	New Large Wall Switch Occupancy Sensor
110	New DualTech Ceiling Sensor
115	Power Pack to be used w/ all CM & WV
275	TOTAL

EMS Upgrades

This scope of work includes the replacement of the existing non-functioning energy management system controls with a Tridium energy management system. The scope of work is as follows:

- Demolish and remove the existing control panels.
- Provide and install three (3) control points per air handler (start/stop/status). Provide and install one zone temperature sensor per rooftop unit for night setback.
- Provide programming, commissioning, software, server communications, system engineering and system graphics.

Building Envelope

Adjust exterior and mechanical door's weather stripping or replace weather stripping as required in 22 doors and 5 garage doors

Seal 1,962 linear feet of cracks around windows

Seal approximately 2,424 linear feet of roof/wall intersection.

DORSEY BLDG VARIABLE VOLUME RTU AIR HANDLER

						w/ RAF	
RTU VAV	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one SAF	New	1
Status		x			one each for SAF and RAF	New	1
Fan Speed			x		VSD	New	1
Duct Static				x	duct static pressure	Existing	1
Zone Temp				x	SA temp	New	1
TOTAL							5

Notes:

1. This generic points list summarizes points on RTU-1 thru 4
2. Points will be connected to a new Tridium controller.
3. New Trane Rooftops will be installed with LON cards for direct control connection.
4. Existing units will be connected to new controls with start/stop/status and VAV control.

DORSEY BLDG CONSTANT VOLUME RTU AIR HANDLER

							w/ RAF
RTU CV	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one SAF	New	1
Status		x			one each for SAF and RAF	New	1
Zone Temp				x	SA temp	New	1
TOTAL							3

Notes:

1. This generic points list summarizes points on RTU-6 thru 21
2. Points will be connected to a new Tridium controller.
3. Existing units will be connected to new controls with start/stop/status and VAV control.

Gateway Building Specific Scope of Work

Lighting

The following upgrades are typical:

Provide new lamp, ballast, sockets and reflector kits for fluorescent fixtures in the project scope.

Fixtures are to be de-lamped from four (4) and three (3) lamps to two (2) lamps in the 2X4 fixtures included in the project scope. Reflectors are to be used in the fixtures that are being de-lamped.

Fixtures that are 1x4 shall be de-lamped to one (1) lamp with a reflector and 2X2 fixtures are to be de-lamped to two (2) straight lamps.

Ballast to be typically tandem wired, except when not feasible. No dimming ballast has been specified in this project due to the cost.

Wherever feasible, non-dimmable incandescent lamps will be replaced with compact Fluorescent lamps.

Fixtures in the project scope having 8 foot Fluorescent lamps will be converted to two 4 foot lamp system.

For actual counts and additional scope of work see table on following page:

Gateway Building		
Type of Fixture	Qty	Proposed Retrofit
2x4 4-Lamp Troffer	958	De-Lamp to T8 '2x4 2L Troffer 28w (STD)Bal. w/reflector
1x4 2-Lamp Wrap	23	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector
Strip	176	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector
1x4 1-Lamp Strip	9	Re-Lamp & Re-Ballast T8 '1x4 1-Lamp Strip 28w (STD)Bal.
1x3 2-Lamp Strip	81	Retro T8 '1x3 2-Lamp F25 (STD)Bal.
1x2 2-Lamp F20 Strip	25	Retro T8 '1x2 2-Lamp (STD)Bal.
1x2 1-Lamp F20 Strip	6	Retro T8 '1x2 1-Lamp (LP)Bal.
2x2 2-Lamp U-6 Trof.	227	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit
Inc. 60w	4	New CFL 1R3016 16W
Inc. 65w Par 30	10	New CFL 15w BR30 Flood
Inc. 65w Par 30	30	New CFL 15w BR30 Flood dimming
Inc. 100W	2	New CFL 25W SI
R150W Inc.	1	New CFL 28923 27W
250 Watt MH Fixture	14	Retro 175 Watt Pulse Start MH kit
400 Watt MH Fixture	24	Retro 320 Watt Pulse Start M.H.
100 Watt MH Can	24	No Retrofit 100 Watt MH Can
Under Lit Classroom	18	Add new fixture T8 2x4 2-Lamp 28w (STD)Bal.
TOTAL	1632	

Lighting Controls

Lighting controls are designed based on the space use and the surrounding environment. The attached table provides a summary of the scope of work.

Gateway Building	
Qty	Proposed Retrofit
2	New Wall Switch Occupancy Sensor
29	New Dual Tech Wall Switch Occ. Sensor
2	New Large Wall Switch Occupancy Sensor
20	New DualTech Ceiling Sensor
22	Power Pack to be used w/ all CM & WV
75	TOTAL



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Variable Speed Drive Installation

This scope of work includes the installation of variable speed drives on five (5) air handlers and one (1) cooling tower. The scope of work is as follows:

- Provide and install variable speed drives with bypass as manufactured by Honeywell or equal. Provide 460 volt Honeywell NBX series variable speed drives with cool blue drive by-pass for the following:

System ID	Drive Size
AHU-1, 2, 3, 4	20 HP
AHU-5	25 HP
Cooling Tower	50 HP

- Mount variable speed drives and by-pass on the mechanical room wall or on rack near the electrical distribution for the equipment. Reconnect existing 460 volt electrical power wiring from existing circuit breaker to new drive. Remove existing disconnect and replace with drive.
- Provide static pressure sensor in duct to control drives on AHU's. Utilize condenser water temperature to control speed of cooling tower fan.
- Provide control communication wiring between variable speed drive and EMS control panel. Provide programming and control points.

Energy Management and Tridium Upgrade

This scope of work includes the upgrade of the existing Metasys DDC system with new DDC control devices and programming.

- Upgrade existing Metasys DDC controls with one (1) Tridium supervisory controller. Replace one Metasys five slot panel for Tridium upgrade.
- Implement EMS programming: Discharge air temperature reset control, VSD control, start/stop/status of equipment.
- Provide programming, commissioning, software, server communications, system engineering and system graphics.

Building Envelope

Adjust exterior and mechanical door's weather stripping or replace weather stripping as required in 25 regular doors.

Seal 618 linear feet of cracks above windows at masonry gap.

Install 184 square feet of energy wall in the soffit areas at the overhangs.

Insulate 368 square feet of the exposed floor in the soffits.

Window Film

Install VE35 film continuously on vertical glass and RK20 on skylight. Install with no gaps or overlaps.

Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt and other foreign materials.

Protect window frames and surrounding conditions from damage during installation.

If seamed, install with no gaps or overlaps. Install seams vertical and plumb. No horizontal seams allowed.

Do not remove release liner from film until just before each piece of film is cut and ready for installation.

Install film with mounting solution and custom cut to the glass with neat, square comers and edges to within 1/8 inch of the window frame.

Remove air bubbles, wrinkles, blisters, and other defects.

After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, banding, thin spots or pinholes.

If installed film does not meet these criteria, remove and replace with new film.

Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

Proper access to the windows is to be facilitated by the County. Providing access means moving furniture and other materials that are impeding the window film installation. The impediments need to be moved such that there is sufficient clearance for the film installation. Our scope does not include providing access to windows.

GATEWAY BLDG VARIABLE SPEED DRIVE AHU-1 thru 5

AHU VSD	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one SAF	Existing	1
Status		x			one SAF	Existing	1
Dampers			x		one each for OA and RA	Existing	2
SA Temp				x	SA temp	Existing	1
RA Temp				x	RA temp	Existing	1
MA Temp				x	MA temp	Existing	1
Smoke Detector		x				Existing	1
Duct static				x		Existing	1
Fan speed			x			New	1
TOTAL							10

Notes:

1. The generic point list above provides a summary for AHU-1 thru 5..
2. Existing points are contained within the existing Metasys system and will be transferred to the Tridium.

GATEWAY BUILDING COOLING TOWER

Cooling Tower	DO	DI	AO	AI	Comments	Existing/New	Points
CWS				x	condenser water supply	Existing	1
CWR				x	condenser water return	Existing	1
CT Start/Stop	x				tower start/stop	Existing	2
CT status		x			tower status (new)	New	1
CT fan speed (VSD)				x	tower fan speed (new)	New	1
TOTAL							6

1. The generic point list is per cooling tower.
2. Points shown are existing within the Metasys and will be transferred to the Tridium.

GATEWAY BUILDING CONDENSER WATER PUMPS

Applies to CDW pumps

Pumps	DO	DI	AO	AI	Comments	Existing/New	Points
Start/Stop	x				one per pump	Existing	1
Status		x			one per pump	Existing	1
HX Free Cooling			x		control point	Existing	1
TOTAL							3

Notes:

1. Points shown are existing within the Metasys and will be transferred to the Tridium.

DETENTION CENTER LIGHTING SURVEY

PROPOSED													
Room #	Room Description	Quantity	Description	Watts	kW	Burn Hour Code	Per Burn Hours	kWh	Quantity	Description	Watts	kW	kWh Saved
412	DIR 412	2	T12 2x4 3-Lamp Troffer	126	0.3	Admin	2470	822	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156
	DIR Office	4	T12 2x4 3-Lamp Troffer	126	0.5	Admin	2470	1,245	4	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.312
	Dir RR	1	T12 1x4 2-Lamp Strip	78	0.1	Admin	2470	183	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
	Upper West Svc. Corr.	8	T12 2x4 3-Lamp Troffer	126	1.1	24	8760	9,834	8	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.4	0.702
415	415	1	T12 2x4 3-Lamp Troffer	126	0.1	Prison	8760	1,104	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.078
414	414 Stair	3	T12 1x4 2-Lamp Wrap	78	0.2	24	8760	2,050	3	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.158
417	417	1	T12 2x4 3-Lamp Troffer	126	0.1	Prison	8760	1,104	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.078
418	418 Stair	3	T12 1x4 2-Lamp Wrap	78	0.2	24	8760	2,050	3	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.159
	408 Admin	12	T12 2x4 3-Lamp Troffer	126	1.5	Admin	2470	3,735	12	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.6	0.936
	405 Conf	6	T12 2x4 3-Lamp Troffer	126	0.8	Admin	2470	1,857	6	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.3	0.468
	404 Mech	8	T12 1x8 1-Lamp Ind.Strip P96	83	0.7	Mech	1040	681	8	Retro T8 1x8 2-lamp 28w 4ft Kit (Std)Bal.	48	0.4	0.280
	404 Mech	6	T12 1x4 2-Lamp Strip	78	0.5	Mech	1040	487	6	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.318
	404 Mech	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	53	1	New LED Exit Fixture	1.5	0.0	0.006
	404 Mech	22	T12 1x4 2-Lamp Ind.Strip - 40 watt lamp	90	2.0	Mech	1040	2,058	22	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.6	1.430
	263 Stair	1	T12 1x4 2-Lamp Strip	78	0.1	24	8760	883	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
	263 Stair	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	New LED Exit Fixture	1.5	0.0	0.009
	263 Stair	1	27 Watt CFL Flood	27	0.0	24	8760	237	1	No Retrofit	27	0.0	0.000
	263 Stair	1	T12 1x4 2-Lamp Wrap	78	0.1	24	8760	683	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
263	263	6	T12 1x4 2-Lamp Ind.Strip - 40 watt lamp	90	0.5	Admin	2470	1,334	6	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.390
	404 Hall	8	T12 2x4 2-Lamp Troffer	78	0.7	24	8760	6,150	8	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.4	0.270
	404 Hall	3	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	158	3	New LED Exit Fixture	1.5	0.0	0.014
	400 Vest	1	T12 2x4 2-Lamp Troffer	78	0.1	24	8760	683	1	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.0	0.030
	400 Vest	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	53	1	New LED Exit Fixture	1.5	0.0	0.005
	210 O	6	T12 1x4 2-Lamp Troffer	78	0.5	Admin	2470	1,198	6	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.316
	211	1	T12 1x4 2-Lamp Strip	78	0.1	Admin	2470	183	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
	212 Audit	4	T12 2x4 4-Lamp Troffer	156	0.6	Admin	2470	1,641	4	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.432
	209 Program Super	6	T12 1x4 2-Lamp Troffer	78	0.5	Admin	2470	1,196	6	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.318
	208 Director	6	T12 1x4 2-Lamp Troffer	78	0.5	Admin	2470	1,196	6	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.316

DETENTION CENTER LIGHTING SURVEY

204 Hall	5	T12 2x2 2-Lamp U-6 Trof.	78	0.4	24	8760	3,416	5	Retro T8 2x2 2-lamp F17 T8 w/ Reflector Kit	29	0.1	0.245
204 Hall	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	New LED Exit Fixture	1.5	0.0	0.009
204 Hall	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	24	8760	883	1	Retro T8 2x2 2-lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
204 Vest.	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	53	1	New LED Exit Fixture	1.5	0.0	0.005
217 W. Lounge	2	T12 1x4 2-Lamp Troffer	78	0.2	Prison	8760	1,387	2	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.1	0.108
217 W. Lounge	2	T12 2x2 2-Lamp U-6 Trof.	78	0.2	Prison	8760	1,387	2	Retro T8 2x2 2-lamp F17 T8 w/ Reflector Kit	29	0.1	0.088
218 Mens Locker	5	T12 1x4 2-Lamp Troffer	78	0.4	C	3640	1,420	5	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.1	0.285
219 shower	2	T12 1x4 2-Lamp Troffer	78	0.2	C	3640	588	2	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.1	0.108
219 shower	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	C	3640	284	1	Retro T8 2x2 2-lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
220 Hall	4	T12 2x2 2-Lamp U-6 Trof.	78	0.3	24	8760	2,733	4	Retro T8 2x2 2-lamp F17 T8 w/ Reflector Kit	29	0.1	0.196
220 Hall	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	53	1	New LED Exit Fixture	1.5	0.0	0.005
221 Closet	2	T12 1x4 2-Lamp Wrap	78	0.2	Mech	1040	162	2	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.1	0.106
Vending	1	T12 2x4 4-Lamp Troffer	156	0.2	24	8760	1,387	1	Delamp T8 2x4 2L 28w (STD) Bal. wire reflector	48	0.0	0.108
Vending	1	Soda Machine	400	0.4	24	8760	3,504	1	Vond Misc - energy sensor	240	0.2	0.160
224 Lobby	11	T12 2x2 2-Lamp U-6 Trof.	78	0.9	24	8760	7,516	11	Retro T8 2x2 2-lamp F17 T8 w/ Reflector Kit	29	0.3	0.539
224 Lobby	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	New LED Exit Fixture	1.5	0.0	0.009
224 Lobby	7	27 Watt CFL Flood	27	0.2	24	8760	1,858	7	No Retrofit	27	0.2	0.000
223 MRR	1	T12 1x4 2-Lamp Troffer	78	0.1	Prison	8760	883	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.0	0.053
223 MRR	1	T12 1x4 2-Lamp Strip	78	0.1	Prison	8760	883	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.0	0.053
224 MRR	1	T12 1x4 2-Lamp Troffer	78	0.1	Prison	8760	883	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.0	0.053
224 MRR	1	T12 1x4 2-Lamp Strip	78	0.1	Prison	8760	883	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.0	0.053
Vestibule	2	26 Watt CFL Deluxe Tube 2-Lamp Can	52	0.1	24	8760	911	2	No Retrofit	52	0.1	0.000
225 Visitor	7	T12 1x4 2-Lamp Troffer	78	0.5	Prison	8760	4,783	7	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.2	0.371
225 Visitor	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	53	1	New LED Exit Fixture	1.5	0.0	0.005
225 A	1	27 Watt CFL Flood	27	0.0	Prison	8760	237	1	No Retrofit	27	0.0	0.000
227 Hall	1	27 Watt CFL Flood	27	0.0	24	8760	237	1	No Retrofit	27	0.0	0.000
227 Upper Control	2	T12 2x2 2-Lamp U-Tube	78	0.2	24	8760	1,387	2	New 2-Lamp 2 Wires	35	0.1	0.086
227 Upper Control	4	27 Watt CFL Flood	27	0.1	24	8760	948	4	No Retrofit	27	0.1	0.000
227 Upper Control	1	R100W Inc. Flood Indoor	100	0.1	24	8760	878	1	NEW CFL R3023 23W	23	0.0	0.077

DETENTION CENTER LIGHTING SURVEY

228 RR	1	T12 1x2 2-Lamp F20 Strip	50	0.1	C	3640	182	1	Retro T8 1'x2 2-Lamp (STD)Bal.	29	0.0	0.021
230 Hall	4	T12 1'x4 2-Lamp Troffer	78	0.3	24	8760	2,733	4	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.212
231 O	2	T12 1'x4 2-Lamp Troffer	78	0.2	Admin	2470	385	2	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.108
232 O	2	T12 1'x4 2-Lamp Troffer	78	0.2	Admin	2470	385	2	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.106
233 O	2	T12 2'x4 4-Lamp Troffer	156	0.3	Admin	2470	771	2	Delamp T8 2'x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216
234 HOUSING G	5	T12 2'x4 4-Lamp Troffer	156	0.8	Prison	8760	6,833	5	Delamp T8 2'x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.540
234 A,B,C,D	18	T12 1'x4 2-Lamp Strip	78	1.2	Prison	8760	10,832	18	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.4	0.848
235	1	T12 1'x4 2-Lamp Troffer	78	0.1	Prison	8760	883	1	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
236	1	T12 1'x4 2-Lamp Troffer	78	0.1	Prison	8760	883	1	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
Storage	3	T12 1'x4 2-Lamp Troffer	78	0.2	C	3640	852	3	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.158
Storage	1	27 Watt CFL Flood	27	0.0	C	3640	98	1	No Retrofit	27	0.0	0.000
229	2	T12 2'x4 2-Lamp Troffer	78	0.2	Prison	8760	1,387	2	Retro T8 2'x4 2-Lamp 28w (STD)Bal.	48	0.1	0.060
229	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	New LED Exit Fixture	1.5	0.0	0.009
285 Stair	3	T12 1'x4 2-Lamp Troffer	78	0.2	24	8760	2,050	3	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.158
285 Stair	2	T12 1'x4 2-Lamp Wmp	78	0.2	24	8760	1,387	2	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.108
239	2	T12 2'x4 4-Lamp Troffer	156	0.3	Prison	8760	2,733	2	Delamp T8 2'x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216
240	2	T12 1'x4 2-Lamp Troffer	78	0.2	Prison	8760	1,387	2	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.108
238 RR	2	T12 2'x4 4-Lamp Troffer	156	0.3	C	3640	1,139	2	Delamp T8 2'x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216
237	2	T12 2'x4 4-Lamp Troffer	156	0.3	Prison	8760	2,733	2	Delamp T8 2'x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.218
238 Vestibule	4	T12 1'x4 2-Lamp Troffer	78	0.3	24	8760	2,733	4	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.212
258 A	1	T12 1'x4 2-Lamp Troffer	78	0.1	Prison	8760	883	1	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
258 B	1	27 Watt CFL Flood	27	0.0	Prison	8760	237	1	No Retrofit	27	0.0	0.000
257	4	T12 1'x4 2-Lamp Troffer	78	0.3	Prison	8760	2,733	4	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.212
259 ABC	9	T12 1'x4 2-Lamp Troffer	78	0.7	Prison	8760	6,180	9	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.477
259 Hall	3	27 Watt CFL Flood	27	0.1	24	8760	710	3	No Retrofit	27	0.1	0.000
259 Hall	2	Soda Machine	400	0.8	24	8760	7,008	2	Vend Miser - energy sensor	240	0.5	0.320
241 Housing M1	6	T12 1'x4 2-Lamp Troffer	78	0.5	Prison	8760	4,100	6	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.318
H1 - H8	18	Inc. 60w	60	1.1	Prison	8760	9,481	18	NEW CFL 28915 Mini lamp 15W	15	0.3	0.810
RR	1	T12 1'x4 2-Lamp Troffer	78	0.1	C	3640	284	1	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
239 Hall	7	T12 1'x4 2-Lamp Troffer	78	0.5	24	8760	4,783	7	Delamp T8 1'x4 1-Lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.371

DETENTION CENTER LIGHTING SURVEY

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153 O	1	T12 1x4 2-Lamp Troffer	78	0.1	Admin	2470	193	1	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
152 Tele	1	T12 1x4 2-Lamp Wrap	78	0.1	MECH	1040	81	1	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
151	2	T12 1x4 2-Lamp Troffer	78	0.2	Prison	8760	1,367	2	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106
150	2	T12 1x4 2-Lamp Troffer	78	0.2	Prison	8760	1,367	2	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106
149 RR	1	T12 1x4 2-Lamp Troffer	78	0.1	C	3640	284	1	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
148	2	T12 1x4 2-Lamp Troffer	78	0.2	Prison	8760	1,367	2	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106
146 Storage	1	T12 1x4 1-Lamp Troffer	48	0.0	MECH	1040	50	1	Retro T8 1'x4 1-lamp 28w (STD)Bal.	25	0.0	0.023
145	1	T12 1x4 2-Lamp Troffer	78	0.1	Prison	8760	683	1	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
147 Stair	1	T12 1x4 2-Lamp Troffer	78	0.1	24	8760	683	1	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
159 Hall	2	27 Watt CFL Flood	27	0.1	24	8760	473	2	No Retrofit	27	0.1	0.000
158	2	27 Watt CFL Flood	27	0.1	Prison	8760	473	2	No Retrofit	27	0.1	0.000
157	4	27 Watt CFL Flood	27	0.1	Prison	8760	946	4	No Retrofit	27	0.1	0.000
160 hall	2	T12 1x4 2-Lamp Troffer	78	0.2	24	8760	1,367	2	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106
160 hall	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	53	1	New LED Exit Fixture	1.5	0.0	0.005
161 O	2	T12 1x4 2-Lamp Troffer	78	0.2	Admin	2470	385	2	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106
Commit Off	5	T12 2x4 2-Lamp Troffer	78	0.4	Admin	2470	963	5	Retro T8 2'x4 2-lamp 28w (STD)Bal.	48	0.2	0.150
Closet	1	T12 1x4 2-Lamp Troffer	78	0.1	C	3640	284	1	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
Hearing	1	T12 2x4 4-Lamp Troffer	156	0.2	Prison	8760	1,367	1	Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.108
Hearing	2	R30w Inc. Flood Indoor	30	0.1	Prison	8760	526	2	NEW CFL 1R3016 16W	16	0.0	0.028
172 Hall	4	T12 1x4 2-Lamp Troffer	78	0.3	24	8760	2,733	4	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.212
172 Hall	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	New LED Exit Fixture	1.5	0.0	0.009
171 Housing F3	4	T12 1x4 2-Lamp Wrap	78	0.3	Prison	8760	2,733	4	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.212
1 + 2	2	T12 1x4 2-Lamp Troffer	78	0.2	Prison	8760	1,367	2	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106
168 Hall	1	T12 1x4 2-Lamp Troffer	78	0.1	24	8760	683	1	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
166 main Con	4	T12 1x4 2-Lamp Troffer	78	0.3	Prison	8760	2,733	4	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.212
166 main Con	6	13 Watt CFL Flood	13	0.1	Prison	8760	683	6	No Retrofit	13	0.1	0.000
166 main Con	1	T12 1x4 2-Lamp Troffer	78	0.1	Prison	8760	683	1	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
165 RR	1	27 Watt CFL Flood	27	0.0	C	3640	98	1	No Retrofit	27	0.0	0.000
164	2	T12 1x4 2-Lamp Wrap	78	0.2	Prison	8760	1,367	2	Delamp T8 1'x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106
164	1	T12 1x4 2-Lamp Strip	78	0.1	Prison	8760	683	1	Delamp T8 1'x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053

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167 ?	4	T12 1x4 2-Lamp Wrap	78	0.3	Prison	8760	2,733	4	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.212
167 ?	1	T12 1x4 2-Lamp Troffer	78	0.1	Prison	8760	683	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
163	1	T12 2x4 4-Lamp Troffer	156	0.2	Prison	8760	1,367	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.108
164 Garage	3	T12 1x8 2-Lamp Ind.Strip	175	0.5	Prison	8760	4,599	3	Retro T8 1x8 2-lamp 28W 4ft Kit (Std)Bal.	48	0.1	0.381
164 Garage	4	100 Watt HPS Wall Pack	130	0.5	Prison	8760	4,555	4	NEW 42W CFL WALL PACK	42	0.2	0.352
185 ?	2	T12 1x8 2-Lamp Ind.Strip	175	0.4	Prison	8760	3,068	2	Retro T8 1x8 2-lamp 28W 4ft Kit (Std)Bal.	48	0.1	0.254
Sprinkler	1	T12 1x4 2-Lamp Strip	78	0.1	MECH	1040	81	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
169 Hall	6	T12 1x4 2-Lamp Troffer	78	0.5	24	8760	4,100	6	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.318
169 Hall	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	63	1	New LED Exit Fixture	1.5	0.0	0.005
Elevator	4	T12 1x4 1-Lamp Strip	48	0.2	24	8760	1,682	4	Retro T8 1x4 1-lamp 28w (STD)Bal.	25	0.1	0.092
181	3	T12 1x4 2-Lamp Troffer	78	0.2	Prison	8760	2,050	3	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.159
104	6	T12 1x4 2-Lamp Troffer	78	0.5	Prison	8760	4,100	6	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.318
103	2	T12 1x4 2-Lamp Troffer	78	0.2	Prison	8760	1,367	2	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.108
102 Dry	9	T12 1x4 2-Lamp Wrap	78	0.7	Prison	8760	6,150	9	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.477
101 Storage	2	T12 1x4 2-Lamp Troffer	78	0.2	MECH	1040	162	2	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.108
Out Sally Port 3	2	T12 1x8 2-Lamp Ind.Strip	175	0.4	Prison	8760	3,068	2	Retro T8 1x8 2-lamp 28W 4ft Kit (Std)Bal.	48	0.1	0.254
Kitchen	20	T12 2x4 4-Lamp Troffer	156	3.1	KITCHEN	5460	17,035	20	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	1.0	2.180
Kitchen Hood	9	27 Watt CFL Flood	27	0.2	KITCHEN	5460	1,327	9	No Retrofit	27	0.2	0.000
Kitchen Hood	9	27 Watt CFL Flood	27	0.2	KITCHEN	5460	1,327	9	No Retrofit	27	0.2	0.000
Freezer 1	3	JJ 27 watt CFL	27	0.1	C	3640	295	3	No Retrofit	27	0.1	0.000
Freezer 2	4	Inc. 60w	60	0.2	C	3640	874	4	NEW CFL 28915 Mini lamp 15W	15	0.1	0.180
108	1	T12 2x4 4-Lamp Troffer	156	0.2	Prison	8760	1,367	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.108
109 Janitor	1	T12 1x4 2-Lamp Troffer	78	0.1	MECH	1040	81	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
110 RR	1	T12 1x4 2-Lamp Troffer	78	0.1	C	3640	284	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
Switch Room	1	T12 1x4 2-Lamp Strip	78	0.1	C	3640	284	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053
119 hall	5	T12 1x4 2-Lamp Troffer	78	0.4	24	8760	3,416	5	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.265
119 hall	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	53	1	New LED Exit Fixture	1.5	0.0	0.005
118	2	T12 1x4 2-Lamp Wrap	78	0.2	Prison	8760	1,367	2	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.108
117 Laundry	5	T12 1x4 2-Lamp Troffer	78	0.4	Prison	8760	3,416	5	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.265
121 Office	5	T12 2x4 4-Lamp Troffer	156	0.8	Admin	2470	1,927	5	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.540

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123 Storage	2	T12 1x4 2-Lamp Wrap	78	0.2	MECH	1040	182	2	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106
133 hall	4	T12 1x4 2-Lamp Troffer	78	0.3	24	8760	2,733	4	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.212
133 hall	2	27 Watt CFL Flood	27	0.1	24	8760	473	2	No Retrofit	27	0.1	0.000
133 hall	4	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	210	4	New LED Exit Fixture	1.5	0.0	0.018
129 RRF	2	27 Watt CFL Flood	27	0.1	C	3640	197	2	No Retrofit	27	0.1	0.000
128 RRM	2	27 Watt CFL Flood	27	0.1	C	3640	197	2	No Retrofit	27	0.1	0.000
124 Exercise	3	T12 2x4 4-Lamp Troffer	156	0.5	C	3640	1,704	3	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.324
125 O	1	T12 1x4 2-Lamp Wrap	78	0.1	Admin	2470	193	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
125 O	1	T12 2x4 2-Lamp Troffer	78	0.1	Admin	2470	193	1	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.0	0.030
125 O	1	27 Watt CFL Flood	27	0.0	Admin	2470	57	1	No Retrofit	27	0.0	0.000
125 Hall	2	T12 1x4 2-Lamp Troffer	78	0.2	24	8760	1,367	2	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106
125 Hall	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	53	1	New LED Exit Fixture	1.5	0.0	0.005
127 Chapel	27	27 Watt CFL Flood	27	0.7	Admin	2470	1,601	27	No Retrofit	27	0.7	0.000
131 Closet	1	27 Watt CFL Flood	27	0.0	C	3640	98	1	No Retrofit	27	0.0	0.000
132 Closet	1	27 Watt CFL Flood	27	0.0	C	3640	98	1	No Retrofit	27	0.0	0.000
300 Staff B?	6	T12 2x4 2-Lamp Troffer	78	0.5	Admin	2470	1,158	6	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.3	0.180
300 Staff B?	1	18 Watt CFL BiAx Tube 2-Lamp Can	36	0.0	Admin	2470	89	1	No Retrofit	36	0.0	0.000
301 Bice Off	2	T12 2x4 4-Lamp Troffer	156	0.3	Admin	2470	771	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216
302 Stoner	2	T12 2x4 3-Lamp Troffer	126	0.3	Admin	2470	622	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156
345 Cadl Off	2	T12 2x4 3-Lamp Troffer	126	0.3	Admin	2470	622	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156
344	2	T12 2x4 3-Lamp Troffer	126	0.3	Admin	2470	622	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156
343 Counselor	2	T12 2x4 3-Lamp Troffer	126	0.3	Admin	2470	622	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156
342 Class Off	2	T12 2x4 3-Lamp Troffer	126	0.3	Admin	2470	622	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156
341	2	T12 2x4 3-Lamp Troffer	126	0.3	Prison	8760	2,208	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156
340	2	T12 2x4 3-Lamp Troffer	126	0.3	Prison	8760	2,208	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156
339	4	T12 2x4 3-Lamp Troffer	126	0.5	Prison	8760	4,415	4	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.312
338 Hall	7	T12 2x4 3-Lamp Troffer	126	0.9	24	8760	7,728	7	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.3	0.548
337 Hall	1	T12 1x4 2-Lamp Troffer	78	0.1	24	8760	683	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
303 hall	1	T12 1x4 2-Lamp Troffer	78	0.1	24	8760	683	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053
304 Hall	6	T12 2x4 3-Lamp Troffer	126	0.8	24	8760	6,823	6	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.3	0.468

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Room	305 Library	9	T12 2x4 3-Lamp Troffer	126	1.1	Admin	2470	2,801	8	Delamp T8 2x4 2L 28w (STD)Bal. wirereflector	48	0.4	0.702
306		1	T12 1x4 2-Lamp Wrap	78	0.1	Prison	8760	863	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	0.0	0.053
307 Off		2	T12 2x4 2-Lamp Troffer	78	0.2	Admin	2470	345	2	Reno T8 2x4 2-lamp 28w (STD)Bal.	48	0.1	0.060
RR		1	9 Watt CFL Deluxe Tube 2-Lamp Can	18	0.0	C	3640	86	1	NEW T8 2-Lamp Wrap	35	0.0	-0.017
West 1		20	175 Watt MH Fixture	210	4.2	Prison	8760	36,792	20	NEW T8 2x4 3-Lamp HO w/ Reflceage	178	3.6	0.640
West 1		73	T12 1x4 2-Lamp Wrap	78	5.7	Prison	8760	48,879	73	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	1.8	3.869
West 1		7	T12 1x4 2-Lamp Wrap	78	0.5	24	8760	4,763	7	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	0.2	0.371
West 1		8	9 Watt CFL Deluxe Tube 2-Lamp Can	18	0.1	Prison	8760	1,261	8	No Retrofit	18	0.1	0.000
West 2		20	175 Watt MH Fixture	210	4.2	Prison	8760	36,792	20	NEW T8 2x4 3-Lamp HO w/ Reflceage	178	3.6	0.840
West 2		80	T12 1x4 2-Lamp Wrap	78	6.2	Prison	8760	54,862	80	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	2.0	4.240
West 2		8	9 Watt CFL Deluxe Tube 2-Lamp Can	18	0.1	Prison	8760	1,261	8	No Retrofit	18	0.1	0.000
West 3		20	175 Watt MH Fixture	210	4.2	Prison	8760	36,792	20	NEW T8 2x4 3-Lamp HO w/ Reflceage	178	3.6	0.840
West 3		80	T12 1x4 2-Lamp Wrap	78	6.2	Prison	8760	54,862	80	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	2.0	4.240
West 3		8	9 Watt CFL Deluxe Tube 2-Lamp Can	18	0.1	Prison	8760	1,261	8	No Retrofit	18	0.1	0.000
West 4		20	175 Watt MH Fixture	210	4.2	Prison	8760	36,792	20	NEW T8 2x4 3-Lamp HO w/ Reflceage	178	3.6	0.840
West 4		80	T12 1x4 2-Lamp Wrap	78	6.2	Prison	8760	54,862	80	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	2.0	4.240
West 4		8	9 Watt CFL Deluxe Tube 2-Lamp Can	18	0.1	Prison	8760	1,261	8	No Retrofit	18	0.1	0.000
312 Hall		11	T12 2x4 3-Lamp Troffer	126	1.4	24	8760	12,141	11	Delamp T8 2x4 2L 28w (STD)Bal. wirereflector	48	0.5	0.858
WF-4		2	400 Watt MH HID fixture	455	0.9	Prison	8760	7,872	2	NEW T8 2x4 4-Lamp HO w/ Reflceage	255	0.5	0.400
WF-4		3	175 Watt MH Fixture	210	0.8	Prison	8760	5,519	3	NEW T8 2x4 3-Lamp HO w/ Reflceage	178	0.5	0.098
WF-4		3	T12 1x4 2-Lamp Wrap	78	0.2	Prison	8760	2,050	3	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	0.1	0.159
1-8		8	T12 1x4 2-Lamp Wrap	78	0.6	Prison	8760	5,466	8	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	0.2	0.424
1-8		16	9 Watt CFL Flood	9	0.1	Prison	8760	1,261	16	No Retrofit	9	0.1	0.000
325		1	T12 1x4 2-Lamp Troffer	78	0.1	Admin	2470	193	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	0.0	0.053
328 Hall		6	T12 2x4 3-Lamp Troffer	126	0.8	24	8760	8,823	6	Delamp T8 2x4 2L 28w (STD)Bal. wirereflector	48	0.3	0.468
332 Hall		3	T12 2x4 3-Lamp Troffer	126	0.4	24	8760	3,311	3	Delamp T8 2x4 2L 28w (STD)Bal. wirereflector	48	0.1	0.234
West 7 Office		2	T12 2x4 3-Lamp Troffer	126	0.3	Admin	2470	622	2	Delamp T8 2x4 2L 28w (STD)Bal. wirereflector	48	0.1	0.156
West 5		24	175 Watt MH Fixture	210	5.0	Prison	8760	44,150	24	NEW T8 2x4 3-Lamp HO w/ Reflceage	178	4.3	0.768
West 5		63	T12 1x4 2-Lamp Wrap	78	4.9	Prison	8760	43,047	63	Delamp T8 1x4 1-lamp 28w (STD)Bal. wirereflector kit	25	1.6	3.339

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West 5 Cells	96	7 Watt Wall Pack	7	0.7	Prison	8760	5,887	98	No Retrofit	7	0.7	0.000
West 5 RR	6	2-18 Watt CFL Plug In Double Max 2-pin	36	0.2	Prison	8760	1,892	6	No Retrofit	36	0.2	0.000
West 6	24	175 Watt MH Fixture	210	5.0	Prison	8760	44,150	24	NEW T5 2x4 31Lamp HO w/ Refl&ce	178	4.3	0.768
West 6	63	T12 1x4 2-Lamp Wrap	78	4.9	Prison	8760	43,047	63	Delamp T8 1x4 1-lamp 28w (STD) Bal. w/reflector kit	25	1.6	3.339
West 6 Cells	96	7 Watt Wall Pack	7	0.7	Prison	8760	5,887	96	No Retrofit	7	0.7	0.000
West 8 RR	6	2-18 Watt CFL Plug In Double Max 2-pin	36	0.2	Prison	8760	1,892	6	No Retrofit	36	0.2	0.000
West 7	24	175 Watt MH Fixture	210	5.0	Prison	8760	44,150	24	NEW T5 2x4 31Lamp HO w/ Refl&ce	178	4.3	0.768
West 7	63	T12 1x4 2-Lamp Wrap	78	4.9	Prison	8760	43,047	63	Delamp T8 1x4 1-lamp 28w (STD) Bal. w/reflector kit	25	1.6	3.339
West 7 Cells	96	7 Watt Wall Pack	7	0.7	Prison	8760	5,887	96	No Retrofit	7	0.7	0.000
West 7 RR	6	2-18 Watt CFL Plug In Double Max 2-pin	36	0.2	Prison	8760	1,892	6	No Retrofit	36	0.2	0.000
335 Hall	1	T12 1x4 2-Lamp Troffer	78	0.1	24	8760	693	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. w/reflector kit	25	0.0	0.053
336 Hall	1	T12 1x4 2-Lamp Troffer	78	0.1	24	8760	693	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. w/reflector kit	25	0.0	0.053
A-D Hall	13	T12 1x4 2-Lamp Troffer	78	1.0	24	8760	8,853	13	Delamp T8 1x4 1-lamp 28w (STD) Bal. w/reflector kit	25	0.3	0.899
A-D Hall	3	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	158	3	New LED Exit Fixture	1.5	0.0	0.014
177 Office	1	T12 1x4 2-Lamp Troffer	78	0.1	Admin	2470	193	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. w/reflector kit	25	0.0	0.053
Housing C	4	175 Watt MH Fixture	210	0.8	H	4380	3,679	4	NEW T5 2x4 31Lamp HO w/ Refl&ce	178	0.7	0.128
Housing C	78	Inc. 60w	60	4.7	H	4380	20,498	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510
Housing A	4	175 Watt MH Fixture	210	0.8	H	4380	3,679	4	NEW T5 2x4 31Lamp HO w/ Refl&ce	178	0.7	0.128
Housing A	78	Inc. 60w	60	4.7	H	4380	20,498	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510
Housing B	4	175 Watt MH Fixture	210	0.8	H	4380	3,679	4	NEW T5 2x4 31Lamp HO w/ Refl&ce	178	0.7	0.128
Housing B	78	Inc. 60w	60	4.7	H	4380	20,498	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510
Housing D	4	175 Watt MH Fixture	210	0.8	H	4380	3,679	4	NEW T5 2x4 31Lamp HO w/ Refl&ce	178	0.7	0.128
Housing D	78	Inc. 60w	60	4.7	H	4380	20,498	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510
Housing E	4	175 Watt MH Fixture	210	0.8	H	4380	3,679	4	NEW T5 2x4 31Lamp HO w/ Refl&ce	178	0.7	0.128
Housing E	78	Inc. 60w	60	4.7	H	4380	20,498	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510
141 Hall	4	T12 1x4 2-Lamp Troffer	78	0.3	24	8760	2,733	4	Delamp T8 1x4 1-lamp 28w (STD) Bal. w/reflector kit	25	0.1	0.212
141 Hall	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	53	1	New LED Exit Fixture	1.5	0.0	0.005
511 Hall	1	T12 1x4 2-Lamp Troffer	78	0.1	24	8760	693	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. w/reflector kit	25	0.0	0.053
510 Hall	2	T12 1x4 2-Lamp Wrap	78	0.2	24	8760	1,387	2	Delamp T8 1x4 1-lamp 28w (STD) Bal. w/reflector kit	25	0.1	0.106

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500	2	T12 2x4 3-Lamp Troffer	126	0.3	Admin	2470	822	2	Delamp T8 2x4 2L 28w (STD) Bal. wire reflector	48	0.1	0.158
500 RR	1	T12 1x4 2-Lamp Strip	78	0.1	C	3640	204	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.0	0.053
507 Laundry	4	T12 1x4 2-Lamp Troffer	78	0.3	C	3640	1,136	4	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.1	0.212
506 Hall	2	T12 1x4 2-Lamp Wrap	78	0.2	24	8760	1,367	2	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.1	0.108
504 Stores	1	T12 2x4 3-Lamp Troffer	126	0.1	C	3640	458	1	Delamp T8 2x4 2L 28w (STD) Bal. wire reflector	48	0.0	0.078
505 Control	1	T12 1x4 2-Lamp Troffer	78	0.1	Prison	8760	683	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.0	0.053
505 Control	1	T12 2x4 3-Lamp Troffer	126	0.1	Prison	8760	1,104	1	Delamp T8 2x4 2L 28w (STD) Bal. wire reflector	48	0.0	0.078
505 Control	3	27 Watt CFL Flood	27	0.1	Prison	8760	710	3	No Retrofit	27	0.1	0.000
512	11	175 Watt MH Fixture	210	2.3	Prison	8760	20,238	11	NEW T5 2x4 3-Lamp HO w/ Refl Range	178	2.0	0.352
512	54	T12 1x4 2-Lamp Wrap	78	4.2	Prison	8760	38,897	54	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	1.4	2.862
600 Storage	2	T12 1x4 2-Lamp Wrap	78	0.2	C	3640	588	2	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.1	0.108
601	1	T12 1x4 2-Lamp Wrap	78	0.1	Prison	8760	683	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.0	0.053
601	3	T12 2x4 4-Lamp Troffer	156	0.5	Prison	8760	4,100	3	Delamp T8 2x4 2L 28w (STD) Bal. wire reflector	48	0.1	0.324
503	3	400 Watt HPS Pole Fixtures	465	1.4	Prison	8760	12,220	3	Retro 320 Watt Pulse Start M.H.	365	1.1	0.300
502	1	T12 1x4 2-Lamp Troffer	78	0.1	Prison	8760	683	1	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.0	0.053
Outside	1	400 Watt HPS Pole Fixtures	465	0.5	OD	4380	2,037	1	Retro 320 Watt Pulse Start M.H.	365	0.4	0.100
Outside	23	400 Watt HPS Pole Fixtures	465	10.7	OD	4380	48,844	23	Retro 320 Watt Pulse Start M.H.	365	8.4	2.300
Outside	11	400 Watt HPS Pole Fixtures	465	5.1	OD	4380	22,404	11	Retro 320 Watt Pulse Start M.H.	365	4.0	1.100
Front parking	5	2-head 400 Watt HPS Pole Fixtures	930	4.7	OD	4380	20,387	5	Retro 2 320 Watt Pulse Start M.H.	730	3.7	1.000
Front parking	7	400 Watt HPS Pole Fixtures	465	3.3	OD	4380	14,257	7	Retro 320 Watt Pulse Start M.H.	365	2.8	0.700
Front parking	2	400 Watt HPS Wall Pack	465	0.9	OD	4380	4,073	2	Retro 320 Watt Pulse Start Metal Halide	365	0.7	0.200
Shop Side	2	400 Watt HPS Wall Pack	465	0.9	OD	4380	4,073	2	Retro 320 Watt Pulse Start Metal Halide	365	0.7	0.200
Back	7	400 Watt HPS Wall Pack	465	3.3	OD	4380	14,257	7	Retro 320 Watt Pulse Start Metal Halide	365	2.8	0.700
Sheds	10	100 Watt MH Wall Pack	122	1.2	OD	4380	5,344	10	NEW 42W CFL WALL PACK	42	0.4	0.800
Sheds	6	250 Watt MH Fixture	291	1.7	OD	4380	7,847	6	Retro 200 Watt Pulse Start MH kit	232	1.4	0.354
Sheds	12	T12 1x4 2-Lamp Strip	78	0.9	OD	4380	4,100	12	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.3	0.638
Sheds	20	T12 1x4 2-Lamp Strip	78	1.8	OD	4380	6,833	20	Delamp T8 1x4 1-lamp 28w (STD) Bal. wire reflector kit	25	0.5	1.060

2,391

1,429,088

2,391

103

Total Annual Savings:

SCAGGSVILLE PUBLIC SAFETY COMPLEX LIGHTING SURVEY

Map Location	Room Description	Quantity	Description	Watts	KW	Burn Hour Code	Pre Burn Hours	kWh	PROPOSED				
									Quantity	Description	Watts	KW	KW Saved
1	District Court	3	T8 2x4 4-Lamp Troffer	106	0.3	OF	3328	1,058	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
2	Duty Office	20	T8 2x4 3-Lamp Troffer	84	1.7	OF	3328	5,591	20	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	1.0	0.720
2	Duty Office	7	T8 2x4 3-Lamp Troffer	84	0.8	OF	3328	1,857	7	Remove fixture, patch, paint and repair... room over lit	0	0.0	0.588
3	RR	1	T8 2x4 4-Lamp Troffer	106	0.1	RR24	8760	929	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058
4	Status Room	2	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	706	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
5	Hall	3	T12 2x2 3-lamp U-1 5/8 Trof.	147	0.4	24	8760	3,863	3	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.354
5	Hall	1	LED exit sign	5	0.0	24	8760	44	1	No Retrofit	5	0.0	0.000
5	Hall	3	T8 2x4 4-Lamp Troffer	106	0.3	24	8760	2,786	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
6	Hall	11	T8 2x4 3-Lamp Troffer	84	0.9	24	8760	8,084	11	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.5	0.396
7	RR	1	T8 1x4 2-Lamp Wrap	62	0.1	RR24	8760	543	1	DeLamp T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.0	0.037
8	Interview	1	T8 2x4 2-Lamp troffer	62	0.1	OF	3328	208	1	Re-Lamp & Re-Ballast T8 2x4 2Lamp Troffer 28w (STD)Bal.	48	0.0	0.014
9	Interview 2	1	T8 2x4 2-Lamp troffer	62	0.1	OF	3328	208	1	Re-Lamp & Re-Ballast T8 2x4 2Lamp Troffer 28w (STD)Bal.	48	0.0	0.014
10	Office 2	2	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	706	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
11	Office 4	2	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	706	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
12	Office 3	3	T8 2x4 4-Lamp Troffer	106	0.3	OF	3328	1,058	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
13	Hall	2	T8 2x4 4-Lamp Troffer	106	0.2	24	8760	1,857	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
13	Hall	2	LED exit sign	5	0.0	24	8760	88	2	No Retrofit	5	0.0	0.000
14	Hall	3	T12 2x4 4-Lamp Troffer	156	0.5	24	8760	4,100	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.324
15	#16	1	T12 1x3 3-lamp Strip	78	0.1	OF	3328	260	1	Retro T8 1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014
16	#17	1	T12 1x3 3-lamp Strip	78	0.1	OF	3328	260	1	Retro T8 1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014
17	Hall	4	T12 2x4 4-Lamp Troffer	156	0.8	24	8760	5,466	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.432
18	FEMALE HOLDING	1	T12 1x3 3-lamp Strip	78	0.1	HOLDING	740	58	1	Retro T8 1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014
19	FEMALE HOLDING	1	T12 1x3 3-lamp Strip	78	0.1	HOLDING	740	58	1	Retro T8 1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014
20	Hall	5	T8 2x4 4-Lamp Troffer	106	0.5	24	8760	4,643	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290
20	Hall	1	LED exit sign	5	0.0	24	8760	44	1	No Retrofit	5	0.0	0.000
21	Juv Booking	4	T8 2x4 4-Lamp Troffer	106	0.4	24	8760	3,714	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232
22	Juv Int	2	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	706	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
23	23	1	T12 1x3 3-lamp Strip	78	0.1	HOLDING	740	58	1	Retro T8 1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014
24	24	1	T12 1x3 3-lamp Strip	78	0.1	HOLDING	740	58	1	Retro T8 1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014
25	21	1	T12 1x3 3-lamp Strip	1	0.0	HOLDING	740	1	1	Retro T8 1x3 3-Lamp F25 (STD)Bal.	1	0.0	0.000
26	20	1	T12 1x3 3-lamp Strip	1	0.0	HOLDING	740	1	1	Retro T8 1x3 3-Lamp F25 (STD)Bal.	1	0.0	0.000
27	Hall	5	T8 2x4 4-Lamp Troffer	106	0.5	24	8760	4,643	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290
27	Hall	1	LED exit sign	5	0.0	24	8760	44	1	No Retrofit	5	0.0	0.000
28	Sally Port	4	250 Watt MH Fixture	288	1.2	OF	3328	3,834	4	Retro 200 Watt Pulse Start MH kit	232	0.9	0.224
29	Storage	2	T8 2x4 4-Lamp Troffer	106	0.2	MECH	1040	220	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
30	Storage	2	T8 2x4 4-Lamp Troffer	106	0.2	MECH	1040	220	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
30	Storage	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	MECH	1040	81	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.049
31	Computer Op	5	T8 2x4 4-Lamp Troffer	106	0.5	OF	3328	1,784	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290
31	Computer Op	1	LED exit sign	5	0.0	24	8760	44	1	No Retrofit	5	0.0	0.000
32	Storage	4	T8 2x4 3-Lamp Troffer	84	0.3	MECH	1040	349	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144
33	Office	4	T8 2x4 4-Lamp Troffer	106	0.4	OF	3328	1,411	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232
34	Office	2	T12 2x4 4-Lamp Troffer	156	0.3	OF	3328	1,038	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.218
35	Office	3	T12 2x4 4-Lamp Troffer	156	0.5	OF	3328	1,558	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.324
36	Hall	2	T8 2x4 4-Lamp Troffer	106	0.2	24	8760	1,857	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
36	Hall	1	LED exit sign	5	0.0	24	8760	44	1	No Retrofit	5	0.0	0.000
37	Lobby	4	250 Watt MH Fixture	288	1.2	24	8760	10,092	4	Retro 200 Watt Pulse Start MH kit	232	0.9	0.224
37	Lobby	1	LED exit sign	5	0.0	24	8760	44	1	No Retrofit	5	0.0	0.000

SCAGGSVILLE PUBLIC SAFETY COMPLEX LIGHTING SURVEY

38	Shower	1	T12 2x2 3-Lamp U-1 5/8 Trof.	147	0.1	RR24	\$760	1,288	1	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.0	0.118
39	RRW	1	T8 1x4 2-Lamp Strip	62	0.1	RR24	\$760	543	1	Delamp T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037
39	RRW	1	T8 2x4 4-Lamp Troffer	106	0.1	RR24	\$760	829	1	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058
39	RRW	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	RR24	\$760	883	1	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.0	0.049
40	Jan	1	T8 2x4 4-Lamp Troffer	106	0.1	J	740	78	1	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.059
41	RRM	1	T8 1x4 2-Lamp Strip	62	0.1	RR24	\$760	543	1	Delamp T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037
41	RRM	1	T8 2x4 4-Lamp Troffer	106	0.1	RR24	\$760	829	1	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058
42	Interview	2	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	708	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
43	Interview	2	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	708	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.118
44	Patrol Off	5	T8 2x4 4-Lamp Troffer	106	0.5	OF	3328	1,784	5	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290
45	District Com	4	T8 2x4 4-Lamp Troffer	106	0.4	OF	3328	1,411	4	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232
45	District Com	1	T12 2x2 3-Lamp U-1 5/8 Trof.	147	0.1	OF	3328	489	1	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.0	0.118
46	RR	1	T12 2x2 3-Lamp U-1 5/8 Trof.	147	0.1	RR24	\$760	1,288	1	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.0	0.118
47	District Com O	3	T8 2x4 4-Lamp Troffer	106	0.3	OF	3328	1,098	3	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
48	Radio Rm	3	T8 2x4 4-Lamp Troffer	106	0.3	24	\$760	2,788	3	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
49	Women's Locker	4	T12 2x4 4-Lamp Troffer	156	0.6	24	\$760	5,486	4	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.432
50	Women's Locker	3	T8 2x2 40 Watt 2-Lamp CFL Bi-x	80	0.2	24	\$760	2,102	3	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.1	0.153
50	Women's Locker	1	T8 1x4 2-Lamp Strip	62	0.1	24	\$760	543	1	Delamp T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037
50	Women's Locker	2	Inc. 60w	60	0.1	24	\$760	1,051	2	New CFL 183016 15W	15	0.0	0.090
51	RR	1	T8 2x2 40 Watt 2-Lamp CFL Bi-x	80	0.1	24	\$760	701	1	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.0	0.051
52	Conf	8	T8 2x4 3-Lamp Troffer	84	0.7	OF	3328	2,238	8	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.4	0.288
52	Conf	12	Inc. 90w Per 38 Dimmable	90	1.1	OF	3328	3,584	12	New CFL 23w BR40 Dimmable Flood	23	0.3	0.804
53	Closet	1	T8 2x2 40 Watt 2-Lamp CFL Bi-x	80	0.1	MECH	1040	83	1	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.0	0.061
54	Roll Call	12	T8 2x4 3-Lamp Troffer	84	1.0	OF	3328	3,355	12	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.6	0.432
54	Roll Call	4	Inc. 90w Per 38 Dimmable	90	0.4	OF	3328	1,188	4	New CFL 23w BR40 Dimmable Flood	23	0.1	0.268
55	Mech Room	12	T8 1x4 3-Lamp Industrial Strip	84	1.0	MECH	1040	1,048	12	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.6	0.432
55	Mech Room	2	2 Lamp 25W Inc. Exit	25	0.1	24	\$760	438	2	New LED Exit Fixture	15	0.0	0.047
56	File	4	T8 1x4 3-Lamp Industrial Strip	84	0.3	OF	3328	1,118	4	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144
56	File	2	2 Lamp 25W Inc. Exit	25	0.1	24	\$760	438	2	New LED Exit Fixture	15	0.0	0.047
57	Evidence	2	T8 2x4 3-Lamp Wrap	84	0.2	OF	3328	589	2	Delamp T8 1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072
58	Storage	2	T8 2x4 3-Lamp Wrap	84	0.2	MECH	1040	175	2	Delamp T8 1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072
59	Hall	20	T8 2x4 3-Lamp Troffer	84	1.7	24	\$760	14,717	20	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	1.0	0.720
59	Hall	3	2 Lamp 6w Plug in CFL kit	6	0.0	24	\$760	159	3	New LED Exit Fixture	15	0.0	0.014
59	Hall	2	LED exit sign	5	0.0	24	\$760	88	2	No Retrofit	5	0.0	0.060
60	Jan	2	T8 2x2 40 Watt 2-Lamp CFL Bi-x	80	0.2	J	740	118	2	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.1	0.102
61	Office	3	T8 2x4 4-Lamp Troffer	106	0.3	OF	3328	1,058	3	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
62	Office	3	T8 2x4 4-Lamp Troffer	106	0.3	OF	3328	1,058	3	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
63	Office	3	T8 2x4 4-Lamp Troffer	106	0.3	OF	3328	1,058	3	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
64	Server	2	T8 2x4 3-Lamp Wrap	84	0.2	OF	3328	589	2	Delamp T8 1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072
64	Server	2	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	706	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116
65	Lounge	4	T8 2x4 3-Lamp Troffer	84	0.3	24	\$760	2,943	4	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144
66	M Locker	7	T8 2x4 4-Lamp Troffer	106	0.7	RR24	\$760	6,500	7	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.3	0.406
67	M Locker	3	T8 1x4 2-Lamp Strip	62	0.2	RR24	\$760	1,829	3	Delamp T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.111
67	M Locker	3	Inc. 60w	60	0.2	RR24	\$760	1,577	3	New CFL 183016 15W	15	0.0	0.135
68	Debriefing	16	T12 2x4 4-Lamp Troffer	156	2.5	OF	3328	6,307	16	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.8	1.728
69	Exercise	5	T12 2x4 4-Lamp Troffer	156	0.8	24	\$760	6,833	5	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.840
70	Hall	23	T8 2x4 3-Lamp Troffer	84	1.9	24	\$760	16,824	23	Delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	1.1	0.828

SCAGGSVILLE PUBLIC SAFETY COMPLEX LIGHTING SURVEY

70	Hall	2 Lamp 25W Inc. Exit	25	0.2	24	8760	1,314	6	New LED Exit Fixture	1.5	0.0	0.141
70	Hall	T8 2x4 3-Lamp Troffer	84	2.2	24	8760	19,132	28	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	1.2	0.936
70	Hall	2 Lamp 25W Inc. Exit	25	0.2	24	8760	1,314	6	New LED Exit Fixture	1.5	0.0	0.165
71	traffic	T12 2x4 4-Lamp Troffer	156	0.9	24	8760	8,199	6	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.3	0.648
72	Commander	T12 2x4 4-Lamp Troffer	156	0.8	OF	3328	2,077	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.432
72	Commander	13 Watt CFL Flood	13	0.0	OF	3328	87	2	No Retrofit	13	0.0	0.000
73	Office	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	859	3	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.108
74	Dispatch	T12 2x4 4-Lamp Troffer	156	2.8	24	8760	24,598	18	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.9	1.944
74	Dispatch	2 Lamp 25W Inc. Exit	25	0.1	24	8760	438	2	New LED Exit Fixture	1.5	0.0	0.047
75	Office	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	1,118	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144
76	Traffic	T12 2x4 4-Lamp Troffer	156	0.9	24	8760	8,199	6	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.3	0.648
76	Traffic	2 Lamp 25W Inc. Exit	25	0.0	24	8760	219	1	New LED Exit Fixture	1.5	0.0	0.024
77	Office	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	859	3	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.108
77	Office	T8 2x4 3-Lamp Troffer	84	0.5	OF	3328	1,677	6	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.3	0.216
78	Storage	T8 2x4 3-Lamp Troffer	84	0.3	MECH	1040	349	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144
79	Storage	T8 2x4 4-Lamp Troffer	106	0.8	OF	3328	2,822	8	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.4	0.484
80	Crime PRFU	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	532	2	Retro T8 2x4 2-Lamp F17 T8 w/Reflector Kit	29	0.1	0.102
80	Crime PRFU	2 T8 2x4 40 Watt 2-Lamp CFL Bias	80	0.0	24	8760	219	1	New LED Exit Fixture	1.5	0.0	0.024
81	Crime PRFU	T8 2x4 4-Lamp Troffer	106	0.1	OF	3328	353	1	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058
82	Office	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	859	3	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.108
83	K-9	T8 2x4 4-Lamp Troffer	106	0.5	OF	3328	1,764	5	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290
84	Office	T8 2x4 4-Lamp Troffer	106	0.3	OF	3328	1,058	3	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
85	Kennel	T8 2x4 3-Lamp Wrap	84	0.3	OD	4380	1,472	4	DeLamp T8 1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.2	0.144
85	Kennel	13 Watt CFL Flood	13	0.0	OD	4380	57	1	No Retrofit	13	0.0	0.000
86	Storage	2 Lamp 25W Inc. Exit	25	0.0	24	8760	219	1	New LED Exit Fixture	1.5	0.0	0.024
86	Storage	T8 2x4 4-Lamp Troffer	106	0.2	MECH	1040	220	2	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116
87	Office	T8 2x4 3-Lamp Wrap	84	0.3	OF	3328	859	3	DeLamp T8 1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.108
88	Conf Rm	T8 2x4 4-Lamp Troffer	106	0.4	OF	3328	1,411	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232
89	Elec	T8 1x4 1-Lamp Strip	35	0.1	MECH	1040	73	2	Re-Lamp & Re-Ballast T8 1x4 1-Lamp Strip 28w (STD)Bal.	23	0.1	0.020
90	Storage	Inc. 100W	100	0.1	MECH	1040	104	1	New CFL 28933 23W	23	0.0	0.077
91	Technical	T8 2x4 4-Lamp Troffer	106	0.6	OF	3328	2,117	6	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.3	0.348
92	office	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	1,118	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144
93	office	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	708	2	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116
94	Cycle	T8 2x4 3-Lamp Wrap	84	0.2	OF	3328	559	2	DeLamp T8 1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072
95	Office	T8 2x4 3-Lamp Troffer	84	2.2	OF	3328	7,288	28	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	1.2	0.936
95	Office	2 Lamp 25W Inc. Exit	25	0.1	24	8760	438	2	New LED Exit Fixture	1.5	0.0	0.047
96	Office	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	1,118	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144
97	Office	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	1,118	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144
98	Office	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	1,118	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144
99	St	T12 2x4 4-Lamp Troffer	156	0.3	OF	3328	1,058	2	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.216
100	Interview	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	708	2	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116
101	Interview	T8 2x4 4-Lamp Troffer	106	0.4	OF	3328	1,411	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232
102	Interview	T8 2x4 4-Lamp Troffer	1	0.0	OF	3328	13	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	1	0.0	0.000
103	Interview	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	708	2	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116
104	Photograph	T12 2x4 4-Lamp Troffer	156	0.6	OF	3328	2,077	4	DeLamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.2	0.432

	Polygraph	1	2 Lamp 25W Inc. Exit	25	0.0	24	8760	219	1	New LED Exit Fixture	LED Exit Fixture	1.5	0.0	0.024
104	RRT	1	T8 1x4 1-Lamp Strip	35	0.0	RR24	8760	307	1	Re-Lamp & Re-Ballast T8 1x4 1-Lamp Strip 28w (STD)Ball.		25	0.0	0.010
105	RFR	1	T8 2x4 4-Lamp Troffer	106	0.1	RR24	8760	929	1	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.0	0.058
106	RRM	1	T8 1x4 1-Lamp Strip	35	0.0	RR24	8760	307	1	Re-Lamp & Re-Ballast T8 1x4 1-Lamp Strip 28w (STD)Ball.		25	0.0	0.010
106	RRm	1	T8 2x4 4-Lamp Troffer	106	0.1	RR24	8760	928	1	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.0	0.058
107	Mason's Office	6	T8 2x4 3-Lamp Troffer	84	0.5	OF	3328	1,577	6	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.3	0.216
107	Mason's Office	8	Inc. 60w	60	0.5	OF	3328	1,597	8	New CFL R32016 15W		15	0.1	0.380
108	Chertical	4	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	1,118	4	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.2	0.144
109	Command	4	T8 2x4 3-Lamp Troffer	84	0.3	OF	3328	1,118	4	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.2	0.144
	FIRE HOUSE													
	Lobby	8	T8 2x4 3-Lamp Troffer	84	0.7	FIRE	8760	5,887	8	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.4	0.288
	RR	1	T8 2x4 3-Lamp Troffer	84	0.1	RR24	8760	738	1	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.0	0.036
	Control	2	T8 2x4 4-Lamp Troffer	106	0.2	FIRE	8760	1,857	2	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.1	0.116
	Off 1	2	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	708	2	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.1	0.116
	Off 2	2	T8 2x4 4-Lamp Troffer	106	0.2	OF	3328	708	2	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.1	0.116
	Training	6	T8 2x4 4-Lamp Troffer	106	0.6	OF	3328	2,117	6	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.3	0.348
	Training	1	2 Lamp 25W Inc. Exit	25	0.0	24	8760	219	1	New LED Exit Fixture		1.5	0.0	0.024
	Lobby	1	2 Lamp 25W Inc. Exit	25	0.0	24	8760	219	1	New LED Exit Fixture		1.5	0.0	0.024
	Lobby	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	FIRE	8760	663	1	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit		29	0.0	0.049
	Closet	1	T8 2x4 3-Lamp Troffer	84	0.1	MECH	1040	87	1	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.0	0.036
	RR	1	T8 2x4 3-Lamp Troffer	84	0.1	RR24	8760	736	1	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.0	0.036
	Bay	4	T8 2x4 3-Lamp Wrap	84	0.3	OD	4380	1,472	4	De-Lamp T8 1x4 2-Lamp Wrap 28w (STD)Ball. w/reflector		48	0.2	0.144
	Bay	11	250 Watt MH Fixure	288	3.2	OD	4380	13,878	11	Retro 200 Watt Pulse Start MH Lit		232	2.8	0.616
	Bay	1	2 Lamp 25W Inc. Exit	25	0.0	24	8760	219	1	New LED Exit Fixture		1.5	0.0	0.024
	Bay	1	LED exit sign	5	0.0	24	8760	44	1	No Retrofit		5	0.0	0.000
	Shop	2	T8 2x4 3-Lamp Wrap	84	0.2	OF	3328	559	2	De-lamp T8 1x4 2-Lamp Wrap 28w (STD)Ball. w/reflector		48	0.1	0.072
	Shic	1	T8 2x4 3-Lamp Troffer	84	0.1	OF	3328	280	1	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48	0.0	0.036
	Gear Rm	3	T8 2x4 3-Lamp Wrap	84	0.3	FIRE	8760	2,208	3	De-Lamp T8 1x4 2-Lamp Wrap 28w (STD)Ball. w/reflector		48	0.1	0.108
	Hall	5	T8 2x4 4-Lamp Troffer	1	0.0	FIRE	8760	44	5	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		1	0.0	0.000
	Kitchen	4	T8 2x4 4-Lamp Troffer	106	0.4	FIRE	8760	3,714	4	De-Lamp T8 2x4 2-Lamp 28w (STD)Ball. w/reflector		48		

SCAGGSVILLE PUBLIC SAFETY COMPLEX LIGHTING SURVEY

	Hall	2	Soda Machine	400	0.8	24	8760	7,008	2	Vend/Misc Occupancy control unit	240	0.5	0.320
	Outside	25	250 Watt MH Fixture	288	7.2	OD	4380	31,536	26	Retro 200 Watt Pulse Start MH kit	232	6.8	1.400
	Outside	4	100 Watt MH Can	122	0.5	OD	4380	2,137	4	No Retrofit	122	0.5	0.000
	Outside	13	400 Watt MH Fixture	455	5.9	OD	4380	25,908	13	Retro 320 Watt Pulse Start M.H.	365	4.7	1.170
	Outside	4	400 Watt MH Pole w/2 Heads	910	3.6	OD	4380	15,943	4	Retro 320 Watt Pulse Start M.H. w/2 heads	730	2.9	0.720
	Outside	1	400 Watt MH Pole w/3 Heads	1365	1.4	OD	4380	5,979	1	Retro 320 Watt Pulse Start M.H. w/3 heads	1095	1.1	0.270

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PROPOSED

Room Description	Quantity	Description	Watts	kW	Burn Hour Code	Pre Burn Hours	kWh	Quantity	Description	Watts	kW	kWh Saved
Main Lobby	6	2-18 Watt CFL Plug in Double bias 2-pin	36	0.2	Lb	4368	943	6	No Retrofit 2-18 Watt CFL Plug in Double bias 2-pin	36	0.2	0.000
Main Lobby	8	100 Watt MH Can	122	1.0	Lb	4368	4,203	8	No Retrofit 100 Watt MH Can	122	1.0	0.000
Main Lobby	4	Edge Lit Exit Sign	6	0.0	24	8760	210	6	No Retro	6	0.0	0.000
RRM	1	T12-1x3 2-Lamp Strip	78	0.1	RR	8760	683	1	Retro T8 1x3 2-Lamp F23 (L7) Bal.	43	0.0	0.035
RRM	4	T8 1x4 2-Lamp Strip	62	0.2	RR	8760	2,172	4	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. w/retrofit	25	0.1	0.148
Display Case	2	T8 1x3 2-Lamp Strip	54	0.1	24	8760	948	2	No Retrofit T8 1x3 2-Lamp Strip	54	0.1	0.000
Display Case	2	T8 1x3 2-Lamp Strip	54	0.1	24	8760	948	2	No Retrofit T8 1x3 2-Lamp Strip	54	0.1	0.000
RRF	1	T12 1x3 2-Lamp Strip	78	0.1	RR	8760	683	1	Retro T8 1x3 2-Lamp F23 (L7) Bal.	43	0.0	0.035
RRF	2	T8 1x4 2-Lamp Strip	62	0.1	RR	8760	1,088	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. w/retrofit	25	0.1	0.074
Meeting Room	12	T8 1x4 2-Lamp Strip	62	0.7	Lb	4368	3,250	12	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. w/retrofit	25	0.3	0.444
Meeting Room	2	Edge Lit Exit Sign	6	0.0	24	8760	188	2	No Retro	6	0.0	0.000
Meeting Room	8	MR 16-50 Watt Low Voltage Flood	50	0.4	24	8760	3,504	8	New LED 8 Watt MR 16 replacement lamp	8	0.1	0.358
Coat Closet	1	T8 2x4 2-Lamp Troffer	62	0.1	M	1040	84	1	Retro T8 2x4 2-Lamp 28w (STD) Bal.	48	0.0	0.014
Coat Closet	1	2-18 Watt CFL Plug in Double bias 2-pin	36	0.0	Lb	4368	157	1	No Retrofit 2-18 Watt CFL Plug in Double bias 2-pin	36	0.0	0.000
Hall	8	T8 2x3 40 Watt 2-Lamp Bi-Lamp	80	0.8	Lb	4368	2,798	8	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.2	0.408
Hall	2	T8 1x4 2-Lamp Strip	62	0.1	Lb	4368	542	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. w/retrofit	25	0.1	0.074
Conf	6	T8 1x4 2-Lamp Strip	62	0.4	Lb	4368	1,625	6	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. w/retrofit	25	0.2	0.222
Office	1	T8 2x4 3-Lamp Troffer	84	0.1	Lb	4368	367	1	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.0	0.036
Copy Rm	20	2-18 Watt CFL Plug in Double bias 2-pin	36	0.7	Lb	4368	3,143	20	No Retrofit 2-18 Watt CFL Plug in Double bias 2-pin	36	0.7	0.000
Telephone Closet	1	Inc. 100W	100	0.1	M	1040	104	1	New CFL 25W SI	25	0.0	0.075
DER Office	8	T8 2x2 2-Lamp Lx4 Trof.	62	0.4	Lb	4368	1,625	8	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.2	0.198
Office Cust.	25	T8 2x4 3-Lamp Troffer Bi-Level	97	2.4	Lb	4368	10,582	25	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	1.2	1.225
Medi Rm	1	T8 2x4 3-Lamp Troffer Bi-Level	97	0.1	Lb	4368	424	1	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.0	0.049
John W. Office	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Brian A. Office	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Low Office	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Corpor Off	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Kenz	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Ann	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
natale	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Chris	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Chris	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Tara	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Kitchen	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
RRM	1	T8 2x4 3-Lamp Troffer Bi-Level	97	0.1	RR	8760	650	1	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.0	0.049
Office	8	T8 2x4 3-Lamp Troffer Bi-Level	97	0.8	Lb	4368	3,390	8	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.4	0.392
Stacy Fish's	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Donna Anderson	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Central Desk	8	T8 2x2 40 Watt 2-Lamp Bi-Lamp	80	0.8	Lb	4368	2,798	8	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.2	0.408
Central Desk	35	2-18 Watt CFL Plug in Double bias 2-pin	36	1.3	Lb	4368	5,504	35	No Retrofit 2-18 Watt CFL Plug in Double bias 2-pin	36	1.3	0.000
Central Desk	3	T12 1x4 3-Lamp Ind Strip	78	0.2	Lb	4368	1,022	3	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. w/retrofit	25	0.1	0.159
Work Room	12	T8 2x4 3-Lamp Troffer Bi-Level	97	1.2	Lb	4368	5,084	12	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.8	0.568
Office 1	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Office 2	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088
Office 3	2	T8 2x4 3-Lamp Troffer Bi-Level	97	0.2	Lb	4368	847	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. w/retrofit	48	0.1	0.088

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Work Room	19	T8 2x4 3-Lamp Troffer Bi-level	97	1.8	Lib	4368	8,050	19	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.9	0.931
Work Room	2	Edge Lit Exit Sign	6	0.0	24	8760	105	2	No Retro	6	0.0	0.000
Office	4	T8 2x4 3-Lamp Troffer Bi-level	97	0.4	Lib	4368	1,695	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.196
Office	4	T8 2x4 3-Lamp Troffer Bi-level	97	0.4	Lib	4368	1,695	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.196
Receiving	7	T8 2x4 3-Lamp Troffer Bi-level	97	0.7	Lib	4368	2,988	7	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.343
Computer	2	T8 2x4 3-Lamp Troffer Bi-level	97	0.2	Lib	4368	847	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.096
Book Drop	1	T8 2x4 4-Lamp Wrap	106	0.1	Lib	4368	463	1	De-Lamp to T8 2x4 2-Lamp 28w reflector (STD)Bal.	48	0.0	0.058
Supply	2	T8 2x4 4-Lamp Wrap	106	0.2	Lib	4368	926	2	De-Lamp to T8 2x4 2-Lamp 28w reflector (STD)Bal.	48	0.1	0.116
Mech Rm	10	T8 1x4 2-Lamp Strip	62	0.8	M	1040	645	10	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.3	0.370
Main Library	14	T8 1x4 2-Lamp Wrap	62	0.9	Lib	4368	3,791	14	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.4	0.518
Stacks	20	T8 8' tube 6-Lamp Bi-level	178	3.6	Lib	4368	15,550	20	De-Lamp to T8 2-Lamp 28w (STD)Bal. w/reflector	48	1.0	2.600
Stacks	22	T8 8' tube 6-Lamp Bi-level	178	3.9	Lib	4368	17,105	22	De-Lamp to T8 3-Lamp 28w (STD)Bal. w/reflector Tandem 4 bd	95	2.1	1.826
Stacks	66	T8 8' tube 6-Lamp Bi-level	178	11.7	Lib	4368	51,315	66	De-Lamp to T8 2-Lamp 28w (STD)Bal. w/reflector Tandem	0	0.0	11.748
H-Conner	11	T8 2x2 40 Watt 2-Lamp Biac Lamps	80	0.9	Lib	4368	3,844	11	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.3	0.561
Along Glass Wall	27	400 Watt MH Fixture	455	12.3	Lib	4368	53,661	27	Retro 320 Watt Pulse Start M.H.	365	9.9	2.430
Along Glass Wall	27	250 Watt MH Fixture	288	7.8	Lib	4368	33,968	27	Remove Fixture and Patch, Paint and Repair	0	0.0	7.776
Along Glass Wall	4	25 Watt CFL Flood	25	0.1	24	8760	676	4	No Retrofit 25 Watt CFL Flood	25	0.1	0.000
Computer Lab 2	1	100 Watt MH Can	122	0.1	Lib	4368	533	1	No Retrofit 100 Watt MH Can	122	0.1	0.000
Computer Lab 2	1	100W Quartz Lamp	100	0.1	Lib	4368	437	1	No Retrofit	100	0.1	0.000
Computer Lab 2	32	Pendant mounted 2x 40 Watt 2-Lamp Biac Lamps	80	2.6	Lib	4368	11,182	32	Remove & replace with NEW T8 4-lamp 2x4 T8 w/Reflector	95	3.0	-0.480
Along Glass wall	8	250W Quartz flood uplight	250	2.0	Lib	4368	8,736	8	Remove Fixture and Patch, Paint and Repair	0	0.0	2.000
Childrens Room	6	MR 16 -50 Watt Low Voltage Flood	50	0.3	Lib	4368	1,310	6	New LED 8 Watt MR 16 replacement lamp	8	0.0	0.252
Childrens Room	10	T8 2x2 40 Watt 2-Lamp Biac Lamps	80	0.8	Lib	4368	3,494	10	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.3	0.510
Childrens Room	34	T8 2x2 40 Watt 2-Lamp Biac Lamps	80	2.7	Lib	4368	11,881	34	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	1.0	1.734
Childrens Room	8	T8 2x2 40 Watt 2-Lamp Biac Lamps	80	0.6	24	8760	5,606	8	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.2	0.408
Staff Only	2	T8 2x4 3-Lamp Troffer	84	0.2	Lib	4368	734	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
Child Room	1	T8 2x4 3-Lamp Troffer	84	0.1	Lib	4368	367	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.036
Child Room	1	T8 2x4 3-Lamp Troffer	84	0.1	Lib	4368	367	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.036
Librarian Office	3	T8 2x4 3-Lamp Troffer Bi-level	97	0.3	Lib	4368	1,271	3	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.147
Story Room	2	T8 2x2 40 Watt 2-Lamp Biac Lamps	80	0.2	Lib	4368	699	2	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.102
CII Librarian	6	T8 1x4 2-Lamp Wrap	62	0.4	Lib	4368	1,625	6	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.2	0.222
CL 1	1	T8 2x4 3-Lamp troffer	62	0.1	M	1040	64	1	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.0	0.014
CL 2	1	T8 2x4 2-Lamp troffer	62	0.1	M	1040	64	1	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.0	0.014
CL 2	3	Edge Lit Exit Sign	6	0.0	24	8760	158	3	No Retro	6	0.0	0.000
Staff Only Office	7	T8 2x4 3-Lamp Troffer Bi-level	97	0.7	Lib	4368	2,966	7	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.343
Staff Only Office	4	Edge Lit Exit Sign	6	0.0	24	8760	210	4	No Retro	6	0.0	0.000
Lobby	4	Edge Lit Exit Sign	6	0.0	24	8760	210	4	No Retro	6	0.0	0.000
Canopies	6	250 Watt MH Fixture	288	1.7	OD	4380	7,569	6	Retro 200 Watt Pulse Start MH kit	232	1.4	0.336
Canopies	3	100 Watt MH Can	122	0.4	OD	4380	1,603	3	No Retrofit 100 Watt MH Can	122	0.4	0.000
pole lights	18	400 Watt MH Fixture	455	7.3	OD	4380	31,888	18	Retro 320 Watt Pulse Start M.H.	365	5.8	1.440
pole lights	9	400 Watt MH Fixture	455	4.1	OD	4380	17,936	9	Retro 320 Watt Pulse Start M.H.	365	3.3	0.810
pole lights	5	250 Watt MH Fixture	288	1.4	OD	4380	6,307	5	Retro 200 Watt Pulse Start MH kit	232	1.2	0.280
RRM	2	T8 1x4 2-Lamp Wrap	62	0.1	RR	8760	1,086	2	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.074
RRM	1	T8 1x4 2-Lamp Troffer	62	0.1	RR	8760	543	1	De-Lamp to T8 1x4 1-Lamp 28w (STD)Bal. w/reflector	25	0.0	0.037
Off 1	2	T8 2x4 3-Lamp Troffer Bi-level	97	0.2	Lib	4368	847	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.088
RRW	2	T8 1x4 2-Lamp Wrap	62	0.1	RR	8760	1,086	2	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.074
RRW	1	2- 18 Watt CFL Plug in Double biac 2-pin	36	0.0	RR	8760	315	1	No Retrofit 2- 18 Watt CFL Plug in Double biac 2-pin	36	0.0	0.000
Off 2	2	T8 2x4 3-Lamp Troffer Bi-level	97	0.2	Lib	4368	847	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098

EAST COLUMBIA LIBRARY

Crafts	4	T8 2x4 3-Lamp Troffer Bi-level	97	0.4	Lib	4368	1,695	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.196
Closet	1	T8 2x4 3-Lamp Troffer Bi-level	97	0.1	M	1040	101	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.049
Off 3	2	T8 2x4 3-Lamp Troffer Bi-level	97	0.2	Lib	4368	847	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.096
Hall	9	T8 2x2 40 Watt 2-Lamp Bi-lamp Lamps	80	0.7	Lib	4368	3,145	9	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.3	0.459
Hall	2	Edge Lit Exit Sign	6	0.0	24	\$760	105	2	No Retro	6	0.0	0.000
Activities	6	T8 1x2 8-Lamp Wrap 4up/4down	214	1.3	Lib	4368	5,609	6	De-lamp to T8 4 lamp 28w (std)Bal. down only	93	0.8	0.714
Activities	3	T8 1x2 8-Lamp Wrap 4up/4down	214	0.6	24	\$760	5,624	3	De-lamp to T8 4 lamp 28w (std)Bal. down only	93	0.3	0.357
Activities	14	100W Quartz Lamp	100	1.4	Lib	4368	6,115	14	Remove Fixture and Patch, Paint and Repair	0	0.0	1.400
Activities	4	Edge Lit Exit Sign	6	0.0	24	\$760	210	4	No Retro	6	0.0	0.000
Activities	6	9 Watt CFL Flood	9	0.1	Lib	4368	236	6	Remove Fixture and Patch, Paint and Repair	0	0.0	0.054
Hall	3	9 Watt CFL Flood	9	0.0	24	\$760	237	3	No Retrofit 9 Watt CFL Flood	9	0.0	0.000
Hall	4	Edge Lit Exit Sign	6	0.0	24	\$760	210	4	No Retro	6	0.0	0.000
Kitchen	1	T8 2x4 3-Lamp Troffer	84	0.1	Lib	4368	367	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.036
Kitchen	1	T8 1x4 2-Lamp Troffer	62	0.1	Lib	4368	271	1	De-Lamp to T8 1x4 1-Lamp 28w (STD)Bal. w/reflector	23	0.0	0.037
Staff Lounge	5	T8 2x4 3-Lamp Troffer Bi-level	97	0.5	Lib	4368	2,118	5	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.245
Staff Lounge	3	Soda Vending Machine	400	1.2	24	\$760	10,512	3	Vending Mfr Soda Occ. Control unit	240	0.7	0.480
RRM	1	T12 1x4 2-Lamp Ind.Strip	78	0.1	RR	\$760	683	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	23	0.0	0.053
RRP	1	T12 1x4 2-Lamp Ind.Strip	78	0.1	RR	\$760	683	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	23	0.0	0.053
RRF	1	Edge Lit Exit Sign	6	0.0	24	\$760	53	1	No Retro	6	0.0	0.000
Ind. Study	2	100 Watt MH Can	122	0.2	Lib	4368	1,066	2	No Retrofit 100 Watt MH Can	122	0.2	0.000
Office	2	100 Watt MH Can	122	0.2	Lib	4368	1,066	2	No Retrofit 100 Watt MH Can	122	0.2	0.000
Production	6	T8 2x4 3-Lamp Troffer Bi-level	97	0.8	Lib	4368	3,390	6	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.4	0.392
Library Services	6	T8 2x4 3-Lamp Troffer Bi-level	97	0.8	Lib	4368	2,542	6	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.294

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CENTRAL LIBRARY LIGHTING SURVEY

EXISTING							PROPOSED				
Room Description	Quantity	Description	Watts	kW	Pre Burn Hours	kWh	Quantity	Description	Watts	kW	KW Saved
Basement Mech Room	23	T12 1x4 2-Lamp Strip	78	1.8	1040	1,866	23	Retro T8 1x4 1-lamp 28w (STD)Bal. w/reflector	25	0.6	1.219
Elevator	1	T12 1x4 2-Lamp Wrap	78	0.1	8760	683	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.053
Basement Open Cubicle	38	T8 2x4 3-Lamp Troffer	84	3.2	4212	13,445	38	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	1.8	1.368
back book Rm	3	T8 2x4 3-Lamp Troffer	84	0.3	4212	1,061	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.108
RR M/F	1	T12 1x4 2-Lamp Wrap	78	0.1	8760	683	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.053
Receiving	3	T8 1x4 2-Lamp Wrap	62	0.2	4212	783	3	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.111
RR M/F	3	T8 1x4 2-Lamp Wrap	62	0.2	8760	1,629	3	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.111
Closet	1	T8 2x4 3-Lamp Troffer	84	0.1	1040	87	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.036
Office	2	T8 2x4 3-Lamp Troffer	84	0.2	4212	708	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.072
Supply Closet	2	T8 2x4 3-Lamp Troffer	84	0.2	1040	175	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.072
Elevator 1 & 2	6	T12 1x3 1-Lamp Strip	46	0.3	8760	2,418	6	Retro T8 1x3 1-Lamp F25 (STD)Bal.	19	0.1	0.162
Stairs 1	6	T12 1x4 2-Lamp Wrap	78	0.5	8760	4,100	6	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.2	0.318
Stairs 1	2	2 Lamp 25W Inc. Exit	25	0.1	8760	438	2	New LED Exit Fixture	1.5	0.0	0.047
Stairs 1	3	T8 1x4 2-Lamp Wrap	62	0.2	8760	1,629	3	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.111
Office	9	T8 2x4 3-Lamp Troffer	84	0.8	4212	3,184	9	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.4	0.324
RRM	1	T8 2x4 3-Lamp Troffer	84	0.1	8760	736	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.036
RRF	1	T8 2x4 3-Lamp Troffer	84	0.1	8760	736	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.036
Break Rm	5	T8 2x4 3-Lamp Troffer	84	0.4	4212	1,769	5	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.180
Soda Mach	1	Soda Machine	400	0.4	8760	3,504	1	Vend Miscr - energy efficient sensor	240	0.2	0.160
Circulation	23	T8 2x4 3-Lamp Troffer	84	1.9	4212	8,138	23	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	1.1	0.828
Office 1	2	T8 2x4 3-Lamp Troffer	84	0.2	4212	708	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.072
Book Drop	1	T8 1x4 2-Lamp Wrap	62	0.1	4212	261	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037

CENTRAL LIBRARY LIGHTING SURVEY

Safe Room	1	T8 1x4 2-Lamp Wrap	62	0.1	4212	261	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037
Front Lobby Main	18	18 Watt CFL Dbiax Tube 2-Lamp Can	26	0.5	4212	1,971	18	No Retrofit 13 Watt CFL Dbiax Tube 2-Lamp Can	26	0.5	0.000
Front Lobby Main	2	2 Lamp 25W Inc. Exit	25	0.1	8760	438	2	New LED Exit Fixture	1.5	0.0	0.047
Vestibule	3	150 Watt HPS Wall Pack	188	0.6	4380	2,470	3	Retro 100 Watt Metal Halide	130	0.4	0.174
Soda Mach	3	Soda Machine	400	1.2	8760	10,512	3	Vend Miser - energy efficient sensor	240	0.7	0.480
RRM	3	T8 1x4 1-Lamp Strip	35	0.1	8760	920	3	Re-Lamp & Re-Ballast T8 1x4 1-Lamp Strip 28w (STD)Bal.	25	0.1	0.030
RRF	3	T8 1x4 1-Lamp Strip	35	0.1	8760	920	3	Re-Lamp & Re-Ballast T8 1x4 1-Lamp Strip 28w (STD)Bal.	25	0.1	0.030
Front Desk	19	18 Watt CFL PL Triple biax Tube 2-Lamp Can	36	0.7	4212	2,881	19	No Retrofit 18 Watt CFL PL Triple biax Tube 2-Lamp Can	36	0.7	0.000
Front Desk	84	32 Watt CFL PL Triple biax Tube 2-Lamp Can	64	5.4	4212	22,644	84	No Retrofit 32 Watt CFL PL Triple biax Tube 2-Lamp Can	64	5.4	0.000
1st floor	51	T8 1x4 2-Lamp Wrap	62	3.2	4212	13,318	51	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. Tandem Ballast 4 lamp	96	4.9	-1.734
1st floor	203	T8 1x4 2-Lamp Wrap	62	12.6	4212	53,012	203	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. Tandem Ballast	0	0.0	12.586
1st floor	95	T8 1x4 2-Lamp Wrap	62	5.9	4212	24,809	95	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	2.4	3.515
White Warfield Room	30	T8 1x4 2-Lamp Wrap	62	1.9	4212	7,834	30	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.8	1.110
Storage Closet	7	T8 2x4 3-Lamp Troffer	84	0.6	1040	612	7	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.3	0.252
Jan Closet	1	Inc. 100W	100	0.1	740	74	1	New CFL 28923 23W	23	0.0	0.077
Child Story Room	8	T8 1x4 2-Lamp Wrap	62	0.5	4212	2,089	8	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.2	0.296
Child Story Room closet	1	T8 1x4 2-Lamp Wrap	62	0.1	1040	64	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037
RR Child	1	T8 1x4 2-Lamp Wrap	62	0.1	8760	543	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037
RR Child	1	T8 1x4 2-Lamp Wrap	62	0.1	8760	543	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037
Lib Child Off 1	4	2x2 3-Lamp F17 T8 Troffer w/Elec	50	0.2	4212	842	4	Retro T8 2x2 2lamp F17 T8 Silver Reflector Kit	35	0.1	0.060
Lib Child Off 2	2	2x2 3-Lamp F17 T8 Troffer w/Elec	50	0.1	4212	421	2	Retro T8 2x2 2lamp F17 T8 Silver Reflector Kit	35	0.1	0.030
Air handler Closet	1	T8 1x4 2-Lamp Wrap	62	0.1	1040	64	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037
Library Top Floor	144	T8 1x4 2-Lamp Wrap	62	8.9	4212	37,605	144	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. Tandem Ballast 4 lamp	96	13.8	-4.896
Library Top Floor	578	T8 1x4 2-Lamp Wrap	62	35.7	4212	150,419	578	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. Tandem Ballast	0	0.0	35.712
Library Stairs	11	300W Quartz uplight	300	3.3	4212	13,900	11	Remove fixture, Patch and Repair	0	0.0	3.300

SUBMITTED BY: ESG

CENTRAL LIBRARY LIGHTING SURVEY

2nd Floor RRM	3	T8 1x4 2-Lamp Wrap	62	0.2	8760	1,629	3	De-Lamp T8 1x4 1-L Wrap 28w (STD) Bal. w/reflector kit	25	0.1	0.111
2nd Floor RRF	3	T8 1x4 2-Lamp Wrap	62	0.2	8760	1,629	3	De-Lamp T8 1x4 1-L Wrap 28w (STD) Bal. w/reflector kit	25	0.1	0.111
2F Closet	1	Inc. 100W	100	0.1	1040	104	1	New CFL 28923 23W	23	0.0	0.077
Library	30	175 Watt MH Wall Pack	210	6.3	4212	26,536	30	Remove fixture, Patch and Repair	0	0.0	6.300
Quiet Study 1	4	T8 1x4 2-Lamp Wrap	62	0.2	4212	1,045	4	De-Lamp T8 1x4 1-L Wrap 28w (STD) Bal. w/reflector kit	25	0.1	0.148
Quiet Study 2	4	T8 1x4 2-Lamp Wrap	62	0.2	4212	1,045	4	De-Lamp T8 1x4 1-L Wrap 28w (STD) Bal. w/reflector kit	25	0.1	0.148
Open Cubicle	32	T8 2x4 3-Lamp Troffer	84	2.7	4212	11,322	32	Retro T8 2x4 2-Lamp 28w reflector(STD) Bal.	48	1.5	1.152
Office 1	2	T8 2x4 3-Lamp Troffer	84	0.2	4212	708	2	Retro T8 2x4 2-Lamp 28w reflector(STD) Bal.	48	0.1	0.072
Back office open cubicle	10	T8 2x4 3-Lamp Troffer	84	0.8	4212	3,538	10	Retro T8 2x4 2-Lamp 28w reflector(STD) Bal.	48	0.5	0.360
Army Office 2	2	T8 2x4 3-Lamp Troffer	84	0.2	4212	708	2	Retro T8 2x4 2-Lamp 28w reflector(STD) Bal.	48	0.1	0.072
Computer Room	6	T8 2x4 3-Lamp Troffer	84	0.5	4212	2,123	6	Retro T8 2x4 2-Lamp 28w reflector(STD) Bal.	48	0.3	0.216
Stairwell 2	6	T12 1x4 2-Lamp Wrap	78	0.5	8760	4,100	6	De-Lamp T8 1x4 1-L Wrap 28w (STD) Bal. w/reflector kit	25	0.2	0.318
Stairwell 2	2	T8 1x4 2-Lamp Wrap	62	0.1	8760	1,086	2	De-Lamp T8 1x4 1-L Wrap 28w (STD) Bal. w/reflector kit	25	0.1	0.074
Stairwell 2	2	2 Lamp 25W Inc. Exit	25	0.1	8760	438	2	New LED Exit Fixture	1.5	0.0	0.047
maxine Waiting rm Pantry	1	T8 2x4 3-Lamp Troffer	84	0.1	4212	354	1	Retro T8 2x4 2-Lamp 28w reflector(STD) Bal.	48	0.0	0.036
Conf	30	T8 1x4 2-Lamp Wrap	62	1.9	4212	7,834	30	De-Lamp T8 1x4 1-L Wrap 28w (STD) Bal. w/reflector kit	25	0.8	1.110
Staff Room	2	T8 1x4 2-Lamp Wrap	62	0.1	4212	522	2	De-Lamp T8 1x4 1-L Wrap 28w (STD) Bal. w/reflector kit	25	0.1	0.074
Back Office	1	150 Watt MH Wall Pack	160	0.2	4212	674	1	Retro 100 Watt Pulse Start MH kit	122	0.1	0.038
outside	3	150 Watt MH Wall Pack	160	0.5	4380	2,102	3	Retro 100 Watt Pulse Start MH kit	122	0.4	0.114

SUBMITTED BY: ESS

CENTRAL LIBRARY LIGHTING SURVEY

outside	3	400 Watt MH Fixture	455	1.4	4380	5,979	3	Retro 320 Watt Pulse Start M.H.	365	1.1	0.270
outside	3	250 Watt HPS Wall Pack	300	0.9	4380	3,942	3	Retro 200 Watt Pulse Start MH kit	233	0.7	0.201
outside	10	250 Watt HPS Shoe Box Pole	300	3.0	4380	13,140	10	New 4 Light Bar LED fixture	104	1.0	1.960
outside	10	250 Watt HPS Shoe Box Pole	300	3.0	4380	13,140	10	New 4 Light Bar LED fixture	104	1.0	1.960
1,579			501,605			1,579			71.7		

Total Annual Savings

RECREATION AND PARKS HEADQUARTERS LIGHTING SURVEY

PROPOSED

Room Description	Quantity	Description	Watts	KW	Burn Hour Code	Pre Burn Hours	kWh	Quantity	Description	Watts	KW	KW Saved
Conf Rm	9	T8 2x4 4-Lamp Trof Bt Level	110	1.0	Admin	5486	5,431	9	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.4	0.558
Conf Rm	3	T8 2x4 4-Lamp Trof Bt Level	110	0.3	Admin	5486	1,810	3	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.1	0.186
Conf Rm	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	NEW LED Exit Fixture	1.5	0.0	0.009
Conf Rm	6	Inc. 100W	100	0.9	Admin	5486	3,292	6	NEW 23 WATT BR40 DIMMABLE 27K	23	0.1	0.462
Elec Rm	4	T8 1x4 2-Lamp Ind Strip	62	0.2	M	1040	258	4	Delamp T8 '1x4 1-Lamp Strip 28w (STD)Bul, wirereflector	25	0.1	0.148
Hall	24	T8 2x4 2-Lamp troffer	62	1.5	Admin	5486	8,183	24	2x4-Lamp & Re-Balast T8 '2x4 2-Lamp Troffer 28w (STD)Bul	48	1.2	0.336
Hall	5	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	263	5	NEW LED Exit Fixture	1.5	0.0	0.023
Conf Rm 2	9	T8 2x4 4-Lamp Trof Bt Level	110	1.0	Admin	5486	5,431	9	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.4	0.558
Conf Rm 2	3	T8 2x4 4-Lamp Trof Bt Level	110	0.3	24	8760	2,891	3	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.1	0.186
Conf Rm 2	6	Inc. 100W	100	0.9	Admin	5486	3,292	6	NEW 23 WATT BR40 DIMMABLE 27K	23	0.1	0.462
Conf Rm 2	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	NEW LED Exit Fixture	1.5	0.0	0.009
Tele C	2	T8 1x4 2-Lamp Ind Strip	62	0.1	M	1040	129	2	Delamp T8 '1x4 1-Lamp Strip 28w (STD)Bul, wirereflector	25	0.1	0.074
Kitchen	8	T8 2x4 4-Lamp Trof Bt Level	110	1.0	Admin	5486	5,431	8	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.4	0.558
Kitchen	3	T8 2x4 4-Lamp Trof Bt Level	110	0.3	24	8760	2,891	3	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.1	0.186
Kitchen	6	Inc. 100W	100	0.9	Admin	5486	3,292	6	NEW 23 WATT BR40 DIMMABLE 27K	23	0.1	0.462
Kitchen	1	400 Watt Soda Machine	400	0.4	24	8760	3,504	1	Vend Meter Control Unit for Vending Machines	254	0.3	0.146
Warehouse	1	T12 1x8 2-Lamp Ind Strip	175	0.2	W	2470	432	1	Retro T8 1x8 2-Lamp 28W 4ft K1 (Std)Bul	48	0.0	0.127
Warehouse	18	400 Watt MH HID fixture	455	5.6	W	2470	21,353	19	NEW T8 2x4 6-Lamp HO w/ Refl-Cage	358	6.8	1.881
Warehouse	14	400 Watt MH HID fixture	455	6.4	24	8760	55,801	14	NEW T8 2x4 6-Lamp HO w/ Refl-Cage	358	5.0	1.388
Warehouse	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	NEW LED Exit Fixture	1.5	0.0	0.009
Warehouse Office	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.1	0.116
Storage Rm	6	T8 1x4 2-Lamp Ind Strip	62	0.5	M	1040	516	8	Delamp T8 '1x4 1-Lamp Strip 28w (STD)Bul, wirereflector	25	0.2	0.286
Sprinkler Rm	2	T8 1x4 2-Lamp Ind Strip	62	0.1	M	1040	129	2	Delamp T8 '1x4 1-Lamp Strip 28w (STD)Bul, wirereflector	25	0.1	0.074
Admin Wing												
Copy Room	2	T8 1x4 2-Lamp Ind Strip	62	0.1	Admin	5486	680	2	Delamp T8 '1x4 1-Lamp Strip 28w (STD)Bul, wirereflector	25	0.1	0.074
Office 1	2	T8 2x4 3-Lamp Troffer	84	0.2	Admin	5486	922	2	Delamp T8 '2x4 2-Lamp Troffer 28w (STD)Bul, wirereflector	48	0.1	0.072
Office 2	2	T8 2x4 3-Lamp Troffer	84	0.2	Admin	5486	922	2	Delamp T8 '2x4 2-Lamp Troffer 28w (STD)Bul, wirereflector	48	0.1	0.072
Office 3	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.1	0.116
Office 4	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.1	0.116
Office 5	2	T8 2x4 2-Lamp troffer	62	0.1	Admin	5486	680	2	2x4-Lamp & Re-Balast T8 '2x4 2-Lamp Troffer 28w (STD)Bul	48	0.1	0.028
Office 6	2	T8 2x4 2-Lamp troffer	62	0.1	Admin	5486	680	2	2x4-Lamp & Re-Balast T8 '2x4 2-Lamp Troffer 28w (STD)Bul	48	0.1	0.028
Office 7	2	T8 2x4 2-Lamp troffer	62	0.1	Admin	5486	680	2	2x4-Lamp & Re-Balast T8 '2x4 2-Lamp Troffer 28w (STD)Bul	48	0.1	0.028
Computer Group	8	T8 2x4 4-Lamp Troffer	106	0.6	Admin	5486	3,489	8	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.3	0.348
FRW	2	T8 2x4 3-Lamp Troffer	84	0.2	Admin	5486	922	2	Delamp T8 '2x4 2-Lamp Troffer 28w (STD)Bul, wirereflector	48	0.1	0.072
Front Lobby	16	100 Watt MH wall Pack	122	2.0	Admin	5486	10,709	0	Remove fixture, patch, paint and repair	0	0.0	1.952
Front Lobby	22	T8 2x2 2-Lamp U-6 Trof.	62	1.4	Admin	5486	7,483	22	Retro T8 '2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.8	0.726
Front Lobby	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	NEW LED Exit Fixture	1.5	0.0	0.009
Registration Desk	12	T8 2x4 2-Lamp troffer	62	0.7	Admin	5486	4,082	12	2x4-Lamp & Re-Balast T8 '2x4 2-Lamp Troffer 28w (STD)Bul	48	0.6	0.188
Office	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 '2x4 2-Lamp 28w (STD)Bul, wirereflector	48	0.1	0.116

RECREATION AND PARKS HEADQUARTERS LIGHTING SURVEY

Registration Desk	6	Inc. 80w indoor screw in	90	0.5	Admin	5486	2,982	6	NEW 23 WATT R40 Flood 27K	23	0.1	0.402
Admin Cubicle	6	T8 2x4 4-Lamp Troffer	106	0.5	Admin	5486	3,489	6	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.3	0.348
Admin Cubicle	2	T8 2x4 2-Lamp U-6 Trof.	82	0.1	Admin	5486	680	2	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	20	0.1	0.068
RRM	2	T8 2x4 3-Lamp Troffer	84	0.2	Admin	5486	922	2	Delamp T8 2x4 2-Lamp Troffer 28w (STD)Bal. wirereflector	48	0.1	0.072
Office 1	2	T8 2x4 2-Lamp troffer	82	0.1	Admin	5486	680	2	Delamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.028
Office 2	2	T8 2x4 2-Lamp troffer	82	0.1	Admin	5486	680	2	Delamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.028
Office 3	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
Office 4	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
Office 5	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
Elevator	2	T12 1x3 2-Lamp Strip	78	0.2	24	8780	1,367	2	Retro T8 1x3 2-Lamp F25 (U)Bal.	43	0.1	0.070
Second Floor												
Open Cubicle	4	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	210	4	NEW LED Exit Fixture	1.5	0.0	0.018
Open Cubicle	18	T8 2x2 2-Lamp U-6 Trof.	82	1.1	Admin	5486	6,122	18	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	28	0.5	0.584
Stairs 1	8	T8 2x2 2-Lamp U-6 Trof.	82	0.5	Admin	5486	2,721	8	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	28	0.2	0.284
Director Office	6	T8 2x2 2-Lamp U-6 Trof.	82	0.4	Admin	5486	2,041	6	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	28	0.2	0.198
Lawyer's Office	4	T8 2x2 2-Lamp U-6 Trof.	82	0.2	Admin	5486	1,361	4	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	28	0.1	0.132
Jean Byrd	6	T8 2x2 2-Lamp U-6 Trof.	82	0.4	Admin	5486	2,041	6	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	28	0.2	0.198
RRM	2	T8 2x4 2-Lamp Troffer	84	0.2	RR	8780	1,472	2	Delamp T8 2x4 2-Lamp Troffer 28w (STD)Bal. wirereflector	48	0.1	0.072
RRW	1	T8 1x4 2-Lamp Strip	62	0.1	RR	8780	543	1	Delamp T8 1x4 1-Lamp Strip 28w (STD)Bal. wirereflector	25	0.0	0.037
RRW	2	T8 2x4 3-Lamp Troffer	84	0.2	RR	8780	1,472	2	Delamp T8 2x4 2-Lamp Troffer 28w (STD)Bal. wirereflector	48	0.1	0.072
P Open Cubicle	34	T8 2x4 3-Lamp Troffer	84	2.9	Admin	5486	15,688	34	Delamp T8 1x4 1-Lamp Strip 28w (STD)Bal. wirereflector	25	0.0	0.037
P Open Cubicle	4	T8 2x2 2-Lamp U-6 Trof.	82	0.2	Admin	5486	1,361	4	Delamp T8 2x4 2-Lamp Troffer 28w (STD)Bal. wirereflector	48	1.8	1.224
P Open Cubicle	5	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	293	5	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	28	0.1	0.132
204 Office Men W	36	100 Watt MH wall Pack	122	4.4	Admin	5486	24,093	0	Remove fixture, patch, paint and repair	0	0.0	4.382
202 Office	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
Cindy Office	3	T8 2x4 4-Lamp Troffer	106	0.3	Admin	5486	1,745	3	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.174
Office 218	3	T8 2x4 3-Lamp Troffer	84	0.3	Admin	5486	1,362	3	Delamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.108
Office 217	2	T8 2x4 2-Lamp Troffer	82	0.1	Admin	5486	680	2	Delamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.028
Teresa Office	1	T8 2x4 4-Lamp Troffer	106	0.1	Admin	5486	682	1	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.0	0.058
Parks Planning Cus	12	T8 2x4 4-Lamp Troffer	106	1.3	Admin	5486	6,978	12	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.6	0.698
Road Office	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
Clark Office	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
220 Storage	4	T8 1x4 2-Lamp Ind. Strip	62	0.2	Admin	5486	1,361	4	Delamp T8 1x4 1-Lamp Strip 28w (STD)Bal. wirereflector	25	0.1	0.148
Hall	9	T8 2x4 2-Lamp troffer	62	0.6	Admin	5486	3,061	9	Delamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.128
Office 1	1	T8 2x4 4-Lamp Troffer	106	0.1	Admin	5486	582	1	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.0	0.058
Office 2	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
225 3 Office	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
228 4 Office	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
File Room	12	T8 1x4 2-Lamp Ind. Strip	62	0.7	Admin	5486	4,062	12	Delamp T8 1x4 1-Lamp Strip 28w (STD)Bal. wirereflector	25	0.3	0.444
Library	8	T8 2x4 4-Lamp Troffer	106	0.8	Admin	5486	3,488	8	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.3	0.348
Library	5	Inc. 60w	60	0.3	Admin	5486	1,846	5	NEW 15 WATT BR30 DIMMABLE 27K	15	0.1	0.225
231	1	T8 2x4 2-Lamp troffer	82	0.1	Admin	5486	340	1	Delamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.014
232	1	T8 2x4 4-Lamp Troffer	106	0.1	Admin	5486	582	1	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.0	0.058
229	4	T8 2x4 4-Lamp Troffer	106	0.4	Admin	5486	2,326	4	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.2	0.232
233	1	T8 2x4 4-Lamp Troffer	106	0.1	Admin	5486	582	1	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.0	0.058
233	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
230 A	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116
230 B	1	T8 2x4 4-Lamp Troffer	106	0.1	Admin	5486	582	1	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.0	0.058
230 C	2	T8 2x4 4-Lamp Troffer	106	0.2	Admin	5486	1,163	2	Delamp T8 2x4 2-Lamp 28w (STD)Bal. wirereflector	48	0.1	0.116

RECREATION AND PARKS HEADQUARTERS LIGHTING SURVEY

Elevator Shaft	1	T8 1x4 2-Lamp Ind.Strip	62	0.1	24	8780	643	1	Delamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037
Stairs 1	3	T8 1x4 2-Lamp Wrap	62	0.2	24	8780	1,629	3	Delamp T8 1'x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.111
Stairs 2	3	T8 1x4 2-Lamp Wrap	62	0.2	24	8780	1,629	3	Delamp T8 1'x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.111
Central Services Hall	9	T8 2x4 2-Lamp troffer	62	0.6	Admin	5486	3,061	9	Re-Lamp & Re-Ballast T8 2'x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.126
Central Services Hall	4	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	210	4	NEW LED Exit Fixture	1.5	0.0	0.018
Central Services Hall	2	400 Watt Soda Machine	400	0.8	24	8780	7,006	2	Vend Meter Control Unit for Vending Machines	254	0.5	0.292
Open Cubicle	17	T8 2x4 4-Lamp Troffer	106	1.8	Admin	5486	9,888	17	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.8	0.868
Jean Office	3	T8 2x4 4-Lamp Troffer	106	0.3	Admin	5486	1,745	3	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
Closet	1	T8 2x4 4-Lamp Troffer	106	0.1	M	1040	110	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058
Admin Central Fleet	3	T8 2x4 4-Lamp Troffer	106	0.3	Admin	5486	1,745	3	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
Office	3	T8 2x4 4-Lamp Troffer	106	0.3	Admin	5486	1,745	3	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174
Mech Shop	37	T8 1x8 4-Lamp Vapor Tight	141	5.2	B	2730	14,242	37	Lamp & Re-Ballast T8 1x8 4-Lamp Vapor Tight 28w (STD)	95	3.5	1.702
Mech Shop	8	T8 1x8 4-Lamp Vapor Tight	141	1.1	24	8780	9,881	8	Lamp & Re-Ballast T8 1x8 4-Lamp Vapor Tight 28w (STD)	95	0.8	0.368
Mech Shop	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	105	2	NEW LED Exit Fixture	1.5	0.0	0.009
Mech Shop	1	LED exit sign	5	0.0	24	8780	44	1	No Retrofit	5	0.0	0.000
Mech Shop	12	T8 1x8 4-Lamp Vapor Tight	156	1.9	B	2730	5,111	12	remove fixture from operation	0	0.0	1.872
Mech Shop	14	T8 1x4 2-Lamp Vapor Tight	78	1.1	B	2730	2,981	14	remove fixture from operation	0	0.0	1.092
Bay 2	14	T8 1x4 2-Lamp Vapor Tight	78	1.1	B	2730	2,981	14	Re-Lamp & Re-Ballast T8 1'x4 2-Lamp VT 28w (STD)Bal.	48	0.7	0.420
Bay 2	8	T8 1x4 2-Lamp Vapor Tight	78	0.6	24	8780	5,468	8	Re-Lamp & Re-Ballast T8 1'x4 2-Lamp VT 28w (STD)Bal.	48	0.4	0.240
Bay 2	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	105	2	NEW LED Exit Fixture	1.5	0.0	0.009
Bay 3	4	T8 1x8 4-Lamp Vapor Tight	141	0.6	B	2730	1,540	4	Lamp & Re-Ballast T8 1x8 4-Lamp Vapor Tight 28w (STD)	95	0.4	0.184
Bay 3	6	T12 1x4 2-Lamp Vapor Tight	92	0.6	B	2730	1,507	6	Retro T8 1'x4 2-Lamp 28w (STD)Bal.	48	0.3	0.254
Bay 3	4	JJ Inc. 60w	60	0.2	B	2730	856	4	NEW CFL 28923 15W	15	0.1	0.180
Bay 3	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	53	1	NEW LED Exit Fixture	1.5	0.0	0.006
Break Room	4	T8 1x4 2-Lamp Vapor Tight	78	0.3	B	2730	852	4	New Vapor Tight 1x4 2 Lamp T8 28w (STD)Bal.	48	0.2	0.120
Parts Storage	2	T8 1x4 2-Lamp Ind.Strip	62	0.1	B	2730	339	2	Delamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.074
Back Warehouse hall	1	T8 1x4 2-Lamp Ind.Strip	62	0.1	B	2730	169	1	Delamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037
Back Warehouse hall	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	53	1	NEW LED Exit Fixture	1.5	0.0	0.006
Wood Shop	5	T8 1x8 4-Lamp Vapor Tight	141	0.7	B	2730	1,925	5	Lamp & Re-Ballast T8 1x8 4-Lamp Vapor Tight 28w (STD)	95	0.5	0.230
Wood Shop	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	105	2	NEW LED Exit Fixture	1.5	0.0	0.009
Hort Shop	6	T12 1x8 4-Lamp Strip	156	0.9	B	2730	2,555	6	Retro T8 1'x8 4-Lamp 32w (STD) Bal.	106	0.6	0.300
Tim Overstreet	1	T12 1x4 2-Lamp Strip	78	0.1	B	2730	213	1	Delamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053
Tim Overstreet	2	T12 2x4 4-Lamp Troffer	156	0.3	B	2730	852	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.218
Tim Overstreet	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	53	1	NEW LED Exit Fixture	1.5	0.0	0.005
Mow Shop	17	T12 1x8 4-Lamp Strip	156	2.7	B	2730	7,240	17	Retro T8 1'x8 4-Lamp 32w (STD) Bal.	106	1.8	0.850
Joann Frush	1	T12 1x4 2-Lamp Strip	78	0.1	B	2730	213	1	Delamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053
Joann Frush	2	T12 2x4 4-Lamp Troffer	156	0.3	B	2730	852	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.218
Joann Frush	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	53	1	NEW LED Exit Fixture	1.5	0.0	0.005
Warehouse Shop	6	T12 1x8 4-Lamp Strip	156	0.9	C	1040	973	6	Retro T8 1'x8 4-Lamp 32w (STD) Bal.	106	0.6	0.300
Warehouse Shop	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	53	1	NEW LED Exit Fixture	1.5	0.0	0.005
Warehouse Shop	1	T12 2x4 4-Lamp Troffer	156	0.2	B	2730	426	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.108
Const Shop	6	T12 1x8 4-Lamp Strip	156	0.9	B	2730	2,555	6	Retro T8 1'x8 4-Lamp 32w (STD) Bal.	106	0.6	0.300
Const Shop	1	2 Lamp 6w Plug in CFL kit	6	0.0	24	8780	53	1	NEW LED Exit Fixture	1.5	0.0	0.005
Const Shop	1	T12 2x4 4-Lamp Troffer	156	0.2	B	2730	426	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.108
Outside	8	100 Watt MH Wall Pack	122	1.0	OD	4380	4,275	8	NEW 23w wallpack w/photocell	23	0.2	0.792
Storage Shed	7	400 Watt MH HID fixture	455	3.2	C	1040	3,312	7	NEW T8 2x4 6Lamp HO w/ Ref&escape	356	2.5	0.693
Storage Shed	7	100 Watt MH Wall Pack	122	0.9	C	1040	888	7	NEW 23w wallpack w/photocell	23	0.2	0.693
Pump Station	4	400 Watt MH Fixture	455	1.8	OD	4380	7,972	4	Retro 320 Watt Pulse Start M.H.	365	1.5	0.380
Warehouse Storage	15	T12 1x8 2-Lamp Ind.Strip	175	2.6	C	1040	2,730	15	Retro T8 1x8 2-Lamp 28W 4R Kit (Std)Bal.	48	0.7	1.905
Bldg C	2	400 Watt MH HID fixture	455	0.9	C	1040	946	2	NEW T8 2x4 6Lamp HO w/ Ref&escape	356	0.7	0.188
Bldg C	1	LED exit sign	5	0.0	24	8780	44	1	No Retrofit	5	0.0	0.000

RECREATION AND PARKS HEADQUARTERS LIGHTING SURVEY

	15	T12 1x8 2-Lamp Ind Strip	175	2.6	C	1040	2,730	15	Retro	T8 1x8 2-Lamp 26W 4ft Kit (Std) Bal.	48	0.7	1.905
2nd Floor	3	LED exit sign	5	0.0	24	8760	131	3		No Retrofit	5	0.0	0.000
2nd Floor	5	250 Watt MH Fixture	288	1.4	OD	4380	6,307	6	Retro	200 Watt Pulse Start MH kit	232	1.2	0.260
Outside	3	100 Watt MH Wall Pack	122	0.4	OD	4380	1,603	3		NEW 23w wallpack w/photocell	23	0.1	0.297
Outside Main Bldg	22	250 Watt HPS Fixture	300	6.6	OD	4380	28,908	22	Retro	200 Watt Pulse Start MH kit	232	5.1	1.496
Outside Main Bldg	2	1-80W, Halogen Flood - outdoor	80	0.2	OD	4380	788	2		NEW Par 38 23W CFL Lamp	23	0.0	0.134
Outside Main Bldg	6	175 Watt MH Wall Pack	210	1.3	OD	4380	5,519	6	Retro	125 Watt Pulse Start MH kit	150	0.9	0.360
Front Glass Bldg	3	175 Watt MH Wall Pack	210	0.6	OD	4380	2,759	3		No Retrofit	210	0.6	0.000
Pole Lights	4	400 Watt HPS Fixture	465	1.9	OD	4380	8,147	4	Retro	320 Watt Pulse Start M.H.	365	1.5	0.400

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DORSEY BUILDING LIGHTING SURVEY

								PROPOSED				
Room Description	Quantity	Description	Watts	KW	Burn Hour Code	Pre Burn Hours	kWh	Quantity	Description	Watts	KW	KW Saved
MAIN LOBBY SMALL HALL	1	T8 1x4 2-Lamp Wrap	62	0.1	O	3120	193	1	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.0	0.037
MAIN LOBBY	6	T12 1x2 2-Lamp F20 Strip	50	0.3	O	3120	936	6	Retro T8 1x2 2-Lamp (std)Bal.	29	0.2	0.126
MAIN LOBBY	10	T8 1x4 2-Lamp Strip	62	0.6	O	3120	1,934	10	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.3	0.370
MAIN LOBBY	7	26 Watt CFL PL Double Tube Bias	26	0.2	O	3120	568	7	No Retrofit 26 Watt CFL PL Double Tube Bias	26	0.2	0.000
MAIN LOBBY	4	T8 2x2 2-Lamp F17 T8 Troffer w/Elec. Bal	35	0.1	O	3120	437	4	No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal w/reflector kit	35	0.1	0.000
MAIN LOBBY	4	T8 1x4 2-Lamp Strip	62	0.2	O	3120	774	4	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.146
VESTIBULE	2	26 Watt CFL PL Double Tube Bias	26	0.1	OD	4380	228	2	No Retrofit 26 Watt CFL PL Double Tube Bias	26	0.1	0.000
RR-PRIVATE	1	T8 1x4 2-Lamp Strip	62	0.1	RR	8760	543	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037
B208-B400-B800 OPEN	59	T8 2x4 3-Lamp Troffer	84	5.0	O	3120	15,463	59	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	2.8	2.124
EMERGENCY LIGHTS	2	T8 2x4 3-Lamp Troffer	84	0.2	24	8760	1,472	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
RECEPTION	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
ENTRANCE	2	T8 2x4 3-Lamp Troffer	84	0.2	24	8760	1,472	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
BREAK ROOM	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
B200 OPEN OFFICE	1	T8 2x2 2-Lamp F17 T8 Troffer w/Elec. Bal	35	0.0	24	8760	307	1	No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal w/reflector kit	35	0.0	0.000
OFFICE 1	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 1	1	T8 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	193	1	Retro T8 2x2 2Lamp F17 T8 w/Reflector Kit	29	0.0	0.033
FILE ROOM	4	T8 2x4 3-Lamp Troffer	84	0.3	O	3120	1,048	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.144
OFFICE 2	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 3	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
CONF ROOM	6	T8 2x4 3-Lamp Troffer	84	0.5	O	3120	1,572	6	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.216
OFFICE 4	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 5	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
SMALL HALL	1	T8 2x2 4-Lamp F17 T8 Troffer w/Elec. Bal.	60	0.1	24	8760	526	1	Retro T8 2x2 2Lamp F17 T8 w/Reflector Kit	29	0.0	0.031
OFFICE 6	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE B800	15	T8 2x4 3-Lamp Troffer	84	1.3	O	3120	3,931	15	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.7	0.540
OFFICE B800	2	T8 2x4 3-Lamp Troffer	84	0.2	24	8760	1,472	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 7	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 8	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 9	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 10	3	T8 2x4 3-Lamp Troffer	84	0.3	O	3120	786	3	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.108
CLOSET	1	T8 2x4 3-Lamp Troffer	84	0.1	M	1040	87	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.038
CLERK'S OFFICE B-0100	24	T8 2x4 3-Lamp Troffer	84	2.0	O	3120	6,290	24	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	1.2	0.864
OPEN OFFICE SPACE	2	T8 2x4 3-Lamp Troffer	84	0.2	24	8760	1,472	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 1	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 2 CORNER	4	T8 2x4 3-Lamp Troffer	84	0.3	O	3120	1,048	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.144
OFFICE 3	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
B0100 FILE STORAGE	7	T8 2x4 3-Lamp Troffer	84	0.6	O	3120	1,835	7	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.252
OPEN OFFICE SPACE	15	T8 2x4 3-Lamp Troffer	84	1.3	O	3120	3,931	15	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.7	0.540
OPEN OFFICE SPACE	3	T8 2x4 3-Lamp Troffer	84	0.3	24	8760	2,208	3	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.108
OPEN OFFICE SPACE	2	Old Style LED exit sign	12	0.0	24	8760	210	2	New LED Exit Fixture	3	0.0	0.018
Complete Building	15	Old Style LED exit sign	12	0.2	24	8760	1,577	15	Remove Unnecessary Exit Sign	0	0.0	0.180
SERVER ROOM	19	T8 2x4 3-Lamp Troffer	84	1.6	O	3120	4,898	19	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.9	0.684
B100A OFFICE	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072
B100A OFFICE	1	T8 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	193	1	Retro T8 2x2 2Lamp F17 T8 w/Reflector Kit	29	0.0	0.033
OFFICE 1	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072

	ELEC CLOSET	1	T8 2x4 3-Lamp Troffer	S4	0-1	M	1040	87	1	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.0	0.098
B-6000 POLICE COMPND		68	T8 2x4 3-Lamp Troffer	S4	5.7	O	3120	17,821	68	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	3.3	2.448
B-6000 POLICE COMPND		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	8760	1,472	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
B-1000 OFFICE 1		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
TRAINING ROOM		12	T8 2x4 3-Lamp Troffer	S4	1.0	O	3120	3,145	12	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.8	0.432
OFFICE IN TRAINING		6	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	6	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
TRAINING ROOM		5	Jns 60w Pwr 30	G5	0.4	O	3120	1,217	5	New CFL 15w BR 30 Flood	15	0.1	0.300
B-1000 B-1200		68	T8 2x4 3-Lamp Troffer	S4	5.8	O	3120	18,064	68	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	3.3	2.484
OPEN OFFICE SPACE		1	T8 2x4 3-Lamp Troffer	S4	0.1	O	8760	738	1	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.0	0.036
OFFICE 2		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 3		1	T8 2x4 3-Lamp Troffer	S4	0.1	O	3120	262	1	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.0	0.036
OFFICE 4		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 5		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 6		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 7		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
B-5500 OPEN OFFICE		9	T8 2x4 3-Lamp Troffer	S4	0.8	O	3120	2,358	9	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.4	0.324
B-5500 OPEN OFFICE		1	T8 2x4 3-Lamp Troffer	S4	0.1	O	8760	738	1	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.0	0.036
B-5500 OPEN OFFICE		1	T8 2x4 4-Lamp F17 T8 Troffer w/Elect. Bal.	G0	0.1	O	3120	187	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.031
OFFICE 1		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
OFFICE 2		1	T8 2x4 3-Lamp Troffer	S4	0.1	O	3120	262	1	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.0	0.036
OFFICE 2		1	T8 2x4 4-Lamp F17 T8 Troffer w/Elect. Bal.	G0	0.1	O	3120	187	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.031
B-640 HALL		1	T8 2x2 4-Lamp F17 T8 Troffer w/Elect. Bal.	G0	0.1	O	3120	187	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.031
B-550-C OFFICE		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
B-550-B OFFICE		2	T8 2x4 3-Lamp Troffer	S4	0.2	O	3120	524	2	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.1	0.072
B-550-B OFFICE		1	T8 2x4 3-Lamp Troffer	S4	0.1	O	3120	262	1	Do-Lamp to T8 2x4 2L Troffer 25w (STD)Bal. w/reflector	48	0.0	0.036
B-550-B OFFICE		1	T8 2x4 4-Lamp F17 T8 Troffer w/Elect. Bal.	G0	0.1	O	3120	187	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.031
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DORSEY BUILDING LIGHTING SURVEY

NOORAL H. OFFICE	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
BOB DIAZ OFFICE	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
FILE ROOM	3	T8 2x4 3-Lamp Troffer	84	0.3	0	3120	788	3 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.108
OFFICE 1	4	T8 2x4 3-Lamp Troffer	84	0.3	0	3120	1,048	4 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.2	0.144
OFFICE 2	4	T8 2x4 3-Lamp Troffer	84	0.3	0	3120	1,048	4 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.2	0.144
CONF ROOM 1	4	T8 2x4 3-Lamp Troffer	84	0.3	0	3120	1,048	4 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.2	0.144
COPY ROOM	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	624	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
MEDIA CENTER STORAGE	10	26 Watt CFL PL Double Tube Bias	26	0.3	0	3120	811	10 No Retrofit 26 Watt CFL PL Double Tube Bias	26	0.3	0.000
MEDIA CENTER STORAGE	1	26 Watt CFL PL Double Tube Bias	26	0.0	24	8760	228	1 No Retrofit 26 Watt CFL PL Double Tube Bias	26	0.0	0.000
STUDIO	8	T8 2x2 2-Lamp U-6 Trof	35	0.3	0	3120	874	8 No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (60) Bal whreflector kit	35	0.3	0.000
STUDIO HALL	4	T8 2x2 2-Lamp U-6 Trof	62	0.2	0	3120	774	4 Retro T8 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.132
B-900 OFFICE	10	T8 2x2 2-Lamp U-6 Trof	62	0.3	0	3120	1,934	10 Retro T8 2x2 2-Lamp F17 T8 whreflector kit	29	0.3	0.330
CONTROL ROOM	8	T8 2x2 2-Lamp U-6 Trof	50	0.3	0	3120	838	8 New CFL R20 FLOOD T8W	7	0.0	0.258
CONTROL ROOM	7	150W halogen uplight	150	1.1	0	3120	3,270	7 No Retrofit	150	1.1	0.000
COMPUTER ROOM	4	T8 2x2 2-Lamp U-6 Trof	62	0.2	0	3120	774	4 Retro T8 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.132
COMPUTER ROOM	1	T8 1x4 2-Lamp Wrap	62	0.1	0	3120	183	1 De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal, whreflector	23	0.0	0.037
TAPE STORAGE	2	T8 2x2 2-Lamp U-6 Trof	62	0.1	0	3120	387	2 Retro T8 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.068
HALLWAY	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
BACK OFFICE	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	580	2 Retro T8 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.098
BACK OFFICE	3	T8 2x2 2-Lamp U-6 Trof	62	0.2	0	3120	680	3 De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal, whreflector	23	0.1	0.111
COMPUTER ROOM	3	T8 1x4 2-Lamp Strip	62	0.2	0	3120	788	3 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.108
B-1100 RECEPTION	3	T8 2x4 3-Lamp Troffer	84	0.3	0	3120	788	3 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.108
OFFICE 1	3	T8 2x4 3-Lamp Troffer	84	0.3	0	3120	1,048	4 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.2	0.144
OFFICE 2	4	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
OFFICE 3	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
B-1150 OFFICE 1	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
B-1150 OFFICE 2	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
LUNCH ROOM	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
OFFICE 3	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, whreflector	48	0.1	0.072
C-2535-2525	13	T8 2x4 4-Lamp Troffer	106	1.4	0	3120	4,209	13 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.8	0.754
OFFICE 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.116
OFFICE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.116
OFFICE 3	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.116
C-2510 OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.116
C-2515 OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.116
OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.2	0.232
OFFICE LOBBY	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.116
OFFICE LOBBY	2	T8 2x4 3-Lamp Wrap	84	0.2	0	3120	524	2 De-Lamp & Re-Ballast T8 2x4 2-Lamp Wrap 28w (STD)Bal, whreflector kit	48	0.1	0.072
SMALL HALL	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.174
OFFICE 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.116
OFFICE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.116
CONF ROOM 2550	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.2	0.232
C-2520 OFFICE	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,869	12 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.6	0.686
CONF ROOM 2500	8	T8 2x4 4-Lamp Troffer	106	0.8	0	3120	2,448	8 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.4	0.404
C-2530 OFFICE	2	T8 2x2 2-Lamp U-6 Trof	62	0.1	0	3120	387	2 Retro T8 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.068
C-2530 OFFICE	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3120	351	1 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.0	0.058
OFFICE 2	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.174
OFFICE 3	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.174
OFFICE 4	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.174
OFFICE 4	1	T8 2x2 2-Lamp U-6 Trof	62	0.1	0	3120	183	1 Retro T8 2x2 2-Lamp F17 T8 whreflector kit	29	0.0	0.033
OFFICE 5	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.1	0.174
C-25445 OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.2	0.232
C-2545A OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.2	0.232
C-2450	16	T8 2x4 4-Lamp Troffer	106	1.7	0	3120	5,292	16 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.8	0.828
KITCHEN	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3120	331	1 deLamp T8 2x4 2-Lamp 28w (STD)Bal, whreflector kit	48	0.0	0.098

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OFFICE 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
OFFICE 2	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.174
OFFICE 3	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
OFFICE 4	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.174
OFFICE 5	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
Storage 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
Storage 2	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.174
Storage 2	1	Old Style LED exit sign	12	0.0	24	8760	105	1 New LED Exit Fixture	3	0.0	0.009
RR-W	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
RR-W	3	T8 2x4 4-Lamp Troffer	106	0.3	RR	8760	2,786	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.174
RR-W	3	T8 2x4 4-Lamp Troffer	62	0.2	RR	8760	1,629	3 Del-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. whitefluor	25	0.1	0.111
JAN CL	2	T8 2x4 4-Lamp Troffer	106	0.2	J	740	157	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
ROOF ACCESS	14	T8 1x4 2-Lamp Wrap	62	0.9	24	8760	7,604	14 Del-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. whitefluor	25	0.4	0.518
RR-M	4	T8 2x4 4-Lamp Troffer	106	0.4	RR	8760	3,714	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
RR-M	2	T8 1x4 2-Lamp Wrap	62	0.1	RR	8760	1,096	2 Del-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. whitefluor	25	0.1	0.074
RR-M	1	T8 2x2 2-Lamp F17 T8 Troffer w/fluor Bal	35	0.0	RR	8760	307	1 No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal whitefluor kit	35	0.0	0.000
RR-M CLOSET	1	Inc. 100W	100	0.1	M	1040	104	1 New CPL 25W SI	35	0.0	0.075
C-2300 FAC ADMIN HALL	7	T8 2x4 4-Lamp Troffer	106	0.7	0	3120	2,315	7 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.3	0.408
C-2300 OFFICE 1	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
C-2300 OFFICE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
C-2300 OFFICE 3	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.174
C-2300 HALL	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3120	331	1 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.0	0.058
OFFICE 1	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.174
C-2350	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,984	6 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.3	0.348
C-2000A	14	T8 2x4 4-Lamp Troffer	106	1.5	0	3120	4,630	14 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.7	0.812
OFFICE 1	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
OFFICE 2	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
OFFICE 3	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
OFFICE 4	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
OFFICE 5	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
OFFICE 6	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,984	6 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.3	0.348
OFFICE 7	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
C-2000A OFFICE LOBBY	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,984	6 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.3	0.348
C-2000A OFFICE LOBBY	1	Old Style LED exit sign	12	0.0	24	8760	105	1 New LED Exit Fixture	3	0.0	0.009
OFFICE 1	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
OFFICE 2	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
C-2000B OPEN SPACE	48	T8 2x4 4-Lamp Troffer	106	5.1	0	3120	15,878	48 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	2.3	2,784
C-2000B OPEN SPACE	5	T8 2x4 4-Lamp Troffer	106	0.5	24	8760	4,843	5 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.290
KENN HAMM OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
JOHN HENGEN VP	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
JOHN HENGEN VP	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
GARY STEWART OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
OFFICE	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.174
BRAD FOR OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
BRAD FOR OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
KITCHEN	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.2	0.232
DRAWING ROOM	14	T8 2x2 2-Lamp U-6 Trof.	62	0.9	0	3120	2,708	14 Retro T8 2x2 2-Lamp F17 T8 whitefluor kit	29	0.4	0.462
CONF ROOM	14	T8 2x2 2-Lamp U-6 Trof.	62	0.9	0	3120	2,708	14 Retro T8 2x2 2-Lamp F17 T8 whitefluor kit	29	0.4	0.462
STATIONARY SUPPLY	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	0.1	0.116
C-2000 VOTING EQUIPMENT	40	T8 2x4 4-Lamp Troffer	106	4.2	0	3120	13,229	40 delamp T8 2x4 2-Lamp 28w (STD)Bal. whitefluor kit	48	1.9	2,320

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OFFICE 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.1	0.116
OFFICE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.1	0.116
C-400 BACK STORAGE	5	T8 2x4 4-Lamp Troffer	106	0.5	0	3120	1,634	5 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.2	0.260
C-400 BACK STORAGE	1	Old Style LED end sign	12	0.0	24	3120	1,634	1 New LED End Fixture	3	0.0	0.009
C-400 BACK HALLWAY	3	T8 2x4 3-Lamp Troffer	84	0.3	0	3120	789	3 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.1	0.108
STAIRWELL	4	T8 2x4 3-Lamp Troffer	84	0.3	24	3120	2,943	4 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.2	0.144
OVERHANG	11	T8 2x4 3-Lamp Wrap	84	0.9	00	4380	4,047	11 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.5	0.366
O.D.	1	31 Inc. 60w	60	0.1	00	4380	263	1 New CFL 28923 23W	16	0.0	0.044
SIGN SHOP 1	32	T8 2x4 4-Lamp Troffer	106	3.4	0	3120	10,593	32 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	1.5	1.856
SIGN SHOP 2	7	T8 2x4 4-Lamp Troffer	106	0.7	0	3120	2,315	7 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.3	0.406
SIGN SHOP 2	2	T12 1x2 2-Lamp End Sign	175	0.4	0	3120	1,092	2 Retro T8 1x2 2-Lamp 23w 48 in (Std)Bul	48	0.1	0.254
KITCHEN	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.1	0.116
STORAGE 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.1	0.116
STORAGE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.1	0.116
C-700 C-710	52	T8 2x4 4-Lamp Troffer	106	5.5	0	3120	17,197	52 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	2.5	3.016
C-700 C-710	3	T8 2x4 4-Lamp Troffer	106	0.3	24	3120	2,789	3 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.1	0.174
OFFICE SHERIFF RECEPTION	5	T8 2x4 3-Lamp Troffer	84	0.4	0	3120	1,310	5 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.2	0.160
HALLWAY	4	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	624	4 No Retrofit T8 2x4 2-Lamp F17 T8 Troffer (std) Bul reflector kit	35	0.1	0.000
OFFICE 1	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	624	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.1	0.072
OFFICE 2	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	624	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.1	0.072
KITCHEN 3	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	624	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.1	0.072
OFFICE 4	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	624	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.1	0.072
OFFICE 5	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	624	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.1	0.072
OFFICE 6	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	624	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.1	0.072
OFFICE 7	2	T8 2x4 3-Lamp Troffer	84	0.2	0	3120	624	2 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.1	0.072
STORAGE CLOSET	1	T8 2x4 3-Lamp F17 T8 Troffer w/End Bul	60	0.1	M	1040	82	1 Retro T8 2x4 2-Lamp F17 T8 w/Reflector Kit	29	0.0	0.031
HALLWAY	2	Old Style LED end sign	12	0.0	24	3120	263	1 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector	48	0.0	0.036
C-1900 STORAGE	15	T8 2x4 4-Lamp Troffer	106	1.8	0	3120	4,961	15 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.7	0.870
C-100	15	T8 2x4 4-Lamp Troffer	106	1.8	0	3120	4,961	15 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.7	0.870
C-300 WAREHOUSE	30	T8 2x4 4-Lamp Troffer	106	3.2	0	3120	9,922	30 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	1.4	1.740
LAB C-1900	20	T8 2x4 4-Lamp Troffer	106	2.1	0	3120	5,614	20 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	1.0	1.180
LAB C-1900	5	T8 2x4 4-Lamp Troffer	106	0.5	0	3120	1,634	5 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.2	0.260
LAB C-1900	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	892	3 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.1	0.174
COMPUTER CONF ROOM	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.2	0.232
C-1800 CAGE STORAGE	48	T8 2x4 4-Lamp Troffer	106	5.1	0	3120	15,676	48 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	2.3	2.784
C-2500 OPEN SPACE	24	T8 2x4 4-Lamp Troffer	106	2.5	0	3120	7,637	24 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	1.2	1.392
C-2550 OPEN SPACE	11	T8 2x4 4-Lamp Troffer	106	1.2	0	3120	3,636	11 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.5	0.638
TELE CLOSET	3	T8 2x4 4-Lamp Troffer	106	0.3	M	1040	331	3 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.1	0.174
C-2550 LAB	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,894	6 delamp T8 2x4 2-Lamp 23w (STD)Bul. reflector kit	48	0.3	0.348

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DRY GOOD STORAGE 2	8	T8 2x4 4-Lamp Wmp	106	0.8	0	3120	2,048	8 Delamp to T8 2x4 2-Lamp 25w (STD)8del. w/reflector kit	48	0.4	0.494
CLOSET	1	Inc. 100W	100	0.1	J	740	74	1 New CFL 25W SI	25	0.0	0.076
ROOM 405	6	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	2,048	8 delamp T8 2x4 2-Lamp 25w (STD)8del. w/reflector kit	48	0.4	0.494
405 OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
ROOM 405A	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
RR-M	2	T8 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
RR-M	2	T8 1x4 2-Lamp Wmp	62	0.1	RR	8760	1,857	2 Del-Lamp to T8 1x4 1-Lamp Wmp 25w (STD)2del. w/reflector	25	0.1	0.074
RR-M	1	T8 2x2 2-Lamp P17 T8 Troffer w/refl. kit	35	0.0	RR	8760	307	1 No Retrofit T8 2x2 2-Lamp P17 T8 Troffer (std) Ref w/reflector kit	35	0.0	0.000
RR-F	2	T8 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
RR-F	3	T8 1x4 2-Lamp Wmp	62	0.2	RR	8760	1,857	3 Del-Lamp to T8 1x4 1-Lamp Wmp 25w (STD)3del. w/reflector	25	0.1	0.111
RR-F CLOSET	1	Inc. 100W	100	0.1	J	740	74	1 New CFL 25W SI	25	0.0	0.076
MECH CLOSET	6	T8 1x4 2-Lamp (std) Strip	62	0.4	M	1040	387	6 Re-Lamp & Re-Ballast T8 1x4 1-Lamp Strip 25w (STD)6del. w/reflector	25	0.2	0.222
SIDE VESTIBULE	3	Inc. 100W	100	0.3	OO	4360	1,314	3 New CFL 25W SI	25	0.1	0.228
A400 MALL	18	T8 2x4 4-Lamp Troffer	106	1.9	O	3120	5,953	18 delamp T8 2x4 2-Lamp 25w (STD)18del. w/reflector kit	48	0.9	1.044
OFFICE 150	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
OFFICE 145	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
OFFICE 140	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3 delamp T8 2x4 2-Lamp 25w (STD)3del. w/reflector kit	48	0.1	0.174
OFFICE 135	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3 delamp T8 2x4 2-Lamp 25w (STD)3del. w/reflector kit	48	0.1	0.174
A400 OFFICE 130	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
A400 OFFICE 125	8	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	2,048	8 delamp T8 2x4 2-Lamp 25w (STD)8del. w/reflector kit	48	0.4	0.494
STORAGE	1	T8 2x4 4-Lamp Troffer	106	0.1	O	3120	331	1 delamp T8 2x4 2-Lamp 25w (STD)1del. w/reflector kit	48	0.0	0.058
CTR MANAGEMENT OFFICE	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3 delamp T8 2x4 2-Lamp 25w (STD)3del. w/reflector kit	48	0.1	0.174
SCORE COUNSELOR OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
MD NETWORK OFFICE	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3 delamp T8 2x4 2-Lamp 25w (STD)3del. w/reflector kit	48	0.1	0.174
J REF OFFICE	6	T8 2x4 4-Lamp Troffer	106	0.6	O	3120	1,984	6 delamp T8 2x4 2-Lamp 25w (STD)6del. w/reflector kit	48	0.3	0.348
INTERCORP 100	10	T8 2x4 4-Lamp Troffer	106	1.1	O	3120	3,307	10 delamp T8 2x4 2-Lamp 25w (STD)10del. w/reflector kit	48	0.5	0.580
HEALTH 105	10	T8 2x4 4-Lamp Troffer	106	1.1	O	3120	3,307	10 delamp T8 2x4 2-Lamp 25w (STD)10del. w/reflector kit	48	0.5	0.580
COPY ROOM	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
CONF ROOM H	6	T8 2x4 4-Lamp Troffer	106	0.6	O	3120	1,984	6 delamp T8 2x4 2-Lamp 25w (STD)6del. w/reflector kit	48	0.3	0.348
TECH COUNSELOR MGMT	5	T8 2x4 4-Lamp Troffer	106	0.5	O	3120	1,654	5 delamp T8 2x4 2-Lamp 25w (STD)5del. w/reflector kit	48	0.2	0.290
RM 116	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4 delamp T8 2x4 2-Lamp 25w (STD)4del. w/reflector kit	48	0.2	0.232
RM 120	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
CONF ROOM B	6	T8 2x4 4-Lamp Troffer	106	0.6	O	3120	1,984	6 delamp T8 2x4 2-Lamp 25w (STD)6del. w/reflector kit	48	0.3	0.348
SERVER ROOM	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
NEOTECH OFFICE	6	T8 2x4 4-Lamp Troffer	106	0.5	O	3120	1,654	6 delamp T8 2x4 2-Lamp 25w (STD)6del. w/reflector kit	48	0.2	0.290
BRO MGMT	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3 delamp T8 2x4 2-Lamp 25w (STD)3del. w/reflector kit	48	0.1	0.174
GLASS CONF ROOM	8	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	2,648	8 delamp T8 2x4 2-Lamp 25w (STD)8del. w/reflector kit	48	0.4	0.494
CTR OF TECH & BUS DEV	9	T8 2x4 4-Lamp Troffer	106	1.0	O	3120	2,976	9 delamp T8 2x4 2-Lamp 25w (STD)9del. w/reflector kit	48	0.4	0.522
COMPUTER LAB	19	T8 2x4 4-Lamp Troffer	106	2.0	O	3120	6,284	19 delamp T8 2x4 2-Lamp 25w (STD)19del. w/reflector kit	48	0.9	1.102
COMPUTER LAB	4	150W halogen, slight	150	0.6	O	3120	1,872	4 No Retrofit	150	0.6	0.000
BUS. RESOURCE LAB	8	T8 2x4 4-Lamp Troffer	106	1.0	O	3120	2,976	8 delamp T8 2x4 2-Lamp 25w (STD)8del. w/reflector kit	48	0.4	0.522
CENTER CAFE	8	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	2,648	8 delamp T8 2x4 2-Lamp 25w (STD)8del. w/reflector kit	48	0.4	0.494
CENTER CAFE	2	Soda Vending Machine	400	0.8	24	8760	7,038	2 Vending Mch Soda Occ. Control unit	240	0.5	0.320
CEN GEN 300-330 HALL	1	T8 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	193	1 Retro T8 2x2 2-Lamp P17 T8 w/reflector kit	29	0.0	0.033
CEN GEN 300-330 HALL	1	Old Style LED exit sign	12	0.0	24	8760	105	1 New LED Exit Fixture	3	0.0	0.009
CEN GEN 300-330 HALL	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4 delamp T8 2x4 2-Lamp 25w (STD)4del. w/reflector kit	48	0.2	0.232
OFFICE 350	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4 delamp T8 2x4 2-Lamp 25w (STD)4del. w/reflector kit	48	0.2	0.232
OFFICE 300	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3 delamp T8 2x4 2-Lamp 25w (STD)3del. w/reflector kit	48	0.1	0.174
OFFICE 305	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2 delamp T8 2x4 2-Lamp 25w (STD)2del. w/reflector kit	48	0.1	0.116
OFFICE 325	5	T8 2x4 4-Lamp Troffer	106	0.5	O	3120	1,654	5 delamp T8 2x4 2-Lamp 25w (STD)5del. w/reflector kit	48	0.2	0.290
OFFICE 310	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3 delamp T8 2x4 2-Lamp 25w (STD)3del. w/reflector kit	48	0.1	0.174

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OFFICE 320	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,964	6 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.3	0.348
OFFICE 315	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,964	6 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.3	0.348
OFFICE 155	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,964	6 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.3	0.348
REAL TIME SQUARE HALL	24	T8 2x4 4-Lamp Troffer	106	2.5	0	3120	7,937	24 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	1.2	1.392
OFFICE 280	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 280A	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 270	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,969	12 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.6	0.696
OFFICE 282	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 283	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OFFICE 284	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 245	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,964	6 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.3	0.348
OFFICE 240	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
BACK OFFICE	9	T8 2x4 4-Lamp Troffer	106	1.0	0	3120	2,978	9 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.4	0.522
OFFICE 220A	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 220A	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 225	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,969	12 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.6	0.696
OFFICE 210	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 215	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,969	12 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.6	0.696
OFFICE 205	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 200	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
STORAGE	5	T8 2x4 4-Lamp Troffer	106	0.5	0	3120	1,654	5 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.290
VESTIBULE NORTH LOBBY	8	T8 2x4 4-Lamp Troffer	106	0.8	0	3120	2,648	8 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.4	0.464
VESTIBULE	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3120	331	1 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.0	0.058
VESTIBULE	6	26 Watt CFL PL Double Tube Biac	26	0.2	0	3120	487	6 No Retrofit 26 Watt CFL PL Double Tube Biac	26	0.2	0.000
N. LOBBY HALLWAY	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,964	6 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.3	0.348
N. LOBBY HALLWAY	9	26 Watt CFL PL Double Tube Biac	26	0.2	0	3120	730	9 No Retrofit 26 Watt CFL PL Double Tube Biac	26	0.2	0.000
SMALL HALL	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
SMALL HALL	1	Old Style LED exit sign	12	0.0	24	8760	105	1 New LED Exit Fixture	3	0.0	0.009
A-1100 LONG HALL	10	T8 2x4 4-Lamp Troffer	106	1.1	0	3120	3,307	10 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.5	0.580
A-1100 LONG HALL	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.018
A-1100 RECEPTION DESK	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OFFICE 1	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OPEN CUBICLE SPACE	48	T8 2x4 4-Lamp Troffer	106	5.1	0	3120	15,873	48 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	2.3	2.784
OPEN CUBICLE SPACE	1	Old Style LED exit sign	12	0.0	24	8760	105	1 New LED Exit Fixture	3	0.0	0.009
BONNIE H OFFICE	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
OFFICE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
NICK S OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
BRENDA S OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
BRENDA S OFFICE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
CORNER OFFICE 3	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
CORNER OFFICE 4	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
CORNER OFFICE 5	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
FILE ROOM	5	T8 2x4 4-Lamp Troffer	106	0.5	0	3120	1,654	5 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.290
ELEC PLANS OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
DON C OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
DRAWING STORAGE	9	T8 2x4 4-Lamp Troffer	106	1.0	0	3120	2,978	9 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.4	0.522
ADMIN SUPPLY CLOSET	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
COPY ROOM	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
KITCHEN	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3120	331	1 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.0	0.058
A-1150	15	T8 2x4 4-Lamp Troffer	106	1.6	0	3120	4,961	15 delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.7	0.870

DORSEY BUILDING LIGHTING SURVEY

BRUCE FOREST OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.116
CONF ROOM A	48	T8 2x4 2-Lamp F17 T8 Troffer w/Elec. Bal	35	1.7	0	3120	5,242	48	No Retrofit T8 2x4 2-Lamp F17 T8 Troffer (std) Bul wire/flector kit	35	1.7	0.000
CONF ROOM A	18	Inc. 65w Par 30	65	1.0	0	3120	3,042	18	New CFL 15w BR30 Flood	15	0.2	0.750
A-1500 CUBICLES	6	T8 2x4 4-Lamp Troffer	106	0.8	0	3120	1,984	6	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.3	0.348
A-1500 CUBICLES	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
A-1500 OFFICE 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.116
TRAFFIC DIV	33	T8 2x4 4-Lamp Troffer	106	3.5	0	3120	10,914	33	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	1.6	1.914
BACK TOOL ROOM	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
TRAFFIC CORNER OFFICE	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.174
SHERIFF OFFICE A 1003	7	T8 2x4 4-Lamp Troffer	106	0.7	0	3120	2,316	7	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.3	0.408
OFFICE A1004	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
GUN STORAGE	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.174
OFFICE 2	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.174
OFFICE 3	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.116
OFFICE 4	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
GUN STORAGE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
MIKE H OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
SHANNON T OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
SHERIFF CONF ROOM	13	Inc. 65w Par 30	65	0.8	0	3120	2,638	13	New CFL 15w BR30 Flood	15	0.2	0.660
SHERIFF CONF ROOM	12	Inc. 50w	50	0.8	0	3120	1,672	12	New CFL R30 FLOOD 7W	7	0.1	0.516
SHERIFF RR	2	T8 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	2	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.116
MAIN SHERIFF	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,984	6	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.3	0.348
A-1000A LOBBY RECEPTION	11	T8 2x4 4-Lamp Troffer	106	1.2	0	3120	3,038	11	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.5	0.638
A-1005 COPY ROOM	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.116
KITCHEN	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
COPY PAPER STORAGE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
MAIN SHERIFF HALL	18	T8 2x4 4-Lamp Troffer	106	1.7	0	3120	5,292	18	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.8	0.928
MAIN SHERIFF HALL	3	Old Style LED exit sign	12	0.0	24	8760	316	3	New LED Exit Fixture	3	0.0	0.027
MAIN SHERIFF HALL	17	25 Watt CFL Flood	25	0.4	0	3120	1,328	17	No Retrofit 25 Watt CFL Flood	25	0.4	0.000
A-1020 OFFICE	8	T8 2x4 4-Lamp Troffer	106	0.8	0	3120	2,048	8	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.4	0.484
A-1200 OFFICE 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.116
A-1200 OFFICE 2	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
A-1030 OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
A-1040A OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
A-1040 OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
A-V ROOM	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.1	0.116
A-V ROOM	1	Inc. 65w Par 30	65	0.1	0	3120	203	1	New CFL 15w BR30 Flood	15	0.0	0.060
A-1040-B OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.2	0.232
A-1050 OFFICE	8	T8 2x4 4-Lamp Troffer	106	0.8	0	3120	2,048	8	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.4	0.484
A-1050 RR	1	T8 2x4 2-Lamp F17 T8 Troffer w/Elec. Bal	35	0.0	RR	8760	307	1	No Retrofit T8 2x4 2-Lamp F17 T8 Troffer (std) Bul wire/flector kit	35	0.0	0.000
CONF ROOM C	24	T8 2x4 4-Lamp F17 T8 Troffer w/Elec. Bal	60	1.4	0	3120	4,483	24	Koro T8 2x4 2-Lamp F17 T8 Troffer (std) Bul wire/flector kit	29	0.7	0.744
CONF ROOM C	10	Inc. 90w Par 38	90	0.9	0	3120	2,008	10	New CFL 23w BR40 Flood	23	0.2	0.670
A-1700 CONF ROOM	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,984	6	delamp T8 2x4 2-Lamp 28w (STD)Bul. wire/flector kit	48	0.3	0.348

DORSEY BUILDING LIGHTING SURVEY

A-1700 CONF ROOM	3	Inc. 65w Per 30	65	0.2	0	3120	608	3 New CFL 15w B320 Flood	15	0.0	0.150
A-1750 CL OSET	6	T8 2x4 4-Lamp Troffer	106	0.0	0	3120	1,984	6 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	0.3	0.348
RR-M	2	T8 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	2 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	0.1	0.116
RR-M	2	T8 1x4 2-Lamp Wrap	62	0.0	RR	8760	1,088	2 De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD) Bal. w/ reflector	25	0.1	0.074
RR-M	1	T8 2x2 2-Lamp F17 T8 Troffer w/Elec. Bal	35	0.0	RR	8760	307	1 No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal. w/ reflector kit	35	0.0	0.000
RR-CL	1	Inc. 100W	100	0.1	M	1040	104	1 New CFL 25W SI	25	0.0	0.078
RR-F	2	T8 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	2 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	0.1	0.116
RR-F	3	T8 1x4 2-Lamp Wrap	62	0.2	RR	8760	1,029	3 De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD) Bal. w/ reflector	25	0.1	0.111
RR-F	1	Inc. 100W	100	0.1	RR	8760	878	1 New CFL 25W SI	25	0.0	0.078
SWITCH GEAR#1	6	T8 1x4 2-Lamp Ind Strip	62	0.4	O	3120	1,161	6 Re-Lamp & Re-Balast T8 1x4 1-Lamp Strip 28w (STD) Bal. w/ reflector	25	0.2	0.222
A-1700 HALL	10	T8 2x4 4-Lamp Troffer	106	1.1	O	3120	3,307	10 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	0.5	0.580
A-1700 HALL	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.018
MAIL ROOM A-1800 OFFICE	4	T8 1x4 2-Lamp Ind Strip	62	0.2	O	3120	774	4 Re-Lamp & Re-Balast T8 1x4 1-Lamp Strip 28w (STD) Bal. w/ reflector	25	0.1	0.148
A-1900 OFFICE	6	T8 2x4 4-Lamp Troffer	106	0.6	O	3120	1,984	6 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	0.3	0.348
A-1950	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	0.1	0.174
A-1600	16	T8 2x4 4-Lamp Troffer	106	1.7	O	3120	5,292	16 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	0.8	0.928
ELEC RM#3	8	T8 1x4 2-Lamp Ind Strip	62	0.5	O	3120	1,848	8 Re-Lamp & Re-Balast T8 1x4 1-Lamp Strip 28w (STD) Bal. w/ reflector	25	0.2	0.296
B-1800	6	T8 2x4 3-Lamp Troffer	84	0.5	O	3120	1,572	6 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/ reflector	48	0.3	0.216
B-1800 OFF 1	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/ reflector	48	0.1	0.072
RONALD OFFICE 2	4	T8 2x4 3-Lamp Troffer	84	0.3	O	3120	1,048	4 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/ reflector	48	0.2	0.144
LINDA	4	T8 2x4 3-Lamp Troffer	84	0.3	O	3120	1,048	4 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/ reflector	48	0.2	0.144
B-1800 HALLWAY	1	T8 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	193	1 Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.033
B-1800 HALLWAY	6	T8 2x4 3-Lamp Troffer	84	0.5	O	3120	1,572	6 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/ reflector	48	0.3	0.216
B-1800 HALLWAY	3	T8 2x4 3-Lamp Troffer	84	0.3	24	8760	2,208	3 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/ reflector	48	0.1	0.108
B-1800 HALLWAY	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.018
B-1800 HALLWAY	1	T8 2x2 2-Lamp F17 T8 Troffer w/Elec. Bal	35	0.0	O	3120	109	1 No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal. w/ reflector kit	35	0.0	0.000
MAIN LOBBY HALLWAY	19	T8 2x2 2-Lamp F17 T8 Troffer w/Elec. Bal	35	0.7	O	3120	2,073	19 No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal. w/ reflector kit	35	0.7	0.000
MAIN LOBBY HALLWAY	8	T8 2x2 2-Lamp F17 T8 Troffer w/Elec. Bal	35	0.3	24	8760	2,453	8 No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal. w/ reflector kit	35	0.3	0.000
MAIN LOBBY HALLWAY	7	Old Style LED exit sign	12	0.1	24	8760	736	7 New LED Exit Fixture	3	0.0	0.083
GLASS FOYER	12	25 Watt CFL Flood	25	0.3	O	3120	936	12 No Retrofit 25 Watt CFL Flood	25	0.3	0.000
GLASS FOYER	6	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	1,984	6 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	0.3	0.348
GLASS FOYER	6	Ind. 50w	50	0.3	O	3120	936	6 New CFL R30 FLOOD TW	7	0.0	0.258
GLASS FOYER	1	T8 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	193	1 Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.033
B 800 HALLWAY	1	T8 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	193	1 Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.033
B 800 HALLWAY	6	T8 2x2 4-Lamp F17 T8 Troffer w/Elec. Bal.	60	0.3	O	3120	936	6 Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.155
B 800 HALLWAY	2	T8 2x2 4-Lamp F17 T8 Troffer w/Elec. Bal.	60	0.1	24	8760	1,051	2 Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.082
B 800 HALLWAY	1	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	79	1 New LED Exit Fixture	3	0.0	0.008
QTR MASTER HALLWAY	17	250 Watt MH Fixture	288	4.9	O	3120	15,276	17 New Wrap Wall Mounted T8 1x4 2-Lamp 28w (STD) Bal.	48	0.8	4.080
QTR MASTER HALLWAY	1	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	79	1 New LED Exit Fixture	3	0.0	0.008
C-700 HALLWAY	22	T8 2x4 4-Lamp Troffer	106	2.3	O	3120	7,276	22 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	1.1	1.276
C-700 HALLWAY	2	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	150	2 New LED Exit Fixture	3	0.0	0.012
LOADING DOCK HALLWAY	10	250 Watt MH Fixture	288	5.5	O	3120	17,073	10 New Wrap Wall Mounted T8 1x4 2-Lamp 28w (STD) Bal.	48	0.9	4.560
LOADING DOCK HALLWAY	10	250 Watt MH Fixture	288	2.9	O	3120	8,988	10 New T8 2x4 32W 4 Lamp pendant wrap fixture (HPI) bal	112	1.1	1.760
LOADING DOCK HALLWAY	2	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	150	2 New LED Exit Fixture	3	0.0	0.012
C-2000 HALLWAY	8	T8 2x4 4-Lamp Troffer	106	1.0	O	3120	2,976	8 delamp T8 2x4 2-Lamp 28w (STD) Bal. w/ reflector kit	48	0.4	0.522

DORSEY BUILDING LIGHTING SURVEY

C-2000 HALLWAY	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.018
C-2000A HALLWAY	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,969	12 delamp T8 2x4 2-Lamp 28w (STD)Bul. withreflector kit	43	0.6	0.898
C-2000A HALLWAY	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.018
C-2450 HALLWAY	11	T8 2x4 4-Lamp Troffer	106	1.2	0	3120	3,638	11 delamp T8 2x4 2-Lamp 28w (STD)Bul. withreflector kit	48	0.5	0.638
C-2450 HALLWAY	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.018
C-2510 HALLWAY	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,969	12 delamp T8 2x4 2-Lamp 28w (STD)Bul. withreflector kit	48	0.6	0.898
C-2515 HALLWAY	1	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	78	1 New LED Exit Fixture	3	0.0	0.006
B-310 HALLWAY	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	962	3 delamp T8 2x4 2-Lamp 28w (STD)Bul. withreflector kit	48	0.1	0.174
B-310 HALLWAY	1	T8 2x4 4-Lamp Troffer	106	0.1	24	8760	920	1 delamp T8 2x4 2-Lamp 28w (STD)Bul. withreflector kit	48	0.0	0.068
B-310 HALLWAY	1	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	78	1 New LED Exit Fixture	3	0.0	0.006
O.D. ENTRANCE	2	Inc. 100W	100	0.2	0.0	4380	876	2 New CFL 25W SI	25	0.1	0.150
O.D. FRONT SIDE	2	Inc. 100W	100	0.2	0.0	4380	876	2 New CFL 25W SI	25	0.1	0.150
O.D. RIGHT SIDE	1	Inc. 100W	100	0.1	0.0	4380	438	1 New CFL 25W SI	25	0.0	0.075
O.D. MAIN ENTRANCE	8	25 Watt CFL Flood	25	0.2	0.0	4380	876	8 No Retrofit 25 Watt CFL Flood	25	0.2	0.000
O.D. MAIN ENTRANCE	3	175 Watt MH Wall Pack	210	0.8	0.0	4380	2,759	3 Retro 175 Watt Pulse Start MH kit	190	0.8	0.180
FRONT LOT	16	400 Watt MH Fixture	455	7.3	0.0	4380	31,898	16 Retro 320 Watt Pulse Start M.H.	365	5.8	1.440
FRONT LOT	5	400 Watt MH Fixture	455	2.3	0.0	4380	9,965	5 Retro 320 Watt Pulse Start M.H.	365	1.8	0.450
FRONT LOT	8	400 Watt MH Fixture	455	3.6	0.0	4380	15,943	8 Retro 320 Watt Pulse Start M.H.	365	2.9	0.720
RIGHT LOT	6	400 Watt MH Fixture	455	2.7	0.0	4380	11,957	6 Retro 320 Watt Pulse Start M.H.	365	2.2	0.540
RIGHT LOT	3	250 Watt MH Fixture	288	0.9	0.0	4380	3,784	3 Retro 175 Watt Pulse Start MH kit	210	0.8	0.234
BACK LOT	3	250 Watt MH Fixture	288	0.9	0.0	4380	3,784	3 Retro 175 Watt Pulse Start MH kit	210	0.8	0.234
BACK LOT	5	400 Watt MH Fixture	455	2.3	0.0	4380	9,965	5 Retro 320 Watt Pulse Start M.H.	365	1.8	0.450
BACK LOT	2	400 Watt MH Fixture	455	0.9	0.0	4380	3,986	2 Retro 320 Watt Pulse Start M.H.	365	0.7	0.180
L SIDE	8	250 Watt MH Fixture	288	2.3	0.0	4380	10,082	8 Retro 175 Watt Pulse Start MH kit	210	1.7	0.824
RECEIVING DOCK	3	400 Watt MH Fixture	455	1.4	0.0	4380	5,978	3 Retro 320 Watt Pulse Start M.H.	365	1.1	0.270
SECURITY BOOTH	4	Inc. 90w Per 38	90	0.4	0.0	4380	1,577	4 New CFL 23w BR40 Flood	23	0.1	0.268
	3,321						1,164,180		3,321		174.2

Annual Energy Savings

GATEWAY BUILDING LIGHTING SURVEY

PROPOSED

Room Description	Quantity	Description	Watts	KW	Burn Hour Code	Pre Burn Hours	kWh	Quantity	Description	Watts	KW	KW Saved
5th Floor												
suite 514 dept of public works	43	T8 2x4 2-Lamp troffer	55	2.4	0	3640	8,609	43	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	2.1	0.301
storage	3	T8 2x4 2-Lamp troffer	55	0.2	0	3640	801	3	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.021
bureau chief	3	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	895	3	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.102
chief operating div	3	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	895	3	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.102
chief recycling div	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.068
chief collections div	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.068
office 1	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.068
kitchen	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.068
side office	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.068
mark Richmond	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.068
chief environmental mgmt div	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.068
card room	4	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	801	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
main elevator lobby cove lighting	1	T12 1x3 2-Lamp Strip	78	0.1	24	8760	893	1	Retro T8 1x3 2-Lamp P25 (STD)Bal.	43	0.0	0.035
elec room	1	T12 1x4 2-Lamp Strip	78	0.1	m	1040	81	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. wire reflector	25	0.0	0.053
mech room	2	T12 1x4 2-Lamp Strip	78	0.2	m	1040	162	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. wire reflector	25	0.1	0.106
hallway	30	T12 2x2 2-Lamp U-6 Trof.	78	2.3	0	3640	8,516	30	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.9	1.470
4th Floor												
hallway	4	T12 2x2 2-Lamp U-6 Trof.	78	0.3	24	8760	2,733	4	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.1	0.196
m-m	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	m	8760	893	1	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
m-m	6	T12 1x4 2-Lamp Strip	78	0.5	m	8760	4,100	6	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. wire reflector	25	0.2	0.316
m-f	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	m	8760	893	1	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
m-f	8	T12 1x4 2-Lamp Strip	78	0.5	m	8760	4,100	8	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. wire reflector	25	0.2	0.316
jan closet	1	R150W Inc.	150	0.2	1	740	111	1	New CFL 28W 27W	27	0.0	0.123
copy room	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.068
office of purchasing open office	34	T8 2x4 3-Lamp Troffer	55	1.9	0	3640	8,907	34	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	1.8	0.238
class levels	4	T8 2x4 2-Lamp troffer	55	0.2	0	3640	891	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
chief purchasing	4	T8 2x4 2-Lamp troffer	55	0.2	0	3640	891	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
kitchen	4	T8 2x4 2-Lamp troffer	55	0.2	0	3640	891	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
conf room	6	T8 2x4 2-Lamp troffer	55	0.3	0	3640	1,201	6	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.3	0.042
storage	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
econ dev. Authority open space	17	T8 2x4 2-Lamp troffer	55	0.9	0	3640	3,403	17	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.8	0.119
econ dev. Authority open space	2	LED exit sign	5	0.0	24	8760	88	2	No Retro	5	0.0	0.000
office 1	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
office 2	4	T8 2x4 2-Lamp troffer	55	0.2	0	3640	801	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
office 3	4	T8 2x4 2-Lamp troffer	55	0.2	0	3640	801	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
office 4	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
office 5	4	T8 2x4 3-Lamp Troffer	82	0.3	0	3640	1,194	4	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.2	0.136
office 6	4	T8 2x4 3-Lamp Troffer	82	0.3	0	3640	1,194	4	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.2	0.136
office 7	4	T8 2x4 3-Lamp Troffer	82	0.3	0	3640	1,194	4	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.2	0.136
office 8	4	T8 2x4 3-Lamp Troffer	82	0.3	0	3640	1,194	4	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.2	0.136
office 8	2	Inc. 65w Par 30	65	0.1	0	3640	473	2	New CFL 15w BR30 Flood	15	0.0	0.100
copy room	5	T8 2x4 4-Lamp Troffer	106	0.5	0	3640	1,929	5	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.280
reception desk	2	Inc. 65w Par 30	65	0.1	0	3640	473	2	New CFL 15w BR30 Flood	15	0.0	0.100
card room	6	T8 2x4 3-Lamp Troffer	82	0.5	0	3640	1,791	6	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.3	0.204
executive conf room	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2-Lamp Troffer 28w (STD)Bal. wire reflector	48	0.1	0.068
executive conf room	10	T8 2x4 2-Lamp troffer	55	0.8	0	3640	2,902	10	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.5	0.070
executive conf room	2	T8 2x2 2-Lamp U-6 Trof.	62	0.1	0	3640	461	2	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.1	0.066
kitchen	1	T8 2x4 2-Lamp troffer	55	0.1	0	3640	200	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007

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police dept	3	LED exit sign	5	0.0	24	8760	131	3	No Retro	5	0.0	0.000
police dept	13	T8 2x4 2-Lamp troffer	55	0.7	0	3640	2,603	13	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.6	0.091
major gardner	4	T8 2x4 3-Lamp Troffer	82	0.3	0	3640	1,194	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136
R. Johnson	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
R. Price	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3640	1,158	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.174
corporate schaeffer	3	T8 2x4 2-Lamp troffer	55	0.2	0	3640	601	3	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.021
sgt lee	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
storage	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
office 1	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
office 2	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
conf room	3	T8 2x4 2-Lamp troffer	55	0.2	0	3640	601	3	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.021
fire & rescue	45	T8 2x4 2-Lamp troffer	55	2.5	0	3640	9,009	45	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	2.2	0.315
open space	4	LED exit sign	5	0.0	24	8760	175	4	No Retro	5	0.0	0.000
back hall	2	T12 2x2 2-Lamp U-6 Trof.	78	0.2	24	8760	1,367	2	Retro T8 2x2 2Lamp F17 T8 w/ Reflector Kit	29	0.1	0.068
conf room	4	T8 2x4 3-Lamp Troffer	82	0.3	0	3640	1,194	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136
kitchen	4	T8 2x4 2-Lamp troffer	55	0.2	0	3640	801	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
back office 1	4	T8 2x4 3-Lamp Troffer	82	0.3	0	3640	1,194	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136
small conf room	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
corner office	3	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	895	3	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.102
charles sharpe	1	T8 2x4 2-Lamp troffer	55	0.1	0	3640	200	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007
side office 1	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3640	1,158	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.174
side office 2	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3640	1,158	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.174
side office 3	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3640	1,158	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.174
regulations office 1	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3640	396	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.068
regulations office 2	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
ryan minch office	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
clerk-payroll	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
rms admin	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
deputy chief	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
communications and info tech	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
steve wilson	1	T8 2x4 2-Lamp troffer	55	0.1	0	3640	200	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007
mail room	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
office of emergency mgmt	3	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	895	3	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.102
office 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
office 2	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
timothy dahl	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
cr 402/weight room	5	T8 2x4 4-Lamp Troffer	106	0.5	0	3640	1,929	5	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.280
cr 402/weight room	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3640	396	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.068
cl room 401	22	T8 2x4 4-Lamp Troffer	106	2.3	0	3640	8,488	22	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	1.1	1.276
main hall elevator	30	T12 2x2 2-Lamp U-6 Trof.	78	2.3	0	3640	8,518	30	Retro T8 2x2 2Lamp F17 T8 w/ Reflector Kit	29	0.9	1.470
copy room	1	T8 2x4 2-Lamp troffer	55	0.1	0	3640	200	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007
ray petty office	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
john abron office	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
jan closet	1	Inc. 60w	60	0.1	1	740	44	1	New CPL 183016 16W	23	0.0	0.037
m-m	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	rr	8760	683	1	Retro T8 2x2 2Lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
m-m	6	T12 1x4 2-Lamp Strip	78	0.5	rr	8760	4,100	6	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.318
elec closet	1	T12 1x4 2-Lamp Strip	78	0.1	1	740	58	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053
mech room	2	T12 1x4 2-Lamp Strip	78	0.2	m	1040	182	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.106
m- female	7	T12 2x2 2-Lamp U-6 Trof.	78	0.5	rr	8760	4,783	7	Retro T8 2x2 2Lamp F17 T8 w/ Reflector Kit	29	0.2	0.343
operations	17	T8 2x4 3-Lamp Troffer	82	1.4	0	3640	5,074	17	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.6	0.578
logistics & fleet svc.	4	LED exit sign	5	0.0	24	8760	175	4	No Retro	5	0.0	0.000
deputy chief	4	T8 2x4 2-Lamp troffer	55	0.2	0	3640	891	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028

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asst chief	4	T8 2x4 2-Lamp troffer	55	0.2	o	3640	801	4	Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
dep butler	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
file room	2	T8 2x4 4-Lamp Troffer	106	0.2	o	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
enr-king	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
kevin seaman	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
fire & boat	4	T8 2x4 2-Lamp troffer	55	0.2	o	3640	801	4	Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
deputy faith	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
conf room 1	4	T8 2x4 4-Lamp Troffer	106	0.4	o	3640	1,543	4	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.232
main elevator hall	20	T12 1x3 2-Lamp Strip	78	1.6	o	3640	5,678	20	Retro T8 1x3 2-Lamp F25 (STD)Bal.	43	0.9	0.700
soffit	6	T12 1x2 2-Lamp F20 Strip	50	0.3	24	8760	2,628	6	Retro T8 1x2 2-Lamp (STD)Bal.	29	0.2	0.126
3rd FLOOR												
main hallway	26	T12 2x2 2-Lamp U-6 Trof.	78	2.0	o	3640	7,008	26	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.7	1.225
main hallway	5	T12 2x2 2-Lamp U-6 Trof.	78	0.4	24	8760	3,416	5	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.1	0.245
main hallway	4	LED exit sign	5	0.0	24	8760	175	4	No Retro	5	0.0	0.000
main hallway elevator soffit	20	T12 1x3 2-Lamp Strip	78	1.6	o	3640	5,678	20	Retro T8 1x3 2-Lamp F25 (STD)Bal.	43	0.9	0.700
soffit	6	T12 1x2 2-Lamp F20 Strip	50	0.3	24	8760	2,628	6	Retro T8 1x2 2-Lamp (STD)Bal.	29	0.2	0.126
elec room	1	T12 1x4 2-Lamp Strip	78	0.1	m	1040	81	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053
mech room	7	T12 1x4 2-Lamp Strip	78	0.5	m	1040	568	7	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.371
jan closet	1	Inc. 60w	60	0.1	j	740	44	1	New CFL R3016 16W	23	0.0	0.037
rr-1	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	rr	8760	883	1	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
rr-1	6	T12 1x4 2-Lamp Strip	78	0.5	rr	8760	4,100	6	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.318
rr-m	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	rr	8760	883	1	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
rr-m	6	T12 1x4 2-Lamp Strip	78	0.5	rr	8760	4,100	6	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.318
kitchen	1	T8 2x4 2-Lamp troffer	55	0.1	o	3640	200	1	Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007
kitchen	2	Soda Vending Machine	400	0.8	24	8760	7,008	2	Vending Mistr Soda Occ. Control unit	240	0.5	0.320
staff only copy room	1	T8 2x4 4-Lamp Troffer	106	0.1	o	3640	388	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058
housing open space	30	T8 2x4 2-Lamp troffer	55	1.7	o	3640	8,008	30	Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	1.4	0.210
corner office	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 1	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 2	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
supply room	1	T8 2x4 3-Lamp Troffer	82	0.1	o	3640	298	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.034
office 3	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
file room	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 4	1	T8 2x4 4-Lamp Troffer	106	0.1	o	3640	388	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058
office 5	4	T8 2x4 2-Lamp troffer	55	0.2	o	3640	801	4	Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028
office 6	2	T8 2x4 4-Lamp Troffer	106	0.2	o	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
community worker 1	1	T8 2x4 4-Lamp Troffer	106	0.1	o	3640	388	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058
community worker 7	1	T8 2x4 4-Lamp Troffer	106	0.1	o	3640	388	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058
community worker 2	1	T8 2x4 4-Lamp Troffer	106	0.1	o	3640	388	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058
admin svc center	1	T8 2x4 4-Lamp Troffer	106	0.1	o	3640	388	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058
robert office 8	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
section 8 program	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
community worker 1	1	T8 2x4 4-Lamp Troffer	106	0.1	o	3640	388	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058
community worker 2	1	T8 2x4 4-Lamp Troffer	106	0.1	o	3640	388	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058
office 9	2	T8 2x4 2-Lamp troffer	55	0.1	o	3640	400	2	Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
conf room	4	T8 2x4 3-Lamp Troffer	82	0.3	o	3640	1,194	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136
office 10	7	T8 2x4 2-Lamp troffer	55	0.4	o	3640	1,401	7	Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.3	0.049
dir office	2	T8 2x4 4-Lamp Troffer	106	0.2	o	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
conf room	8	T8 2x4 3-Lamp Troffer	82	0.7	o	3640	2,388	8	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.4	0.272
office 11	2	T8 2x4 2-Lamp troffer	55	0.1	o	3640	400	2	Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
office 12	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068

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office 13	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2 Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116
office 13	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014
risk mgmt	7	T8 2x4 2-Lamp troffer	55	0.4	0	3640	1,401	7 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.3	0.049
open space	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	108	2 New LED Exit Fixture	15	0.0	0.009
office 1	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014
admin & boardroom	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014
hybrid kitchen	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2 Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116
office 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2 Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116
safety bus	5	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	1,001	5 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.2	0.058
file room	4	T8 2x4 2-Lamp troffer	55	0.3	0	3640	1,194	4 Re-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.2	0.138
conf room	4	T8 2x4 2-Lamp troffer	55	1.0	0	3640	3,604	18 Re-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.9	0.128
citizen a/c open space	18	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	108	2 New LED Exit Fixture	15	0.0	0.009
citizen a/c open space	2	T8 2x4 2-Lamp troffer	106	0.2	0	3640	772	2 Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116
outer office 1	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2 Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116
outer office 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3640	772	2 Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116
restroom office 1	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3640	368	1 Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.0	0.058
financial office	2	T8 2x4 2-Lamp Troffer	55	0.2	0	3640	597	2 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.1	0.068
data center	1	T8 2x4 3-Lamp Troffer	82	0.1	0	3640	288	1 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.0	0.034
office 3	1	T8 2x4 2-Lamp Troffer	82	0.1	0	3640	288	1 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.0	0.034
office 4	1	T8 2x4 3-Lamp Troffer	82	0.1	0	3640	288	1 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.0	0.034
deputy director	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.1	0.068
admin aide	1	T8 2x4 2-Lamp Troffer	55	0.1	0	3640	200	1 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.0	0.007
director	4	T8 2x4 3-Lamp Troffer	82	0.3	0	3640	1,194	4 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.2	0.138
conf room	4	T8 2x4 3-Lamp Troffer	82	0.3	0	3640	1,194	4 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.2	0.138
kitchen	1	T8 2x4 2-Lamp troffer	55	0.1	0	3640	200	1 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.0	0.007
file room	1	T8 2x4 2-Lamp troffer	55	0.1	0	3640	200	1 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.0	0.007
or 301	16	T8 2x4 3-Lamp Troffer	82	1.3	0	3640	4,716	16 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.8	0.544
or 301	1	LED exit sign	5	0.0	24	8760	44	1 No Retro	5	0.0	0.000
computer server	5	T8 2x4 3-Lamp Troffer	82	0.4	0	3640	1,492	5 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.2	0.170
computer server	1	T8 1x4 2-Lamp Strip	62	0.1	0	3640	228	1 Dec-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. white reflector	25	0.0	0.037
or 303	18	T8 2x4 3-Lamp Troffer	82	1.5	0	3640	5,373	18 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.9	0.612
ev storage	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.1	0.068
office	2	T8 2x4 3-Lamp Troffer	82	0.2	0	3640	597	2 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.1	0.068
2nd floor	25	T12 2x2 2-Lamp U-4 Trof.	78	2.0	0	3640	7,058	25 Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	39	0.7	1.225
main hallway											
main hallway	8	T12 2x2 2-Lamp U-4 Trof.	78	0.4	24	8760	3,418	8 Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.1	0.245
main hallway	4	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	210	4 New LED Exit Fixture	15	0.0	0.018
elevator lobby	20	T12 1x3 2-Lamp Strip	78	1.8	0	3640	5,878	20 Retro T8 1x3 2-Lamp F25 (STD) Bal.	43	0.9	0.700
elevator lobby	6	T12 1x2 2-Lamp F20 Strip	50	0.3	24	8760	2,628	6 Retro T8 1x2 2-Lamp (STD) Bal.	29	0.2	0.126
elec room	1	T12 1x4 2-Lamp Strip	78	0.1	m	1040	81	1 Dec-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. white reflector	25	0.0	0.063
mechan room	2	T12 1x4 2-Lamp Strip	78	0.2	m	1040	162	2 Dec-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. white reflector	25	0.1	0.108
jan closet	1	Inc. 100W	100	0.1	1	740	74	1 New CFL 25W S1	25	0.0	0.076
IT-11	1	T12 2x2 2-Lamp U-4 Trof.	78	0.1	11	8760	883	1 Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.0	0.048
IT-11	6	T12 1x4 2-Lamp Strip	78	0.5	11	8760	4,100	6 Dec-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. white reflector	25	0.2	0.318
IT-1	1	T12 2x2 2-Lamp U-4 Trof.	78	0.1	11	8760	883	1 Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.0	0.048
IT-1	6	T12 1x4 2-Lamp Strip	78	0.5	11	8760	4,100	6 Dec-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. white reflector	25	0.2	0.318
copier room	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014
waiting room	2	T8 2x4 2-Lamp troffer	55	0.1	0	3640	400	2 Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014
waiting room	1	Soda Vending Machine	400	0.4	24	8760	3,504	1 Vending Mixer Soda Oas. Control unit	240	0.2	0.160
community action counsel	1	T12 2x2 2-Lamp U-4 Trof.	78	0.1	0	3640	284	1 Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.0	0.048
community action counsel	8	T8 2x4 3-Lamp Troffer	82	0.7	0	3640	2,398	8 Dec-Lamp to T8 2x4 2-Lamp Troffer 28w (STD) Bal. white reflector	48	0.4	0.272

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open space	62	T8 2x4 2-Lamp troffer	55	5.1	o	3640	18,418	92	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	4.4	0.844
open space	9	2 Lamp 6w Plug in CFL kit	6	0.1	24	8760	473	9	New LED Exit Fixture	1.5	0.0	0.041
office 1	2	T8 2x4 4-Lamp Troffer	106	0.2	o	3640	772	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116
office 2	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 3	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 4	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 5	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 6	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 7	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
amanda b.	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
fiscal mgr	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
locked	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
v.p.	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
president	4	T8 2x4 4-Lamp Troffer	106	0.4	o	3640	1,543	4	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.232
jana smith	4	T8 2x4 3-Lamp Troffer	82	0.3	o	3640	1,194	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136
storage closet	2	T8 2x4 2-Lamp troffer	55	0.1	m	1040	114	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014
kida rr	1	T8 2x4 3-Lamp Troffer	82	0.1	rr	8760	718	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.034
m-h.c.	1	T8 2x4 2-Lamp troffer	55	0.1	rr	8760	482	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007
m-h.c.	1	T8 1x4 2-Lamp Strip	55	0.1	rr	8760	482	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.030
in preg	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
rebecca downman	4	T8 2x4 4-Lamp Troffer	106	0.4	o	3640	1,543	4	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.232
cubical office	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 8	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 9	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 10	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 11	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 12	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 13	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 14	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 15	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 16	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 17	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 18	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office 19	4	T8 2x4 3-Lamp Troffer	82	0.3	o	3640	1,194	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136
conf room	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
small conf room	1	T8 2x4 4-Lamp Troffer	106	0.1	o	3640	388	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058
office 20	1	T8 2x4 2-Lamp troffer	55	0.1	o	3640	200	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007
or	15	T8 2x4 3-Lamp Troffer	82	1.2	o	3640	4,477	15	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.7	0.510
corner office	2	T8 2x4 3-Lamp Troffer	82	0.2	o	3640	597	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
office storage	2	T8 1x4 2-Lamp Strip	62	0.1	o	3640	451	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.074
conf room	6	T8 2x4 2-Lamp troffer	55	0.3	o	3640	1,201	6	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.3	0.042
storage room	2	T12 2x4 2-Lamp Troffer	78	0.2	o	3640	568	2	Retro T8 2x4 2-Lamp 28w (STD)Bal.	48	0.1	0.060
key pad	6	T8 2x4 3-Lamp Troffer	82	0.5	o	3640	1,791	6	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.204
1st FLOOR												
elevator lobby	20	T12 1x3 2-Lamp Strip	78	1.6	of	3900	6,084	20	Retro T8 1x3 2-Lamp F25 (STD)Bal.	43	0.9	0.700
elevator lobby	6	T12 1x2 2-Lamp F20 Strip	50	0.3	24	8760	2,828	6	Retro T8 1x2 2-Lamp (STD)Bal.	29	0.2	0.128
hall	29	T12 2x2 2-Lamp U-6 Trof.	78	2.3	of	3900	8,822	29	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.8	1.421
hall	5	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	263	5	New LED Exit Fixture	1.5	0.0	0.023
lobby	4	100 Watt MH Can	122	0.5	of	3900	1,903	4	No Retrofit 100 Watt MH Can	122	0.5	0.000
public telephone	2	T12 2x2 2-Lamp U-6 Trof.	78	0.2	24	8760	1,367	2	Retro T8 2x2 2-Lamp F17 T8 w/ Reflector Kit	29	0.1	0.098
public telephone	2	T12 1x4 2-Lamp Strip	78	0.2	24	8760	1,367	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.108
vending area	1	Soda Vending Machine	400	0.4	24	8760	3,504	1	Vending Mixer Soda Occ. Control unit	240	0.2	0.160

GATEWAY BUILDING LIGHTING SURVEY

mech closet	2	T12 1x4 2-Lamp Strip	78	0.2	m	1040	162	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.108
elec closet	2	T12 1x4 2-Lamp Strip	78	0.2	m	1040	162	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.108
rr-w	1	T8 2x4 2-Lamp troffer	55	0.1	rr	8760	482	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007
rr-w	1	T12 1x4 2-Lamp Strip	78	0.1	rr	8760	683	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053
rr-m	1	T8 2x4 2-Lamp troffer	55	0.1	rr	8760	482	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007
rr-m	1	T12 1x4 2-Lamp Strip	78	0.1	rr	8760	683	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053
closet	8	T8 2x4 2-Lamp troffer	55	0.4	m	1040	458	8	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.056
closet	8	T8 2x4 2-Lamp troffer	55	0.4	m	1040	458	8	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.056
mail room	8	T8 2x4 2-Lamp troffer	55	0.4	of	3900	1,716	8	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.056
mail room	8	T8 2x4 2-Lamp troffer	55	0.4	of	3900	1,716	8	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.056
vending area	6	T8 2x4 2-Lamp troffer	55	0.3	of	3900	1,287	6	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.3	0.042
vending area	1	Soda Vending Machine	400	0.4	24	8760	3,504	1	Vending Maser Soda Occ. Control unit	240	0.2	0.160
room 6	19	T8 2x4 3-Lamp Troffer	82	1.6	of	3900	6,076	19	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.9	0.846
room 6	3	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	168	3	New LED Exit Fixture	1.5	0.0	0.014
lab e	15	T8 1x4 2-Lamp Strip	62	0.9	of	3900	3,627	15	Re-Lamp & Re-Ballast T8 1x4 2-Lamp Strip 28w (STD)Bal. Dimming	48	0.7	0.210
lab e	1	Inc. 65w Par 30	65	0.1	of	3900	254	1	New CFL 15w BR30 Flood dimming	15	0.0	0.050
jan closet	1	Inc. 100W	100	0.1	l	740	74	1	New CFL 25W S4	25	0.0	0.075
rr-f	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	rr	8760	683	1	Retro T8 2x2 2Lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
rr-f	6	T12 1x4 2-Lamp Strip	78	0.5	rr	8760	4,100	6	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.318
rr-m	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	rr	8760	683	1	Retro T8 2x2 2Lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
rr-m	6	T12 1x4 2-Lamp Strip	78	0.5	rr	8760	4,100	6	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.318
plant light	5	T8 1x4 1-Lamp Strip	28	0.1	24	8760	1,226	5	Re-Lamp & Re-Ballast T8 1x4 1-Lamp Strip 28w (STD)Bal.	25	0.1	0.015
plant light	4	T8 1x4 1-Lamp Strip	28	0.1	24	8760	961	4	Re-Lamp & Re-Ballast T8 1x4 1-Lamp Strip 28w (STD)Bal.	25	0.1	0.012
cr 4	14	T8 2x4 3-Lamp Troffer	82	1.1	of	3900	4,477	14	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.7	0.476
cr 4	6	Under Lit Classroom	0	0.0	of	3900	0	6	Add new fixture T8 2x4 2-Lamp 28w (STD)Bal.	48	0.3	-0.288
cr 1	13	T8 2x4 3-Lamp Troffer	82	1.1	of	3900	4,167	13	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.6	0.442
cr 1	6	Under Lit Classroom	0	0.0	of	3900	0	6	Add new fixture T8 2x4 2-Lamp 28w (STD)Bal.	48	0.3	-0.288
lab c - comp room	18	T8 1x4 2-Lamp Strip	62	1.1	of	3900	4,352	18	Re-Lamp & Re-Ballast T8 1x4 2-Lamp Strip 28w (STD)Bal. Dimming	48	0.9	0.252
ecs office	6	T8 1x4 2-Lamp Strip	62	0.4	of	3900	1,451	6	Re-Lamp & Re-Ballast T8 1x4 2-Lamp Strip 28w (STD)Bal. Dimming	48	0.3	0.084
ecs hall	6	T12 2x2 2-Lamp U-6 Trof.	78	0.5	of	3900	1,825	6	Retro T8 2x2 2Lamp F17 T8 w/ Reflector Kit	29	0.2	0.294
ecs hall	3	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	158	3	New LED Exit Fixture	1.5	0.0	0.014
lab a - comp room	11	T8 1x4 2-Lamp Strip	62	0.7	of	3900	2,660	11	Re-Lamp & Re-Ballast T8 1x4 2-Lamp Strip 28w (STD)Bal. Dimming	48	0.5	0.164
cr 3	12	T8 2x4 3-Lamp Troffer	82	1.6	of	3900	3,638	12	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.6	0.408
cr 3	6	Under Lit Classroom	0	0.0	of	3900	0	6	Add new fixture T8 2x4 2-Lamp 28w (STD)Bal.	48	0.3	-0.288
lab d	14	T8 1x4 2-Lamp Strip	62	0.9	of	3900	3,385	14	Re-Lamp & Re-Ballast T8 1x4 2-Lamp Strip 28w (STD)Bal. Dimming	48	0.7	0.198
business training center	6	T8 2x4 3-Lamp Troffer	82	0.5	of	3900	1,919	6	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.204
open halls	6	Inc. 65w Par 30	65	0.4	of	3900	1,521	6	New CFL 15w BR30 Flood	15	0.1	0.300
open halls	2	2 Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2	New LED Exit Fixture	1.5	0.0	0.009
coat closet	1	T12 1x2 2-Lamp F20 Strip	90	0.1	m	1040	52	1	Retro T8 1x2 2-Lamp (STD)Bal.	29	0.0	0.021
lab b	2	Inc. 60w	60	0.1	of	3900	468	2	New CFL 1R3016 16W	23	0.0	0.074
office dev	2	T8 2x4 3-Lamp Troffer	82	0.2	of	3900	640	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
off 2	2	T8 2x4 3-Lamp Troffer	82	0.2	of	3900	640	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068
tel closet	1	T12 2x2 2-Lamp U-6 Trof.	78	0.1	m	1040	81	1	Retro T8 2x2 2Lamp F17 T8 w/ Reflector Kit	29	0.0	0.049
cr 5	26	T8 2x4 3-Lamp Troffer	82	2.1	of	3900	8,316	26	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	1.2	0.884
board room	29	Inc. 65w Par 30	65	1.9	of	3900	7,352	29	New CFL 15w BR30 Flood dimming	15	0.4	1.450
ceve light	30	T8 1x4 2-Lamp Strip	62	1.9	of	3900	7,254	30	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.8	1.110
board room	8	T8 2x4 3-Lamp Troffer	82	0.7	of	3900	2,558	8	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.4	0.272
kitchen	2	T8 2x4 2-Lamp troffer	55	0.1	of	3900	429	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014

GATEWAY BUILDING LIGHTING SURVEY

cr 2	16	T8 2x2 2-Lamp U-6 Trof.	62	1.0	od	3900	3,869	16 Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.5	0.528	
lab b lobby	7	T8 2x2 2-Lamp U-6 Trof.	62	0.4	od	3900	1,063	7 Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.2	0.231	
lab b cr	16	T8 2x2 2-Lamp U-6 Trof.	62	1.0	od	3900	3,869	16 Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.5	0.528	
main lobby lights	16	100 Watt MH Can	122	2.0	24	8760	17,100	16 No Retrofit, 100 Watt MH Can	122	2.0	0.000	
elevator 1	2	T12 1x4 2-Lamp Wrap	78	0.2	24	8760	1,387	2 De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD) Bal. w/Reflector	25	0.1	0.108	
elevator 1	3	T12 1x4 2-Lamp F30 Strip	32	0.1	24	8760	841	3 Retro T8 1x2 1-Lamp (L/P) Bal.	17	0.1	0.045	
elevator 2	2	T12 1x4 2-Lamp Wrap	78	0.2	24	8760	1,387	2 De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD) Bal. w/Reflector	25	0.1	0.108	
stairwell west	3	T12 1x2 1-Lamp F30 Strip	32	0.1	24	8760	841	3 Retro T8 1x2 1-Lamp (L/P) Bal.	17	0.1	0.045	
stairwell west	9	T12 1x4 2-Lamp Wrap	78	0.7	24	8760	6,150	9 De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD) Bal. w/Reflector	25	0.2	0.477	
stairwell west	2	2-Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2 New LED Exit Fixture	1.5	0.0	0.009	
stairwell west	5	T12 2x2 2-Lamp U-6 Trof.	78	0.4	24	8760	3,418	5 Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.1	0.245	
stairwell east	9	T12 1x4 2-Lamp Wrap	78	0.7	24	8760	6,150	9 De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD) Bal. w/Reflector	25	0.2	0.477	
stairwell east	2	2-Lamp 6w Plug in CFL kit	6	0.0	24	8760	105	2 New LED Exit Fixture	1.5	0.0	0.009	
stairwell east	14	250 Watt MH Fixture	288	4.0	od	4380	17,680	14 Retro 175 Watt Pulse Start MH kit	210	2.9	1.092	
400w circle fixtures	16	400 Watt MH Fixture	455	8.2	od	4380	35,872	16 Retro 320 Watt Pulse Start M.H.	365	6.6	1.620	
400w circle fixtures	6	400 Watt MH Fixture	455	2.7	od	4380	11,857	6 Retro 320 Watt Pulse Start M.H.	365	2.2	0.540	
side corners	4	100 Watt MH Can	122	0.5	od	4380	2,137	4 No Retrofit, 100 Watt MH Can	122	0.5	0.000	
									1,689	564,519	1,689	49.5

Total Annual Savin

DETENTION CENTER MOTION SENSOR SURVEY

PROPOSED

Room Description	Quantity	Description	Watts	KW	KW Saved	Sensor Type	Sensor Qty	Post Burn Hours	kWh	kWh Saved
DIR 412	2	Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			2470.00	237	385
DIR Office	4	Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.312	CM-PDT	1.0	1827.80	351	894
Dir RR	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053			2470.00	62	131
Upper West Svc. Corr.	9	Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.4	0.702			8760.00	3,784	6,150
415	1	Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.078			8760.00	420	683
414 Stair	3	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.159			8760.00	657	1,393
417	1	Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.078			8760.00	420	683
416 Stair	3	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.1	0.159			8760.00	657	1,393
406 Admin	12	Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.6	0.936			2470.00	1,423	2,312
405 Conf	6	Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.3	0.468	WSD-PDT-2P-V	1.0	1432.60	413	1,455
404 Mech	8	Retro T8 1x8 2-lamp 28w 4ft Kit (Std)Bal.	48	0.4	0.280			1040.00	398	291
404 Mech	6	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.318			1040.00	156	331
404 Mech	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
404 Mech	22	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.6	1.430			1040.00	572	1,487
263 Stair	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053			8760.00	219	464
263 Stair	2	New LED Exit Fixture	1.5	0.0	0.009			8760.00	26	79
263 Stair	1	No Retrofit	27	0.0	0.000			8760.00	237	0
263 Stair	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053			8760.00	219	464
263	6	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.2	0.390	WSD-PDT	1.0	1827.80	274	1,060

SUBMITTED BY: ESG

DETENTION CENTER MOTION SENSOR SURVEY

404 Hall	9	Retro T8 '2x4 2-lamp 28w (STD)Bal.	48	0.4	0.270	cm-pdt	1.0	6132.00	2,849	3,500
404 Hall	3	New LED Exit Fixture	1.5	0.0	0.014			8760.00	39	118
400 Vest.	1	Retro T8 '2x4 2-lamp 28w (STD)Bal.	48	0.0	0.030			8760.00	420	263
400 Vest.	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
210 O	6	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.318	WSD-PDT	1.0	1827.80	274	882
211	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053			2470.00	62	131
212 Audit	4	Delamp T8 '2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.432	WSD-PDT	1.0	1827.80	351	1,190
209 Program Super	6	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.318	WSD-PDT	1.0	1827.80	274	882
208 Director	6	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.318	WSD-PDT	1.0	1827.80	274	882
204 Hall	5	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.245	cm-pdt	1.0	6132.00	889	2,527
204 Hall	2	New LED Exit Fixture	1.5	0.0	0.009			8760.00	26	79
204 Hall	1	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.0	0.049			8760.00	254	429
204 Vest.	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
217 W. Lounge	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.108	cm-pdt	1.0	6132.00	307	1,060
217 W. Lounge	2	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.098			8760.00	508	858
218 Mens Locker	5	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.265	WSD-PDT	1.0	1274.00	159	1,260
219 shower	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.108			3640.00	182	388
218 shower	1	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.0	0.049			3640.00	108	178
220 Hall	4	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.198	cm-pdt	1.0	6132.00	711	2,022
220 Hall	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
221 Closet	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106			1040.00	52	110

DETENTION CENTER MOTION SENSOR SURVEY

Vending	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.108			8760.00	420	946
Vending	1	Vend Miser - energy sensor	240	0.2	0.160			8760.00	2,102	1,402
224 Lobby	11	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.3	0.539	CM-PDT	2.0	3328.80	1,062	6,454
						CM-PDT				
224 Lobby	2	New LED Exit Fixture	1.5	0.0	0.009			8760.00	26	79
224 Lobby	7	No Retrofit	27	0.2	0.000	cm-pc-dz	1.0	6132.00	1,159	497
223 MRR	1	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053	cm-pdt	1.0	3066.00	77	607
223 MRR	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.0	0.053		0.0	3066.00	77	607
224 MRR	1	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053	cm-pdt	1.0	3066.00	77	607
224 MRR	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.0	0.053		0.0	3066.00	77	607
Vestibule	2	No Retrofit	52	0.1	0.000			8760.00	911	0
225 Visitor	7	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.2	0.371			8760.00	1,533	3,250
225 Visitor	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
225 A	1	No Retrofit	27	0.0	0.000			8760.00	237	0
227 Hall	1	No Retrofit	27	0.0	0.000			8760.00	237	0
227 Upper Control	2	New 2-Lamp 2' Wrap	35	0.1	0.086			8760.00	613	753
227 Upper Control	4	No Retrofit	27	0.1	0.000			8760.00	946	0
227 Upper Control	1	NEW CFL 1R3023 23W	23	0.0	0.077			8760.00	201	675
228 RR	1	Retro T8 1x2 2-Lamp (STD)Bal.	29	0.0	0.021	cm-pdt	1.0	1274.00	37	145
230 Hall	4	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.212			8760.00	876	1,857
231 O	2	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			2470.00	124	262

DETENTION CENTER MOTION SENSOR SURVEY

232 O	2 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			2470.00	124	262
233 O	2 Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216			2470.00	237	534
234 HOUSING G	5 Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.540			8760.00	2,102	4,730
234 A,B,C,D	16 Delamp T8 '1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.4	0.848	WSD	1.0	8482.40	2,593	8,340
235	1 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	484
236	1 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	484
Storage	3 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.159			3640.00	273	579
Storage	1 No Retrofit	27	0.0	0.000			3640.00	98	0
229	2 Retro T8 '2x4 2-lamp 28w (STD)Bal.	48	0.1	0.080			8760.00	841	526
229	2 New LED Exit Fixture	1.5	0.0	0.009			8760.00	28	79
265 Stair	3 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.159			8760.00	657	1,393
265 Stair	2 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			8760.00	438	929
239	2 Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216			8760.00	841	1,892
240	2 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			8760.00	438	929
238 RR	2 Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216	cm-pdt	1.0	2548.00	245	891
237	2 Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216			8760.00	841	1,892
258-Vestibule	4 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.212	cm-pc-dz	1.0	8132.00	813	2,120
258 A	1 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	464
258 B	1 No Retrofit	27	0.0	0.000			8760.00	237	0
257	4 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.212			8760.00	876	1,857
259 ABC	9 Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.2	0.477			8760.00	1,971	4,179

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259 Hall	3	No Retrofit	27	0.1	0.000			8760.00	710	0
259 Hall	2	Vend Miser - energy sensor	240	0.5	0.320			8760.00	4,205	2,803
241 Housing H1	6	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.2	0.318			8760.00	1,314	2,786
H1 - H6	18	NEW CFL 28915 Mini lamp 15W	15	0.3	0.810			8760.00	2,365	7,096
RR	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			3840.00	91	193
239 Hall	7	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.2	0.371	cm-pdt	1.0	6132.00	1,073	3,710
239 Hall	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
243 Housing H2	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	464
243 Housing H2	4	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.432			8760.00	1,682	3,784
RR	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053	cm-pdt	1.0	2548.00	64	220
Off	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.0	0.053			2470.00	62	131
Storage	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.0	0.053			3840.00	91	193
242	2	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.1	0.106			8760.00	438	929
244	2	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106			8760.00	438	929
245	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	464
245	5	No Retrofit	27	0.1	0.000			8760.00	1,183	0
245	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
246	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			8760.00	438	929
254 O	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.108			2470.00	119	267
254 ?	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			2470.00	62	131
253 O	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.108			2470.00	119	267

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249 O	2	DeLamp T8 2x4-2L 28w (STD)Bal. w/reflector	48	0.1	0.216		2470.00	237	534
250 Exam	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216		8760.00	841	1,892
Closet	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053		3640.00	91	193
248	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053		8760.00	219	464
247 Hold	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106		8760.00	438	929
Cell 228	2	No Retrofit	52	0.1	0.000		8760.00	911	0
Cell 228	2	No Retrofit	52	0.1	0.000		8760.00	911	0
242 Stair	3	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.159		8760.00	657	1,393
276 Hall	4	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.212		8760.00	876	1,857
176 Housing F1	7	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.371		8760.00	1,533	3,250
1-6	18	NEW CFL 28915 Mini lamp 15W	15	0.3	0.810		8760.00	2,365	7,096
173 F2	7	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.371		8760.00	1,533	3,250
1-6	18	NEW CFL 28915 Mini lamp 15W	15	0.3	0.810		8760.00	2,365	7,096
156	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106		8760.00	438	929
154 O	8	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.2	0.424		2470.00	494	1,047
153 O	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053		2470.00	62	131
152 Tele	1	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053		1040.00	26	55
151	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106		8760.00	438	929
150	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106		8760.00	438	929
149 RR	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053		3640.00	91	193
148	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106		8760.00	438	929

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148 Storage	1	Retro T8 '1x4 1-lamp 28w (STD)Bal.	25	0.0	0.023			1040.00	26	24
145	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	484
147 Stair	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	484
159 Hall	2	No Retrofit	27	0.1	0.000			8760.00	473	0
158	2	No Retrofit	27	0.1	0.000			8760.00	473	0
157	4	No Retrofit	27	0.1	0.000			8760.00	948	0
160 hall	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			8760.00	438	829
160 hall	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
161 O	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			2470.00	124	262
Comunit Off	5	Retro T8 '2x4 2-lamp 28w (STD)Bal.	48	0.2	0.150			2470.00	593	371
Closet	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			3640.00	91	193
Hearing	1	Delamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.108			8760.00	420	946
Hearing	2	NEW CFL 1R3016 16W	16	0.0	0.028			8760.00	280	245
172 Hall	4	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.212	cm-pdt	1.0	6132.00	613	2,120
172 Hall	2	New LED Exit Fixture	1.5	0.0	0.009			8760.00	26	79
171 Housing F3	4	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.212			8760.00	876	1,857
1 + 2	2	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			8760.00	438	929
168 Hall	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	484
166 main Con	4	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.212			8760.00	876	1,857
166 main Con	6	No Retrofit	13	0.1	0.000			8760.00	683	0
168 main Con	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	484

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165 RR	1	No Retrofit	27	0.0	0.000			3640.00	98	0
164	2	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106			8760.00	438	929
164	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.0	0.053			8760.00	219	464
167 ?	4	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.212			8760.00	876	1,857
167 ?	1	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	464
163	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.108			8760.00	420	846
164 Garage	3	Retro T8 1x8 2-lamp 28W 4ft Kit (Std)Bal.	48	0.1	0.381			8760.00	1,261	3,338
164 Garage	4	NEW 42W CFL WALL PACK	42	0.2	0.352			8760.00	1,472	3,084
185 ?	2	Retro T8 1x8 2-lamp 28W 4ft Kit (Std)Bal.	48	0.1	0.254			8760.00	841	2,225
Sprinkler	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.0	0.053			1040.00	26	55
169 Hall	6	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.2	0.318	cm-pdt	1.0	1.00	0	4,100
169 Hall	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
Elevator	4	Retro T8 1x4 1-lamp 28w (STD)Bal.	25	0.1	0.092			8760.00	876	806
181	3	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.159			8760.00	657	1,393
104	6	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.2	0.318	WSD-PDT	1.0	3066.00	460	3,640
103	2	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			8760.00	438	929
102 Dry	9	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.477			8760.00	1,971	4,179
101 Storage	2	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.106			1040.00	52	110
Out Sally Port 3	2	Retro T8 1x8 2-lamp 28W 4ft Kit (Std)Bal.	48	0.1	0.254			8760.00	841	2,225
Kitchen	20	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	1.0	2.160			5460.00	5,242	11,794
Kitchen Hood	9	No Retrofit	27	0.2	0.000			5460.00	1,327	0

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Kitchen Hood	9	No Retrofit	27	0.2	0.000			5460.00	1,327	0
Freezer 1	3	No Retrofit	27	0.1	0.000			3640.00	295	0
Freezer 2	4	NEW CFL 28915 Mini lamp 15W	15	0.1	0.180			3640.00	218	655
108	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.108			8760.00	420	946
109 Janitor	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053			1040.00	26	55
110 RR	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053			3640.00	91	193
Switch Room	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.0	0.053			3640.00	91	193
119 hall	5	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.265	cm-pdt	1.0	6132.00	767	2,650
119 hall	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
118	2	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106			8760.00	438	929
117 Laundry	5	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.265			8760.00	1,095	2,321
121 Office	5	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.540			2470.00	593	1,334
123 Storage	2	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106			1040.00	52	110
133 hall	4	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.212	cm-pdt	1.0	6132.00	613	2,120
133 hall	2	No Retrofit	27	0.1	0.000		0.0	6132.00	331	142
133 hall	4	New LED Exit Fixture	1.5	0.0	0.018			8760.00	53	158
129 RRF	2	No Retrofit	27	0.1	0.000			3640.00	197	0
128 RRM	2	No Retrofit	27	0.1	0.000			3640.00	197	0
124 Exercise	3	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.324			3640.00	524	1,179
125 O	1	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053			2470.00	62	131
125 O	1	Retro T8 '2x4 2-lamp 28w (STD)Bal.	48	0.0	0.030			2470.00	119	74

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125 O	1	No Retrofit	27	0.0	0.000			2470.00	67	0
125 Hall	2	DeLamp T8 '1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.1	0.108			8760.00	438	929
125 Hall	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
127 Chapel	27	No Retrofit	27	0.7	0.000			2470.00	1,801	0
131 Closet	1	No Retrofit	27	0.0	0.000			3640.00	98	0
132 Closet	1	No Retrofit	27	0.0	0.000			3640.00	98	0
300 Staff B?	6	Retro T8 '2x4 2-lamp 28w (STD)Bal.	48	0.3	0.180	WSD-PDT	1.0	1827.80	526	830
300 Staff B?	1	No Retrofit	36	0.0	0.000			2470.00	89	0
301 Bice Off	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.216			2470.00	237	534
302 Stoner	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			2470.00	237	385
345 Cadt Off	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			2470.00	237	385
344	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			2470.00	237	385
343 Counselor	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			2470.00	237	385
342 Class Off	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			2470.00	237	385
341	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			8760.00	841	1,367
340	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			8760.00	841	1,367
339	4	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.2	0.312	WSD-PDT-2P-V	1.0	6482.40	1,245	3,170
338 Hall	7	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.3	0.546	CM-PDT	1.0	4117.20	1,383	6,343
337 Hall	1	DeLamp T8 '1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.0	0.053			8760.00	219	464
303 Hall	1	DeLamp T8 '1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.0	0.053			8760.00	219	464
304 Hall	6	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.3	0.468	cm-pdt	1.0	6132.00	1,766	4,857

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305 Library	9	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.4	0.702			2470.00	1,067	1,734
306	1	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053			8760.00	219	464
307 Off	2	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.1	0.060			2470.00	237	148
RR	1	NEW 2' 2-Lamp Wrap	35	0.0	-0.017			3640.00	127	-62
West 1	20	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	3.6	0.640			8760.00	31,186	5,606
West 1	73	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	1.8	3.869			8760.00	15,987	33,892
West 1	7	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.371			8760.00	1,533	3,250
West 1	8	No Retrofit	18	0.1	0.000			8760.00	1,261	0
West 2	20	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	3.6	0.640			8760.00	31,186	5,606
West 2	80	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	2.0	4.240			8760.00	17,520	37,142
West 2	8	No Retrofit	18	0.1	0.000			8760.00	1,261	0
West 3	20	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	3.6	0.640			8760.00	31,186	5,606
West 3	80	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	2.0	4.240			8760.00	17,520	37,142
West 3	8	No Retrofit	18	0.1	0.000			8760.00	1,261	0
West 4	20	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	3.6	0.640			8760.00	31,186	5,606
West 4	80	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	2.0	4.240			8760.00	17,520	37,142
West 4	8	No Retrofit	18	0.1	0.000			8760.00	1,261	0
312 Hall	11	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.5	0.858	cm-pdt	2.0	6132.00	3,238	8,904
						cm-pdt				
WF-4	2	NEW T5 2x4 4Lamp HO w/ Refl&cage	255	0.5	0.400			8760.00	4,468	3,504
WF-4	3	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	0.5	0.096			8760.00	4,678	841

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WF-4	3	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.159			8760.00	657	1,393
1-8	8	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.2	0.424			8760.00	1,752	3,714
1-8	18	No Retrofit	9	0.1	0.000			8760.00	1,261	0
325	1	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			2470.00	62	131
326 Hall	6	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.3	0.468	cm-pdt	1.0	6132.00	1,766	4,857
332 Hall	3	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.234			8760.00	1,261	2,050
West 7 Office	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			2470.00	237	385
West 5	24	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	4.3	0.768			8760.00	37,423	6,728
West 5	63	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	1.6	3.339			8760.00	13,797	29,250
West 5 Cells	96	No Retrofit	7	0.7	0.000			8760.00	5,887	0
West 5 RR	6	No Retrofit	36	0.2	0.000			8760.00	1,892	0
West 6	24	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	4.3	0.768			8760.00	37,423	6,728
West 6	63	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	1.6	3.339			8760.00	13,797	29,250
West 6 Cells	96	No Retrofit	7	0.7	0.000			8760.00	5,887	0
West 6 RR	6	No Retrofit	36	0.2	0.000			8760.00	1,892	0
West 7	24	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	4.3	0.768			8760.00	37,423	6,728
West 7	63	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	1.6	3.339			8760.00	13,797	29,250
West 7 Cells	96	No Retrofit	7	0.7	0.000			8760.00	5,887	0
West 7 RR	6	No Retrofit	36	0.2	0.000			8760.00	1,892	0
335 Hall	1	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	464
336 Hall	1	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	464

DETENTION CENTER MOTION SENSOR SURVEY

A-D Hall	13	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.3	0.689	cm-pdt	2.0	6132.00	1,993	6,890
						cm-pdt				
A-D Hall	3	New LED Exit Fixture	1.5	0.0	0.014			8760.00	39	118
177 Office	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			2470.00	62	131
Housing C	4	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	0.7	0.128			4380.00	3,119	561
Housing C	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510			4380.00	5,125	15,374
Housing A	4	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	0.7	0.128			4380.00	3,119	561
Housing A	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510			4380.00	5,125	15,374
Housing B	4	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	0.7	0.128			4380.00	3,119	561
Housing B	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510			4380.00	5,125	15,374
Housing D	4	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	0.7	0.128			4380.00	3,119	561
Housing D	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510			4380.00	5,125	15,374
Housing E	4	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	0.7	0.128			4380.00	3,119	561
Housing E	78	NEW CFL 28915 Mini lamp 15W	15	1.2	3.510			4380.00	5,125	15,374
141 Hall	4	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.212	cm-pdt	1.0	6132.00	613	2,120
141 Hall	1	New LED Exit Fixture	1.5	0.0	0.005			8760.00	13	39
511 Hall	1	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.0	0.053			8760.00	219	464
510 Hall	2	Delamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106			8760.00	438	929
509	2	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.156			2470.00	237	385
508 RR	1	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector ki	25	0.0	0.053			3640.00	91	193
507 Laundry	4	Delamp T8 '1x4 1-lamp 28w (STD)Bal.w/reflector ki	25	0.1	0.212			3640.00	364	772

DETENTION CENTER MOTION SENSOR SURVEY

506 hall	2	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106			8760.00	438	929
504 Stores	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.078			3640.00	175	284
505 Control	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053			8760.00	219	464
505 Control	1	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.0	0.078			8760.00	420	683
505 Control	3	No Retrofit	27	0.1	0.000			8760.00	710	0
512	11	NEW T5 2x4 3Lamp HO w/ Refl&cage	178	2.0	0.352			8760.00	17,152	3,084
512	54	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	1.4	2.862			8760.00	11,828	25,071
600 Storage	2	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.1	0.106			3640.00	182	386
601	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053			8760.00	219	464
601	3	DeLamp T8 2x4 2L 28w (STD)Bal. w/reflector	48	0.1	0.324			8760.00	1,261	2,838
503	3	Retro 320 Watt Pulse Start M.H.	365	1.1	0.300			8760.00	9,592	2,628
502	1	DeLamp T8 1x4 1-lamp 28w (STD)Bal.w/reflector kit	25	0.0	0.053			8760.00	219	464
Outside	1	Retro 320 Watt Pulse Start M.H.	365	0.4	0.100			4380.00	1,599	438
Outside	23	Retro 320 Watt Pulse Start M.H.	365	8.4	2.300			4380.00	36,770	10,074
Outside	11	Retro 320 Watt Pulse Start M.H.	365	4.0	1.100			4380.00	17,586	4,818
Front parking	5	Retro 2 320 Watt Pulse Start M.H.	730	3.7	1.000			4380.00	15,987	4,380
Front parking	7	Retro 320 Watt Pulse Start M.H.	365	2.6	0.700			4380.00	11,191	3,066
Front parking	2	Retro 320 Watt Pulse Start Metal Halide	365	0.7	0.200			4380.00	3,197	876
Shop Side	2	Retro 320 Watt Pulse Start Metal Halide	365	0.7	0.200			4380.00	3,197	876
Beck	7	Retro 320 Watt Pulse Start Metal Halide	365	2.6	0.700			4380.00	11,191	3,066
Sheds	10	NEW 42W CFL WALL PACK	42	0.4	0.800			4380.00	1,840	3,504

DETENTION CENTER MOTION SENSOR SURVEY

Sheds	6	Retro 200 Watt Pulse Start MH kit	232	1.4	0.354			4380.00	6,097	1,551
Sheds	12	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.3	0.636			4380.00	1,314	2,786
Sheds	20	Delamp T8 1x4 1-lamp 28w (STD)Bal. w/reflector kit	25	0.5	1.060			4380.00	2,190	4,643
2,391				103			38		716,138	712,949

Total Annual Savings:

SCAGGSVILLE PUBLIC SAFETY COMPLEX MOTION SENSOR SURVEY

PROPOSED

Room Description	Quantity	Description	Watts	kW	KW Saved	Sensor Type	Sensor Qty	Post Burn Hours	kWh	kWh Saved
District Court	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174	WSD-PD	1.0	2462.72	355	704
Duty Office	20	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	1.0	0.720			3328.00	3,195	2,396
Duty Office	7	Remove fixture, patch, paint and repair... room over lit	0	0.0	0.588			3328.00	0	1,957
RR	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058			8760.00	420	508
Status Room	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
Hall	3	Retro T8 '2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.354	cm-pdt	1.0	5258.00	457	3,408
Hall	1	No Retrofit	5	0.0	0.000			8760.00	44	0
Hall	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174	cm-pdt	1.0	5256.00	757	2,029
Hall	11	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.5	0.396	cm-pdt	1.0	5256.00	2,775	5,319
RR	1	DeLamp T8 '1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.0	0.037			8760.00	219	324
Interview	1	Re-Lamp & Re-Ballast T8 '2x4 2Lamp Troffer 28w (STD)Bal.	48	0.0	0.014			3328.00	160	47
Interview 2	1	Re-Lamp & Re-Ballast T8 '2x4 2Lamp Troffer 28w (STD)Bal.	48	0.0	0.014			3328.00	160	47
Office 2	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
Office 4	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
Office 3	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174	WSD	1.0	2462.72	355	704
Hall	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			8760.00	841	1,016
Hall	2	No Retrofit	5	0.0	0.000			8760.00	88	0
Hall	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.324	cm-pdt	1.0	5256.00	757	3,343
#16	1	Retro T8 '1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014			3328.00	213	47
#17	1	Retro T8 '1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014			3328.00	213	47
Hall	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.432	cm-pdt	1.0	5256.00	1,009	4,457
FEMALE HOLDING	1	Retro T8 '1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014			740.00	47	10
FEMALE HOLDING	1	Retro T8 '1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014			740.00	47	10
Hall	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290	cm-pdt	1.0	5256.00	1,261	3,381
Hall	1	No Retrofit	5	0.0	0.000			8760.00	44	0
Juv. Booking	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232			8760.00	1,882	2,032
Juv Int	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
23	1	Retro T8 '1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014			740.00	47	10
24	1	Retro T8 '1x3 3-Lamp F25 (STD)Bal.	64	0.1	0.014			740.00	47	10
21	1	Retro T8 '1x3 3-Lamp F25 (STD)Bal.	1	0.0	0.000			740.00	1	0
20	1	Retro T8 '1x3 3-Lamp F25 (STD)Bal.	1	0.0	0.000			740.00	1	0
Hall	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290	cm-pdt	1.0	5256.00	1,261	3,381
Hall	1	No Retrofit	5	0.0	0.000			8760.00	44	0

SCAGGSVILLE PUBLIC SAFETY COMPLEX MOTION SENSOR SURVEY

Sally Port	4	Retro 200 Watt Pulse Start MH kit	232	0.9	0.224			3328.00	3,088	745
Storage	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			1040.00	100	121
Storage	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			1040.00	100	121
Storage	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.049			1040.00	30	51
Computer Op	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290			3328.00	799	965
Computer Op	1	No Retrofit	5	0.0	0.000			8760.00	44	0
Storage	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144	WSD	1.0	416.00	80	270
Office	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232			3328.00	639	772
Office	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.216			3328.00	319	719
Office	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.324			3328.00	479	1,078
Hall	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116	cm-pdt	1.0	5256.00	505	1,353
Hall	1	No Retrofit	5	0.0	0.000			8760.00	44	0
Lobby	4	Retro 200 Watt Pulse Start MH kit	232	0.9	0.224			8760.00	8,129	1,962
Lobby	1	No Retrofit	5	0.0	0.000			8760.00	44	0
Shower	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.118			8760.00	254	1,034
RRW	1	DeLamp T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037	cm-pdt	1.0	3066.00	77	466
RRW	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058		0.0	5256.00	252	676
RRW	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.049		0.0	5256.00	152	531
Jan	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058			740.00	36	43
RRM	1	DeLamp T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037	cm-pdt	1.0	5256.00	131	412
RRm	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058		0.0	5256.00	252	676
Interview	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
Interview	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
Patrol Off	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290	WSD-PDT	1.0	2462.72	591	1,173
District Com	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232	CM-PDT	1.0	2462.72	473	938
District Com	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.118			3328.00	97	393
RR	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.118	cm-pdt	1.0	3066.00	89	1,199
District Com O	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174	WSD-PDT	1.0	2462.72	355	704
Radio Rm	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174	CM-PDT	1.0	6482.40	933	1,852
Womens Locker	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.432	CM-PDT	1.0	3066.00	589	4,878
Womens Locker	3	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.153	WSD-PDT	1.0	3066.00	267	1,836
Womens Locker	1	DeLamp T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037			8760.00	219	324
Womens Locker	2	New CFL 1R3016 15W	15	0.0	0.090			8760.00	263	788
RR	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.051	cm-pdt	1.0	3066.00	89	612
Conf	8	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.4	0.288	CM-PDT	1.0	1930.24	741	1,495
Conf	12	New CFL 23w BR40 Dimmable Flood	23	0.3	0.804			3328.00	919	2,676
Closet	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.051			1040.00	30	53

SCAGGSVILLE PUBLIC SAFETY COMPLEX MOTION SENSOR SURVEY

Roll Call	12	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.6	0.432	WV-PDT	1.0	2462.72	1,419	1,938
Roll Call	4	New CFL 23w BR40 Dimmable Flood	23	0.1	0.268			3328.00	306	892
Mech Room	12	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.6	0.432			1040.00	598	449
Mech Room	2	New LED Exit Fixture	1.5	0.0	0.047			8760.00	26	412
File	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144			3328.00	839	479
File	2	New LED Exit Fixture	1.5	0.0	0.047			8760.00	26	412
Evidence	2	DeLamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072			3328.00	319	240
Storage	2	DeLamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072			1040.00	100	75
Hall	20	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	1.0	0.720	cm-pdt	3.0	5258.00	5,048	9,671
						cm-pdt				
						cm-pdt				
Hall	3	New LED Exit Fixture	1.5	0.0	0.014			8760.00	39	118
Hall	2	No Retrofit	5	0.0	0.000			8760.00	88	0
Jan	2	Retro T8 '2x2 2Lamp F17 T8 w/Reflector Kit	29	0.1	0.102			740.00	43	75
Office	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174	WSD-PD	1.0	2462.72	355	704
Office	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174	WSD-PD	1.0	2462.72	355	704
Office	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174	WSD-PD	1.0	2462.72	355	704
Server	2	DeLamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072			3328.00	319	240
Server	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	388
Lounge	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144	WSD-PD	1.0	3328.80	638	2,304
M Locker	7	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.3	0.406			8760.00	2,943	3,557
M Locker	3	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.111	WSD-PD	1.0	3068.00	230	1,399
M Locker	3	New CFL IR3016 15W	15	0.0	0.135			8760.00	394	1,183
Debriefing	16	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.8	1.728	CM-PDT	2.0	2462.72	1,891	6,415
						CM-PDT				
Exercise	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.540			8760.00	2,102	4,730
Hall	23	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	1.1	0.828	cm-pdt	3.0	5258.00	5,803	11,122
						cm-pdt				
						cm-pdt				
Hall	6	New LED Exit Fixture	1.5	0.0	0.141			8760.00	79	1,235
Hall	28	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	1.2	0.936	cm-pdt	3.0	5258.00	6,559	12,572
						cm-pdt				
						cm-pdt				
Hall	7	New LED Exit Fixture	1.5	0.0	0.165			8760.00	92	1,441
traffic	6	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.3	0.648			8760.00	2,523	5,676
Commander	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.432	CM-PDT	1.0	2462.72	473	1,604
Commander	2	No Retrofit	13	0.0	0.000			3328.00	87	0

SCAGGSVILLE PUBLIC SAFETY COMPLEX MOTION SENSOR SURVEY

Office	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.108	WSD	1.0	2462.72	355	484
Dispatch	18	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.9	1.944			8760.00	7,569	17,029
Dispatch	2	New LED Exit Fixture	1.5	0.0	0.047			8760.00	26	412
Office	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144			3328.00	639	479
Traffic	6	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.3	0.648			8760.00	2,523	5,676
Traffic	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
Office	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.108	WSD	1.0	2462.72	355	484
Office	6	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.3	0.216	CM-PDT	1.0	2462.72	709	968
Storage	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144	WSD-PD	1.0	416.00	80	270
Crime PRFU	8	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.4	0.464			3328.00	1,278	1,544
Crime PRFU	2	Retro T8 '2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.102			3328.00	193	339
Crime PRFU	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
Crime PRFU	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058			3328.00	160	193
Office	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.108	WSD-PD	1.0	2462.72	355	484
K-9	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.290	WSD-PD	1.0	2462.72	591	1,173
Office	3	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174	WSD-PD	1.0	2462.72	355	704
Kennel	4	Delamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.2	0.144	WSD	1.0	3241.20	622	849
Kennel	1	No Retrofit	13	0.0	0.000			4380.00	57	0
K-9	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
Storage	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			1040.00	100	121
Office	3	Delamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.108			3328.00	479	359
Conf Rm	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232	WSD-PD	1.0	1930.24	371	1,040
Elec	2	Re-Lamp & Re-Ballast T8 '1x4 1-Lamp Strip 28w (STD)Bal.	25	0.1	0.020			1040.00	52	21
Storage	1	New CFL 28923 23W	23	0.0	0.077			1040.00	24	80
Tactical	6	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.3	0.348	CM-PDT	1.0	2462.72	709	1,407
office	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144	WSD-PD	1.0	2462.72	473	645
office	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
Cycle	2	Delamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072			3328.00	319	240
Office	26	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	1.2	0.936	CM-PDT	3.0	2462.72	3,073	4,195
						CM-PDT				
						CM-PDT				
Office	2	New LED Exit Fixture	1.5	0.0	0.047			8760.00	26	412
Office	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144	WSD	1.0	2462.72	473	645
Office	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144	WSD	1.0	2462.72	473	645
Office	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144	CM-PDT	1.0	2462.72	473	645
St	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.216			3328.00	319	719
Interview	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386

SCAGGSVILLE PUBLIC SAFETY COMPLEX MOTION SENSOR SURVEY

Interview	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232	WSD	1.0	2462.72	473	938
Interview	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	1	0.0	0.000	WSD	1.0	2462.72	10	3
Interview	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
Polygraph	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.432	WSD	2.0	2462.72	473	1,604
						WSD				
Polygraph	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
RRf	1	Re-Lamp & Re-Ballast T8 '1x4 1-Lamp Strip 28w (STD)Bal.	25	0.0	0.010	cm-pdt	1.0	3066.00	77	230
RRF	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058		0.0	5256.00	252	676
RRM	1	Re-Lamp & Re-Ballast T8 '1x4 1-Lamp Strip 28w (STD)Bal.	25	0.0	0.010	cm-pdt	1.0	3066.00	77	230
RRm	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058		0.0	5256.00	252	676
Mason's Office	6	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.3	0.216	CM-PDT	1.0	2462.72	709	968
Mason's Office	8	New CFL IR3016 15W	15	0.1	0.360			3328.00	399	1,198
Clerical	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144	WSD-PD	1.0	2462.72	473	645
Command	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.144	WSD-PD	1.0	2462.72	473	645
FIRE HOUSE										
Lobby	8	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.4	0.288	cm-pc-dz	1.0	5256.00	2,018	3,868
RR	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.036			8760.00	420	315
Control	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			8760.00	841	1,016
Off 1	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
Off 2	2	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			3328.00	319	386
Training	6	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.3	0.348	CM-PDT	1.0	2462.72	709	1,407
Training	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
Lobby	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
Lobby	1	Retro T8 '2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.049			8760.00	254	429
Closet	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.036			1040.00	50	37
RR	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.036			8760.00	420	315
Bay	4	DeLamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.2	0.144			4380.00	841	631
Bay	11	Retro 200 Watt Pulse Start MH kit	232	2.6	0.616			4380.00	11,178	2,698
Bay	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
Bay	1	No Retrofit	5	0.0	0.000			8760.00	44	0
Shop	2	DeLamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072			3328.00	319	240
Siric	1	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.0	0.036			3328.00	160	120
Gear Rm	3	DeLamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.108			8760.00	1,261	948
Hall	5	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	1	0.0	0.000	cm-pdt	1.0	5256.00	26	18
WEIGHT ROOM	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232	WSD-PD	1.0	6482.40	1,245	2,470
Kitchen	2	DeLamp T8 '1x4 2-Lamp Wrap 28w (STD)Bal. w/reflector	48	0.1	0.072			8760.00	841	631
Conf	4	DeLamp T8 2x4 2Lamp 28w (STD)Bal. w/reflector	48	0.2	0.232	WSD	1.0	1930.24	371	1,040

SCAGGSVILLE PUBLIC SAFETY COMPLEX MOTION SENSOR SURVEY

Elec	1	Delamp T8 2x4 2Lamp 28w (STD) Bal. w/reflector	48	0.0	0.036			1040.00	50	37
Jan	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.051			740.00	21	38
Locker	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
Locker	5	Delamp T8 2x4 2Lamp 28w (STD) Bal. w/reflector	48	0.2	0.290	WSD	1.0	3066.00	736	3,907
Laundry	10	Delamp T8 2x4 2Lamp 28w (STD) Bal. w/reflector	48	0.5	0.580	WV-PDT	2.0	3328.80	1,598	7,688
Lounge	4	Delamp T8 2x4 2Lamp 28w (STD) Bal. w/reflector	48	0.2	0.144			8760.00	1,682	1,261
Lounge	1	No Retrofit	5	0.0	0.000			8760.00	44	0
Closet	1	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.0	0.051			1040.00	30	53
Sleeping	12	Delamp T8 1x4 1-Lamp Troffer 28w (STD) Bal. w/reflector	25	0.3	0.444	WSD	4.0	1996.80	599	1,877
						WSD				
						WSD				
						WSD				
Sleeping	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
D RR Shower	1	Delamp T8 1x4 1-Lamp Sftp 28w (STD) Bal. w/reflector	25	0.0	0.037			8760.00	219	324
D RR Shower	1	New CFL IR3016 15W	15	0.0	0.045			8760.00	131	394
Hall	5	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.255	cm-pdt	2.0	5256.00	762	2,742
						cm-pdt				
Hall	1	New LED Exit Fixture	1.5	0.0	0.024			8760.00	13	206
Hall	2	Vend/Miscer Occupancy control unit	240	0.5	0.320			8760.00	4,205	2,803
Outside	25	Retro 200 Watt Pulse Start MH Kit	232	5.8	1.400			4380.00	25,404	6,132
Outside	4	No Retrofit	122	0.5	0.000			4380.00	2,137	0
Outside	13	Retro 320 Watt Pulse Start M.H.	365	4.7	1.170			4380.00	20,763	5,125
Outside	4	Retro 320 Watt Pulse Start M.H. w/2 heads	730	2.9	0.720			4380.00	12,790	3,154
Outside	1	Retro 320 Watt Pulse Start M.H. w/3 heads	1095	1.1	0.270			4380.00	4,796	1,183

Total Annual Savings:

731 38.1 80 199,407 246,119

EAST COLUMBIA LIBRARY MOTION SENSOR SURVEY

PROPOSED										
Room Description	Quantity	Description	Watts	KW	KW Saved	Sensor Type	Sensor Qty	Post Burn Hours	kWh	kWh Saved
Main Lobby	6	No Retrofit 2- 18 Watt CFL Plug In Double biax 2-pin	36	0.2	0.000	CM-PC-DZ	1.0	3278.00	708	238
Main Lobby	8	No Retrofit 100 Watt MH Can	122	1.0	0.000		0.0	3278.00	3,197	1,068
Main Lobby	4	No Retro	6	0.0	0.000			8760.00	210	0
RRM	1	Retro T8 1x3 2-Lamp F25 (LP)Bal.	43	0.0	0.035			8760.00	377	307
RRM	4	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.148			8760.00	876	1,296
Display Case	2	No Retrofit T8 1x3 2-Lamp Strip	54	0.1	0.000			8760.00	946	0
Display Case	2	No Retrofit T8 1x3 2-Lamp Strip	54	0.1	0.000			8760.00	946	0
RRF	1	Retro T8 1x3 2-Lamp F25 (LP)Bal.	43	0.0	0.035	cm-pdt	1.0	6132.00	264	420
RRF	2	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.074		0.0	6132.00	307	780
Meeting Room	12	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.3	0.444			4368.00	1,310	1,939
Meeting Room	2	No Retro	6	0.0	0.000			8760.00	105	0
Meeting Room	8	New LED 8 Watt MR 16 replacement lamp	8	0.1	0.338			8760.00	561	2,943
Coat Closet	1	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.0	0.014			1040.00	50	15
Coat Closet	1	No Retrofit 2- 18 Watt CFL Plug In Double biax 2-pin	36	0.0	0.000			4368.00	157	0
Hall	8	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.2	0.408	cm-pdt	2.0	3057.60	709	2,086
Hall	2	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.074	cm-pdt	0.0	3057.60	153	389
Conf	6	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.2	0.222	WSD	1.0	3494.40	524	1,101
Office	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.036			4368.00	210	157
Copy Rm	20	No Retrofit 2- 18 Watt CFL Plug In Double biax 2-pin	36	0.7	0.000	cm-pdt	1.0	3057.60	2,201	943
Telephone Closet	1	New CFL 25W SI	25	0.0	0.075			1040.00	26	78
DER Office	8	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.2	0.198			4368.00	760	865
Office Cus.	25	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	1.2	1.225	CM-PDT	3.0	3057.60	3,669	6,923
						CM-PDT				
						CM-PDT				
Mech Rm	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.049			4368.00	210	214
John W Office	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512
Brian A Office	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512
Lew Office	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512
Cronor Off	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512
Kenz	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512
Ann	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512
natalie	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512
Chris	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512
Chris	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512
Tara	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	1.0	3494.40	335	512

EAST COLUMBIA LIBRARY MOTION SENSOR SURVEY

Kitchen	2	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	0.098	4388.00	419	428
RRM	1	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.049	WSD	4380.00	210	639
Office	8	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.4	0.392	CM-PDT	3057.60	1,174	2,215
Stacey Fields	2	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	3494.40	335	512
Donna Anderson	2	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-2P	3494.40	335	512
Central Desk	8	Retro T8 2'x2 2lamp F17 T8 w/Reflector Kit	29	0.2	0.408		4368.00	1,013	1,782
Central Desk	35	No Retrofit 2-18 Watt CFL Plug In Double bias 2-pin	36	1.3	0.000		4368.00	5,504	0
Central Desk	3	De-Lamp to T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.159		4368.00	328	695
Work Room	12	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.6	0.588	CM-PDT	3057.60	1,761	3,323
Office 1	2	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-PDT-2F	3494.40	335	512
Office 2	2	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-PDT-2F	3494.40	335	512
Office 3	2	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-PDT-2F	3494.40	335	512
Work Room	19	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.9	0.931	CM-PDT	3494.40	3,187	4,863
Work Room									
Office	4	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.196	CM-PDT	3494.40	671	1,024
Receiving	7	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.343	CM-PDT	3057.60	1,027	1,939
Computer	2	De-Lamp to T8 2'x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.088		4368.00	419	428
Book Drop	1	De-Lamp to T8 2'x4 2-Lamp 28w reflector (STD)Bal.	48	0.0	0.058		4368.00		
Supply	2	De-Lamp to T8 2'x4 2-Lamp 28w reflector (STD)Bal.	48	0.1	0.116	WSD	3057.60	294	632
Mech Rm	10	De-Lamp to T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.3	0.370		1040.00	260	385
Main Library	14	De-Lamp to T8 1'x4 1-Lamp W/rap 28w (STD)Bal. w/reflector	25	0.4	0.518		4368.00	1,529	2,263
Stacks	20	De-Lamp to T8 2-Lamp 28w (STD)Bal. w/reflector	48	1.0	2.600		4368.00	4,193	11,357
Stacks	22	De-Lamp to T8 2-Lamp 28w (STD)Bal. w/reflector Tandem 4 b	95	2.1	1.826		4368.00	8,129	7,976
Stacks	66	De-Lamp to T8 2-Lamp 28w (STD)Bal. w/reflector Tandem	0	0.0	11.748		4368.00	0	51,315
H-Corner	11	Rcto T8 2'x2 2lamp F17 T8 w/Reflector Kit	29	0.3	0.561		4368.00	1,393	2,450
Along Glass Wall	27	Rcto 320 Watt Pulse Start M.H.	365	9.9	2.430	CM-PC-DZ	3276.00	32,285	21,376
Along Glass Wall	27	Remove Fixture and Patch,Paint and Repair	0	0.0	7.776		4368.00	0	33,966
Along Glass Wall	4	No Retrofit 25 Watt CFL Flood	25	0.1	0.000		8760.00	876	0
Computer Lab 2	1	No Retrofit 100 Watt MH Can	122	0.1	0.000		4368.00	533	0
Computer Lab 2	1	No Retrofit	100	0.1	0.000		4368.00	437	0
Computer Lab 2	32	Remove & replace with NEW T8 4-lamp 2'x4 T8 w/Reflector	95	3.0	-0.480		4368.00	13,279	-2,097
Along Glass Wall	8	Remove Fixture and Patch,Paint and Repair	0	0.0	2.000		4368.00	0	8,736

SUBMITTED BY: ESG

EAST COLUMBIA LIBRARY MOTION SENSOR SURVEY

Childrens Room	6	New LED 8 Watt MR 16 replacement lamp	8	0.0	0.252			4368.00	210	1,101
Childrens Room	10	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.3	0.510	CM-PC-DZ	1.0	3276.00	950	2,544
Childrens Room	34	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	1.0	1.734			4368.00	4,307	7,574
Childrens Room	8	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.2	0.408			8760.00	2,032	3,574
Staff Only	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072	WSD	1.0	3057.60	294	440
Child Room	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.036			4368.00	210	157
Child Room	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.036			4368.00	210	157
Librarian Office	3	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.147	WSD-PDT-2F	1.0	3494.40	503	768
Story Room	2	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.102			4368.00	253	446
CL Librarian	6	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.2	0.222			4368.00	655	970
CL 1	1	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.0	0.014			1040.00	50	15
CL 2	1	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.0	0.014			1040.00	50	15
CL 2	3	No Retro	6	0.0	0.000			8760.00	158	0
Staff Only Office	7	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.343	CM-PDT	1.0	3057.60	1,027	1,939
Staff Only Office	4	No Retro	6	0.0	0.000			8760.00	210	0
Lobby	4	No Retro	6	0.0	0.000			8760.00	210	0
Canopies	6	Retro 200 Watt Pulse Start MH kit	232	1.4	0.336			4380.00	6,097	1,472
Canopies	3	No Retrofit 100 Watt MH Can	122	0.4	0.000			4380.00	1,603	0
pole lights	16	Retro 320 Watt Pulse Start M.H.	365	5.8	1.440			4380.00	25,579	6,307
pole lights	9	Retro 320 Watt Pulse Start M.H.	365	3.3	0.810			4380.00	14,388	3,548
pole lights	5	Retro 200 Watt Pulse Start MH kit	232	1.2	0.280			4380.00	5,081	1,228
RRM	2	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.074	WSD-PDT	1.0	4380.00	219	867
RRM	1	De-Lamp to T8 1x4 1-Lamp 28w (STD)Bal. w/reflector	25	0.0	0.037		0.0	4380.00	110	434
Off 1	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-PDT-2F	1.0	3494.40	335	512
RRW	2	De-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.074			8760.00	438	648
RRW	1	No Retrofit 2- 18 Watt CFL Plug In Double base 2-pin	36	0.0	0.000	WSD-PDT	1.0	4380.00	158	158
Off 2	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-PDT-2F	1.0	3494.40	335	512
Crafts	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.196	WSD-PDT-2F	1.0	3494.40	671	1,024
Closet	1	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.0	0.049			1040.00	50	51
Off 3	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.098	WSD-PDT-2F	1.0	3494.40	335	512
Hall	9	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.3	0.459	cm-pdt	2.0	3057.60	798	2,347
						cm-pdt				
Hall	2	No Retro	6	0.0	0.000			8760.00	105	0
Activities	6	DeLamp to T8 4-lamp 28w (std)Bal. down only	95	0.6	0.714	CM-PDT-P	3.0	3057.60	1,743	3,868
						CM-PDT-P				
						CM-PDT-P				
Activities	3	DeLamp to T8 4 lamp 28w (std)Bal. down only	95	0.3	0.357		0.0	6132.00	1,748	3,876
Activities	14	Remove Fixture and Patch, Paint and Repair	0	0.0	1.400			4368.00	0	6,115
Activities	4	No Retro	6	0.0	0.000			8760.00	210	0

CENTRAL LIBRARY MOTION SENSOR SURVEY

PROPOSED

Room Description	Quantity	Description	Watts	kW	KW Saved	Sensor Type	Sensor Qty	Post Burn Hours	kWh	kWh Saved
Basement Mech Room	23	Retro T8 1x4 1-lamp 28w (STD)Bal. w/reflector	25	0.6	1.219			1040.00	598	1,288
Elevator	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.053			8760.00	219	484
Basement Open Cubicle	38	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	1.8	1.368			4212.00	7,683	5,762
back book Rm	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.108			4212.00	607	455
RR M/F	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.053			8760.00	219	484
Receiving	3	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.111			4212.00	316	488
RR M/F	3	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.111			8760.00	657	972
Closet	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.036			1040.00	50	37
Office	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.072			4212.00	404	303
Supply Closet	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.072			1040.00	100	75
Elevator 1 & 2	6	Retro T8 1x3 1-Lamp F25 (STD)Bal.	19	0.1	0.162			8760.00	999	1,419
Stairs 1	6	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.2	0.318			8760.00	1,314	2,786
Stairs 1	2	New LED Exit Fixture	1.5	0.0	0.047			8760.00	26	412
Stairs 1	3	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.111			8760.00	657	972
Office	9	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.4	0.324	WSD-PDT	1.0	3116.88	1,348	1,838
RRM	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.036	CM-PDT	1.0	6132.00	294	442
RRF	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.036	CM-PDT	1.0	6132.00	294	442
Break Rm	5	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.180	WSD-PDT	1.0	1600.56	384	1,385
Soda Mach	1	Vend Miscr - energy efficient sensor	240	0.2	0.160			8760.00	2,102	1,402

CENTRAL LIBRARY MOTION SENSOR SURVEY

Circulation	23	Retro T8 2'x4 2-Lamp 28w reflector(STD)Bal.	48	1.1	0.828			4212.00	4,650	3,488
Office 1	2	Retro T8 2'x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.072			4212.00	404	303
Book Drop	1	De-Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037			4212.00	105	156
Safe Room	1	De-Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037			4212.00	105	156
Front Lobby Main	18	No Retrofit 13 Watt CFL Dbiux Tube 2-Lamp Can	26	0.5	0.000	CM-PC-DZ	1.0	2948.40	1,380	591
Front Lobby Main	2	New LED Exit Fixture	1.5	0.0	0.047			8760.00	26	412
Vestibule	3	Retro 100 Watt Metal Halide	130	0.4	0.174			4380.00	1,708	762
Soda Mach	3	Vend Miser - energy efficient sensor	240	0.7	0.480			8760.00	6,307	4,205
RRM	3	Re-Lamp & Re-Ballast T8 1'x4 1-Lamp Strip 28w (STD)Bal.	25	0.1	0.030	WSD-PDT	1.0	5256.00	394	526
RRF	3	Re-Lamp & Re-Ballast T8 1'x4 1-Lamp Strip 28w (STD)Bal.	25	0.1	0.030	WSD-PDT	1.0	5256.00	394	526
Front Desk	19	No Retrofit 18 Watt CFL PL Triple biux Tube 2-Lamp Can	36	0.7	0.000			4212.00	2,881	0
Front Desk	84	No Retrofit 32 Watt CFL PL Triple biux Tube 2-Lamp Can	64	5.4	0.000			4212.00	22,644	0
1st floor	51	Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. Tandem Ballast 4 lamp	96	4.9	-1.734			4212.00	20,622	-7,304
1st floor	203	De-Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. Tandem Ballast	0	0.0	12.566			4212.00	0	53,012
1st floor	95	De-Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	2.4	3.515			4212.00	10,004	14,805
White Warfield Room	30	De-Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.8	1.110	CM-PDT	1.0	3706.56	2,780	5,054
Storage Closet	7	Retro T8 2'x4 2-Lamp 28w reflector(STD)Bal.	48	0.3	0.252	wsd-pdt	1.0	416.00	140	472
Jan Closet	1	New CFL 28923 23W	23	0.0	0.077			740.00	17	57
Child Story Room	8	De-Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.2	0.296	cm-pdt	1.0	1432.08	286	1,803
Child Story Room closet	1	De-Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037			1040.00	26	38
RR Child	1	De-Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037	CM-PDT	1.0	6132.00	153	390
RR Child	1	De-Lamp T8 1'x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037	CM-PDT	1.0	6132.00	153	390

SUBMITTED BY: ESG

CENTRAL LIBRARY MOTION SENSOR SURVEY

Lib Child Off 1	4	Retro T8 2x2 2lamp F17 T8 Silver Reflector Kit	35	0.1	0.060	wsd	1.0	3622.32	507	335
Lib Child Off 2	2	Retro T8 2x2 2lamp F17 T8 Silver Reflector Kit	35	0.1	0.030			4212.00	295	126
Air handler Closet	1	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.0	0.037			1040.00	26	38
Library Top Floor	144	amp T8 1x4 1-L Wrap 28w (STD)Bal. Tandem Ballast 4 lamp	96	13.8	-4.896	CM-PC-DZ	1.0	2527.20	34,936	2,669
Library Top Floor	576	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. Tandem Ballast	0	0.0	35.712		0.0	2527.20	0	150,419
Library Stairs	11	Remove fixture, Patch and Repair	0	0.0	3.300			4212.00	0	13,900
2nd Floor RRM	3	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.111	wsd-pdt	1.0	5256.00	394	1,235
2nd Floor RRF	3	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.111	wsd-pdt	1.0	3504.00	263	1,367
2F Closet	1	New CFL 28923 23W	23	0.0	0.077			1040.00	24	80
Library	30	Remove fixture, Patch and Repair	0	0.0	6.300			4212.00	0	26,536
Quiet Study 1	4	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.148	wsd	1.0	1432.08	143	901
Quiet Study 2	4	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.148	wsd	1.0	1432.08	143	901
Open Cubicle	32	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	1.5	1.152	cm-pdt	4.0	3622.32	5,564	5,758
						cm-pdt				
						cm-pdt				
						cm-pdt				
Office 1	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.072			4212.00	404	303
Back office open cubicle	10	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.5	0.360	cm-pdt	1.0	3622.32	1,739	1,799
Army Office 2	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.072			4212.00	404	303
Computer Room	6	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.3	0.216	wsd-pdt	1.0	3622.32	1,043	1,080
Stairwell 2	6	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.2	0.318			8760.00	1,314	2,786
Stairwell 2	2	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.074			8760.00	438	648

CENTRAL LIBRARY MOTION SENSOR SURVEY

Stairwell 2	2	New LED Exit Fixture	1.5	0.0	0.047			8760.00	26	412
maxine Waiting rm Pantry	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.036			4212.00	202	152
Conf	30	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.8	1.110	CM-PDT	4.0	2948.40	2,211	5,623
						CM-PDT				
						CM-PDT				
						CM-PDT				
Staff Room	2	De-Lamp T8 1x4 1-L Wrap 28w (STD)Bal. w/reflector kit	25	0.1	0.074			4212.00	211	312
Back Office	1	Retro 100 Watt Pulse Start MH kit	122	0.1	0.038			4212.00	514	160
outside	3	Retro 100 Watt Pulse Start MH kit	122	0.4	0.114			4380.00	1,603	499
outside	3	Retro 320 Watt Pulse Start M.H.	365	1.1	0.270			4380.00	4,798	1,183
outside	3	Retro 200 Watt Pulse Start MH kit	233	0.7	0.201			4380.00	3,062	880
outside	10	New 4 Light Bar LED fixture	104	1.0	1.960			4380.00	4,555	8,585
outside	10	New 4 Light Bar LED fixture	104	1.0	1.960			4380.00	4,555	8,585
1,579			71.7			28			162,824 338,781	

Total Annual Savings:

RECREATION AND PARKS HEADQUARTERS MOTION SENSORS SURVEY

PROPOSED

Room Description	Quantity	Description	Watts	kW	KW Saved	Sensor Type	Sensor Qty	Post Burn Hours	kWh	kWh Saved
Conf Rm	9	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.4	0.558	WSD-PDT-2P	2.0	3181.88	1,375	4,057
Conf Rm	3	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.186	WSD-PDT-2P	1.0	3840.20	553	1,257
Conf Rm	2	NEW LED Exit Fixture	1.5	0.0	0.009	cm-pdt		8760.00	28	79
Conf Rm	6	NEW 23 WATT BR40 DIMMABLE 27K	23	0.1	0.462			5486.00	757	2,535
Elec Rm	4	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.148			1040.00	104	154
Hall	24	2-Lamp & Re-Ballast T8 '2x4 2-Lamp Troffer 28w (STD)Bal.	48	1.2	0.336	CM-PDT	3.0	2578.42	2,970	5,193
						CM-PDT				
						CM-PDT				
Hall	5	NEW LED Exit Fixture	1.5	0.0	0.023			8760.00	68	197
Conf Rm 2	9	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.4	0.558	WSD-PDT-2P	2.0	3181.88	1,375	4,057
Conf Rm 2	3	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.186	WSD-PDT-2P	2.0	8132.00	883	2,008
Conf Rm 2	6	NEW 23 WATT BR40 DIMMABLE 27K	23	0.1	0.462	WSD-PDT-2P		5486.00	757	2,535
Conf Rm 2	2	NEW LED Exit Fixture	1.5	0.0	0.009			8760.00	28	79
Tele Cl	2	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.074			1040.00	52	77
Kitchen	9	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.4	0.558	CM-PDT	2.0	2084.68	901	4,531
Kitchen	3	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.186			8760.00	1,261	1,628
Kitchen	6	NEW 23 WATT BR40 DIMMABLE 27K	23	0.1	0.462			5486.00	757	2,535
Kitchen	2	Retro T8 '2x4 2-Lamp 28w (STD)Bal.	48	0.1	0.060			5486.00	527	328
Kitchen	1	Vend Miser Control Unit for Vending Machines	254	0.3	0.148			8760.00	2,225	1,279
Warehouse	1	Retro T8 '1x8 2-Lamp 28w 4ft Kit (Std)Bal.	48	0.0	0.127			2470.00	119	314
Warehouse	4	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.148			2470.00	247	366
Warehouse	19	NEW T8 2x4 6-Lamp HO w/ Refl&cage	356	6.8	1.881	CM-RB6	19.0	543.40	3,676	17,678
Warehouse	14	NEW T8 2x4 6-Lamp HO w/ Refl&cage	356	5.0	1.386			8760.00	43,660	12,141
Warehouse	2	NEW LED Exit Fixture	1.5	0.0	0.009			8760.00	28	79
Warehouse Office	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
Storage Rm	8	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.296			1040.00	208	308
Sprinkler Rm	2	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.074			1040.00	52	77
Admin Wing										
Copy Room	2	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.074	cm-pdt	1.0	3940.20	192	486
Office 1	2	DeLamp T8 '2x4 2-Lamp Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072			5486.00	527	395
Office 2	2	DeLamp T8 '2x4 2-Lamp Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072			5486.00	527	395
Office 3	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
Office 4	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
Office 5	2	2-Lamp & Re-Ballast T8 '2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.028			5486.00	527	154
Office 6	2	2-Lamp & Re-Ballast T8 '2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.028			5486.00	527	154
Office 7	2	2-Lamp & Re-Ballast T8 '2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.028			5486.00	527	154

RECREATION AND PARKS HEADQUARTERS MOTION SENSORS SURVEY

Hall	2	DeLamp & Re-Ballast T8 '2x4 2Lamp Troffer 28w (STD)Bal.	48	0.1	0.028			5486.00	527	154
Computer Group	6	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.3	0.348	CM-PDT	1.0	4059.84	1,169	2,320
RRW	2	DeLamp T8 '2x4 2Lamp Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072			5486.00	527	395
Front Lobby	0	Remove fixture, patch, paint and repair	0	0.0	1.952			5486.00	0	10,709
Front Lobby	22	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.6	0.726	cm-po-dz	1.0	3840.20	2,450	5,033
Front Lobby	2	NEW LED Exit Fixture	1.5	0.0	0.009			8760.00	26	79
Registration Desk	12	DeLamp & Re-Ballast T8 '2x4 2Lamp Troffer 28w (STD)Bal.	48	0.6	0.168			5486.00	3,160	922
Office	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
Registration Desk	6	NEW 23 WATT R40 Flood 27K	23	0.1	0.402			5486.00	757	2,205
Admin Cubicle	6	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.3	0.348			5486.00	1,580	1,909
Admin Cubicle	2	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.066			5486.00	318	362
RRM	2	DeLamp T8 '2x4 2Lamp Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072	cm-pdt	1.0	3840.20	389	553
Office 1	2	DeLamp & Re-Ballast T8 '2x4 2Lamp Troffer 28w (STD)Bal.	48	0.1	0.028			5486.00	527	154
Office 2	2	DeLamp & Re-Ballast T8 '2x4 2Lamp Troffer 28w (STD)Bal.	48	0.1	0.028			5486.00	527	154
Office 3	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
Office 4	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
Office 5	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
Elevator	2	Retro T8 '1x3 2-Lamp F25 (LP)Bal.	43	0.1	0.070			8760.00	753	613
Second Floor										
Open Cubicle	4	NEW LED Exit Fixture	1.5	0.0	0.018			8760.00	53	158
Open Cubicle	18	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.5	0.594			5486.00	2,864	3,259
Stairs 1	8	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.2	0.264			5486.00	1,273	1,448
Director Office	6	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.2	0.198			5486.00	955	1,086
Laves Office	4	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.132			5486.00	636	724
Joan Byrd	6	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.2	0.198			5486.00	955	1,086
RRM	2	DeLamp T8 '2x4 2Lamp Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072	cm-pdt	1.0	6132.00	589	883
RRM	1	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037		0.0	6132.00	153	390
RRW	2	DeLamp T8 '2x4 2Lamp Troffer 28w (STD)Bal. w/reflector	48	0.1	0.072	cm-pdt	1.0	6132.00	589	883
RRW	1	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037		0.0	6132.00	153	390
P Open Cubicle	34	DeLamp T8 '2x4 2Lamp Troffer 28w (STD)Bal. w/reflector	48	1.6	1.224			5486.00	8,953	6,715
P Open Cubicle	4	Retro T8 '2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.132			5486.00	636	724
P Open Cubicle	5	NEW LED Exit Fixture	1.5	0.0	0.023			8760.00	66	197
P Open Cubicle	0	Remove fixture, patch, paint and repair	0	0.0	4.392			5486.00	0	24,095
204 Office Ken W	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
202 Office	3	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.174			5486.00	790	955
Cindy Office	2	DeLamp & Re-Ballast T8 '2x4 2Lamp Troffer 28w (STD)Bal.	48	0.1	0.028			5486.00	527	154
Office 218	3	DeLamp T8 '2x4 2Lamp Troffer 28w (STD)Bal. w/reflector	48	0.1	0.108			5486.00	790	592
Office 217	2	DeLamp & Re-Ballast T8 '2x4 2Lamp Troffer 28w (STD)Bal.	48	0.1	0.028			5486.00	527	154
Teresa Office	1	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.058			5486.00	263	318
Parks Planning Cus	12	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.6	0.696			5486.00	3,160	3,818
Raul Office	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
Clark Office	2	DeLamp T8 '2x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.116			5486.00	527	636
220 Storage	4	DeLamp T8 '1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.148			5486.00	549	812

RECREATION AND PARKS HEADQUARTERS MOTION SENSORS SURVEY

Hall	9	9	48	0.4	0.126	CM-PDT	2.0	2578.42	1,114	1,947
		9	48			CM-PDT				
Office 1	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.0	0.058			5488.00	263	318
Office 2	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.1	0.116			5488.00	527	636
225 3 Office	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.1	0.116			5488.00	527	636
226 4 Office	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.1	0.116			5488.00	527	636
File Room	12	DeLamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. wire/reflect	25	0.3	0.444	LWS	1.0	2084.68	625	3,456
Library	6	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.3	0.348	LWS	1.0	2084.68	600	2,889
Library	5	NEW 15 WATT BR30 DIMMABLE 27K	15	0.1	0.225			5488.00	411	1,234
231	1	9-Lamp & Re-Ballast T8 2'x4 2-Lamp Troffer 28w (STD)Bal	48	0.0	0.014			5488.00	263	77
232	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.0	0.058			5488.00	263	318
229	4	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.2	0.232	WSD-PDT	1.0	4059.64	779	1,547
233	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.0	0.058			5488.00	263	318
233	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.1	0.116			5488.00	527	636
230 A	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.1	0.116			5488.00	527	636
230 B	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.0	0.058			5488.00	263	318
230 C	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.1	0.116			5488.00	527	636
Elevator Shaft	1	DeLamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. wire/reflect	25	0.0	0.037			8760.00	219	324
Stairs 1	3	DeLamp T8 1'x4 1-Lamp Wrap 28w (STD)Bal. wire/reflect	25	0.1	0.111			8760.00	657	972
Stairs 2	3	DeLamp T8 1'x4 1-Lamp Wrap 28w (STD)Bal. wire/reflect	25	0.1	0.111			8760.00	657	972
Central Services Hall	9	9-Lamp & Re-Ballast T8 2'x4 2-Lamp Troffer 28w (STD)Bal	48	0.4	0.126	CM-PDT	2.0	2578.42	1,114	1,947
Central Services Hall	4	NEW LED Exit Fixture	15	0.0	0.018	CM-PDT		8760.00	53	158
Central Services Hall	2	Vend Miser Control Unit for Vending Machines	254	0.5	0.282			8760.00	4,450	2,558
Open Cubicle	17	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.8	0.986			5488.00	4,477	5,409
Jean Office	3	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.1	0.174			5488.00	790	955
Closet	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.0	0.058			1040.00	50	60
Admin Central Fleet	3	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.1	0.174			5488.00	790	955
Office	3	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. wire/reflect	48	0.1	0.174			5488.00	790	955
Mech Shop	37	Lamp & Re-Ballast T8 1x8 4-Lamp Vapor Tight 28w (STD)	95	3.5	1.702	HMR-16	1.0	2184.00	7,677	6,566
Mech Shop	8	Lamp & Re-Ballast T8 1x8 4-Lamp Vapor Tight 28w (STD)	95	0.8	0.368			8760.00	6,658	3,224
Mech Shop	2	NEW LED Exit Fixture	15	0.0	0.009			8760.00	26	79
Mech Shop	1	No Retrofit	5	0.0	0.000			8760.00	44	0
Mech Shop	12	remove fixture from operation	0	0.0	1.872	HMR-16	1.0	2184.00	0	5,111
Mech Shop	14	remove fixture from operation	0	0.0	1.092	HMR-16	1.0	2184.00	0	2,981
Bay 2	14	Re-Lamp & Re-Ballast T8 1'x4 2-Lamp VT 28w (STD)Bal	48	0.7	0.420	HMR-16	1.0	2184.00	1,468	1,514
Bay 2	8	Re-Lamp & Re-Ballast T8 1'x4 2-Lamp VT 28w (STD)Bal	48	0.4	0.240			8760.00	3,384	2,102
Bay 2	2	NEW LED Exit Fixture	15	0.0	0.009			8760.00	26	79
Bay 3	4	Lamp & Re-Ballast T8 1x8 4-Lamp Vapor Tight 28w (STD)	95	0.4	0.184	HMR-16	1.0	2184.00	830	710
Bay 3	6	Retro T8 1'x4 2-Lamp 28w (STD)Bal	48	0.3	0.264	HMR-16	1.0	2184.00	629	878
Bay 3	4	NEW CFL 28923 15W	15	0.1	0.180			2730.00	164	491
Bay 3	1	NEW LED Exit Fixture	15	0.0	0.005			8760.00	13	39
Break Room	4	New Vapor Tight 1'x4 2-Lamp T8 28w (STD)Bal	48	0.2	0.120			2730.00	524	328

RECREATION AND PARKS HEADQUARTERS MOTION SENSORS SURVEY

Parts Storage	2	DeLamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.074		2730.00	137	202
Back Warehouse hall	1	DeLamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.037		2730.00	68	101
Back Warehouse hall	1	NEW LED Exit Fixture	1.5	0.0	0.005		8760.00	13	39
Wood Shop	5	Lamp & Re-Ballast T8 1x8 4-Lamp Vapor Tight 28w (STD)	95	0.5	0.230		2730.00	1,297	628
Wood Shop	2	NEW LED Exit Fixture	1.5	0.0	0.009		8760.00	26	79
Hort Shop	8	Retro T8 1'x8 4-Lamp 32w (STD) Bal.	106	0.6	0.300		2730.00	1,736	819
Tim Overstreet	1	DeLamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053		2730.00	68	145
Tim Overstreet	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.216		2730.00	262	590
Tim Overstreet	1	NEW LED Exit Fixture	1.5	0.0	0.005		8760.00	13	39
Mow Shop	17	Retro T8 1'x8 4-Lamp 32w (STD) Bal.	106	1.8	0.850		2730.00	4,919	2,321
Joann Frush	1	DeLamp T8 1'x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053		2730.00	68	145
Joann Frush	2	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.1	0.216		2730.00	262	590
Joann Frush	1	NEW LED Exit Fixture	1.5	0.0	0.005		8760.00	13	39
Warehouse Shop	6	Retro T8 1'x8 4-Lamp 32w (STD) Bal.	106	0.8	0.300		1040.00	661	312
Warehouse Shop	1	NEW LED Exit Fixture	1.5	0.0	0.005		8760.00	13	39
Warehouse Shop	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.108		2730.00	131	295
Const Shop	6	Retro T8 1'x8 4-Lamp 32w (STD) Bal.	106	0.6	0.300		2730.00	1,736	819
Const Shop	1	NEW LED Exit Fixture	1.5	0.0	0.005		8760.00	13	39
Const Shop	1	DeLamp T8 2'x4 2-Lamp 28w (STD)Bal. w/reflector	48	0.0	0.108		2730.00	131	295
Outside	8	NEW 23w wallpack w/photocell	23	0.2	0.792		4380.00	806	3,469
Storage Shed	7	NEW T8 2x4 6Lamp HO w/ Refl&cage	356	2.5	0.693		1040.00	2,582	721
Storage Shed	7	NEW 23w wallpack w/photocell	23	0.2	0.693		1040.00	167	721
Pump Station	4	Retro 320 Watt Pulse Start M.H.	365	1.5	0.360		4380.00	6,395	1,577
Warehouse Storage	15	Retro T8 1x8 2-lamp 28W 4ft Kit (Std)Bal.	48	0.7	1.905		1040.00	749	1,981
Bldg C	2	NEW T8 2x4 6Lamp HO w/ Refl&cage	356	0.7	0.198		1040.00	740	206
Bldg C	1	No Retrofit	5	0.0	0.000		8760.00	44	0
2nd Floor	15	Retro T8 1x8 2-lamp 28W 4ft Kit (Std)Bal.	48	0.7	1.905		1040.00	749	1,981
2nd Floor	3	No Retrofit	5	0.0	0.000		8760.00	131	0
Outside	5	Retro 200 Watt Pulse Start MH kit	232	1.2	0.280		4380.00	5,081	1,226
Outside	3	NEW 23w wallpack w/photocell	23	0.1	0.297		4380.00	302	1,301
Outside Main Bldg	22	Retro 200 Watt Pulse Start MH kit	232	5.1	1.496		4380.00	22,358	6,552
Outside Main Bldg	2	NEW Par 38 23W CFL Lamp	23	0.0	0.134		4380.00	201	587
Outside Main Bldg	6	Retro 125 Watt Pulse Start MH kit	150	0.9	0.360		4380.00	3,942	1,577
Front Glass Bldg	3	No Retrofit	210	0.6	0.000		4380.00	2,759	0
Pole Lights	4	Retro 320 Watt Pulse Start M.H.	365	1.5	0.400		4380.00	6,395	1,752

752

46.2

50.0

768,635

216,316

232,787

Total Annual Savings:

DORSEY BUILDING MOTION SENSORS SURVEY

PROPOSED

Room Description	Quantity	Description	Watts	KW	Burn Hour Code	Pwr Burn Hours	kWh	Quantity	Description	Watts	KW	kWh Served
MAIN LOBBY SMALL HALL	1	T8 1x4 2-Lamp Wrgp	62	0.1	O	3120	183	1	Dec-Lamp to T8 1x4 1-Lamp Wrgp 28w (STD)Bal, wireReflector	25	0.0	0.037
MAIN LOBBY	6	T12 1x2 2-Lamp F20 Strip	50	0.3	O	3120	936	6	Retro T8 1x2 2-Lamp (std)Bal	29	0.2	0.126
MAIN LOBBY	10	T8 1x4 3-Lamp Strip	62	0.6	O	3120	1,924	10	Dec-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal, wireReflector	25	0.3	0.370
MAIN LOBBY	7	26 Watt CFL PL Double Tube Black	26	0.2	O	3120	688	7	No Retrofit 26 Watt CFL PL Double Tube Black	26	0.2	0.000
MAIN LOBBY	4	T8 2x2 3-Lamp F17 T8 Troffer w/Dec. Bal	35	0.1	O	3120	437	4	No Retrofit T8 2x2 3-Lamp F17 T8 Troffer (std) Bal wireReflector Kit	35	0.1	0.000
MAIN LOBBY	4	T8 1x4 2-Lamp Strip	62	0.2	O	3120	774	4	Dec-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal, wireReflector	25	0.1	0.148
VESTIBULE	2	26 Watt CFL PL Double Tube Black	26	0.1	OO	4380	228	2	No Retrofit 26 Watt CFL PL Double Tube Black	26	0.1	0.000
RR-PRIVATE	1	T8 1x4 2-Lamp Strip	62	0.1	RR	8760	543	1	Dec-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal, wireReflector	25	0.0	0.037
B200-B400-B800 OPEN	60	T8 2x4 3-Lamp Troffer	84	5.0	O	3120	15,463	60	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	2.8	2.124
EMERGENCY LIGHTS	2	T8 2x4 3-Lamp Troffer	84	0.2	24	8760	1,472	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
RECEPTION	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
ENTRANCE	2	T8 2x4 3-Lamp Troffer	84	0.2	24	8760	1,472	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
BREAK ROOM	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
B200 OPEN OFFICE	1	T8 2x2 2-Lamp F17 T8 Troffer w/Dec. Bal	35	0.0	24	8760	307	1	No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal wireReflector Kit	35	0.0	0.000
OFFICE 1	1	T8 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	524	1	Dec-Lamp to T8 2x2 2-Lamp F17 T8 wireReflector Kit	29	0.0	0.033
FILE ROOM	4	T8 2x4 3-Lamp Troffer	84	0.3	O	3120	1,048	4	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.2	0.144
OFFICE 2	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE 3	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
CONF ROOM	6	T8 2x4 3-Lamp Troffer	84	0.5	O	3120	1,572	6	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.3	0.216
OFFICE 4	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE 5	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
SMALL HALL	1	T8 2x2 4-Lamp F17 T8 Troffer w/Dec. Bal	60	0.1	24	8760	536	1	Retro T8 2x2 2-Lamp F17 T8 wireReflector Kit	29	0.0	0.031
OFFICE 6	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE B800	15	T8 2x4 3-Lamp Troffer	84	1.3	O	3120	3,031	15	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.7	0.540
OFFICE B800	2	T8 2x4 3-Lamp Troffer	84	0.2	24	8760	1,472	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE 7	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE 8	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE 9	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE 10	3	T8 2x4 3-Lamp Troffer	84	0.3	O	3120	786	3	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.106
CLOSET	1	T8 2x4 3-Lamp Troffer	84	0.1	M	1040	87	1	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.0	0.036
CLERK'S OFFICE B-0100	24	T8 2x4 3-Lamp Troffer	84	2.0	O	3120	6,260	24	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	1.2	0.864
OPEN OFFICE SPACE	2	T8 2x4 3-Lamp Troffer	84	0.2	24	8760	1,472	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE 1	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
OFFICE 2 CORNER	4	T8 2x4 3-Lamp Troffer	84	0.3	O	3120	1,048	4	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.2	0.144
OFFICE 3	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
B0100 FILE STORAGE	7	T8 2x4 3-Lamp Troffer	84	0.6	O	3120	1,635	7	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.3	0.252
OPEN OFFICE SPACE	15	T8 2x4 3-Lamp Troffer	84	1.3	O	3120	3,031	15	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.7	0.540
OPEN OFFICE SPACE	3	T8 2x4 3-Lamp Troffer	84	0.3	24	8760	2,208	3	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.108
OPEN OFFICE SPACE	2	OM Style LED exit sign	12	0.0	24	8760	210	2	New LED Exit Fixtures	3	0.0	0.018
COMPANY BUILDING	15	OM Style LED exit sign	12	0.2	24	8760	1,377	15	Remove Unnecessary Exit Sign	0	0.0	0.180
SERVER ROOM	19	T8 2x4 3-Lamp Troffer	84	1.6	O	3120	4,860	19	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.9	0.684
B100A OFFICE	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072
B100A OFFICE	1	T8 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	193	1	Retro T8 2x2 2-Lamp F17 T8 wireReflector Kit	29	0.0	0.033
OFFICE 1	2	T8 2x4 3-Lamp Troffer	84	0.2	O	3120	524	2	Dec-Lamp to T8 2x4 2L Troffer 28w (STD)Bal, wireReflector	48	0.1	0.072

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NOORAL H. OFFICE	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.072
B08 DIAZ OFFICE	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.072
FILE ROOM	3	TS 2x4 3-Lamp Troffer	84	0.3	0	3120	788	4	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.106
OFFICE 1	4	TS 2x4 3-Lamp Troffer	84	0.3	0	3120	1,048	4	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.2	0.144
OFFICE 2	4	TS 2x4 3-Lamp Troffer	84	0.3	0	3120	1,048	4	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.2	0.144
CONF ROOM 1	4	TS 2x4 3-Lamp Troffer	84	0.3	0	3120	1,048	4	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.2	0.144
COPY ROOM	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.072
MEDIA CENTER STORAGE	10	25 Watt CFL PL Double Tube Blue	26	0.3	0	3120	811	10	No Retrofit 26 Watt CFL PL Double Tube Blue	26	0.3	0.000
MEDIA CENTER STORAGE	1	25 Watt CFL PL Double Tube Blue	26	0.0	24	8760	228	1	No Retrofit 26 Watt CFL PL Double Tube Blue	26	0.0	0.000
STUDIO HALL	4	TS 2x2 2-Lamp F17 T8 Troffer w/Blue Bal	35	0.3	0	3120	874	6	No Retrofit TS 2x2 2-Lamp F17 T8 Troffer (std) Bal whreflector kit	35	0.3	0.000
STUDIO HALL	4	TS 2x2 2-Lamp U-6 Trof.	62	0.2	0	3120	774	4	Retro TS 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.132
B-400 OFFICE	10	TS 2x2 2-Lamp U-6 Trof.	62	0.8	0	3120	1,934	10	Retro TS 2x2 2-Lamp F17 T8 whreflector kit	29	0.3	0.330
CONTROL ROOM	6	TS 2x2 2-Lamp U-6 Trof.	50	0.3	0	3120	638	6	New CFL R20 FLOOD 7W	7	0.0	0.258
CONTROL ROOM	7	150W halogen uplight	150	1.1	0	3120	3,276	7	No Retrofit	150	1.1	0.000
COMPUTER ROOM	4	TS 2x2 2-Lamp U-6 Trof.	62	0.2	0	3120	774	4	Retro TS 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.132
TAPE STORAGE	1	TS 1x4 2-Lamp Wrap	62	0.1	0	3120	192	1	De-Lamp to TS 1x4 1-Lamp Wrap 28w (STD)Bal. whreflector	21	0.0	0.037
HALLWAY	2	TS 2x2 2-Lamp U-6 Trof.	62	0.1	0	3120	387	2	Retro TS 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.068
BACK OFFICE	2	TS 2x2 3-Lamp Troffer	84	0.2	0	3120	524	2	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.072
BACK OFFICE	3	TS 2x2 3-Lamp U-6 Trof.	62	0.2	0	3120	500	3	Retro TS 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.099
COMPUTER ROOM	3	TS 1x4 2-Lamp Strip	62	0.2	0	3120	680	3	De-Lamp to TS 1x4 1-Lamp Strip 28w (STD)Bal. whreflector	21	0.1	0.111
B-1100 RECEPTION	3	TS 2x4 3-Lamp Troffer	84	0.3	0	3120	788	3	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.108
OFFICE 1	3	TS 2x4 3-Lamp Troffer	84	0.3	0	3120	788	3	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.108
OFFICE 2	4	TS 2x4 3-Lamp Troffer	84	0.3	0	3120	1,048	4	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.2	0.144
OFFICE 3	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.072
B-1150 OFFICE 1	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.072
B-1150 OFFICE 2	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.072
LUNCH ROOM	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.072
OFFICE 3	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	De-Lamp to TS 2x4 2L Troffer 28w (STD)Bal. whreflector	48	0.1	0.072
C-2535-2520	13	TS 2x4 4-Lamp Troffer	106	1.4	0	3120	4,299	13	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.6	0.754
OFFICE 1	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.116
OFFICE 2	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.116
OFFICE 3	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.116
C-2510 OFFICE	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.116
C-2516 OFFICE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.2	0.232
OFFICE LOBBY	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.116
OFFICE LOBBY	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.116
SMALL HALL	3	TS 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.174
OFFICE 1	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.116
OFFICE 2	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.116
CONF ROOM 2500	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.2	0.232
C-2520 OFFICE	12	TS 2x4 4-Lamp Troffer	106	1.3	0	3120	3,969	12	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.6	0.586
CONF ROOM 2500	8	TS 2x4 4-Lamp Troffer	106	0.8	0	3120	2,648	8	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.4	0.484
C-2530 OFFICE	2	TS 2x2 2-Lamp U-6 Trof.	62	0.1	0	3120	387	2	Retro TS 2x2 2-Lamp F17 T8 whreflector kit	29	0.1	0.066
C-2530 OFFICE	1	TS 2x4 4-Lamp Troffer	106	0.1	0	3120	331	1	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.0	0.068
OFFICE 2	3	TS 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.174
OFFICE 3	3	TS 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.174
OFFICE 4	3	TS 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.174
OFFICE 5	1	TS 2x2 2-Lamp U-6 Trof.	62	0.1	0	3120	163	1	Retro TS 2x2 2-Lamp F17 T8 whreflector kit	29	0.0	0.033
OFFICE 6	3	TS 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.1	0.174
OFFICE 7	1	TS 2x2 2-Lamp U-6 Trof.	62	0.1	0	3120	163	1	Retro TS 2x2 2-Lamp F17 T8 whreflector kit	29	0.0	0.033
C-2544B OFFICE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.2	0.232
C-2544A OFFICE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.2	0.232
C-2450	10	TS 2x4 4-Lamp Troffer	106	1.7	0	3120	5,282	10	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.8	0.828
KITCHEN	1	TS 2x4 4-Lamp Troffer	106	0.1	0	3120	331	1	delamp TS 2x4 2-Lamp 28w (STD)Bal. whreflector kit	48	0.0	0.058

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OFFICE 1	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 2	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	892	3	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
OFFICE 3	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
OFFICE 4	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	892	3	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
OFFICE 5	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
Storage 1	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
Storage 2	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	892	3	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
Storage 2	1	Old Style LED exit sign	12	0.0	24	8760	105	1	New LED Exit Fixture	3	0.0	0.009
vending	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
RR-W	3	T8 2x4 4-Lamp Troffer	106	0.3	RR	8760	2,786	3	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
RR-W	3	T8 1x4 2-Lamp Wrap	62	0.2	RR	8760	1,629	3	Do-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.111
JAN CL	2	T8 2x4 4-Lamp Troffer	106	0.2	J	740	157	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
ROOF ACCESS	14	T8 1x4 2-Lamp Wrap	62	0.9	24	8760	7,604	14	Do-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.4	0.518
RR-M	4	T8 2x4 4-Lamp Troffer	106	0.4	RR	8760	3,714	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
RR-M	2	T8 1x4 2-Lamp Wrap	62	0.1	RR	8760	1,068	2	Do-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal. w/reflector	25	0.1	0.074
RR-M	1	T8 2x2 2-Lamp F17 T8 Troffer w/Elec. Bal	35	0.0	RR	8760	307	1	No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal w/reflector kit	35	0.0	0.000
RR-M CLOSET	1	Inc. 100W	100	0.1	M	1040	104	1	New CPL 25W SI	25	0.0	0.075
C-2300 FAC ADMIN HALL	7	T8 2x4 4-Lamp Troffer	106	0.7	O	3120	2,315	7	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.3	0.408
C-2300 OFFICE 1	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
C-2300 OFFICE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
C-2300 OFFICE 3	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	892	3	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
C-2300 HALL	1	T8 2x4 4-Lamp Troffer	106	0.1	O	3120	331	1	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.0	0.058
OFFICE 1	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	892	3	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
C-2350	6	T8 2x4 4-Lamp Troffer	106	0.6	O	3120	1,984	6	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.3	0.348
C-2000A	14	T8 2x4 4-Lamp Troffer	106	1.5	O	3120	4,630	14	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.7	0.812
OFFICE 1	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OFFICE 2	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OFFICE 3	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OFFICE 4	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OFFICE 5	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OFFICE 6	6	T8 2x4 4-Lamp Troffer	106	0.6	O	3120	1,984	6	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.3	0.348
OFFICE 7	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
C-200A OFFICE LOBBY	6	T8 2x4 4-Lamp Troffer	106	0.6	O	3120	1,984	6	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.3	0.348
C-200A OFFICE LOBBY	1	Old Style LED exit sign	12	0.0	24	8760	105	1	New LED Exit Fixture	3	0.0	0.009
OFFICE 1	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OFFICE 2	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
C-2000B OPEN SPACE	48	T8 2x4 4-Lamp Troffer	106	5.1	O	3120	15,678	48	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	2.3	2.784
C-2000B OPEN SPACE	5	T8 2x4 4-Lamp Troffer	106	0.5	24	8760	4,643	5	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.290
KENN HAMM OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
KENN HAMM OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
JOHN HENGEN VP	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
JOHN HENGEN VP	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
GARY STEWART OFFICE	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
OFFICE	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	892	3	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.174
BRAD FOR OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
BRAD FOR OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
KITCHEN	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.2	0.232
DRAWING ROOM	14	T8 2x2 2-Lamp U-6 Trof.	62	0.9	O	3120	2,708	14	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.4	0.462
CONF ROOM	14	T8 2x2 2-Lamp U-6 Trof.	62	0.9	O	3120	2,708	14	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.4	0.462
STATIONARY SUPPLY	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	0.1	0.116
C-2000 VOTING EQUIPMENT	40	T8 2x4 4-Lamp Troffer	106	4.2	O	3120	13,220	40	delamp T8 2x4 2-Lamp 28w (STD)Bal. w/reflector kit	48	1.9	2.320

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OFFICE 1	2	TS 2x4 4-Lamp Troffer	106	0.2	Q	3120	661	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.1	0.118
OFFICE 2	2	TS 2x4 4-Lamp Troffer	106	0.2	Q	3120	661	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.1	0.118
C-400 BACK STORAGE	5	TS 2x4 4-Lamp Troffer	106	0.5	Q	3120	1,654	5 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.2	0.290
C-400 BACK STORAGE	1	Old Style LED exit sign	12	0.0	24	8760	105	1 New LED Exit Fixture	3	0.0	0.009
C-400 BACK HALLWAY	3	TS 2x4 3-Lamp Troffer	84	0.3	Q	3120	788	3 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.1	0.108
STARWELL	4	TS 2x4 3-Lamp Troffer	84	0.3	24	8760	2,943	4 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.2	0.144
OVERHANG	11	TS 2x4 3-Lamp Troffer	84	0.9	OO	4380	4,047	11 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.5	0.396
O.D.	1	If inc. 60w	60	0.1	OO	4380	283	1 New CFL 28W 23W	16	0.0	0.044
SIGN SHOP 1	32	TS 2x4 4-Lamp Troffer	106	3.4	Q	3120	10,583	32 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	1.5	1.856
SIGN SHOP 2	7	TS 2x4 4-Lamp Troffer	106	0.7	Q	3120	2,315	7 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.3	0.468
SIGN SHOP 2	2	T12 1x8 2-Lamp Ind Snip	175	0.4	Q	3120	1,092	2 Remo TS 1x8 2-Lamp 28W 4R Kit (S40)Bal.	48	0.1	0.234
KITCHEN	2	TS 2x4 4-Lamp Troffer	106	0.2	Q	3120	661	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.1	0.118
STORAGE 1	2	TS 2x4 4-Lamp Troffer	106	0.2	Q	3120	661	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.1	0.118
STORAGE 2	2	TS 2x4 4-Lamp Troffer	106	0.2	Q	3120	661	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.1	0.118
C-700 C-710	52	TS 2x4 4-Lamp Troffer	106	5.5	Q	3120	17,197	52 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	2.5	3.016
C-700 C-710	3	TS 2x4 4-Lamp Troffer	106	0.3	24	8760	2,766	3 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.1	0.174
OFFICE SHERIFF RECEPTION	5	TS 2x4 3-Lamp Troffer	84	0.4	Q	3120	1,310	5 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.2	0.180
HALLWAY	4	TS 2x2 2-Lamp P17 TS Troffer w/Elec. Bal	35	0.1	Q	3120	437	4 No Recraft TS 2x2 2-Lamp P17 TS Troffer (red) Bal wireflexor kit	33	0.1	0.060
OFFICE 1	2	TS 2x4 3-Lamp Troffer	84	0.2	Q	3120	624	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.1	0.072
OFFICE 2	2	TS 2x4 3-Lamp Troffer	84	0.2	Q	3120	624	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.1	0.072
KITCHEN 3	2	TS 2x4 3-Lamp Troffer	84	0.2	Q	3120	624	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.1	0.072
OFFICE 4	2	TS 2x4 3-Lamp Troffer	84	0.2	Q	3120	624	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.1	0.072
OFFICE 5	2	TS 2x4 3-Lamp Troffer	84	0.2	Q	3120	624	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.1	0.072
OFFICE 6	2	TS 2x4 3-Lamp Troffer	84	0.2	Q	3120	624	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.1	0.072
OFFICE 7	2	TS 2x4 3-Lamp Troffer	84	0.2	Q	3120	624	2 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.1	0.072
STORAGE CLOSET	1	TS 2x2 4-Lamp P17 TS Troffer w/Elec. Bal.	60	0.1	M	1040	62	1 Remo TS 2x2 2-Lamp P17 TS wireflexor kit	29	0.0	0.031
HALLWAY	1	TS 2x4 3-Lamp Troffer	84	0.1	Q	3120	262	1 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor	48	0.0	0.038
HALLWAY	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.078
C-1300 STORAGE	15	TS 2x4 4-Lamp Troffer	106	1.8	Q	3120	4,981	15 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.7	0.870
C-100	15	TS 2x4 4-Lamp Troffer	106	1.8	Q	3120	4,981	15 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.7	0.870
C-300 WAREHOUSE	30	TS 2x4 4-Lamp Troffer	106	3.2	Q	3120	9,922	30 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	1.4	1.740
LAB C1600	20	TS 2x4 4-Lamp Troffer	106	2.1	Q	3120	6,614	20 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	1.0	1.180
LAB C1900	5	TS 2x4 4-Lamp Troffer	106	0.5	Q	3120	1,654	5 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.2	0.290
LAB C1900	3	TS 2x4 4-Lamp Troffer	106	0.3	Q	3120	982	3 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.1	0.174
COMPUTER CONF ROOM	4	TS 2x4 4-Lamp Troffer	106	0.4	Q	3120	1,323	4 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.2	0.232
C-1000 CAGE STORAGE	48	TS 2x4 4-Lamp Troffer	106	5.1	Q	3120	15,875	48 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	2.3	2.784
C-2550 OPEN SPACE	24	TS 2x4 4-Lamp Troffer	106	2.5	Q	3120	7,837	24 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	1.2	1.382
C-2550 OPEN SPACE	11	TS 2x4 4-Lamp Troffer	106	1.2	Q	3120	3,838	11 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.5	0.638
TELE CLOSET	3	TS 2x4 4-Lamp Troffer	106	0.3	M	1040	331	3 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.1	0.174
C-2550 LAB	6	TS 2x4 4-Lamp Troffer	106	0.6	Q	3120	1,864	6 de-lamp TS 2x4 2-Lamp 28w (STD)Bal. wireflexor kit	48	0.3	0.348

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	7	TS 1x4 2-Lamp Wmp	62	0.4	0	3120	1,354	7	Do-Lamp to TS 1x4 1-Lamp Wmp 28w (STD)Bul. w/reflector	25	0.2	0.250
C-2550 HALL MEZANINE												
C-1800A CAGE	1	TS 1x4 2-Lamp Wmp	175	0.2	0	3120	546	1	Do-Lamp to TS 1x4 2-Lamp Wmp 28w (STD)Bul. w/reflector	48	0.0	0.127
C-1700 STORAGE	10	TS 2x4 4-Lamp Troffer	106	1.1	0	3120	3,307	10	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.5	0.580
C-1700 STORAGE	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
RR-W	3	TS 2x4 4-Lamp Troffer	106	0.3	RR	8760	2,786	3	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.174
RR-W	4	TS 1x4 2-Lamp Wmp	62	0.2	RR	8760	2,172	4	Do-Lamp to TS 1x4 1-Lamp Wmp 28w (STD)Bul. w/reflector	25	0.1	0.148
RR-M	7	TS 2x4 4-Lamp Troffer	106	0.7	RR	8760	6,503	7	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.3	0.408
RR-M	4	TS 1x4 2-Lamp Wmp	62	0.2	RR	8760	2,172	4	Do-Lamp to TS 1x4 1-Lamp Wmp 28w (STD)Bul. w/reflector	25	0.1	0.148
RECORDS	16	TS 2x4 3-Lamp Troffer	84	1.3	0	3120	4,183	16	Do-Lamp to TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.8	0.570
RECORDS	1	TS 2x4 3-Lamp Troffer	84	0.1	24	8760	736	1	Do-Lamp to TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.0	0.036
B-550-A HALL	8	TS 2x4 3-Lamp Troffer	84	0.7	0	3120	2,907	8	Do-Lamp to TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.4	0.288
B-550 OFFICE 1	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	Do-Lamp to TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.1	0.072
B-550 OFFICE 1	2	TS 2x4 2-Lamp U-6 Trof.	62	0.1	0	3120	387	2	Retro TS 2x4 2-Lamp F17 TS w/reflector kit	29	0.1	0.066
CONF ROOM	2	TS 2x4 3-Lamp Troffer	84	0.2	0	3120	524	2	Do-Lamp to TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.1	0.072
ELEC ROOM#4	2	TS 1x4 2-Lamp Ind Strip	62	0.1	M	1040	129	2	Rac-Lamp & Rac-Bulb TS 1x4 1-Lamp Strip 28w (STD)Bul. w/reflector	25	0.1	0.074
B-550 KITCHEN	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
VENDING AREA	2	Scots Vending Machine	400	0.8	24	8760	7,808	2	Vending Miser Soda Oen. Control unit	240	0.5	0.320
VENDING AREA	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
A-100 RM400	13	TS 2x4 4-Lamp Troffer	106	1.4	0	3120	4,288	13	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.6	0.754
A-100 CONF ROOM	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
A-100 SUPPLY ROOM	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
OFFICE 1	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
OFFICE 2	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
SERVER 3	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	681	2	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
HALLWAY	24	TS 2x4 4-Lamp Troffer	106	2.5	0	3120	7,937	24	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	1.2	1.382
HALLWAY	2	Inc. 65w Pw 30	65	0.1	0	3120	408	2	New CFL 15w B30 Flood	15	0.0	0.100
HALLWAY	15	TS 2x4 4-Lamp Troffer	106	1.8	0	3120	4,961	15	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.7	0.970
CONF ROOM 535	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
CONF ROOM 540	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
CONF ROOM 1	6	TS 2x4 3-Lamp Troffer	84	0.5	0	3120	1,572	6	Do-Lamp to TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.3	0.316
CONF ROOM 2	6	TS 2x4 3-Lamp Troffer	84	0.5	0	3120	1,572	6	Do-Lamp to TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.3	0.316
OFFICE 545	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
OFFICE 515	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
OFFICE 510	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
OFFICE 520	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
OFFICE 505	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
OFFICE 525	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
CONF ROOM 530	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
OFFICE 500	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
OLD KITCHEN HALL	4	TS 2x4 3-Lamp Troffer	84	0.3	0	3120	1,048	4	Do-Lamp to TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.2	0.144
OLD KITCHEN HALL	1	Old Style LED exit sign	12	0.0	24	8760	105	1	New LED Exit Fixture	3	0.0	0.009
KITCHEN STORAGE 1	1	TS 1x4 2-Lamp Ind Strip	62	0.1	0	3120	193	1	Rac-Lamp & Rac-Bulb TS 1x4 1-Lamp Strip 28w (STD)Bul. w/reflector	25	0.0	0.037
KITCHEN STORAGE 2	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.2	0.232
RR-MF	2	TS 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	2	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
JAN CL	1	Inc. 100W	100	0.1	J	740	74	1	New CFL 25W 81	25	0.0	0.075
RR-L	2	TS 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	2	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
KITCHEN HOOD	3	JI Inc. 60w	60	0.2	0	3120	562	3	New CFL 25W 81	16	0.0	0.132
OLD KITCHEN PREP	21	TS 2x4 4-Lamp Troffer	106	2.2	0	3120	6,945	21	delamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	1.0	1.218
KITCHEN HOOD	3	JI Inc. 60w	60	0.2	0	3120	562	3	New CFL 25W 81	16	0.0	0.132
DRY GOOD STORAGE 1	7	TS 1x4 2-Lamp Ind Strip	62	0.4	0	3120	1,354	7	Rac-Lamp & Rac-Bulb TS 1x4 1-Lamp Strip 28w (STD)Bul. w/reflector	25	0.2	0.269

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DRY GOOD STORAGE 2	8	T8 2x4 4-Lamp Wrap	106	0.8	O	3120	2,646	8	Delamp to T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.4	0.484
CLOSET	1	Inc. 100W	100	0.1	J	740	74	1	New CFL 25W SI	25	0.0	0.075
ROOM 405	8	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	2,646	8	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.4	0.484
405 OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
ROOM 405A	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
RR-M	2	T8 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
RR-M	2	T8 1x4 2-Lamp Wrap	62	0.1	RR	8760	1,068	2	Del-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal, w/reflector	25	0.1	0.074
RR-M	1	T8 2x2 2-Lamp F17 T8 Troffer w/Bloc. Bal	35	0.0	RR	8760	307	1	No Retrofit T8 2x2 2-Lamp F17 T8 Troffer (std) Bal w/reflector kit	35	0.0	0.000
RR-F	2	T8 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
RR-F	3	T8 1x4 2-Lamp Wrap	62	0.2	RR	8760	1,829	3	Del-Lamp to T8 1x4 1-Lamp Wrap 28w (STD)Bal, w/reflector	25	0.1	0.111
RR-F CLOSET	1	Inc. 100W	100	0.1	J	740	74	1	New CFL 25W SI	25	0.0	0.075
MECH CLOSET	6	T8 1x4 2-Lamp Ind Strip	62	0.4	M	1040	387	6	Re-Lamp & Re-Balast T8 1x4 1-Lamp Strip 28w (STD)Bal, w/ reflector	25	0.2	0.222
SIDE VESTIBULE	3	Inc. 100W	100	0.3	OD	4380	1,314	3	New CFL 25W SI	25	0.1	0.225
A400 HALL	18	T8 2x4 4-Lamp Troffer	106	1.9	O	3120	8,953	18	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.9	1.044
OFFICE 150	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
OFFICE 145	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
OFFICE 140	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.174
OFFICE 135	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.174
A400 OFFICE 130	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
A400 OFFICE 125	8	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	2,646	8	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.4	0.484
STORAGE	1	T8 2x4 4-Lamp Troffer	106	0.1	O	3120	331	1	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.0	0.058
CTR MANAGEMENT OFFICE	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.174
SCORE COUNSELOR	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
MD NETWORK OFFICE	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.174
J REF OFFICE	6	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	1,984	6	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.3	0.348
INTERCORP 100	10	T8 2x4 4-Lamp Troffer	106	1.1	O	3120	3,307	10	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.5	0.580
HEALTH 105	10	T8 2x4 4-Lamp Troffer	106	1.1	O	3120	3,307	10	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.5	0.580
COPY ROOM	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
CONF ROOM H	8	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	1,984	8	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.3	0.348
TECH COUNSELOR MGMT	5	T8 2x4 4-Lamp Troffer	106	0.5	O	3120	1,654	5	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.2	0.290
RM 115	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.2	0.232
RM 120	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
CONF ROOM B	6	T8 2x4 4-Lamp Troffer	106	0.6	O	3120	1,984	6	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.3	0.348
SERVER ROOM	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
NEOTECH OFFICE	5	T8 2x4 4-Lamp Troffer	106	0.5	O	3120	1,654	5	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.2	0.290
BRC MGMT	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.174
GLASS CONF ROOM	8	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	2,646	8	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.4	0.484
CTR OF TECH & BUS DEV	9	T8 2x4 4-Lamp Troffer	106	1.0	O	3120	2,978	9	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.4	0.522
COMPUTER LAB	19	T8 2x4 4-Lamp Troffer	106	2.0	O	3120	8,284	19	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.9	1.102
COMPUTER LAB	4	150W halogen uplight	150	0.8	O	3120	1,872	4	No Retrofit	150	0.8	0.000
BUS. RESOURCE LIB	9	T8 2x4 4-Lamp Troffer	106	1.0	O	3120	2,978	9	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.4	0.522
CENTER CAFE	8	T8 2x4 4-Lamp Troffer	106	0.8	O	3120	2,646	8	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.4	0.484
CENTER CAFE	2	Soda Vending Machine	400	0.8	24	8760	7,008	2	Vending Mkr Soda Occ. Control unit	240	0.8	0.320
CEN GEN 300-330 HALL	1	T8 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	193	1	Retro T8 2x2 2-Lamp F17 T8 w/Reflector Kit	29	0.0	0.033
CEN GEN 300-330 HALL	1	Old Style LED exit sign	12	0.0	24	8760	105	1	New LED Exit Fixture	3	0.0	0.009
CEN GEN 300-330 HALL	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.2	0.232
OFFICE 330	4	T8 2x4 4-Lamp Troffer	106	0.4	O	3120	1,323	4	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.2	0.232
OFFICE 300	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.174
OFFICE 305	2	T8 2x4 4-Lamp Troffer	106	0.2	O	3120	661	2	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.116
OFFICE 325	5	T8 2x4 4-Lamp Troffer	106	0.5	O	3120	1,654	5	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.2	0.290
OFFICE 310	3	T8 2x4 4-Lamp Troffer	106	0.3	O	3120	992	3	delamp T8 2x4 2-Lamp 28w (STD)Bal, w/reflector kit	48	0.1	0.174

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OFFICE 320	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,884	6	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.3	0.348
OFFICE 315	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,884	6	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.3	0.348
OFFICE 165	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,884	6	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.3	0.348
REAL TIME SQUARE HALL	24	T8 2x4 4-Lamp Troffer	106	2.5	0	3120	7,807	24	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	1.2	1.392
OFFICE 280	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
OFFICE 280A	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
OFFICE 270	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,069	12	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.6	0.696
OFFICE 282	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
OFFICE 283	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.2	0.232
OFFICE 284	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
OFFICE 245	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,884	6	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.3	0.348
OFFICE 240	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.2	0.232
BACK OFFICE	9	T8 2x4 4-Lamp Troffer	106	1.0	0	3120	2,876	9	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.4	0.432
OFFICE 220A	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
OFFICE 220A	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
OFFICE 225	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,069	12	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.6	0.696
OFFICE 210	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
OFFICE 215	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,069	12	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.6	0.696
OFFICE 205	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
OFFICE 200	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
STORAGE	5	T8 2x4 4-Lamp Troffer	106	0.5	0	3120	1,654	5	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.2	0.260
VESTIBULE NORTH LOBBY	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	2,846	6	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.4	0.464
VESTIBULE	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3120	331	1	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.0	0.068
VESTIBULE	6	26 Wat CFL PL Double Tube Blax	26	0.2	0	3120	487	6	No Retrofit 26 Wat CFL PL Double Tube Blax	26	0.2	0.000
N LOBBY HALLWAY	6	T8 2x4 4-Lamp Troffer	106	0.6	0	3120	1,884	6	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.3	0.348
N LOBBY HALLWAY	8	26 Wat CFL PL Double Tube Blax	26	0.2	0	3120	730	8	No Retrofit 26 Wat CFL PL Double Tube Blax	26	0.2	0.000
SMALL HALL	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	962	3	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.174
SMALL HALL	1	Old Style LED exit sign	12	0.0	24	8760	105	1	New LED Exit Fixture	3	0.0	0.009
A-1100 LONG HALL	10	T8 2x4 4-Lamp Troffer	106	1.1	0	3120	3,307	10	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.6	0.680
A-1100 LONG HALL	2	Old Style LED exit sign	12	0.0	24	8760	210	2	New LED Exit Fixture	3	0.0	0.018
A-1100 RECEPTION DESK	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.2	0.232
OFFICE 1	4	T8 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.2	0.232
OPEN CUBICLE SPACE	48	T8 2x4 4-Lamp Troffer	106	5.1	0	3120	15,875	48	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	2.3	2.764
OPEN CUBICLE SPACE	1	Old Style LED exit sign	12	0.0	24	8760	105	1	New LED Exit Fixture	3	0.0	0.009
BONNIE H OFFICE	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	962	3	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.174
OFFICE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
NICK S OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
BRENDA S OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
BRENDA S OFFICE 2	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
CORNER OFFICE 3	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	962	3	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.174
CORNER OFFICE 4	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
CORNER OFFICE 5	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
FILE ROOM	5	T8 2x4 4-Lamp Troffer	106	0.5	0	3120	1,654	5	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.2	0.260
ELEC PLANS OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
DON C OFFICE	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
DRAWING STORAGE	9	T8 2x4 4-Lamp Troffer	106	1.0	0	3120	2,970	9	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.4	0.522
ADMIN SUPPLY CLOSET	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
COPY ROOM	2	T8 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.1	0.116
KITCHEN	1	T8 2x4 4-Lamp Troffer	106	0.1	0	3120	331	1	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.0	0.068
A-1150	15	T8 2x4 4-Lamp Troffer	106	1.6	0	3120	4,981	15	delamp T8 2x4 2-Lamp 23w (STD)8d, whitefluor kit	48	0.7	0.870

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BRUCE FOREST OFFICE	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	661	2	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.1	0.110
CONF ROOM A	48	TS 2x2 2-Lamp F17 T8 Troffer w/Dec. Bal	35	1.7	0	3120	5,242	48	No Retrofit TS 2x2 2-Lamp F17 T8 Troffer (std) Bal white reflector kit	35	1.7	0.000
CONF ROOM A	15	Inc. 65w Par 30	65	1.0	0	3120	3,042	15	New CFL 15w BR30 Flood	15	0.2	0.750
A-1500 CUBICLES	6	TS 2x4 4-Lamp Troffer	106	0.6	0	3120	1,844	6	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.3	0.348
A-1500 CUBICLES	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
A-1600 OFFICE 1	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	861	2	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.1	0.116
TRAFFIC DIV	33	TS 2x4 4-Lamp Troffer	106	3.5	0	3120	10,814	33	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	1.8	1.814
BACK TOOL ROOM	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
TRAFFIC CORNER OFFICE	3	TS 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.1	0.174
SHERIFF OFFICE A-1000	7	TS 2x4 4-Lamp Troffer	106	0.7	0	3120	2,315	7	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.3	0.408
OFFICE A-1004	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
GUN STORAGE	3	TS 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.1	0.174
OFFICE 2	3	TS 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.1	0.174
OFFICE 3	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	861	2	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.1	0.116
OFFICE 4	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
GUN STORAGE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
MIKE H OFFICE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
SHANNON T OFFICE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
SHERIFF CONF ROOM	13	Inc. 65w Par 30	65	0.8	0	3120	2,635	13	New CFL 15w BR30 Flood	15	0.2	0.850
SHERIFF CONF ROOM	12	Inc. 50w	50	0.6	0	3120	1,872	12	New CFL R30 FLOOD TW	7	0.1	0.516
SHERIFF RR	2	TS 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,837	2	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.1	0.116
MAIN SHERIFF	8	TS 2x4 4-Lamp Troffer	106	0.8	0	3120	1,894	8	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.3	0.348
A-1000A LOBBY RECEPTION	11	TS 2x4 4-Lamp Troffer	106	1.2	0	3120	3,638	11	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.5	0.938
A-1008 COPY ROOM	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	861	2	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.1	0.116
KITCHEN	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
COPY PAPER STORAGE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
MAIN SHERIFF HALL	16	TS 2x4 4-Lamp Troffer	106	1.7	0	3120	5,262	16	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.8	0.928
MAIN SHERIFF HALL	3	OH Style LED exit sign	12	0.0	24	8760	315	3	New LED Exit Flood	3	0.0	0.027
MAIN SHERIFF HALL	17	25 Watt CFL Flood	25	0.4	0	3120	1,326	17	No Retrofit 25 Watt CFL Flood	25	0.4	0.000
A-1020 OFFICE	8	TS 2x4 4-Lamp Troffer	106	0.8	0	3120	2,640	8	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.4	0.464
A-1200 OFFICE 1	2	TS 2x4 4-Lamp Troffer	106	0.2	0	3120	861	2	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.1	0.116
A-1200 OFFICE 2	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
A-1030 OFFICE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
A-1040 OFFICE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
A-V ROOM	2	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	2	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
A-V ROOM	1	Inc. 65w Par 30	65	0.1	0	3120	861	1	New CFL 15w BR30 Flood	15	0.0	0.060
A-1040-B OFFICE	4	TS 2x4 4-Lamp Troffer	106	0.4	0	3120	1,323	4	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.2	0.232
A-1050 OFFICE	8	TS 2x4 4-Lamp Troffer	106	0.8	0	3120	2,640	8	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.4	0.464
A-1050 RR	1	TS 2x2 2-Lamp F17 T8 Troffer w/Dec. Bal	35	0.0	RR	8760	307	1	No Retrofit TS 2x2 2-Lamp F17 T8 Troffer (std) Bal white reflector kit	35	0.0	0.000
CONF ROOM C	24	TS 2x2 2-Lamp F17 T8 Troffer w/Dec. Bal	60	1.4	0	3120	4,493	24	Retro TS 2x2 2-Lamp F17 T8 white reflector kit	29	0.7	0.744
CONF ROOM C	10	Inc. 90w Par 38	90	0.9	0	3120	2,808	10	New CFL 23w BR40 Flood	23	0.2	0.870
A-1700 CONF ROOM	6	TS 2x4 4-Lamp Troffer	106	0.6	0	3120	1,864	6	delamp TS 2x4 2-Lamp 28w (STD)HdL, white reflector kit	48	0.3	0.348

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A-1700 CONF ROOM	3	Inc. 65w Par 30	43	0.2	0	3120	606	3	New CFL 15w BR30 Flood	15	0.0	0.150
A-1700 CLOSET	6	TS 2x4 4-Lamp Troffer	106	0.8	0	3120	1,884	48	6 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.3	0.248
RR-M	2	TS 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	48	2 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
RR-M	2	TS 1x4 2-Lamp Wrap	62	0.1	RR	8760	1,068	25	2 1-Lamp TS 1x4 1-Lamp Wrap 28w (STD)Bul. w/reflector	25	0.1	0.074
RR-M	1	TS 2x2 2-Lamp P17 TS Troffer w/Elec. Bal	35	0.0	RR	8760	307	35	1 No Retrofit TS 2x2 2-Lamp P17 TS Troffer (std) Bal w/reflector kit	35	0.0	0.000
RR-CL	1	Inc. 100W	100	0.1	M	1040	104	25	1 New CFL 25W R	25	0.0	0.075
RR-F	2	TS 2x4 4-Lamp Troffer	106	0.2	RR	8760	1,857	48	2 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.116
RR-F	3	TS 1x4 2-Lamp Wrap	62	0.2	RR	8760	1,829	25	3 1-Lamp TS 1x4 1-Lamp Wrap 28w (STD)Bul. w/reflector	25	0.1	0.111
RR-F	1	Inc. 100W	100	0.1	RR	8760	876	25	1 New CFL 25W S	25	0.0	0.075
SWITCH GEAR RM	6	TS 1x4 3-Lamp Ind. Strip	62	0.4	O	3120	1,011	25	6 Re-Lamp & Re-Bulb TS 1x4 1-Lamp Strip 28w (STD)Bul. w/reflector	25	0.2	0.222
A-1700 HALL	10	TS 2x4 4-Lamp Troffer	106	1.1	O	3120	3,307	48	10 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.5	0.580
A-1700 HALL	2	Old Style LED exit sign	12	0.0	24	8760	210	3	2 New LED Exit Fixture	3	0.0	0.016
MAIL ROOM A-1800 OFFICE	4	TS 1x4 2-Lamp Ind. Strip	62	0.2	O	3120	774	25	4 Re-Lamp & Re-Bulb TS 1x4 1-Lamp Strip 28w (STD)Bul. w/reflector	25	0.1	0.148
A-1800 OFFICE	6	TS 2x4 4-Lamp Troffer	106	0.8	O	3120	1,884	48	6 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.3	0.348
A-1800	3	TS 2x4 4-Lamp Troffer	106	0.3	O	3120	922	48	3 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.1	0.174
A-1800	16	TS 2x4 4-Lamp Troffer	106	1.7	O	3120	5,222	48	16 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.8	0.928
ELEC RM#3	8	TS 1x4 2-Lamp Ind. Strip	62	0.5	O	3120	1,548	25	8 Re-Lamp & Re-Bulb TS 1x4 1-Lamp Strip 28w (STD)Bul. w/reflector	25	0.2	0.286
B-1800	6	TS 2x4 3-Lamp Troffer	84	0.5	O	3120	1,572	48	6 3-Lamp TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.3	0.216
B-1800 OFF 1	2	TS 2x4 3-Lamp Troffer	84	0.2	O	3120	524	48	2 3-Lamp TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.1	0.072
RONALD OFFICE 2	4	TS 2x4 3-Lamp Troffer	84	0.3	O	3120	1,048	48	4 3-Lamp TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.2	0.144
LINDA	4	TS 2x4 3-Lamp Troffer	84	0.3	O	3120	1,048	48	4 3-Lamp TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.2	0.144
B-1800 HALLWAY	1	TS 2x4 3-Lamp U-6 Trof.	62	0.1	O	3120	183	29	1 Retro TS 2x4 2-Lamp P17 TS w/reflector kit	29	0.0	0.033
B-1800 HALLWAY	6	TS 2x4 3-Lamp Troffer	84	0.5	O	3120	1,572	48	6 3-Lamp TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.3	0.216
B-1800 HALLWAY	3	TS 2x4 3-Lamp Troffer	84	0.3	24	8760	2,208	48	3 4-Lamp TS 2x4 2-Lamp Troffer 28w (STD)Bul. w/reflector	48	0.1	0.106
B-1800 HALLWAY	2	Old Style LED exit sign	12	0.0	24	8760	210	3	2 New LED Exit Fixture	3	0.0	0.016
B-1800 HALLWAY	1	TS 2x2 2-Lamp P17 TS Troffer w/Elec. Bal	35	0.0	O	3120	109	35	1 No Retrofit TS 2x2 2-Lamp P17 TS Troffer (std) Bal w/reflector kit	35	0.0	0.000
MAIN LOBBY HALLWAY	18	TS 2x2 2-Lamp P17 TS Troffer w/Elec. Bal	35	0.7	O	3120	2,075	35	18 No Retrofit TS 2x2 2-Lamp P17 TS Troffer (std) Bal w/reflector kit	35	0.7	0.000
MAIN LOBBY HALLWAY	6	TS 2x2 2-Lamp P17 TS Troffer w/Elec. Bal	35	0.3	24	8760	2,453	35	6 No Retrofit TS 2x2 2-Lamp P17 TS Troffer (std) Bal w/reflector kit	35	0.3	0.000
MAIN LOBBY HALLWAY	7	Old Style LED exit sign	12	0.1	24	8760	736	3	7 New LED Exit Fixture	3	0.0	0.083
GLASS FOYER	12	25 Watt CFL Flood	25	0.3	O	3120	936	25	12 No Retrofit 25 Watt CFL Flood	25	0.3	0.000
GLASS FOYER	6	TS 2x4 4-Lamp Troffer	106	0.8	O	3120	1,884	48	6 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.3	0.348
GLASS FOYER	6	Inc. 50w	50	0.3	O	3120	936	7	6 New CFL R20 FLOOD TW	7	0.0	0.258
GLASS FOYER	1	TS 3x2 2-Lamp U-6 Trof.	62	0.1	O	3120	183	29	1 Retro TS 2x2 2-Lamp P17 TS w/reflector kit	29	0.0	0.033
B 800 HALLWAY	1	TS 2x2 2-Lamp U-6 Trof.	62	0.1	O	3120	183	29	1 Retro TS 2x2 2-Lamp P17 TS w/reflector kit	29	0.0	0.033
B 800 HALLWAY	5	TS 2x2 2-Lamp P17 TS Troffer w/Elec. Bal.	60	0.3	O	3120	936	29	5 Retro TS 2x2 2-Lamp P17 TS w/reflector kit	29	0.1	0.155
B 800 HALLWAY	2	TS 3x2 4-Lamp P17 TS Troffer w/Elec. Bal.	60	0.1	24	8760	1,031	29	2 Retro TS 2x2 2-Lamp P17 TS w/reflector kit	29	0.1	0.083
B 800 HALLWAY	1	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	79	3	1 New LED Exit Fixture	3	0.0	0.008
QTR MASTER HALLWAY	17	250 Watt MH Fixture	258	4.9	O	3120	15,276	48	17 New Wrap Wall Mounted TS 1x4 2-Lamp 28w (STD)Bul.	48	0.8	4.080
QTR MASTER HALLWAY	1	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	79	3	1 New LED Exit Fixture	3	0.0	0.008
C-700 HALLWAY	22	TS 2x4 4-Lamp Troffer	106	2.3	O	3120	7,276	48	22 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	1.1	1.276
C-700 HALLWAY	2	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	156	3	2 New LED Exit Fixture	3	0.0	0.012
LOADING DOCK HALLWAY	18	250 Watt MH Fixture	258	5.5	O	3120	17,072	48	18 New Wrap Wall Mounted TS 1x4 2-Lamp 28w (STD)Bul.	48	0.9	4.580
LOADING DOCK HALLWAY	10	250 Watt MH Fixture	258	2.9	O	3120	8,980	112	10 New TS 2x4 3-Lamp 4-Lamp pendant wrap fixture (HP) bal	112	1.1	1.760
LOADING DOCK HALLWAY	2	2 Lamp 6w Plug in CFL kit	9	0.0	24	8760	156	3	2 New LED Exit Fixture	3	0.0	0.012
C-2000 HALLWAY	9	TS 2x4 4-Lamp Troffer	106	1.0	O	3120	2,976	48	9 4-Lamp TS 2x4 2-Lamp 28w (STD)Bul. w/reflector kit	48	0.4	0.522

DORSEY BUILDING MOTION SENSORS SURVEY

C-2000 HALLWAY	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.018
C-2000A HALLWAY	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,069	12 delamp T8 2x4 2-Lamp 25w (STD)Bul. withreflector kit	48	0.6	0.696
C-2000A HALLWAY	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.018
C-2450 HALLWAY	11	T8 2x4 4-Lamp Troffer	106	1.2	0	3120	3,638	11 delamp T8 2x4 2-Lamp 25w (STD)Bul. withreflector kit	48	0.5	0.638
C-2450 HALLWAY	2	Old Style LED exit sign	12	0.0	24	8760	210	2 New LED Exit Fixture	3	0.0	0.018
C-2615 HALLWAY	12	T8 2x4 4-Lamp Troffer	106	1.3	0	3120	3,989	12 delamp T8 2x4 2-Lamp 25w (STD)Bul. withreflector kit	48	0.6	0.698
C-2615 HALLWAY	1	2 Lamp low Plug in CFL kit	9	0.0	24	8760	79	1 New LED Exit Fixture	3	0.0	0.008
B-310 HALLWAY	3	T8 2x4 4-Lamp Troffer	106	0.3	0	3120	992	3 delamp T8 2x4 2-Lamp 25w (STD)Bul. withreflector kit	48	0.1	0.174
B-310 HALLWAY	1	T8 2x4 4-Lamp Troffer	106	0.1	24	8760	929	1 delamp T8 2x4 2-Lamp 25w (STD)Bul. withreflector kit	48	0.0	0.058
B-310 HALLWAY	1	2 Lamp low Plug in CFL kit	9	0.0	24	8760	79	1 New LED Exit Fixture	3	0.0	0.008
O.D. ENTRANCE	2	Inc. 100W	100	0.2	00	4380	878	2 New CFL 25W SI	25	0.1	0.150
O.D. FRONT SIDE	2	Inc. 100W	100	0.2	00	4380	878	2 New CFL 25W SI	25	0.1	0.150
O.D. RIGHT SIDE	1	Inc. 100W	100	0.1	00	4380	438	1 New CFL 25W SI	25	0.0	0.075
O.D. MAIN ENTRANCE	8	25 Watt CFL Flood	25	0.2	00	4380	878	8 No Retrofit 25 Watt CFL Flood	25	0.2	0.000
O.D. MAIN ENTRANCE	3	175 Watt MH Wall Pack	310	0.8	00	4380	2,759	3 Retro 175 Watt Pulse Start MH kit	190	0.3	0.180
FRONT LOT	18	400 Watt MH Fixture	435	7.3	00	4380	31,886	18 Retro 320 Watt Pulse Start M.H.	365	8.6	1.440
FRONT LOT	5	400 Watt MH Fixture	455	2.3	00	4380	9,885	5 Retro 320 Watt Pulse Start M.H.	365	1.8	0.480
FRONT LOT	8	400 Watt MH Fixture	455	3.8	00	4380	15,843	8 Retro 320 Watt Pulse Start M.H.	365	2.9	0.720
RIGHT LOT	8	400 Watt MH Fixture	455	2.7	00	4380	11,957	8 Retro 320 Watt Pulse Start M.H.	365	2.2	0.540
RIGHT LOT	3	250 Watt MH Fixture	283	0.9	00	4380	3,784	3 Retro 175 Watt Pulse Start MH kit	210	0.8	0.234
BACK LOT	3	250 Watt MH Fixture	283	0.9	00	4380	3,784	3 Retro 175 Watt Pulse Start MH kit	210	0.8	0.234
BACK LOT	8	400 Watt MH Fixture	455	2.3	00	4380	9,885	8 Retro 320 Watt Pulse Start M.H.	365	1.8	0.450
BACK LOT	2	400 Watt MH Fixture	455	0.9	00	4380	3,886	2 Retro 320 Watt Pulse Start M.H.	365	0.7	0.180
L SIDE	8	250 Watt MH Fixture	283	2.3	00	4380	10,092	8 Retro 175 Watt Pulse Start MH kit	210	1.7	0.624
RECEIVING DOCK	3	400 Watt MH Fixture	455	1.4	00	4380	5,878	3 Retro 320 Watt Pulse Start M.H.	365	1.1	0.278
SECURITY BOOTH	4	Inc. 90w Per 18	90	0.4	00	4380	1,571	4 New CFL 25w BR40 Flood	25	0.1	0.268

3,321

1,164,190 3,321

174.2

Annual Energy Savings

GATEWAY BUILDING MOTION SENSORS SURVEY

PROPOSED

Room Description	Quantity	Description	Watts	KW	KW Saved	KW Cost Savings	Sensor Type	Sensor Qty	Post Burn Hours	KWH	KWH Saved
5th Floor											
suite 514 dept of public works	43	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	2.1	0.301	\$	-		3640.00	7,513	1,096
storage	3	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.1	0.021	\$	-		3640.00	624	76
bureau chief	3	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.1	0.102	\$	-		3640.00	624	371
chief recycling div	3	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.1	0.102	\$	-		3640.00	624	371
chief recycling div	2	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.1	0.068	\$	-		3640.00	348	248
chief collections div	2	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.1	0.068	\$	-		3640.00	348	248
office 1	2	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.1	0.068	\$	-		3640.00	348	248
kitchen	2	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.1	0.014	\$	-		3640.00	348	51
side office	2	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.1	0.014	\$	-		3640.00	348	61
mark richmond	2	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.1	0.068	\$	-		3640.00	348	248
chief environmental mgmt div	2	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.1	0.068	\$	-		3640.00	348	248
conf room	4	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.2	0.028	\$	-	cm-pdt	1.0	2548.00	488
main elevator lobby cove lighting	1	Re-Lamp 18 1x4 2-Lamp F25 (STD)Bal	43	0.0	0.035	\$	-		8760.00	377	307
elec room	1	De-Lamp to 18 1x4 1-Lamp Strip 28w (STD)Bal w/reflector	25	0.0	0.053	\$	-		1040.00	26	55
mech room	2	De-Lamp to 18 1x4 1-Lamp Strip 28w (STD)Bal w/reflector	25	0.1	0.108	\$	-		1040.00	62	110
hallway	30	Re-Lamp 18 2x2 2lamp F17 18 w/Reflector Kit	29	0.9	1.470	\$	-	cm-pdt	3.0	2548.00	2,217
							cm-pdt				
hallway											
hallway	4	Re-Lamp 18 2x2 2lamp F17 18 w/Reflector Kit	29	0.1	0.196	\$	-		8760.00	1,016	1,717
m-n	1	Re-Lamp 18 2x2 2lamp F17 18 w/Reflector Kit	29	0.0	0.048	\$	-	wed-pdt	1.0	3642.00	568
m-n	6	De-Lamp to 18 1x4 1-Lamp Strip 28w (STD)Bal w/reflector	25	0.2	0.318	\$	-		6132.00	920	3,180
m-f	1	Re-Lamp 18 2x2 2lamp F17 18 w/Reflector Kit	29	0.0	0.048	\$	-	wed-pdt	1.0	3642.00	568
m-f	6	De-Lamp to 18 1x4 1-Lamp Strip 28w (STD)Bal w/reflector	25	0.2	0.318	\$	-		6132.00	920	3,180
Jan closet	1	New CFL 28923 27W	27	0.0	0.123	\$	-		740.00	20	81
copy room	2	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.1	0.068	\$	-		3640.00	348	248
office of purchasing open office	34	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	1.6	0.236	\$	-		3640.00	6,040	866
dane lewis	4	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.2	0.028	\$	-	cm-pdt	1.0	2693.60	517
chief purchasing	4	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.2	0.028	\$	-	wed-pdt	1.0	2693.60	517
kitchen	4	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.2	0.028	\$	-	wed-pdt	1.0	1383.20	268
conf room	6	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.3	0.042	\$	-	wed-pdt	1.0	2111.20	606
storage	2	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.1	0.014	\$	-		3640.00	348	51
econ dev. Authority open space	17	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.8	0.118	\$	-		3640.00	2,870	433
econ dev. Authority open space	2	No Retro	5	0.0	0.000	\$	-		8760.00	88	0
office 1	2	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.1	0.014	\$	-		3640.00	348	51
office 2	4	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.2	0.028	\$	-	wed-pdt	1.0	2693.60	517
office 3	4	Re-Lamp & Re-Balast 18 2x4 2-Lamp Troffer 28w (STD)Bal	48	0.2	0.028	\$	-	wed-pdt	1.0	2693.60	517
office 4	2	Re-Lamp 18 2x4 2-Lamp 28w reflector(STD)Bal	48	0.1	0.118	\$	-		3640.00	348	422
office 5	4	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.2	0.136	\$	-	wed-pdt	1.0	2693.60	517
office 6	4	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.2	0.136	\$	-	wed-pdt	1.0	2548.00	488
office 7	4	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.2	0.136	\$	-	wed-pdt	1.0	2693.60	517
office 8	4	De-Lamp to 18 2x4 2L Troffer 28w (STD)Bal w/reflector	48	0.2	0.136	\$	-	wed-pdt	1.0	2693.60	517
office 8	2	New CFL 15W BR30 Flood	15	0.0	0.100	\$	-		3640.00	108	384
copy room	8	Re-Lamp 18 2x4 2-Lamp 28w reflector(STD)Bal	48	0.2	0.280	\$	-	wed-pdt	1.0	2693.60	517

GATEWAY BUILDING MOTION SENSORS SURVEY

reception desk	2	New CFL 15w BR30 Flood	15	0.0	0.100	\$ -			3640.00	109	364
conf room	6	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.204	\$ -	wad-pdt	1.0	2111.20	608	1,183
executive conf room	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
executive conf room	10	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.5	0.070	\$ -	hws	1.0	2111.20	1,013	989
executive conf room	2	Retro T8 2x2 2lamp F17 T8 w/Reflector Kit	29	0.1	0.068	\$ -			3640.00	211	240
kitchen	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007	\$ -			3640.00	175	25
4th FLOOR											
police dept	3	No Retro	5	0.0	0.000	\$ -			8760.00	131	0
police dept	13	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.6	0.091	\$ -			3640.00	2,271	331
major gardner	4	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136	\$ -	wad-pdt	1.0	2693.60	517	677
lt. johnson	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116	\$ -			3640.00	349	422
lt. price	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.174	\$ -			3640.00	524	633
corporal schaeffer	3	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.021	\$ -			3640.00	524	78
sgt lee	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116	\$ -			3640.00	349	422
storage	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014	\$ -			3640.00	349	51
office 1	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014	\$ -			3640.00	349	51
office 2	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014	\$ -			3640.00	349	51
conf room	3	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.021	\$ -			3640.00	524	78
fire & rescue	45	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	2.2	0.315	\$ -			3640.00	7,862	1,147
open space	4	No Retro	5	0.0	0.000	\$ -			8760.00	175	0
back hall	2	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.098	\$ -	cm-pdt	1.0	6132.00	358	1,011
conf room	4	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136	\$ -	wad-pdt	1.0	2111.20	405	789
kitchen	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028	\$ -	wad-pdt	1.0	1383.20	266	535
back office 1	4	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136	\$ -	wad-pdt	1.0	2693.60	517	677
small conf room	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -	cm-pdt	1.0	2548.00	245	352
corner office	3	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.102	\$ -			3640.00	524	371
charles sharpe	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007	\$ -			3640.00	175	25
side office 1	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.174	\$ -			3640.00	524	633
side office 2	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.174	\$ -			3640.00	524	633
side office 3	3	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.174	\$ -			3640.00	524	633
regulations office 1	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058	\$ -			3640.00	175	211
regulations office 2	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
ryan mitch office	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
cindi-payroll	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116	\$ -			3640.00	349	422
rms admin	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116	\$ -			3640.00	349	422
deputy chief	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
communications and info tech	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
steve wilson	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007	\$ -			3640.00	175	25
mail room	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116	\$ -			3640.00	349	422
office of emergency mgmt	3	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.102	\$ -			3640.00	524	371
office 1	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116	\$ -			3640.00	349	422
office 2	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
timothy dethl	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
cr 402/weight room	5	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.290	\$ -			3640.00	874	1,056
cr 402/weight room	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058	\$ -			3640.00	175	211
cl room 401	22	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	1.1	1.276	\$ -	cm-pdt	2.0	3094.00	3,267	5,221
							cm-pdt				
main hall elevator	30	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.9	1.470	\$ -	cm-pdt	3.0	2548.00	2,217	6,301

GATEWAY BUILDING MOTION SENSORS SURVEY

							tm-pdt				
							cm-pdt				
copy room	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007	\$ -			3640.00	175	25
ray petry office	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014	\$ -			3640.00	349	51
john abron office	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.1	0.014	\$ -			3640.00	349	51
jan closet	1	New CFL IR3016 16W	23	0.0	0.037	\$ -			740.00	17	27
m-m	1	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.0	0.049	\$ -	cm-pdt	1.0	6132.00	178	505
m-m	6	Do-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.318	\$ -		0.0	6132.00	920	3,180
elec closet	1	Do-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053	\$ -			740.00	19	39
mech room	2	Do-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.106	\$ -			1040.00	52	110
m- female	7	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.2	0.343	\$ -	wsd-pdt	1.0	3066.00	622	4,161
operations	17	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.8	0.578	\$ -			3640.00	2,970	2,104
logistics & fleet svc.	4	No Retro	5	0.0	0.000	\$ -			8760.00	175	0
deputy chief	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028	\$ -	wsd	1.0	2693.60	517	284
asst chief	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028	\$ -	wsd	1.0	2693.60	517	284
dep butler	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
file room	2	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.1	0.116	\$ -	wsd-pdt	1.0	2548.00	245	527
ems-king	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
kevin seaman	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
fire & fleet	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.2	0.028	\$ -	wsd-pdt	1.0	2693.60	517	284
deputy faith	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
conf room 1	4	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.232	\$ -	wsd-pdt	1.0	2111.20	405	1,138
main elevator hall	20	Retro T8 1x3 2-Lamp F25 (STD)Bal.	43	0.9	0.700	\$ -	cm-pdt	3.0	2548.00	2,191	3,487
							cm-pdt				
							cm-pdt				
soffit	6	Retro T8 1x2 2-Lamp (STD)Bal.	29	0.2	0.126	\$ -			8760.00	1,524	1,104
3rd FLOOR											
main hallway	25	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.7	1.225	\$ -	cm-pdt	3.0	2548.00	1,847	5,251
							cm-pdt				
							cm-pdt				
main hallway	5	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.245	\$ -	cm-pdt	1.0	6132.00	889	2,527
main hallway	4	No Retro	5	0.0	0.000	\$ -			8760.00	175	0
main hallway elevator soffit	20	Retro T8 1x3 2-Lamp F25 (STD)Bal.	43	0.9	0.700	\$ -	cm-pdt	1.0	2548.00	2,191	3,487
soffit	6	Retro T8 1x2 2-Lamp (STD)Bal.	29	0.2	0.126	\$ -			8760.00	1,524	1,104
elec room	1	Do-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053	\$ -			1040.00	26	55
mech room	7	Do-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.371	\$ -			1040.00	162	366
jan closet	1	New CFL IR3016 16W	23	0.0	0.037	\$ -			740.00	17	27
m-f	1	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.0	0.049	\$ -	wsd-pdt	1.0	3066.00	89	594
m-f	6	Do-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.318	\$ -		0.0	3066.00	460	3,640
m-m	1	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.0	0.049	\$ -	wsd-pdt	1.0	3066.00	88	594
m-m	6	Do-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.2	0.318	\$ -		0.0	3066.00	460	3,640
kitchen	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007	\$ -			3640.00	175	25
kitchen	2	Vending Miser Soda Occ. Control unit	240	0.5	0.320	\$ -			8760.00	4,205	2,803
staff only copy room	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058	\$ -			3640.00	175	211
housing open space	30	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	1.4	0.210	\$ -			3640.00	5,242	764
corner office	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
office 1	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248
office 2	2	Do-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3640.00	349	248

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supply room	1	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.0	0.034	\$	-	-	3640.00	175	124
office 3	2	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.1	0.068	\$	-	-	3640.00	349	248
file room	2	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.1	0.068	\$	-	-	3640.00	349	248
office 4	1	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.0	0.058	\$	-	-	3640.00	175	211
office 5	4	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.2	0.028	\$	-	cm-pdt	2548.00	489	312
office 6	2	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116	\$	-	-	3640.00	349	422
community worker 1	1	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.0	0.058	\$	-	-	3640.00	175	211
community worker 7	1	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.0	0.058	\$	-	-	3640.00	175	211
community worker 2	1	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.0	0.058	\$	-	-	3640.00	175	211
admin svc center	1	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.0	0.058	\$	-	-	3640.00	175	211
robert office 8	2	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.1	0.068	\$	-	-	3640.00	349	248
section 8 program	2	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.1	0.068	\$	-	-	3640.00	349	248
community worker 1	1	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.0	0.058	\$	-	-	3640.00	175	211
community worker 2	1	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.0	0.058	\$	-	-	3640.00	175	211
office 9	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014	\$	-	-	3640.00	349	51
conf room	4	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.2	0.136	\$	-	wad-pdt	2111.20	405	789
office 10	7	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.3	0.048	\$	-	cm-pdt	2548.00	856	545
air office	2	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116	\$	-	-	3640.00	349	422
conf room	8	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.4	0.272	\$	-	wad-pdt	2111.20	811	1,577
office 11	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014	\$	-	-	3640.00	349	51
office 12	2	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.1	0.068	\$	-	-	3640.00	349	248
office 13	2	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116	\$	-	-	3640.00	349	422
office 13	2	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.014	\$	-	-	3640.00	349	51
risk mgmt	7	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.3	0.049	\$	-	cm-pdt	2548.00	858	545
open space	2	New LED Exit Fixture	1.5	0.0	0.009	\$	-	-	8760.00	26	78
office 1	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014	\$	-	-	3640.00	349	51
admin & joelrak	2	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014	\$	-	-	3640.00	249	51
lynda levin	2	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116	\$	-	-	3640.00	349	422
office 1	2	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116	\$	-	-	3640.00	349	422
safety less	2	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116	\$	-	-	3640.00	349	422
file room	5	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.2	0.035	\$	-	cm-pdt	1747.20	419	582
conf room	4	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.2	0.136	\$	-	cm-pdt	2111.20	405	789
citizen svc open space	18	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.9	0.126	\$	-	-	3640.00	3,146	458
citizen svc open space	2	New LED Exit Fixture	1.5	0.0	0.009	\$	-	-	8760.00	26	78
outer office 1	2	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116	\$	-	-	3640.00	349	422
outer office 2	2	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116	\$	-	-	3640.00	349	422
inside office 1	1	Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.0	0.058	\$	-	-	3640.00	175	211
facial office	2	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.1	0.068	\$	-	-	3640.00	349	248
data mgr	1	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.0	0.034	\$	-	-	3640.00	175	124
office 3	1	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.0	0.034	\$	-	-	3640.00	175	124
office 4	1	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.0	0.034	\$	-	-	3640.00	175	124
deputy director	2	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.1	0.068	\$	-	-	3640.00	349	248
admin aide	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.0	0.007	\$	-	-	3640.00	175	25
director	4	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.2	0.136	\$	-	wad-pdt	2893.60	517	877
conf room	4	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.2	0.136	\$	-	wad-pdt	2111.20	405	789
kitchen	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.0	0.007	\$	-	-	3640.00	175	25
file room	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.0	0.007	\$	-	-	3640.00	175	25
cr 301	16	De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. w/reflector	48	0.8	0.544	\$	-	cm-pdt	2548.00	1,957	2,819

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CR 301	1 No Retro	5	0.0	0.000	\$	-	cm-pdt	8760.00	44	0
computer server	5 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.2	0.170	\$	-		3640.00	874	619
computer server	1 De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. wire/reflect	25	0.0	0.037	\$	-		3640.00	91	135
CR 303	18 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.9	0.612	\$	-	cm-pdt	3094.00	2,673	2,689
							cm-pdt			
av storage	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
office	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
2nd floor										
main hallway	25 Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.7	1.225	\$	-	cm-pdt	2548.00	1,847	5,251
							cm-pdt			
							cm-pdt			
main hallway	6 Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.245	\$	-		8760.00	1,270	2,148
main hallway	4 New LED Exit Fixture	15	0.0	0.018	\$	-		8760.00	53	158
elevator lobby	20 Retro T8 1x3 2-Lamp P25 (STD) Bal.	43	0.9	0.700	\$	-	cm-pdt	2548.00	2,191	3,457
elevator lobby	6 Retro T8 1x2 2-Lamp (STD) Bal.	29	0.2	0.128	\$	-		8760.00	1,824	1,104
elec room	1 De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. wire/reflect	25	0.0	0.053	\$	-		1040.00	28	55
mech room	2 De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. wire/reflect	25	0.1	0.108	\$	-		1040.00	52	110
jan closet	1 New CFL 25W SI	25	0.0	0.073	\$	-		740.00	19	86
rm	1 Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.0	0.048	\$	-	cm-pdt	8132.00	178	508
rm	6 De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. wire/reflect	25	0.2	0.318	\$	-		6132.00	920	3,180
rm	1 Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.0	0.048	\$	-	cm-pdt	8132.00	178	505
rm	6 De-Lamp to T8 1x4 1-Lamp Strip 28w (STD) Bal. wire/reflect	25	0.2	0.318	\$	-		8132.00	920	3,180
copier room	2 De-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014	\$	-	cm-pdt	2548.00	245	156
vending room	2 Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014	\$	-	cm-pdt	2548.00	245	156
vending room	1 Vending Mixer Soda Oca. Control unit	240	0.2	0.180	\$	-		8760.00	2,102	1,402
community action counsel	1 Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.0	0.048	\$	-		3640.00	108	178
community action counsel	8 De-Lamp to T8 1x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.4	0.272	\$	-		3640.00	1,398	900
open space	82 Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	4.4	0.844	\$	-		3640.00	18,074	2,344
open space	9 New LED Exit Fixture	15	0.0	0.041	\$	-		8760.00	118	355
office 1	2 Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.1	0.116	\$	-		3640.00	349	422
office 2	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
office 3	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
office 4	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
office 5	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
office 6	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
office 7	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
annex b.	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
facial mngt	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
locked	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
v.p.	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248
president	4 Retro T8 2x4 2-Lamp 28w reflector (STD) Bal.	48	0.2	0.232	\$	-	cm-pdt	2548.00	489	1,054
lena smth	4 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.2	0.136	\$	-	cm-pdt	2548.00	489	705
storage closet	2 Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.1	0.014	\$	-		1040.00	100	15
kids r.	1 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.0	0.034	\$	-		8760.00	420	298
n.h.c.	1 Re-Lamp & Re-Balast T8 2x4 2-Lamp Troffer 28w (STD) Bal.	48	0.0	0.007	\$	-	wad-pdt	6132.00	204	187
n.h.c.	1 De-Lamp to T8 1x4 1-Lamp Wrip 28w (STD) Bal. wire/reflect	25	0.0	0.030	\$	-	wad-pdt	6132.00	153	329
in greg	2 De-Lamp to T8 2x4 2L Troffer 28w (STD) Bal. wire/reflect	48	0.1	0.068	\$	-		3640.00	349	248

GATEWAY BUILDING MOTION SENSORS SURVEY

office	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
rebecca downman	4	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.2	0.232	\$ -	cm-pdt	1.0	2548.00	489	1,054
cubical office	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 8	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 9	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 10	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 11	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 12	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 13	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 14	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 15	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 16	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 17	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 18	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office 19	4	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.2	0.136	\$ -	wsd-pdt	1.0	2893.60	517	677
conf room	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
small conf room	1	Retro T8 2x4 2-Lamp 28w reflector(STD)Bal.	48	0.0	0.058	\$ -			3840.00	175	211
office 20	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007	\$ -			3840.00	175	25
cr	15	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.7	0.510	\$ -	cm-pdt	1.00	2548.00	1,835	2,643
corner office	2	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.1	0.068	\$ -			3840.00	349	248
office storage	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.074	\$ -			3840.00	182	269
conf room	6	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.3	0.042	\$ -	lws	1.0	2111.20	608	593
storage room	2	Retro T8 2x4 2-lamp 28w (STD)Bal.	48	0.1	0.060	\$ -			3840.00	349	218
key pad	6	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.3	0.204	\$ -	cm-pdt	1.0	2693.60	778	1,015
1st FLOOR											
elevator lobby	20	Retro T8 1'x3 2-Lamp F25 (STD)Bal.	43	0.9	0.700	\$ -	cm-pdt	1.0	2730.00	2,348	3,736
elevator lobby	6	Retro T8 1'x2 2-Lamp (STD)Bal.	29	0.2	0.126	\$ -			8760.00	1,524	1,104
hall	29	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.8	1.421	\$ -	cm-pdt	3.0	2730.00	2,296	6,528
							cm-pdt				
							cm-pdt				
hall	5	New LED Exit Fixture	1.5	0.0	0.023	\$ -			8780.00	66	187
lobby	4	No Retrofit 100 Watt MH Can.	122	0.6	0.000	\$ -			3900.00	1,903	0
public telephone	2	Retro T8 2x2 2lamp F17 T8 w/ Reflector Kit	29	0.1	0.098	\$ -			8760.00	508	858
public telephone	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.106	\$ -			8760.00	438	929
vending area	1	Vending Misco Soda Occ. Control unit	240	0.2	0.180	\$ -			8760.00	2,102	1,402
mech closet	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.106	\$ -			1040.00	52	118
elec closet	2	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.1	0.106	\$ -			1040.00	52	110
m-w	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007	\$ -	wsd-pdt	1.0	3068.00	147	335
m-w	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053	\$ -		0.0	3068.00	77	607
m-m	1	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.0	0.007	\$ -	wsd-pdt	1.0	3068.00	147	335
m-m	1	De-Lamp to T8 1x4 1-Lamp Strip 28w (STD)Bal. w/reflector	25	0.0	0.053	\$ -		0.0	3068.00	77	607
closet	8	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.058	\$ -	cm-pdt	1.0	728.00	280	178
closet	8	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.058	\$ -	cm-pdt	1.0	728.00	280	178
mail room	8	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.058	\$ -	cm-pdt	1.0	2730.00	1,048	668
mail room	8	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.4	0.058	\$ -	cm-pdt	1.0	2730.00	1,048	668
vending area	8	Re-Lamp & Re-Ballast T8 2x4 2-Lamp Troffer 28w (STD)Bal.	48	0.3	0.042	\$ -	cm-pdt	1.0	1482.00	427	860
vending area	1	Vending Misco Soda Occ. Control unit	240	0.2	0.180	\$ -			8760.00	2,102	1,402
room 6	19	De-Lamp to T8 2x4 2L Troffer 28w (STD)Bal. w/reflector	48	0.9	0.646	\$ -	cm-pdt	3.0	2888.00	2,632	3,444

GATEWAY BUILDING MOTION SENSORS SURVEY

[illegible]

elevator 2	2	Dec-Lamp to T8 1x4 1-Lamp Wrmp 28w (STD)Bal. wireflexor	25	0.1	\$ 0.108	\$ -				8760.00	438	929
elevator 2	3	Retro T8 1'x2 1-Lamp (LP)Bal.	17	0.1	\$ 0.045	\$ -				8760.00	447	584
stairwell west	9	Dec-Lamp to T8 1x4 1-Lamp Wrmp 28w (STD)Bal. wireflexor	25	0.2	\$ 0.477	\$ -				8760.00	1,971	4,179
stairwell west	2	New LED Exit Fixture	1.5	0.0	\$ 0.009	\$ -				8760.00	28	79
stairwell west	5	Retro T8 2x2 2Lamp P17 T8 w/ Reflector Kit	29	0.1	\$ 0.245	\$ -				8760.00	1,270	2,145
stairwell east	9	Dec-Lamp to T8 1x4 1-Lamp Wrmp 28w (STD)Bal. wireflexor	25	0.2	\$ 0.477	\$ -				8760.00	1,971	4,179
stairwell east	2	New LED Exit Fixture	1.5	0.0	\$ 0.009	\$ -				8760.00	28	79
outdoor												
sidewalk 7' post	14	Retro 175 Watt Pulse Start MH kit	210	2.9	\$ 1.092	\$ -				4380.00	12,877	4,783
400w circle fixtures	18	Retro 320 Watt Pulse Start M.H.	365	6.6	\$ 1.820	\$ -				4380.00	28,777	7,068
400w circle fixtures	6	Retro 320 Watt Pulse Start M.H.	365	2.2	\$ 0.540	\$ -				4380.00	9,592	2,365
side corners	4	No Retrofit 100 Watt MH Can	122	0.6	\$ 0.000	\$ -				4380.00	2,137	0
	1,689				49.5	\$ -			110		300,359	284,160

Total Annual Savings:

Table 1 - Utility Rates

Electric Rate	\$	0.108	\$/kWh
Natural Gas	\$	1.43	\$/therm
Residual Oil Rate			
Distilled Oil Rate	\$	2.50	\$/gal
Propane	\$	2.10	\$/gal
Chilled Water Rate			\$/tonhr

Notes:
 1. Propane = 95,152 Btu/gal
 2. Nat Gas = 100,000 Btu/gal
 3. Pricing is average for the year.

Table 2 - Operating Costs

Existing (HHW/Boiler) Operate at 78% Efficiency	
Gas Fired CB Boilers	
84,261	therms/year
8,426	MMBtu/yr Existing boiler input
Maintenance	
\$	- \$/yr O&M
Proposed (HHW/Boiler) Operating at 88% Efficiency	
N.G.	
8,426	MMBtu/yr Existing boiler input
78%	% Existing boiler efficiency
6,572	MMBtu/yr Existing boiler output
88%	% Proposed boiler efficiency
7,469	MMBtu/yr Proposed boiler input
958	Savings, MMBtu/yr

Existing Conditions:

Building and domestic water heating is currently provided by three Cleaver Brooks fire tube boilers operating on natural gas. Each boiler is rated at 3,348 MBH. Only two boilers are needed during peak periods to meet the heating requirements of the building.

Proposed Conditions:

The intent of this measure is to replace the two existing CB boilers located in the older section of the Detention Center with high efficiency Pulse type boilers as manufactured by Lochivar or Fulton. The new plant will consist of all non-condensing boilers. The remaining CB boiler will be directly connected to the domestic hot water load. The DC Gas Utilities sheet summarizes the existing natural gas load for the Detention Center. The domestic water gas load was estimated based on domestic water tank schedule data and 7 day per week operation of the kitchen and laundry.

Advantages:

- New boilers use the latest gas condensing technology and provide optimum combustion efficiency and load matching.
- The new boilers will serve only the building heating load and can be reset as needed to match the building heating load.

The remaining CB boiler will operate at 180 degrees to provide domestic water heating.

DC Energy Savings & Cost

DC Stand Boiler Retro (2)

8/5/2008

Facility: Detention Center
CM: Install VFD on Hot Water Pumps
Engineer: INITIALS

SAVINGS SUMMARY				
Do not delete or move this Table				
	Baseline	Post-Retrofit	Savings	Rate (\$)
kWh blended	13,370	3,350	10,020	0.106
kWh Incremental	0.0	0.0	0.0	0.00
Winter kW rates	0.0	0.0	0.0	0.00
Summer kW rates	0.0	0.0	0.0	0.00
MMBtu gas				0.00
MMBtu oil				0.00
kgal Supply				0.00
kgal Waste				0.00
MMBtu steam				
Ton/yr				
				TOTAL

Variable:	Value:	Basis for Values:
Designation:	two 3 HP pumps, One running, one stand-by.	
Balance Temp	65.0	
motor input hp	3.0	
Exponent	2.1	
Minimum Drive Speed	30%	
Motor kW	2.25	
Motor load/efficiency equation:	$Y = Ax^2 + Bx + C$, where x is load percent	
A	-0.5143	
B	2.0667	
C	91.54	
Adjustment Factor for comparing motor	0.064	
VFD load/efficiency equation:	$Y = Ax^2 + Bx + C$, where x is load percent	
A	-1.2786	
B	4.1614	
C	93.84	

Heating loads vary proportionally from the balance temperature to the design temperatures.
Existing motor kWh is based on metered kW, which includes motor efficiency.

Basis for savings: reduce pump speed from existing full speed, in accordance with building load, down to a minimum speed.

30-year ASHRAE Weather Data			Heating %				HW Pump	New	New	New	Heating
Temp Range (°F)	Avg. Temp in Bin (°F)	Hours in Bin	of Full Load	Existing Speed	Existing kW	Existing kWh	Drive Speed	HW Pump motor Input hp	HW Pump VFD Input kW	HW Pump VFD Input kWh	kWh Saved
95 to 100	97.5	3	0.0%	0%	0	-	0%	0.0	-	0	0
90 to 95	92.5	52	0.0%	0%	0	-	0%	0.0	-	0	0
85 to 90	87.5	104	0.0%	0%	0	-	0%	0.0	-	0	0
80 to 85	82.5	477	0.0%	0%	0	-	0%	0.0	-	0	0
75 to 80	77.5	856	0.0%	0%	0	-	0%	0.0	-	0	0
70 to 75	72.5	907	0.0%	0%	0	-	0%	0.0	-	0	0
65 to 70	67.5	819	0.0%	0%	0	-	0%	0.0	-	0	0
60 to 65	62.5	983	4.8%	100%	2	2,212	30%	0.2	0.2	189	2,023
55 to 60	57.5	825	14.3%	100%	2	1,408	30%	0.2	0.2	120	1,288
50 to 55	52.5	540	23.6%	100%	2	1,215	30%	0.2	0.2	104	1,111
45 to 50	47.5	578	33.3%	100%	2	1,298	33%	0.3	0.2	138	1,158
40 to 45	42.5	552	42.9%	100%	2	1,242	43%	0.5	0.4	223	1,019
35 to 40	37.5	1,067	52.4%	100%	2	2,401	52%	0.8	0.8	853	1,748
30 to 35	32.5	885	61.9%	100%	2	1,541	62%	1.1	0.9	583	949
25 to 30	27.5	442	71.4%	100%	2	995	71%	1.5	1.2	515	480
20 to 25	22.5	248	81.0%	100%	2	558	81%	1.9	1.5	374	184
15 to 20	17.5	184	90.6%	100%	2	414	90%	2.5	1.9	350	64
10 to 15	12.5	40	100.0%	100%	2	90	100%	3.0	2.3	94	(4)
TOTALS		8,780				13,370			0.8	3,350	10,020

Table 1 - Utility Rates

Electric Rate	\$	0.106	\$/kWh
Natural Gas	\$	1.43	\$/therm
Residual Oil Rate			
Distilled Oil Rate	\$	2.50	\$/gal
Propane	\$	2.10	\$/gal
Cooled Water Rate			\$/ton/hr

Notes:			
1.	Propane	=	95,152 Btu/gal.
2.	Nat Gas	=	100,000 Btu/gal.
3.	Pricing	(saverage) for the year	

Table 2 - Operating Costs

Existing HW Pump, 79% Rated Efficiency		3
Electric Pump HP		22,335 kWh/yr Existing Pump Energy
Maintenance	\$	- \$/yr O&M
Proposed HW Pump, 91% Rated Efficiency		3
Electric Pump		19,389 kWh/yr Proposed Pump Energy
Savings		2,945 kWh/yr

Existing Conditions:

The existing heating water distribution pumps are original and in need of replacement. Several pumps have been replaced by the facilities group already, but the HW pumps appear to be in poor condition.

Proposed Conditions:

Replace the two existing HW pumps with pumps of equal capacity. Install premium efficiency motors.

Advantages:

- New pumps will operate more efficiently and reduce the consumption of electricity.

DC Energy Savings & Cost

DC HWP Retrofit

8/5/2008

Howard County Gov. - ESG (DETENTION CENTER)
VFD for Cooling Tower Fan

Project Description

Install VFD to control cooling tower fan operation.

Fan HP
Fan Hours/yr

Fan kW

db Temp	% Spd	% hrs/yr	Base Case			Proposed Case			Savings	
			% Load	kW	kWh	% Load	kW	kWh	kW	kWh
97	100%	5%	100%	7.3	1,716	100%	7.3	1,716	0.0	0
92	90%	15%	100%	7.3	5,147	90%	6.6	4,632	0.7	515
87	80%	20%	100%	7.3	6,862	75%	5.5	5,147	1.8	1,716
82	70%	30%	100%	7.3	10,293	60%	4.4	6,176	2.9	4,117
77	60%	15%	100%	7.3	5,147	50%	3.7	2,573	3.7	2,573
72	50%	10%	50%	3.7	1,716	35%	2.6	1,201	1.1	515
67	40%	5%	50%	3.7	858	25%	1.8	429	1.8	429
62	30%	0%	50%	3.7	0	25%	1.8	0	0.0	0
57	20%	0%	50%	3.7	0	25%	1.8	0	0.0	0
52	10%	0%	50%	3.7	0	25%	1.8	0	0.0	0
TOTAL		100%	due to cycling of fan		31,737			21,873 kWh / Yr =		9,864

Facility: Detention Center
 CM: Install VFD on Chilled Water Pumps
 Engineer: INITIALS

SAVINGS SUMMARY				
Do not delete or move this Table				
	Baseline	Post-Retrofit	Savings	Rate (\$)
kWh blended				
kWh incremental	22,580	5,657	18,922	0.108
Winter kW rates	0.0	0.0	0.0	0.00
Summer kW rates	0.0	0.0	0.0	0.00
MMBtu gas				0.00
MMBtu oil				0.00
kgal Supply				0.00
kgal Waste				0.00
MMBtu steam				
Ton/yr				
				TOTAL

Variable:	Value:	Basis for Values:
Designation:	two 5 HP pumps. One running, one stand-by.	
Balance Temp	65.0	
motor input hp	5.1	
Exponent	2.1	
Minimum Drive Speed	30%	
Motor kW	3.8	
Motor load/efficiency equation:	$Y = Ax^2 + Bx + C$, where x is load percent	
A	-0.5143	
B	2.0867	
C	91.54	
Adjustment Factor for comparing motor	0.084	
VFD load/efficiency equation:	$Y = Ax^2 + Bx + C$, where x is load percent	
A	-1.2788	
B	4.1814	
C	93.84	

Heating loads vary proportionally from the balance temperature to the design temperatures.
 Existing motor kWh is based on metered kW, which includes motor efficiency.

Basis for savings: reduce pump speed from existing full speed, in accordance with building load, down to a minimum speed.

30-year ASHRAE Weather Data			Heating %	Existing	Existing	Existing	HW Pump	New	New	New	Heating
Temp Range (°F)	Avg Temp in Bin (°F)	Hours in Bin	of Full Load	Speed	kW	kWh	Drive Speed	HW Pump motor input hp	HW Pump VFD input kW	HW Pump VFD input kWh	kWh Saved
95 to 100	97.5	3	0.0%	0%	0	-	0%	0.0	-	0	0
90 to 95	92.5	52	0.0%	0%	0	-	0%	0.0	-	0	0
85 to 90	87.5	104	0.0%	0%	0	-	0%	0.0	-	0	0
80 to 85	82.5	477	0.0%	0%	0	-	0%	0.0	-	0	0
75 to 80	77.5	656	0.0%	0%	0	-	0%	0.0	-	0	0
70 to 75	72.5	907	0.0%	0%	0	-	0%	0.0	-	0	0
65 to 70	67.5	819	0.0%	0%	0	-	0%	0.0	-	0	0
60 to 65	62.5	983	4.8%	100%	4	3,735	30%	0.4	0.3	319	3,417
55 to 60	57.5	626	14.3%	100%	4	2,375	30%	0.4	0.3	203	2,172
50 to 55	52.5	640	23.8%	100%	4	2,052	30%	0.4	0.3	175	1,877
45 to 50	47.5	576	33.3%	100%	4	2,189	33%	0.6	0.4	232	1,956
40 to 45	42.5	552	42.8%	100%	4	2,098	43%	0.9	0.7	376	1,722
35 to 40	37.5	1,067	52.4%	100%	4	4,055	52%	1.3	1.0	1,102	2,952
30 to 35	32.5	686	61.8%	100%	4	2,603	62%	1.9	1.5	1,001	1,602
25 to 30	27.5	442	71.4%	100%	4	1,680	71%	2.5	2.0	669	811
20 to 25	22.5	248	81.0%	100%	4	942	81%	3.3	2.5	632	310
15 to 20	17.5	184	90.6%	100%	4	699	90%	4.2	3.2	590	109
10 to 15	12.5	40	100.0%	100%	4	152	100%	5.1	3.9	158	(0)
TOTALS		8,780				22,580			1.0	6,657	18,922

Global Facility Solutions, LLC.
Optimize Chiller Plant Operation and Staging

Project Description

Replace existing Trane Chillers with new higher efficiency chillers. Existing chillers are rated at .80 kW/ton new. Efficiency deration due to tube fouling is estimated at .20 kW/ton or 10 to 15% since installation in 1985.

Norm. Peak Load (Tons) 250

Chiller Operating Efficiencies

	Tons	25%	50%	75%	100%	NPLV
Chiller 1	100	1.05	0.90	0.85	1.00	1.00
Chiller 2	100	1.05	0.90	0.95	1.00	1.00
Chiller 3	100	0.85	0.80	0.83	0.85	0.86
						0.00
						0.00

EXISTING PLANT OPERATION

Loop (dis.F)	Radius	Chiller	Part Load Regs	Chiller Load Tons	Chiller kW	Chiller % Load	Chiller #1 kW	Chiller #2 % Load	Chiller #2 kW	Chiller #3 % Load	Chiller #3 kW	1994	1995	1996
97	3	100%	250	750	100	100%	100	100%	100	100%	100	240	578	250
92	52	95%	238	12,350	100	100%	100	100%	100	100%	100	232	9,851	240
87	104	92%	230	23,820	95	95%	95	95%	95	95%	95	222	18,470	230
82	477	90%	225	107,325	90	95%	86	95%	86	95%	86	209	79,640	230
77	656	85%	213	139,400	80	95%	86	95%	86	95%	86	202	105,957	220
72	907	80%	200	181,400	90	95%	76	80%	76	80%	76	190	137,884	200
67	619	75%	188	116,063	90	85%	86	90%	86	85%	86	176	87,031	185
62	983	65%	163	159,738	78	80%	76	80%	76	80%	76	152	119,533	180
57	825	60%	150	93,750	71	75%	71	75%	71	75%	71	143	71,250	150
52	540	50%	125	67,500	59	65%	54	60%	54	60%	54	113	48,600	125
47	576	45%	113	64,800	54	60%	45	50%	45	50%	45	99	45,619	110
42	552	40%	100	55,200	100	100%	-	0%	-	0%	-	100	44,160	100
37	1,067	0%	-	-	-	0%	-	-	-	-	-	-	-	-
32	685	0%	-	-	-	-	-	-	-	-	-	-	-	-
27	442	0%	-	-	-	-	-	-	-	-	-	-	-	-
22	248	0%	-	-	-	-	-	-	-	-	-	-	-	-
17	184	0%	-	-	-	-	-	-	-	-	-	-	-	-
12	40	0%	-	-	-	-	-	-	-	-	-	-	-	-
7	0	0%	-	-	-	-	-	-	-	-	-	-	-	-
2	0	0%	-	-	-	-	-	-	-	-	-	-	-	-
(3)	0	0%	-	-	-	-	-	-	-	-	-	-	-	-
(8)	0	0%	-	-	-	-	-	-	-	-	-	-	-	-
	8,780			1,022,195								TOTAL KWH	768,352	

Global Facility Solutions, LLC.
Optimize Chiller Plant Operation and Staging

Project Description

Replace existing Trane Chillers with new higher efficiency chillers. Existing chillers are rated at .80 kW/ton new. Efficiency deration due to tube fouling is estimated at .20 kW/ton or 10 to 15% since installation in 1985.

PROPOSED PLANT OPERATION

Temp (d: F)	Bin Hrs	% Load	Plant Tons Req'd	Chiller Ton- Hrs	Chiller #1 kW	Chiller #1 Load	Chiller #2 kW	Chiller #2 Load	Chiller #3 kW	Chiller #3 Load	Total kW	kWh	Tons Produced
97	3	100%	250	750	55	85%	55	85%	-	-	111	265	255
92	52	95%	238	12,350	46	80%	46	80%	-	-	92	3,834	240
87	104	92%	230	23,920	46	80%	43	75%	-	-	89	7,428	233
82	477	90%	225	107,325	43	75%	43	75%	-	-	86	32,970	225
77	656	88%	213	139,400	43	74%	40	70%	-	-	83	43,529	216
72	907	80%	200	181,400	40	70%	34	65%	-	-	75	54,159	203
67	619	75%	188	116,063	37	65%	32	60%	-	-	69	34,228	188
62	983	65%	163	159,738	32	60%	26	50%	-	-	58	45,674	165
57	625	60%	150	93,750	65	100%	-	0%	-	0%	65	32,500	150
52	540	50%	125	67,500	55	85%	-	0%	-	0%	55	23,888	128
47	578	45%	113	64,800	44	77%	-	0%	-	0%	44	20,437	116
42	552	40%	100	55,200	35	67%	-	0%	-	0%	35	15,622	101
37	1,067	0%	-	-	-	-	-	-	-	-	-	-	-
32	685	0%	-	-	-	-	-	-	-	-	-	-	-
27	442	0%	-	-	-	-	-	-	-	-	-	-	-
22	248	0%	-	-	-	-	-	-	-	-	-	-	-
17	184	0%	-	-	-	-	-	-	-	-	-	-	-
12	40	0%	-	-	-	-	-	-	-	-	-	-	-
7	0	0%	-	-	-	-	-	-	-	-	-	-	-
2	0	0%	-	-	-	-	-	-	-	-	-	-	-
(3)	0	0%	-	-	-	-	-	-	-	-	-	-	-
(8)	0	0%	-	-	-	-	-	-	-	-	-	-	-
8,760				1,022,195									
												TOTAL kWh	314,515
												Savings	453,837 363,070

Chiller Operating Efficiencies

	Tons	25%	50%	75%	100%	NPLV
Chiller 1	150	0.74	0.53	0.58	0.65	0.57
Chiller 2	150	0.74	0.53	0.58	0.65	0.57
Chiller 3	100	0.85	0.85	0.80	0.85	0.86
						0.00
						0.00

Savings % from Total kWh 19%

Global Facility Solutions, LLC

Facility Name How. Co. Gov. Detention Center
Measure: AHU-1 IGV to VFD (50 HP SAF, 7 1/2 HP RAF)
Engineer: RKC

SAVINGS SUMMARY					
Do not delete or move this Table					
	Baseline	Post-Retrofit	Savings	Rate (\$/Unit)	\$ Savings
kWh blended					
kWh incremental	216,548	91,093	125,455	0.106	
Winter kW	204	109	0	0.00	
Summer kW	149	150	0	0.00	0
MMBtu gas				0.00	
MMBtu oil				0.00	
kgal Supply				0.00	
kgal Waste				0.00	
MMBtu steam					
TOTAL				\$	

Variable:	Value:	Basis for Values
Min. VAV Airflow	50%	
Chiller 'On' Point (°F):	55	
Cooling Design Temp (°F):	55	
Heating 'On' Point (°F):	50	
Heating Design Temp (°F):	6	
Calculated kW	39.7	
Measured cfm	10,000	
Design CFM	10,000	
Estimated % cfm	100%	
Estimated % full load kw from igv curve	101%	
Estimated full load kW	39.7	
IGV unloading curve (% kw vs % speed)	1.3214x^2-1.1821x+0.8743	generic curve see below
	1.3214	
	-1.1821	
	0.8743	
VFD unloading curve	%speed ^ 2.2	
	2.2	
VFD Efficiency	0.83	

38 year ASHRAE Weather Data - Baltimore				Cooling Load %	Heating Load %	Present Air Flow w/IGV	Proposed Air Flow On VFD	Present % Input kW w/IGV	Proposed % Input kW w/VFD	Present kW w/IGV	Present Energy Use kWh	Proposed kW w/VFD	Proposed Energy Use kWh	Estimated kW Saved	Estimated kWh Saved
Temp. Range (°F)	Avg. Temp In Bin (°F)	Hours In Bin	MCWB												
Annual															
85 to 100	97.5	3	78	106%	0%	106%	106%	111%	123%	44.1	132	48.8	146	-5	-14
90 to 95	92.5	62	75	94%	0%	94%	94%	93%	93%	36.8	1,915	37.0	1,920	0	-11
85 to 90	87.5	104	73	81%	0%	81%	81%	79%	68%	31.2	3,246	27.0	2,812	4	434
80 to 85	82.5	477	70	69%	0%	69%	69%	69%	47%	27.2	12,894	18.7	8,929	9	4,065
75 to 80	77.5	658	66	56%	0%	56%	56%	63%	30%	24.9	16,341	12.0	7,897	13	8,444
70 to 75	72.5	907	65	44%	0%	50%	50%	61%	23%	24.4	22,094	9.3	6,427	15	13,668
65 to 70	67.5	619	60	31%	0%	50%	50%	61%	23%	24.4	15,079	9.3	5,751	15	9,328
60 to 65	62.5	983	56	19%	0%	50%	50%	61%	23%	24.4	23,946	9.3	8,133	15	14,813
55 to 60	57.5	825	51	6%	0%	50%	50%	61%	23%	24.4	15,225	9.3	5,807	15	9,418
50 to 55	52.5	540	48	0%	0%	50%	50%	61%	23%	24.4	13,164	9.3	5,017	15	8,137
45 to 50	47.5	576	41	0%	8%	50%	50%	61%	23%	24.4	14,031	9.3	5,351	15	8,680
40 to 45	42.5	852	37	0%	17%	50%	50%	61%	23%	24.4	13,447	9.3	5,128	15	8,318
35 to 40	37.5	1,067	32	0%	28%	50%	50%	61%	23%	24.4	25,992	9.3	9,913	15	16,079
30 to 35	32.5	686	28	0%	39%	50%	50%	61%	23%	24.4	16,587	9.3	6,364	15	10,223
25 to 30	27.5	442	23	0%	60%	50%	50%	61%	23%	24.4	10,787	9.3	4,100	15	6,681
20 to 25	22.5	248	19	0%	61%	50%	50%	61%	23%	24.4	6,041	9.3	2,304	15	3,737
15 to 20	17.5	184	15	0%	72%	50%	50%	61%	23%	24.4	4,482	9.3	1,709	15	2,773
10 to 15	12.5	40	10	0%	83%	50%	50%	61%	23%	24.4	974	9.3	372	15	603
Total		8,780									216,548		91,093		125,455

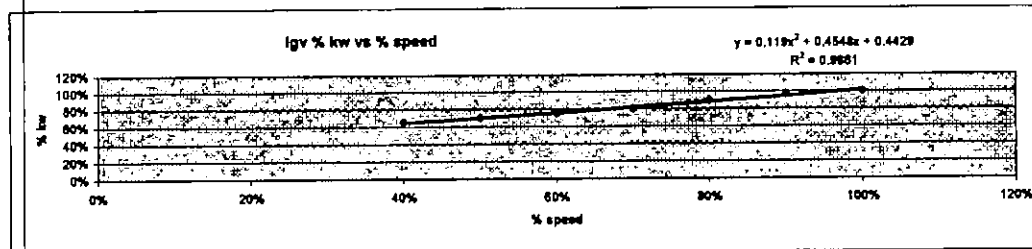
Facility Name How. Co. Gov. Detention Center

Measure: AHU-1 IGV to VFD (50 HP SAF, 7 1/2 HP RAF)

Engineer: RKC

	peak bin temp	°F if included	pre kW	post kW	kW saved	\$/kW from	Tarif \$ saved
January	47.6 n		24.4	9.3	-	\$	\$
February	62.6 n		24.4	9.3	-	\$	\$
March	62.6 n		24.4	9.3	-	\$	\$
April	62.6 n		27.2	18.7	-	\$	\$
May	62.6 n		27.2	18.7	-	\$	\$
June	62.6 n		36.6	37.0	-	\$	\$
July	67.6 n		44.1	46.8	-	\$	\$
August	62.6 n		36.6	37.0	-	\$	\$
September	67.6 n		31.2	27.0	-	\$	\$
October	62.6 n		27.2	18.7	-	\$	\$
November	77.6 n		24.9	12.0	-	\$	\$
December	62.6 n		24.4	9.3	-	\$	\$
Totals and Averages							

Generic Curve Regression			1.3214
			-1.1821
			0.8743
% speed	% kw	curve	
100%	100%	100%	101%
90%	97%		88%
80%	90%		77%
70%	80%		69%
60%	75%		64%
50%	70%		61%
40%	65%		61%



Proposed Conditions:
Reset the DAT from AHI-1 via controls. Reduce the amount of reheat energy by 2 deg F average.
cooling/conditioning)
operation. Increasing the discharge air temperature will reduce the amount of reheat (simultaneous
The discharge air temperature from AHI-1 remains at 55 deg F year round which causes the inlets to
cooling/conditioning)

DO NOT DELETE OR MOVE THIS TABLE					
SAVINGS SUMMARY					
	KWh billed	Base	Post-Retire	Savings	
		118,465	101,905	16,559	
	Therms Retest	8,997	8,030	1,967	
	Nat'l Btu oil	0	0	0	
	Royal Supply	0	0	0	
	Royal Waste	0	0	0	
	MWH steam	0	0	0	
	Ton/Tx	0	0	0	

Run Data		Current Annual Operating Conditions									
OAT Bldg	Mtd Pkgt Temp	Total Heaters	Mixed Air Temperature (°F)	Outside Air Flow (CFM)	Predict Dischg Temperature (°F)	Overheating Recvry (MMBtu)	Additional Preheat Required (MMBtu)	Cooling Energy (MMBtu)	Cooling Energy (tons)	Cooling Energy (kW)	Cooling Energy (ton-hrs)
95 to 100	97.5	3	17,300	87	85	0	3	0	-	-	-
90 to 95	92.5	52	17,300	84	83	3	49	78	45	4,073	-
85 to 90	87.5	104	17,300	81	80	6	359	171	41	3,605	29,937
80 to 85	82.5	477	17,300	78	77	29	433	63	32	42,803	24,193
75 to 80	77.5	856	17,300	74	73	40	514	55	47	42,803	24,193
70 to 75	72.5	907	17,300	70	69	55	593	39	32	42,803	24,193
65 to 70	67.5	919	17,300	66	64	60	644	18	18	42,803	24,193
60 to 65	62.5	963	17,300	62	59	64	679	14	14	42,803	24,193
55 to 60	57.5	925	17,300	58	56	58	698	8	8	4,762	-
45 to 50	47.5	552	17,300	54	53	35	57	3	0	0	0
35 to 40	37.5	1,007	17,300	50	52	34	3	0	0	0	0
30 to 35	32.5	686	17,300	47	49	0	0	0	-	-	-
25 to 30	27.5	442	17,300	44	46	0	0	0	-	-	-
20 to 25	22.5	248	17,300	41	43	0	0	0	-	-	-
15 to 20	17.5	104	17,300	38	40	0	0	0	-	-	-
10 to 15	12.5	40	17,300	35	37	0	0	0	-	-	-
			Totals	17,300	37	373	537	2,455	-	-	204,284
Current Annual Comparisons:											
Total Heating Fuel Input Energy, MMBtu: 1,000											
Total Cooling Energy, Ton-hrs: 204,284											
Total Water Rejected at Tower, Kgals: 0											
Total: 0											
Second year annual cost assumes that electric chiller is used as the load chiller											

Variable:	Total CFM	Min % Outside Air in Summer	Min % Outside Air in Winter	Min Outside Air Flow	Min Outside Air Flow Winter	Mixed/Discharging Air Temp Set Pt	Return Air Temp (Avg)	Degrees Fahrenheit or Cooling	Boiler Efficiency	Chiller Efficiency (Wt/Hon)	Economizer working? Enter "x" if yes	offset deg econ	Winter Cross Over	gal of water consumed at tower per ton-hr
Valuable:	28,300	61%	61%	17,300	17,300	55	70.0	91%	0.00	0.58	enter "x" if yes	5	40	0
Basis for Values:	From Design Drawings	From Design Drawings	From Design Drawings	From Design Drawings	From Design Drawings	Estimated Avg. Yr. Round	Estimated Avg.	New Boiler efficiency	New Chiller efficiency					Not Needed

Bin Data			Proposed Conditions with Upgraded Controls						
OAT Bin	Mid Point Temp	Total Hours	Mixed Air Temperature (F)	Outside Air Flow (CFM)	Preheating Required (MMBtu)	Cooling Required (MMBtu)	Cooling Escap. (tons)	Cooling Energy (kW)	Cooling Energy (ton hrs)
95 to 100	97.5	3	87	17,300	0	3	0	0	0
90 to 95	92.5	52	84	17,300	0	46	73	42	3,804
85 to 90	87.5	104	81	17,300	0	82	65	38	6,807
80 to 85	82.5	477	78	17,300	0	330	58	33	27,507
75 to 80	77.5	656	75	17,300	0	393	50	29	32,723
70 to 75	72.5	987	72	17,300	0	458	42	24	38,182
65 to 70	67.5	619	68	17,300	0	255	34	20	21,239
60 to 65	62.5	933	65	17,300	0	313	27	15	26,077
55 to 60	57.5	625	62	17,300	0	141	19	11	11,714
50 to 55	52.5	540	59	17,300	0	71	11	6	5,917
45 to 50	47.5	576	56	17,300	0	22	3	2	1,827
40 to 45	42.5	552	53	17,300	31	0	0	0	0
35 to 40	37.5	1067	50	17,300	159	0	0	0	0
30 to 35	32.5	683	47	17,300	166	0	0	0	0
25 to 30	27.5	442	44	17,300	148	0	0	0	0
20 to 25	22.5	248	41	17,300	106	0	0	0	0
15 to 20	17.5	184	38	17,300	96	0	0	0	0
10 to 15	12.5	40	35	17,300	25	0	0	0	0
		8760	Totals		731	2,113			175,803

Global Facility Solutions, LLC.

Facility Name Howard County Government - Detention Center
CM: Discharge Air Reset to Reduce Reheat Load, AHU-1
Engineer: RKC

Existing Conditions:
 The discharge air temperature from AHU-1 remains at 55 deg F year round which causes the reheats to operate. Increasing the discharge air temperature will reduce the amount of reheat (simultaneous cooling/heating)
Proposed Conditions:
 Reset the DAT from AHU-1 via controls. Reduce the amount of reheat energy by 2 deg F average.

SAVINGS SUMMARY				
Do not delete or move this Table				
	Baseline	Post-Retrofit	Savings	
kWh blended	118,485	101,966	16,519	
Therms Reheat	9,997	8,030	1,967	
MMBtu oil	0	0	0	
kgal Supply	0	0	0	
MMBtu steam	0	0	0	
Ton/hr				

Variable:	Value:	Basis for Values:
Total CFM	28,300	From Design Drawings
Min % Outside Air in Summer	61%	
Min % Outside Air in Winter	61%	
Min Outside Air Flow	17,300	From Design Drawings
Min Outside Air Flow Winter	17,300	
Mixed/Dischg Air Temp Set Pt	70.0	Sequence of Ops
Return Air Temp (Avg)	70.0	Estimated Avg. Yr. Round
Degrees Overheating or Cooling	2.00	Estimated Avg.
Boiler Efficiency	91%	New Boiler efficiency
Chiller Efficiency (kW/ton)	0.58	New Chiller efficiency
Economizer working? Enter "x" if yes		enter "x" if yes
offset deg econ	5	
Winter Cross Over	40	
gal of water consumed at tower per ton-hr	0	Not Needed

Bin Data			Current Operating Conditions								
OAT Bin	Mid Point Temp	Total Hours	Mixed Air Temperature (F)	Outside Air Flow (CFM)	Preheat Dischg Temperature (F)	Overheating Energy (MMBtu)	Additional Preheat Required (MMBtu)	Cooling Energy (MMBtu)	Cooling Energy (tons)	Cooling Energy (kW)	Cooling Energy (ton-hrs)
85 to 100	92.5	3	87	17,300	89	0	0	3	-	-	-
80 to 85	87.5	52	84	17,300	86	3	0	49	78	45	4,073
85 to 90	87.5	104	81	17,300	83	6	0	88	71	41	7,337
80 to 85	82.5	477	78	17,300	80	29	0	359	63	36	29,937
75 to 80	77.5	656	75	17,300	77	40	0	433	55	32	36,065
70 to 75	72.5	907	72	17,300	74	55	0	514	47	27	42,803
65 to 70	67.5	819	68	17,300	70	38	0	293	39	23	24,393
60 to 65	62.5	983	65	17,300	67	60	0	373	32	18	31,084
55 to 60	57.5	625	62	17,300	64	38	0	179	24	14	14,898
50 to 55	52.5	540	59	17,300	61	33	0	104	16	9	8,668
45 to 50	47.5	570	56	17,300	58	35	0	57	8	5	4,762
40 to 45	42.5	852	53	17,300	55	34	0	3	0	0	266
35 to 40	37.5	1,087	50	17,300	52	0	94	0	-	-	-
30 to 35	32.5	885	47	17,300	49	0	124	0	-	-	-
25 to 30	27.5	442	44	17,300	46	0	121	0	-	-	-
20 to 25	22.5	248	41	17,300	43	0	91	0	-	-	-
15 to 20	17.5	184	38	17,300	40	0	85	0	-	-	-
10 to 15	12.5	40	35	17,300	37	0	22	0	-	-	-
		8,780	Totals				373	537	2,455		204,284

Current Annual Consumption:

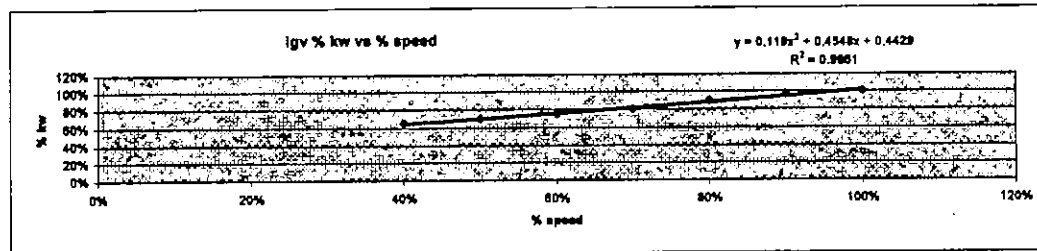
Total Heating Fuel Input Energy, MMBtu:	1,000
Total Cooling Fuel Input Energy, MMBtu:	
Total Cooling Energy, Ton-hrs:	204,284
Total Water Rejected at Tower, kgal:	0
Total	

Second year annual cost assumes that electric chiller is used as the lead chiller

Facility Name How. Co. Gov. Detention Center
 Measure: AHU-1 IGV to VFD (50 HP SAF, 7 1/2 HP RAF)
 Engineer: RKC

	peak bin temp	"y" if included	pre kW	post kW	kW saved	\$/kW from Tariff saved	\$ saved
January	47.5 n		24.4	9.3	-	\$	\$
February	52.5 n		24.4	9.3	-	\$	\$
March	62.5 n		24.4	9.3	-	\$	\$
April	62.5 n		27.2	18.7	-	\$	\$
May	62.5 n		27.2	18.7	-	\$	\$
June	62.5 n		36.6	37.0	-	\$	\$
July	67.5 n		44.1	48.8	-	\$	\$
August	62.5 n		36.6	37.0	-	\$	\$
September	67.5 n		31.2	27.0	-	\$	\$
October	62.5 n		27.2	18.7	-	\$	\$
November	77.5 n		24.9	12.0	-	\$	\$
December	62.5 n		24.4	9.3	-	\$	\$
Totals and Averages							

Generic Curve Regression				1.3214
				-1.1821
				0.8743
% speed	% kw	curve		
100%	100%	100%	101%	
90%	97%		88%	
80%	90%		77%	
70%	80%		69%	
60%	75%		64%	
50%	70%		61%	
40%	65%		61%	



Chiller Operating Efficiencies						
	Tons	100	1.05	0.90	75%	100%
Chiller 1	100	1.05	0.90	0.95	1.00	NPLV
Chiller 2	100	1.05	0.90	0.95	1.00	1.00
Chiller 3	100	0.95	0.80	0.83	0.85	0.86
						0.00
						0.00

[illegible]

Global Facility Solutions, LLC.
Optimize Chiller Plant Operation and Staging

Project Description

Replace existing Trane Chillers with new higher efficiency chillers. Existing chillers are rated at .80 kW/ton new. Efficiency deration due to tube fouling is estimated at .20 kW/ton or 10 to 15% since installation in 1985.

PROPOSED PLANT OPERATION

PROPOSED PLANT OPERATION													
Temp in/F	Br Hrs	Load	Plant Ton- Read	Chiller Ton- Hrs	Chiller #1 kW	Chiller # Load	Chiller #2 kW	Chiller #2 Load	Chiller #3 kW	Chiller #3 Load	Chiller #4 kW	Tons Produced	Tons Produced
97	3	100%	250	750	55	85%	55	85%	-	-	111	265	255
92	52	95%	238	12,350	46	80%	46	80%	-	-	92	3,834	240
87	104	92%	230	23,920	46	80%	43	75%	-	-	89	7,428	233
82	477	90%	225	107,325	43	75%	43	75%	-	-	86	32,970	225
77	656	85%	213	139,400	43	74%	40	70%	-	-	83	43,529	216
72	907	80%	200	181,400	40	70%	34	65%	-	-	75	54,159	203
67	619	75%	188	116,063	37	65%	32	60%	-	-	69	34,228	188
62	983	65%	183	159,738	32	60%	26	50%	-	-	58	45,674	165
57	625	60%	150	93,750	65	100%	-	0%	-	0%	65	32,500	150
52	540	50%	125	67,500	55	85%	-	0%	-	0%	55	23,868	128
47	576	45%	113	64,800	44	77%	-	0%	-	0%	44	20,437	116
42	552	40%	100	55,200	35	67%	-	0%	-	0%	35	15,822	101
37	1,087	0%	-	-	-	-	-	-	-	-	-	-	-
32	685	0%	-	-	-	-	-	-	-	-	-	-	-
27	442	0%	-	-	-	-	-	-	-	-	-	-	-
22	248	0%	-	-	-	-	-	-	-	-	-	-	-
17	184	0%	-	-	-	-	-	-	-	-	-	-	-
12	40	0%	-	-	-	-	-	-	-	-	-	-	-
7	0	0%	-	-	-	-	-	-	-	-	-	-	-
2	0	0%	-	-	-	-	-	-	-	-	-	-	-
(3)	0	0%	-	-	-	-	-	-	-	-	-	-	-
(8)	0	0%	-	-	-	-	-	-	-	-	-	-	-
8,760			1,022,195										
TOTAL KWH												314,515	
Savings												453,837	363,070

Chiller Operating Efficiencies

	Tons	25%	50%	75%	100%	NPLV
Chiller 1	150	0.74	0.53	0.58	0.65	0.57
Chiller 2	150	0.74	0.53	0.58	0.65	0.57
Chiller 3	100	0.95	0.85	0.80	0.85	0.86
						0.00
						0.00

Savings % from Total kWh 19%

Englinter: INITIALS

[illegible]

Basis for savings: reduce pump speed from existing full speed, in accordance with building load, down to a minimum speed.

[illegible]

Variable:	Value:	Units for Values:
Description:	Two 5 HP pumps, one running, one standby	
Balance Temp	65.0	
motor input hp	5.1	
Exponent	2.1	
Minimum Drive Speed	30%	
Motor kW	3.8	
motor load/efficiency equation:	$Y=A \times X^2 + Bx + C$, where x is load percent	
A	-0.5143	
B	2.0657	
C	0.154	
Adjustment Factor for comparing motor	0.064	
VFD load/efficiency equation:	$Y=A \times X^2 + Bx + C$, where x is load percent	
A	-1.2796	
B	4.1614	
C	83.84	

Heating loads vary proportionally from the balance temperature to the design temperatures. Exiting motor kWh is based on measured kWh, which includes motor efficiency.

Global Facility Solutions, LLC

Facility Name: Howard County Government - Scaggsville PS
ECM: Minimum Outside Air Controls with CO2 Sensor, AHU-1
Engineer: RKC

SAVESUMMARY			
Do not delete or move this table			
	Baseline	Post-Retrofit	Delta
KWH blended	148,781	134,183	12,598
KWH	443.5	348.0	95
Summer KW	274.6	215.9	58
MAINTENANCE	-	-	-
Cost of	1,011.02	33.83	977.1
KCAL Supply			
KCAL Waste			
MMBtu steam			
Ton/hr			

Variable	Value	Basis
Scheduled CFM not used in calc	32,000	Not Measured, Design Schedule
Measured CFM	32,000	30%
Baseline % OA	20%	Average over usage period
Proposed Min % OA	6.400	Avg. return yr. round
Average RA temp	80	80
Average RA Gdb	55	55
DAT subpoint	80	80
DAT humidity ratio	75%	Existing Boilers
Heating Efficiency (Ehe)	0.85	Estimated
Est chiller input	56	56
Chiller On Peak (TP)		

Current Conditions															Outside			148,781 TOTAL	
Annual															Latent cooling tons	Total tons	kW		kWh
Temperature Bin		Humidity Ratio (lb/lb)	Baseline % OA	OA cfm	RA cfm	MAT	MAASH (Grain/lb)	PAC lamp	PAC MAASH	CO lamp	cedding tons								
High	Midpoint											Total OSH							
85 to 100	87.5	3	82	30%	9,600	22,400	74.1	69.6	74.05	-	56	55	17	72	68.7	206			
80 to 85	92.5	52	88	30%	9,600	22,400	72.6	68.4	72.95	-	56	51	15	66	62.5	3,249			
75 to 80	87.5	104	85	30%	9,600	22,400	71.1	67.5	71.05	-	56	46	14	60	58.8	5,811			
70 to 75	82.5	477	83	30%	9,600	22,400	69.6	66.8	69.95	-	55	42	13	54	51.7	24,658			
65 to 70	77.5	650	80	30%	9,600	22,400	68.1	66.0	68.05	-	56	38	11	48	48.0	30,148			
60 to 75	72.5	807	64	30%	9,600	22,400	66.6	65.2	66.55	-	55	33	2	35	33.7	30,637			
55 to 70	67.5	619	53	30%	9,600	22,400	65.1	63.8	65.05	-	55	28	-	29	27.5	17,021			
50 to 65	62.5	863	39	30%	9,600	22,400	63.6	63.7	63.55	-	55	23	-	26	23.4	22,995			
45 to 60	57.5	629	30	30%	9,600	22,400	62.1	61.0	62.05	-	56	20	-	20	19.3	12,096			
40 to 55	52.5	540	24	30%	9,600	22,400	60.6	49.2	60.95	-	55	-	-	-	-	-			
35 to 50	47.5	576	18	30%	9,600	22,400	59.1	47.4	59.05	-	55	-	-	-	-	-			
30 to 45	42.5	552		30%	9,600	22,400	57.6	42.0	57.55	-	55	-	-	-	-	-			
25 to 40	37.5	1,067		30%	9,600	22,400	56.1	42.0	56.06	-	55	-	-	-	-	-			
20 to 35	32.5	648		30%	9,600	22,400	54.6	42.0	55.00	11	55	-	-	-	-	-			
15 to 30	27.5	442		30%	9,600	22,400	53.1	42.0	55.00	30	55	-	-	-	-	-			
10 to 25	22.5	248		30%	9,600	22,400	51.6	42.0	55.00	30	55	-	-	-	-	-			
5 to 20	17.5	144		30%	9,600	22,400	50.1	42.0	55.00	31	55	-	-	-	-	-			
0 to 15	12.5	40		30%	9,600	22,400	48.6	42.0	65.00	9	55	-	-	-	-	-			
															116	338	72		

Facility Name: Howard County Government - Scaggsville PS
ECM: Minimum Outside Air Controls with CO2 Sensor, AHU-1
Engineer: RKC

Annual		Prepared %OA		OA cfm		RA cfm	MAT	MAWH (Grains/lb)	PHC MMSU	PHC temp	CC temp	Coolable		Total tons	kW	kWh	
Temperature Btu		Humidity Ratio (Grains/lb)	Total O&B	High	Low	RA cfm	MAT	MAWH (Grains/lb)	PHC MMSU	PHC temp	CC temp	Latent cooling tons	Sensible cooling tons	Total tons	kW	kWh	
High	Low																
98 to 100	87.5	3	92	8,400	25,000	70.7	68.4	70.70	-	85	45	12	57	54.9	162		
99 to 95	92.5	52	88	8,400	25,000	63.7	65.8	68.70	-	93	42	10	52	49.9	2,583		
89 to 90	87.5	104	83	8,400	25,000	66.7	65.0	64.70	-	95	39	8	49	46.1	4,794		
80 to 85	82.5	477	83	8,400	25,000	67.7	64.8	67.70	-	63	37	8	45	42.7	20,354		
78 to 80	77.5	856	80	8,400	25,000	66.7	64.0	66.70	-	63	34	7	41	38.8	23,443		
70 to 78	72.5	907	84	8,400	25,000	63.7	60.8	63.70	-	65	31	1	32	30.7	27,863		
65 to 70	67.5	819	53	8,400	25,000	64.7	58.6	64.70	-	85	26	-	28	26.5	16,428		
60 to 65	62.5	883	30	8,400	25,000	63.7	55.8	63.70	-	85	25	-	25	23.8	33,389		
55 to 60	57.5	625	30	8,400	25,000	62.7	54.0	62.70	-	65	22	-	22	21.1	13,167		
50 to 55	52.5	640	24	8,400	25,000	61.7	52.8	61.70	-	85	-	-	-	0.0	-		
45 to 50	47.5	878	18	8,400	25,000	60.7	51.6	60.70	-	86	-	-	-	0.0	-		
40 to 45	42.5	632		8,400	25,000	59.7	48.9	59.70	-	88	-	-	-	0.0	-		
35 to 40	37.5	1,087		8,400	25,000	58.7	48.0	58.70	-	96	-	-	-	0.0	-		
30 to 35	32.5	885		8,400	25,000	57.7	48.0	57.70	-	35	-	-	-	0.0	-		
25 to 30	27.5	442		8,400	25,000	56.7	48.0	56.70	-	96	-	-	-	0.0	-		
20 to 25	22.5	248		8,400	25,000	56.7	48.0	53.70	-	98	-	-	-	0.0	-		
15 to 20	17.5	184		8,400	25,000	54.7	48.0	56.00	2	95	-	-	-	0.0	-		
10 to 15	12.5	40		8,400	25,000	53.7	48.0	58.00	2	95	-	-	-	0.0	-		
															393	48	134,183 TOTAL
															4		
															8,789		

Table 1 - Utility Rates

Electric Rate	\$	0.107	\$/kWh
Natural Gas	\$	1.44	\$/therm
Residual Oil Rate			
Distilled Oil Rate	\$	2.70	\$/gal
Propane	\$	2.10	\$/gal
Chilled Water Rate			\$/tonhr

Notes:
 1. Propane = 95,152 Btu/gal
 2. Nat Gas = 100,000 Btu/gal
 3. Pricing is average for the year

Table 2 - Operating Costs

Existing Fan Operation Costs		
Electric Fan 1/2 HP	3	
	3,937 kWh/yr Existing Pump Energy	
Maintenance	-	\$/yr O&M
Proposed Fan Operation Costs		
Electric Fan 1/2 HP	3	
	1,948 kWh/yr Proposed Pump Energy	
Maintenance	-	\$/yr O&M
	1,989 kWh/yr savings	

Existing Conditions:

The existing MER exhaust fan operates 24 hours every day regardless of the room temperature.

Proposed Conditions:

The exhaust fan will be controlled by a room thermostat to shut off the fan when the room temperature is less than 80 deg F.

Advantages:

- New pumps will operate more efficiently and reduce the consumption of electricity.

Variable:	Value:	B ratio:
Scheduled CFM not used in calls	20,000	
Unmeasured CFM	25,000	
Baseline % OA	15%	Not Measured, Design Schedule
Proposed Min % OA		8% Average over usage period,
Proposed Max OA	2,000	64 Avg. return yr. record
Average RA Temp	60	
Average RA Gals	60	
DAT subunit	65	
DAT humidity ratio	80	
Heating Efficiency (E _h)	85%	Existing Boilers (Pulse)
E _h boiler inventory	0.68	Estimated
Callers On Paid (T ₂)	56	

QA sized for 165 persons	13%
QA sized for 60 persons	5%
QA at 5% min to cover make-up of requirements	2,000

Annual			Current Conditions		Variable										kW	kWh
Temperature Bin			Baseline % CA	Heatrate % (Chilled)	OA db	RA db	MAT	MARH (Granules)	FMC Temp	FMC MMBtu	CC Temp	Cooling tons	Latent cooling tons	Total tons		
High	Medium	Total CMB														
66 to 100	97.5	3	15%	15%	3,760	21,250	68.0	64.8	60.03	-	55	32	7	38	38.4	100
86 to 96	92.5	52	15%	16%	3,760	21,260	68.3	64.2	60.28	-	55	30	6	30	34.0	1,760
85 to 90	87.5	104	15%	16%	3,750	21,260	67.5	63.8	60.53	-	55	28	5	33	31.8	3,506
80 to 85	82.5	477	16%	16%	3,760	21,250	66.8	63.5	60.78	-	56	26	5	31	29.8	14,250
75 to 80	77.5	658	16%	16%	3,750	21,250	68.0	63.0	60.03	-	55	25	4	29	27.8	18,087
70 to 75	72.5	907	15%	16%	3,750	21,250	66.3	60.6	60.28	-	55	23	1	24	22.8	20,653
65 to 70	67.5	619	15%	16%	3,750	21,250	64.5	59.0	60.53	-	55	21	-	21	20.4	12,903
60 to 65	62.5	883	15%	16%	3,760	21,250	63.8	58.9	60.78	-	56	20	-	20	18.9	18,436
55 to 60	57.5	925	15%	16%	3,760	21,250	63.0	58.5	63.03	-	55	18	-	18	17.2	10,721
50 to 55	52.5	540	15%	16%	3,750	21,250	62.3	54.6	62.28	-	55	-	-	-	0.0	-
45 to 50	47.5	579	15%	16%	3,750	21,250	61.5	53.7	61.53	-	55	-	-	-	0.0	-
40 to 45	42.5	552	15%	16%	3,750	21,250	60.6	51.0	60.78	-	55	-	-	-	0.0	-
35 to 40	37.5	1,087	15%	16%	3,750	21,250	60.0	51.0	60.03	-	55	-	-	-	0.0	-
30 to 35	32.5	688	15%	16%	3,750	21,250	58.3	51.0	59.28	-	55	-	-	-	0.0	-
25 to 30	27.5	442	15%	16%	3,750	21,250	58.5	51.0	64.53	-	56	-	-	-	0.0	-
20 to 25	22.5	248	15%	16%	3,760	21,250	57.8	51.0	67.78	-	56	-	-	-	0.0	-
15 to 20	17.5	184	15%	16%	3,760	21,260	57.0	51.0	67.03	-	55	-	-	-	0.0	-
10 to 15	12.5	40	15%	16%	3,750	21,260	56.3	51.0	56.28	-	55	-	-	-	0.0	-
												223	28			89,908 TOTAL

Global Facility Solutions, LLC

Facility Name: Howard County Government - East Columbia Library
ECM: Minimum Outside Air Controls with CO2 Sensor, AHU-1
Engineer: RKC

Annual				Proposed Conditions										Savings			
Temperature Bin		Humidity Ratio	Yrly (2018)	Proposed %OA	OA cfm	RA cfm	MAT	MARH (Grain/lb)	PHC temp	PHC MMBtu	CO2 temp	Latent cooling tons	Total tons	kW	kWh		
High	Low	(Grain/lb)															
94 to 100	97.5	3	82	8%	2,000	23,000	66.7	62.6	66.68	-	55	26	4	30	28.4	86	
90 to 95	92.5	52	86	8%	2,000	23,000	66.3	62.2	66.28	-	55	26	3	29	27.1	1,411	
85 to 90	87.5	104	86	8%	2,000	23,000	65.9	62.0	66.08	-	55	24	3	27	25.9	2,899	
80 to 85	82.5	477	83	8%	2,000	23,000	65.5	61.8	66.48	-	55	24	3	26	24.9	11,895	
75 to 80	77.5	656	80	8%	2,000	23,000	66.1	61.6	66.06	-	55	23	2	26	23.7	16,836	
70 to 75	72.5	907	84	8%	2,000	23,000	64.7	60.3	64.06	-	55	22	0	22	21.1	18,157	
65 to 70	67.5	619	83	8%	2,000	23,000	64.3	59.4	64.26	-	55	21	-	21	19.8	12,278	
60 to 65	62.5	963	39	8%	2,000	23,000	63.9	58.3	63.88	-	55	20	-	20	18.0	18,058	
55 to 60	57.5	625	30	8%	2,000	23,000	63.5	57.8	63.48	-	55	19	-	19	18.1	11,329	
50 to 55	52.5	540	24	8%	2,000	23,000	63.1	57.1	63.08	-	55	-	-	-	0.0	-	
45 to 50	47.5	578	18	8%	2,000	23,000	62.7	56.6	62.68	-	55	-	-	-	0.0	-	
40 to 45	42.5	552		8%	2,000	23,000	62.3	56.2	62.28	-	55	-	-	-	0.0	-	
35 to 40	37.5	1,067		8%	2,000	23,000	61.9	56.2	61.88	-	55	-	-	-	0.0	-	
30 to 35	32.5	885		8%	2,000	23,000	61.5	56.2	61.48	-	55	-	-	-	0.0	-	
25 to 30	27.5	442		8%	2,000	23,000	61.1	56.2	61.08	-	55	-	-	-	0.0	-	
20 to 25	22.5	248		8%	2,000	23,000	60.7	56.2	60.68	-	55	-	-	-	0.0	-	
15 to 20	17.5	184		8%	2,000	23,000	60.3	56.2	60.28	-	55	-	-	-	0.0	-	
10 to 15	12.5	40		8%	2,000	23,000	59.9	55.2	59.88	-	55	-	-	-	0.0	-	
															204	16	92,019 TOTAL

Global Facility Solutions, LLC

Facility Name: Howard County Government - East Columbia Library
ECM: Minimum Outside Air Controls with CO2 Sensor, AHU-4
Engineer: RKC

SAVINGS SUMMARY

Do not delete or move this Table

	Baseline	Post-Retrofit	Savings
KWH blended			
KWH	16,743	13,286	3,445
Winter KW	-	-	-
Summer KW	-	-	-
MMBTU NG	285.45	-	285.5
Gallons oil	-	-	-
KGAL Supply	-	-	-
KGAL Waste	-	-	-
MMBTU steam	-	-	-
Ton/yr	-	-	-

Variable:	Value:	Basis:
Scheduled CFM-not used in calc	3,500	
Measured CFM	3,500	Net Measured, Design Schedule
Baseline % OA	35%	
Proposed Min % OA	10%	Average over usage period
Proposed Min OA	350	
Average RA temp	64	Avg. return yr. round
Average RA Grb	80	
DAT setpoint	55	
DAT humidity ratio	60	
Heating Efficiency (Elec)	85%	Existing Boilers (Pulse)
Est chiller input	0.83	Estimated
Chiller 'On' Point (°F)	55	

OA sized for 60 persons 34%
OA sized for 15 persons 9%
OA at 8% min to cover make-up air requirements 280

Annual			Humidity Ratio (Grains/lb)	Current Conditions												
Temperature Bin				Baseline % OA	OA cfm	RA cfm	MAT	MARH (Grains/lb)	PHC temp	PHC MMBtu	CC temp	Sensible cooling tons	Latent cooling tons	Total tons	KW	kWh
High	Midpoint	Total CDD														
95 to 100	97.5	3	92	35%	1,225	2,275	76.7	71.2	75.73	-	55	7	2	9	8.3	25
90 to 95	92.5	52	88	35%	1,225	2,275	74.0	68.8	73.98	-	55	6	2	8	7.5	391
85 to 90	87.5	104	85	35%	1,225	2,275	72.2	66.8	72.23	-	55	5	2	7	6.8	708
80 to 85	82.5	477	83	35%	1,226	2,275	70.8	64.1	70.48	-	55	5	2	6	6.1	2,932
75 to 80	77.5	658	80	35%	1,225	2,275	68.7	60.9	68.73	-	55	4	1	6	5.4	3,553
70 to 75	72.5	807	64	35%	1,225	2,275	67.0	61.4	66.98	-	55	4	0	4	3.8	3,480
65 to 70	67.5	819	53	35%	1,225	2,275	65.2	57.6	65.23	-	55	3	-	3	3.1	1,894
60 to 65	62.5	883	38	35%	1,225	2,275	63.5	52.7	63.48	-	55	3	-	3	2.8	2,483
55 to 60	57.5	825	30	35%	1,225	2,275	61.7	49.5	61.73	-	55	2	-	2	2.0	1,258
50 to 55	52.5	540	24	35%	1,225	2,275	60.0	47.4	59.98	-	55	-	-	-	0.0	-
45 to 50	47.5	578	18	35%	1,226	2,275	58.2	45.3	58.23	-	55	-	-	-	0.0	-
40 to 45	42.5	552		35%	1,225	2,275	56.5	38.0	56.48	-	55	-	-	-	0.0	-
35 to 40	37.5	1,087		35%	1,225	2,275	54.7	39.0	55.00	1	55	-	-	-	0.0	-
30 to 35	32.5	685		35%	1,225	2,275	53.0	38.0	55.00	5	55	-	-	-	0.0	-
25 to 30	27.5	442		35%	1,225	2,275	51.2	39.0	55.00	8	55	-	-	-	0.0	-
20 to 25	22.5	248		35%	1,225	2,275	49.8	39.8	55.00	5	55	-	-	-	0.0	-
15 to 20	17.5	184		35%	1,225	2,275	47.7	39.0	55.00	5	55	-	-	-	0.0	-
10 to 15	12.5	40		35%	1,225	2,275	48.0	39.0	55.00	1	55	-	-	-	0.0	-
		8,768								24		39	9			16,743 TOTAL

Global Facility Solutions, LLC

Facility Name: Howard County Government - East Columbia Library
ECM: Minimum Outside Air Controls with CO2 Sensor, AHU-4
Engineer: RKC

Annual		Proposed Conditions		Sensible		Latent		Total		kW		kWh			
Temperature Rise Midpoint		Humidity Ratio (Grain/lb)	Proposed MOA	OA cfm	RA cfm	MAAT	MAHPH (Grain/lb)	PHC temp	PHC MMERU	CC temp	cooling tons	cooling tons	Total tons	kWh	
High	Total DBB														
85 to 100	87.5	3	10%	350	3,150	67.4	63.2	67.35	-	55	4	1	5	4.3	13
80 to 85	82.5	52	10%	350	3,150	68.9	62.8	68.85	-	55	4	1	4	4.1	212
85 to 90	87.5	104	10%	350	3,150	68.4	62.5	68.35	-	55	4	0	4	3.8	402
80 to 85	82.5	477	10%	350	3,150	65.9	62.3	65.85	-	55	3	0	4	3.7	1,756
75 to 80	77.5	856	10%	350	3,150	65.4	62.0	65.35	-	55	3	0	4	3.5	2,277
70 to 75	72.5	967	10%	350	3,150	64.9	60.4	64.85	-	55	3	0	3	3.0	2,742
65 to 70	67.5	618	10%	350	3,150	64.4	59.3	64.35	-	55	3	-	3	2.8	1,732
60 to 65	62.5	883	10%	350	3,150	63.8	57.8	63.85	-	55	3	-	3	2.8	2,803
55 to 60	57.5	625	10%	350	3,150	63.4	57.0	63.35	-	55	3	-	3	2.5	1,982
50 to 55	52.5	640	10%	350	3,150	62.9	56.4	62.85	-	55	-	-	-	0.0	-
45 to 50	47.5	578	10%	350	3,150	62.4	55.8	62.35	-	55	-	-	-	0.0	-
40 to 45	42.5	652	10%	350	3,150	61.9	54.0	61.85	-	55	-	-	-	0.0	-
35 to 40	37.5	1,087	10%	350	3,150	61.4	54.0	61.35	-	55	-	-	-	0.0	-
30 to 35	32.5	685	10%	350	3,150	60.9	54.0	60.85	-	55	-	-	-	0.0	-
25 to 30	27.5	442	10%	350	3,150	60.4	54.0	60.35	-	55	-	-	-	0.0	-
20 to 25	22.5	248	10%	350	3,150	59.9	54.0	59.85	-	55	-	-	-	0.0	-
15 to 20	17.5	184	10%	350	3,150	59.4	54.0	59.35	-	55	-	-	-	0.0	-
10 to 15	12.5	40	10%	350	3,150	58.9	54.0	58.85	-	55	-	-	-	0.0	-
												28	3	13,288 TOTAL	
												5,769			

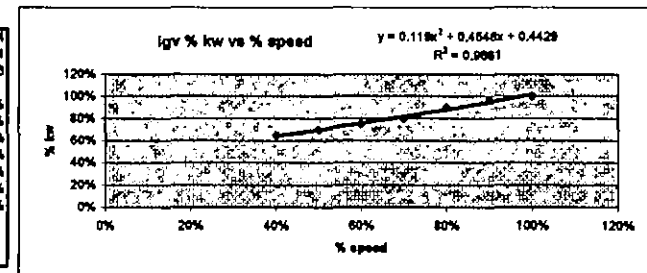
Facility Name: How. Co. Gov. East Columbia Library
 Measure: AHU-1 IGV to VFD (40 HP SAF)
 Engineer: RKC

SAVINGS SUMMARY				
Do not delete or move this Table				
	Baseline	Post-Retrofit	Savings	
kWh blended	180,746	101,675	79,072	
Winter kW	0	0	0	
Summer kW	0	0	0	
MMBtu gas				
MMBtu oil				
kgal Supply				
kgal Waste				
MMBtu steam				

Variable:	Value:	Units for Values
Min. VAV Airflow	60%	
Chiller 'On' Point (°F)	55	
Cooling Design Temp (°F)	55	
Heating 'On' Point (°F)	60	
Heating Design Temp (°F)	6	
Calculated kW	31.9	
Measured cfm	25,000	
Design CFM	25,000	
Estimated % cfm	100%	
Estimated % full load kw from IGV curve	101%	
Estimated full load kW	31.9	
IGV unloading curve (% kw vs % speed)		
$1.3214x^2 - 1.1821x + 0.8743$ generic curve see below		
	1.3214	
	-1.1821	
	0.8743	
VFD unloading curve		
	% speed ^ 2.2	
	2.2	
VFD Efficiency		
	0.83	

30 year ASHRAE Weather Data - Baltimore				Cooling Load %	Heating Load %	Present Air Flow w/IGV	Proposed Air Flow On VFD	Present % Input kW w/IGV	Proposed % Input kW w/VFD	Present kW w/IGV	Present Energy Use kWh	Proposed kW w/VFD	Proposed Energy Use kWh	Estimated kW Saved	Estimated kWh Saved
Temp Range (°F)	Avg. Temp In Bin (°F)	Hours In Bin	MCWB												
Annual															
95 to 100	97.5	3	78	100%	0%	100%	100%	111%	123%	35.4	106	39.2	118	-4	-11
90 to 95	92.5	52	75	94%	0%	94%	94%	93%	93%	29.6	1,538	29.8	1,548	0	-8
85 to 90	87.5	104	73	81%	0%	81%	81%	78%	68%	25.1	2,269	21.7	2,269	3	349
80 to 85	82.5	477	70	69%	0%	69%	69%	69%	47%	21.9	10,441	15.0	7,175	7	3,266
75 to 80	77.5	656	68	56%	0%	60%	60%	64%	35%	20.4	13,408	11.1	7,314	9	6,095
70 to 75	72.5	907	65	44%	0%	60%	60%	64%	35%	20.4	18,539	11.1	10,112	9	8,427
65 to 70	67.5	619	60	31%	0%	60%	60%	64%	35%	20.4	12,652	11.1	6,901	9	5,751
60 to 65	62.5	963	56	19%	0%	60%	60%	64%	35%	20.4	20,092	11.1	10,990	9	9,133
55 to 60	57.5	626	51	8%	0%	60%	60%	64%	35%	20.4	12,776	11.1	6,988	9	5,807
50 to 55	52.5	640	46	0%	0%	60%	60%	64%	35%	20.4	11,037	11.1	6,021	9	5,017
45 to 50	47.5	676	41	0%	6%	60%	60%	64%	35%	20.4	11,773	11.1	6,422	9	5,351
40 to 45	42.5	552	37	0%	17%	60%	60%	64%	35%	20.4	11,283	11.1	6,164	9	5,126
35 to 40	37.5	1,067	32	0%	28%	60%	60%	64%	35%	20.4	21,809	11.1	11,896	9	9,913
30 to 35	32.5	685	28	0%	39%	60%	60%	64%	35%	20.4	14,001	11.1	7,637	9	6,364
25 to 30	27.5	442	23	0%	50%	60%	60%	64%	35%	20.4	9,034	11.1	4,926	9	4,108
20 to 25	22.5	248	19	0%	61%	60%	60%	64%	35%	20.4	5,069	11.1	2,765	9	2,304
15 to 20	17.5	184	15	0%	72%	60%	60%	64%	35%	20.4	3,781	11.1	2,051	9	1,709
10 to 15	12.5	40	10	0%	83%	60%	60%	64%	35%	20.4	816	11.1	446	9	372
Total		8,760									180,746		101,675		79,072

	peak bin temp	°F if included	pre kW	post kW	kW saved	\$kW from Tarif \$ saved	Generic Curve Regression
January	47.5 n		20.4	11.1	-	\$ - \$	1.3214
February	52.5 n		20.4	11.1	-	\$ - \$	-1.1821
March	62.5 n		20.4	11.1	-	\$ - \$	0.8743
April	82.5 n		21.9	15.0	-	\$ - \$	
May	82.5 n		21.9	15.0	-	\$ - \$	
June	92.5 n		29.6	29.6	-	\$ - \$	
July	97.5 n		35.4	39.2	-	\$ - \$	
August	92.5 n		29.6	29.6	-	\$ - \$	
September	87.5 n		25.1	21.7	-	\$ - \$	
October	82.5 n		21.9	16.0	-	\$ - \$	
November	77.5 n		20.4	11.1	-	\$ - \$	
December	62.5 n		20.4	11.1	-	\$ - \$	
Totals and Averages							



Global Facility Solutions, LLC

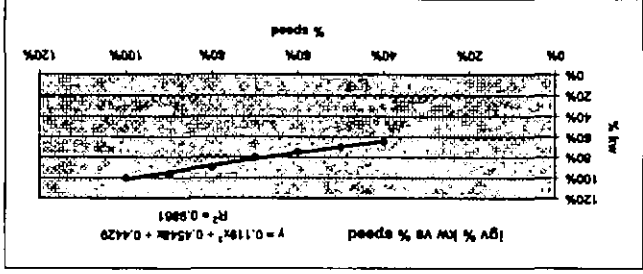
Facility Name How. Co. Gov. East Columbia Library

Measure: AHU-1 IGV to VFD (40 HP SAF)

Engineer: RKC

Variables:	Value:	Units for Values
Min. VAV Airflow	60%	
Chiller On Point (°F)	45	
Cooling Design Temp (°F)	55	
Heating On Point (°F)	50	
Heating Design Temp (°F)	6	
Calculated kW	7.98	
Measured chm	5.500	
Design CFM	8.500	
Estimated % chm	100%	
Estimated % full load kw from giv curve	101%	
Estimated full load kw	8.0	
IGV unloading curve (% kw vs % speed)	1.3214x2-1.1821x-0.8743	generic curve see below
VFD unloading curve	1.3214x2-1.1821x-0.8743	
VFD Efficiency	2.2	% speed
	0.83	

Month	peak bin lamp % if included	pre kW	post kW	kW saved	\$/hr from T&E saved	% speed	% kw	curve
January	47.5	5.1	2.8	\$	\$	100%	100%	101%
February	62.5	5.1	2.8	\$	\$	90%	87%	88%
March	62.5	5.1	2.8	\$	\$	100%	87%	101%
April	62.5	5.5	3.5	\$	\$	90%	87%	88%
May	62.5	5.5	3.5	\$	\$	90%	87%	88%
June	62.5	7.4	7.4	\$	\$	70%	80%	69%
July	62.5	6.9	6.9	\$	\$	70%	80%	69%
August	62.5	7.4	7.4	\$	\$	60%	75%	64%
September	62.5	6.3	5.4	\$	\$	60%	70%	61%
October	62.5	6.5	3.8	\$	\$	60%	70%	61%
November	77.5	5.1	2.8	\$	\$	60%	70%	61%
December	62.5	5.1	2.8	\$	\$	60%	70%	61%
Totals and Averages								

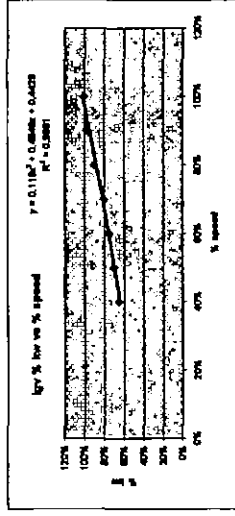


Facility Name: How. Co. Gov. East Columbia Library
Measure: AHU-4 IGW to VFD (5 HP SAF)
Engineer: RKC

30 Year ASHRAE Weather Data - Baltimore			
Temp Range (°F)	Base	Peak	Savings
Winter kW	22,064	12,748	9,316
Summer kW	0	0	0
Multi-use	0	0	0
Lighting	0	0	0
Water	0	0	0
Refrigeration	0	0	0
Other	0	0	0
Total	22,064	12,748	9,316

Variable	Value	Units for Values
Min. VAV Airflow	60%	
Chiller On Point (°F)	65	
Cooling Design Temp (°F)	65	
Heating On Point (°F)	50	
Heating Design Temp (°F)	5	
Calculated kW	4	
Measured kW	3,500	
Design CFM	3,500	
Estimated % load from lgv curve	100%	
Estimated % load kW	4.0	
IGW unloading curve (% lgv vs % speed)	1.3214x ^{0.75} - 0.8743	Genetic curve see below
VFD unloading curve	1.3214x ^{0.75} - 0.8743	
VFD Efficiency	2.2	
	0.93	

Temp Range (°F)	30 Year ASHRAE Weather Data - Baltimore		Cooling Load %	Heating Load %	Present Air Flow w/IGW	Proposed Air Flow On VFD	Present % Input kW w/IGW	Proposed % Input kW w/VFD	Present Energy Use kWh	Proposed Energy Use kWh	Estimated kW Saved	Estimated kWh Saved
	Base	Peak										
Annual	97.5	97.5	100%	0%	100%	100%	111%	120%	4.4	13	0	-1
04 to 100	92.5	92.5	100%	0%	100%	100%	111%	120%	3.7	104	0	-1
80 to 95	87.5	87.5	100%	0%	100%	100%	111%	120%	3.1	283	0	44
65 to 80	82.5	82.5	100%	0%	100%	100%	111%	120%	2.7	600	1	410
50 to 65	77.5	77.5	100%	0%	100%	100%	111%	120%	2.6	917	1	794
35 to 50	72.5	72.5	100%	0%	100%	100%	111%	120%	2.6	1,280	1	1,057
20 to 35	67.5	67.5	100%	0%	100%	100%	111%	120%	2.6	1,374	1	1,145
5 to 20	62.5	62.5	100%	0%	100%	100%	111%	120%	2.6	874	1	729
0 to 5	57.5	57.5	100%	0%	100%	100%	111%	120%	2.6	758	1	629
0 to 15	52.5	52.5	100%	0%	100%	100%	111%	120%	2.6	825	1	671
0 to 25	47.5	47.5	100%	0%	100%	100%	111%	120%	2.6	1,415	1	1,183
0 to 35	42.5	42.5	100%	0%	100%	100%	111%	120%	2.6	1,722	1	1,453
0 to 45	37.5	37.5	100%	0%	100%	100%	111%	120%	2.6	1,758	1	1,489
0 to 55	32.5	32.5	100%	0%	100%	100%	111%	120%	2.6	1,133	1	915
0 to 65	27.5	27.5	100%	0%	100%	100%	111%	120%	2.6	472	1	289
0 to 75	22.5	22.5	100%	0%	100%	100%	111%	120%	2.6	163	1	47
0 to 85	17.5	17.5	100%	0%	100%	100%	111%	120%	2.6	163	1	47
0 to 95	12.5	12.5	100%	0%	100%	100%	111%	120%	2.6	163	1	47
Total	8,760	8,760	100%	0%	100%	100%	111%	120%	22,863	12,748	10,115	8,115



Month	peak bin temp	% included	pre kW	post kW	kW saved	\$/kW from Total \$ saved
January	47.5 °F	1.4	2.6	2.6	0	\$ -
February	52.5 °F	1.4	2.6	2.6	0	\$ -
March	62.5 °F	1.4	2.6	2.6	0	\$ -
April	67.5 °F	1.4	2.6	2.6	0	\$ -
May	72.5 °F	1.4	2.6	2.6	0	\$ -
June	77.5 °F	1.4	2.6	2.6	0	\$ -
July	82.5 °F	1.4	2.6	2.6	0	\$ -
August	87.5 °F	1.4	2.6	2.6	0	\$ -
September	92.5 °F	1.4	2.6	2.6	0	\$ -
October	97.5 °F	1.4	2.6	2.6	0	\$ -
November	102.5 °F	1.4	2.6	2.6	0	\$ -
December	107.5 °F	1.4	2.6	2.6	0	\$ -
Totals and Averages	82.5 °F	1.4	2.6	2.6	0	\$ -

Facility: Detention Center
 CM: Install VFD on Hot Water Pumps
 Engineer: INITIALS

SAVINGS SUMMARY: Do not delete or move this Table			
	Baseline	Post-Retrofit	Savings
kWh blended	45,753	14,578	31,175
kWh incremental	0.0	0.0	0.0
Winter kW rates	0.0	0.0	0.0
Summer kW rates	0.0	0.0	0.0
MMBtu gas			
MMBtu oil			
MMBtu coal			
MMBtu steam			
MMBtu waste			
MMBtu other			
Ton/yr			

Variable:	Value:	Basis for Values:
Designation:	two 10 HP pumps. One running, one stand-by.	
Balance Temp	65.0	
motor input hp	10.0	
Exponent	2.1	
Minimum Drive Speed	50%	
Motor kW	7.7	
Motor load/efficiency equation:	$Y = Ax^2 + Bx + C$, where x is load percent	
A	-0.6143	
B	2.0857	
C	91.64	
Adjustment Factor for comparing motor	0.064	
VFD load/efficiency equation:	$Y = Ax^2 + Bx + C$, where x is load percent	
A	-1.2766	
B	4.1614	
C	93.84	

Heating loads vary proportionally from the balance temperature to the design temperature.
 Existing motor kWh is based on metered kW, which includes motor efficiency.

Basis for savings: reduce pump speed from existing full speed, in accordance with building load, down to a minimum speed.

30-year ASHRAE Weather Data		Heating %		Existing		New		New		New		New		New		New	
Temp Range (°F)	Avg. Temp in Bin (°F)	Hours in Bin	of Full Load	Existing Speed	Existing kW	Existing kwh	HW Pump Drive Speed	New HW Pump motor input hp	New HW Pump VFD Input kW	New HW Pump VFD Input kWh	Heating Saved kWh	Heating Saved kWh	Heating Saved kWh	Heating Saved kWh	Heating Saved kWh	Heating Saved kWh	Heating Saved kWh
95 to 100	97.5	3	0.0%	0%	0	-	0%	0.0	-	0	0	0	0	0	0	0	0
90 to 95	92.5	52	0.0%	0%	0	-	0%	0.0	-	0	0	0	0	0	0	0	0
85 to 90	87.5	104	0.0%	0%	0	-	0%	0.0	-	0	0	0	0	0	0	0	0
80 to 85	82.5	477	0.0%	0%	0	-	0%	0.0	-	0	0	0	0	0	0	0	0
75 to 80	77.5	856	0.0%	0%	0	-	0%	0.0	-	0	0	0	0	0	0	0	0
70 to 75	72.5	907	0.0%	0%	0	-	0%	0.0	-	0	0	0	0	0	0	0	0
65 to 70	67.5	619	0.0%	0%	0	-	0%	0.0	-	0	0	0	0	0	0	0	0
60 to 65	62.5	983	4.3%	100%	8	7,589	50%	2.4	1.8	1,810	5,759	5,759	5,759	5,759	5,759	5,759	5,759
55 to 60	57.5	625	14.3%	100%	8	4,813	90%	2.4	1.8	1,151	3,662	3,662	3,662	3,662	3,662	3,662	3,662
50 to 55	52.5	540	23.8%	100%	8	4,158	50%	2.4	1.8	994	3,164	3,164	3,164	3,164	3,164	3,164	3,164
45 to 50	47.5	676	33.3%	100%	8	4,435	50%	2.4	1.8	1,061	3,375	3,375	3,375	3,375	3,375	3,375	3,375
40 to 45	42.5	552	42.9%	100%	8	4,250	50%	2.4	1.8	1,016	3,234	3,234	3,234	3,234	3,234	3,234	3,234
35 to 40	37.5	1,067	52.4%	100%	8	8,216	52%	2.6	2.0	2,164	6,052	6,052	6,052	6,052	6,052	6,052	6,052
30 to 35	32.5	686	61.9%	100%	8	5,275	62%	3.7	2.9	1,965	3,309	3,309	3,309	3,309	3,309	3,309	3,309
25 to 30	27.5	442	71.4%	100%	8	3,403	71%	5.0	3.8	1,706	1,697	1,697	1,697	1,697	1,697	1,697	1,697
20 to 25	22.5	248	81.0%	100%	8	1,910	81%	6.5	5.0	1,241	689	689	689	689	689	689	689
15 to 20	17.5	184	90.6%	100%	8	1,417	80%	8.2	6.3	1,159	259	259	259	259	259	259	259
10 to 15	12.5	40	100.0%	100%	8	308	100%	10.1	7.8	310	(2)	(2)	(2)	(2)	(2)	(2)	(2)
TOTALS		8,760				48,753			2.0	14,878							

Variable	Value	Weight
Attributed C-F-H used in carbon	8,000	
Measured C-F-H	8,000	
Depleted % OA	20%	
Trapped loss to OA	17%	
Average over usage period	530	
Return to ground	80	
Average RA trap	80	
DMT release	80	
DMT function rate	80	
Leaching Efficiency (Eco)	7%	
IP System with Leco	0.01	
Estimated	80	
Crusher Out Port (%)	80	

OA rated for 20 persons
OA rated for 15 persons
OA at 10% min to cover make-up at requirement

[illegible]

Facility Name: Howard County Government - Central Library
ECM: Minimum Outside Air Controls with CO2 Sensor, HP108
Engineer: RKC

Assumed															11,888 TOTAL	
Temperature Bin		Hazardity Rate (Coulombs)	Da den	RA den	MAT	MAOH (Coulombs)	PHG time	PHG MHz/Hz	CC temp	Laser cooling time	Total time	MW	MWh			
Epoch	1/2 year														Total O&S	
88 to 100	87.5	3	82	10%	820	4,880	88.3	83.2	63.25	-	80	4	1	8	4.8	14
80 to 85	82.5	52	88	10%	820	4,880	87.8	82.8	67.75	-	80	4	1	4	4.2	220
88 to 90	87.5	104	88	10%	820	4,880	87.5	82.5	67.25	-	80	3	1	4	3.8	408
80 to 85	82.5	477	83	10%	820	4,880	88.8	83.3	68.78	-	80	3	1	4	3.8	1,738
78 to 80	77.5	888	85	10%	820	4,880	88.3	83.0	68.25	-	80	3	1	4	3.3	2,187
70 to 75	72.5	897	84	10%	820	4,880	88.78	83.4	68.75	-	80	3	0	3	2.7	2,620
88 to 90	87.5	818	83	10%	820	4,880	88.3	83.3	68.25	-	80	2	-	2	2.3	1,948
80 to 85	82.5	883	78	10%	820	4,880	88.8	87.8	64.78	-	80	2	-	2	2.1	2,078
55 to 60	57.5	825	30	10%	820	4,880	84.3	87.0	84.25	-	80	2	-	2	1.8	1,181
50 to 55	52.5	840	24	10%	820	4,880	83.8	86.4	83.78	-	80	-	-	-	0.0	-
45 to 50	47.5	878	18	10%	820	4,880	83.3	85.8	83.35	-	80	-	-	-	0.0	-
40 to 45	42.5	882	-	10%	820	4,880	82.8	84.0	82.78	-	80	-	-	-	0.0	-
35 to 40	37.5	1,087	-	10%	820	4,888	82.3	84.0	82.25	-	80	-	-	-	0.0	-
30 to 35	32.5	888	-	10%	820	4,880	81.8	84.0	81.78	-	80	-	-	-	0.0	-
25 to 30	27.5	442	-	10%	820	4,880	81.3	84.0	81.28	-	80	-	-	-	0.0	-
20 to 25	22.5	248	-	10%	820	4,880	80.8	84.0	80.78	-	80	-	-	-	0.0	-
15 to 20	17.5	164	-	10%	820	4,880	80.3	84.0	80.35	-	80	-	-	-	0.0	-
10 to 15	12.5	40	-	10%	820	4,880	80.8	84.0	80.30	-	80	-	-	-	0.0	-
															8,788	11,888

Variable	Value	Units
Scheduled CFM-not used in calc	3,300	
Measured CFM	3,300	Net Measured Design Extrudate
Baseline % OA	17%	
Prepared Min % OA	19%	Average over usage period
Prepared Min % OA	28%	
Average RA temp	65	Avg return yr. round
Average RA Gells	60	
OAT subject	60	
DAT humidity ratio	60	
Heating Efficiency (Eao)	78%	By system with Eao
Est collar factor	0.95	Estimated
Chiller "On" Point (F)	55	

QA sized for 25 persons	15%	254 cm
QA sized for 8 persons	9%	
QA at 90 min to cover make-up air requirements		

Current Conditions															Leaving Conditions															TOTAL	
Annual		Temperature Rise		Humidity Ratio (Grains/lb)		Enthalpy % OA		OA	RA	MAT	MARH (Grains/lb)	PHC temp	PHC MATH	GC temp	Leaving cooling tons	Total tons	MW	LHV													
Temp	Moisture	Temp	Moisture	Temp	Moisture	Temp	Moisture	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp	Temp													
85 to 100	87.5	3	62	15%	2,805	68.8	64.8	66.65	-	60	3	1	4	3.8	11																
80 to 85	82.5	52	58	15%	2,805	68.1	64.2	66.13	-	60	3	1	3	3.3	173																
85 to 90	87.5	104	65	15%	2,805	66.4	63.8	65.38	-	60	2	1	3	3.0	318																
80 to 85	82.5	477	33	15%	2,805	67.8	63.6	67.03	-	60	2	1	3	2.8	1,319																
75 to 80	77.5	697	80	15%	2,805	66.9	63.0	66.86	-	60	2	1	3	2.5	1,819																
70 to 75	72.5	868	64	15%	2,805	66.1	60.8	66.13	-	60	2	9	2	1.8	1,064																
65 to 70	67.5	818	53	15%	2,805	63.4	58.8	65.38	-	60	2	-	2	1.8	978																
60 to 65	62.5	843	30	15%	2,805	64.6	58.9	64.53	-	60	1	-	1	1.3	1,283																
55 to 60	57.5	825	20	15%	2,805	63.8	55.5	63.88	-	60	1	-	1	1.1	843																
50 to 55	52.5	540	24	15%	2,805	63.1	54.8	63.13	-	60	-	-	-	0.0	-																
45 to 50	47.5	578	18	15%	2,805	62.4	53.7	62.38	-	60	-	-	-	0.0	-																
40 to 45	42.5	552	11	15%	2,805	61.6	51.0	61.63	-	60	-	-	-	0.0	-																
35 to 40	37.5	1,067	1	15%	2,805	60.8	51.0	60.38	-	60	-	-	-	0.0	-																
30 to 35	32.5	685	0	15%	2,805	60.1	51.0	60.13	-	60	-	-	-	0.0	-																
25 to 30	27.5	442	0	15%	2,805	59.4	51.0	60.00	1	60	-	-	-	0.0	-																
20 to 25	22.5	248	0	15%	2,805	58.6	51.0	60.00	1	60	-	-	-	0.0	-																
15 to 20	17.5	184	0	15%	2,805	57.9	51.0	60.00	1	60	-	-	-	0.0	-																
10 to 15	12.5	40	0	15%	2,805	57.1	51.0	60.00	1	60	-	-	-	0.0	-																
															13	4	1,068														

Facility Name: Howard County Government - Central Library
ECM: Minimum Outside Air Controls with CO2 Sensor, HP101
Engineer: RKC

Annual		Temperature Rise Midpoint	Total O&E	Humidity Ratio (Grain/ton)	Proximal MOA	OA Cfm	RA cfm	MAT	MARPH (Grain/lb)	PMHC temp	PMHC Moisture	OC temp	Latent cooling tons	Total tons	kW	MMWh	
Temp	Temp																
85 to 100	97.5	52	3	82	0%	284	3,008	67.6	62.8	67.00	-	60	2	0	3	2.8	6
80 to 85	92.5	52	3	83	0%	284	3,008	67.2	62.2	67.20	-	60	2	0	3	2.4	126
81 to 80	97.5	184	25	85	0%	284	3,008	66.8	62.8	66.80	-	60	2	0	2	2.3	236
80 to 85	92.5	477	83	83	0%	284	3,008	66.4	61.8	66.40	-	60	2	0	2	2.1	1,017
75 to 80	97.5	636	89	80	0%	284	3,008	66.8	61.8	66.08	-	60	2	0	2	2.0	1,208
78 to 75	92.5	907	77	84	0%	284	3,008	66.4	60.3	65.90	-	60	2	0	2	1.8	1,465
83 to 70	87.5	618	53	83	0%	284	3,008	83.2	58.4	83.20	-	60	2	-	2	1.8	908
80 to 65	82.5	843	39	80	0%	284	3,008	84.8	64.3	84.80	-	60	1	-	1	1.4	1,331
58 to 60	87.5	625	30	30	0%	284	3,008	84.4	67.0	84.40	-	60	1	-	1	1.2	779
58 to 55	82.5	548	24	24	0%	284	3,008	84.8	67.1	84.00	-	60	-	-	-	0.0	-
45 to 50	47.5	578	18	18	0%	284	3,008	83.8	66.8	83.80	-	60	-	-	-	0.0	-
40 to 45	42.5	552			0%	284	3,008	83.2	66.2	83.20	-	60	-	-	-	0.0	-
35 to 40	37.5	1,087			0%	284	3,008	82.8	65.2	82.80	-	60	-	-	-	8.8	-
30 to 35	32.5	695			0%	284	3,008	82.4	65.2	82.40	-	60	-	-	-	8.9	-
25 to 30	27.5	442			0%	284	3,008	82.0	64.2	82.00	-	60	-	-	-	8.0	-
20 to 25	22.5	248			0%	284	3,008	81.6	63.2	81.60	-	60	-	-	-	0.0	-
18 to 20	17.5	184			0%	284	3,008	81.2	63.2	81.20	-	60	-	-	-	0.0	-
18 to 15	12.5	40			0%	284	3,008	66.8	55.2	66.80	-	60	-	-	-	0.0	-
		6,790											16	2		7,183	TOTAL

Howard County Gov. - ESG (Central Library)
VFD for Cooling Tower Fan

Project Description

Install VFD to control cooling tower fan operation.

Fan HP
Fan Hours/yr

Fan kW

			Base Case			Proposed Case			Savings		
db Temp	% Spd	% hrs/yr	% Load	kW	kWh	% Load	kW	kWh	kW	kWh	
97	100%	0%	100%	5.5	39	100%	5.5	39	0.0	0	
92	90%	1%	100%	5.5	394	90%	5.0	354	0.6	39	
87	80%	2%	100%	5.5	788	75%	4.1	591	1.4	197	
82	70%	10%	100%	5.5	3,939	60%	3.3	2,363	2.2	1,575	
77	60%	13%	100%	5.5	5,120	50%	2.8	2,560	2.8	2,560	
72	50%	20%	100%	5.5	7,877	35%	1.9	2,757	3.6	5,120	
67	40%	13%	100%	5.5	5,120	25%	1.4	1,280	4.1	3,840	
62	30%	20%	100%	5.5	7,877	25%	1.4	1,969	4.1	5,908	
57	20%	11%	100%	0.0	0	0%	0.0	0	0.0	0	
52	10%	10%	100%	0.0	0	0%	0.0	0	0.0	0	
47	0%	0%	0%	0.0	0	0%	0.0	0	0.0	0	
42	0%	0%	0%	0.0	0	0%	0.0	0	0.0	0	
37	0%	0%	0%	0.0	0	0%	0.0	0	0.0	0	
TOTAL		100%	due to cycling of fan		31,154				11,914	kWh / Yr =	19,240

[illegible]

QA sized for 65 persons	20% plus redupers estimate
QA sized for 20 persons	6%
QA at 18% min to cover make-up of requirement	600 chn

[illegible]

Global Facility Solutions, LLC

Facility Name: Howard County Government - Central Library
ECMC Minimum Outside Air Controls with CO2 Sensor, HP113
Engineer: RKC

Proposed Outcomes																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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		Assumed	Proposed	(lb/lb)	OA db	RA db	MAT	MARCH (Outside)	PMO Temp	PMO Mch/Br	OC Temp	Latent cooling lb/hr	Total lb/hr	WWh																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
Age	Temperature Bin	Assumed	Proposed	(lb/lb)	OA db	RA db	MAT	MARCH (Outside)	PMO Temp	PMO Mch/Br	OC Temp	Latent cooling lb/hr	Total lb/hr	WWh																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
65 to 100	87.5	3	85	10%	690	5,850	68.3	63.2	66.25	-	60	6	1	6	8.7	17																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
100 to 125	87.5	87	85	10%	680	5,800	67.8	62.8	67.75	-	60	6	1	6	8.3	276																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
125 to 150	87.5	104	85	10%	680	5,800	67.3	62.5	67.25	-	60	4	1	4	8.0	810																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
150 to 175	87.5	477	85	10%	650	5,698	66.8	62.2	66.75	-	60	4	1	4	8.8	2,173																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
175 to 200	77.5	665	80	10%	609	5,850	66.3	62.0	66.25	-	60	4	1	4	4.2	2,724																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
200 to 225	72.5	607	84	10%	650	5,800	65.8	60.4	65.75	-	60	3	0	3	3.3	3,028																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
225 to 250	67.5	818	93	10%	650	5,800	65.3	60.3	65.25	-	60	3	-	3	2.8	1,808																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
250 to 275	62.5	943	98	10%	650	5,800	64.8	57.8	64.75	-	60	3	-	3	2.6	2,065																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
275 to 300	57.5	825	90	10%	650	5,800	64.3	57.0	64.25	-	60	2	-	2	2.4	1,478																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
300 to 325	52.5	840	84	10%	650	5,800	63.8	56.4	63.75	-	60	-	-	-	0.0	-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
325 to 350	47.5	878	78	10%	650	5,800	63.3	56.8	63.25	-	60	-	-	-	0.0	-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
350 to 400	42.5	952	68	10%	649	5,850	62.8	54.0	62.75	-	60	-	-	-	0.8	-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
400 to 450	37.5	1,087	58	10%	680	5,850	62.3	54.0	62.25	-	60	-	-	-	0.8	-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
450 to 500	32.5	1,056	50	10%	680	5,850	61.8	54.0	61.75	-	60	-	-	-	8.0	-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
500 to 550	27.5	442	44	10%	680	5,850	61.3	54.0	61.25	-	60	-	-	-	8.0	-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
550 to 600	22.5	245	34	10%	650	5,850	60.8	54.0	60.75	-	60	-	-	-	0.0	-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
600 to 650	17.5	184	24	10%	680	5,850	60.3	54.0	60.25	-	60	-	-	-	0.0	-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
650 to 700	12.5	45	18	10%	650	5,850	59.8	54.0	60.00	0	60	-	-	-	0.0	-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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Table 1 - Utility Rates

Electric Rate	\$ 0.107	\$/kWh
Natural Gas	\$ 1.51	\$/Therm
Res. Heat Oil Rate		
Dist. Heat Oil Rate	\$ 2.22	\$/gal
Propane	\$ -	\$/gal
Chilled Water Rate		\$/tonhr

Notes:

1. Propane = 95,152 Btu/gal
2. Nat Gas = 144,000 Btu/gal
3. Pricing is average for the campus

Table 2 - Operating Costs

Existing			
Cooling			
255	MMBtu/yr cooling output		
8.00	EER	2.00	kW/ton
42,418	kWh/yr	1.78	COP
Proposed			
Cooling			
255	MMBtu/yr cooling		
9.00	EER	1.33	kW/ton
28,277	kWh/yr	2.64	COP
14,139	kWh/yr	Savings	

Existing

Seven of the nine RTU units serving the Recs and Parks building are original. The existing units are 14 to 15 years old and are not as efficient as current units. Data logging of five rooftop units (four existing and one new unit) was completed to verify the increase in efficiency of the units. The new units consume 40% less energy during cooling operation.

Proposed

The existing rooftop units will be replaced with new, high efficiency (EER = 9.0) York Predator rooftop units. Two 3,400 units with 3 HP fans.

Advantages

- Energy savings from higher efficiency units

Assumptions:

- Average increase in energy consumption is based on 40% increase in cooling efficiency. Heating efficiency (gas-fired) remains equal.

Table 1 - Utility Rates

Electric Rate	\$	0.107	\$/kWh
Natural Gas	\$	1.51	\$/Therm
Residual Oil Rate	\$	2.22	\$/gal
Distilled Oil Rate	\$	-	\$/gal
Propane	\$	-	\$/gallon
Chilled Water Rate	\$	-	\$/ton/hr

Notes:

- Propane = 95,152 Btu/gal
- Nat. Gas = 144,000 Btu/gal
- Pricing is average for the campus

Table 2 - Operating Costs

Existing			
Cooling	300 MMBtu/yr cooling output	6.00 EER	2.00 kWh/ton
		49,901 kWh/yr	1.76 COP
Proposed			
Cooling	300 MMBtu/yr cooling	9.00 EER	1.33 kWh/ton
		33,287 kWh/yr	2.64 COP
		16,634 kWh/yr	Savings

Existing
Seven of the nine RTU units serving the Recs and Parks building are original. The existing units are 14 to 15 years old and are not as efficient as current units. Data logging of five rooftop units (four existing and one new unit) was completed to verify the increase in efficiency of the units. The new units consume 40% less energy during cooling operation

Proposed
The existing rooftop units will be replaced with new, high efficiency (EER = 9.0) York Predator rooftop units. One 4,000 units with 3 HP fans.

Advantages
• Energy savings from higher efficiency units

Assumptions:
- Average increase in energy consumption is based on 40% increase in cooling efficiency. Heating efficiency (gas-fired) remains equal.

Table 1 - Utility Rates

Electric Rate	\$	0.107	\$/kWh
Natural Gas	\$	1.51	\$/Therm
Residual Oil Rate			
Distilled Oil Rate	\$	2.22	\$/gal
Propane	\$	-	\$/gal
Chilled Water Rate			\$/tonhr

Notes:

1. Propane = 95,152 Btu/gal.
2. Nat Gas = 144,000 Btu/gal.
3. Pricing is average for the campus.

Table 2 - Operating Costs

Existing:			
Cooling			
75	MMBtu/yr cooling output		
8.00	EER	2.00	kW/ton
12,476	kWh/yr	1.76	COP

Proposed:			
Cooling			
75	MMBtu/yr cooling		
8.00	EER	3.33	kW/ton
8,317	kWh/yr	2.64	COP
4,158	kWh/yr	Savings	

Existing

Seven of the nine RTU units serving the Recs and Parks building are original. The existing units are 14 to 15 years old and are not as efficient as current units. Data logging of five rooftop units (four existing and one new unit) was completed to verify the increase in efficiency of the units. The new units consume 40% less energy during cooling operation.

Proposed

The existing rooftop units will be replaced with new, high efficiency (EER = 8.0) York Predator rooftop units. One 1,000 units with 3/4 HP fans.

Advantages

- Energy savings from higher efficiency units

Assumptions:

- Average increase in energy consumption is based on 40% increase in cooling efficiency. Heating efficiency (gas-fired) remains equal.

Table 1 - Utility Rates

Electric Rate	\$	0.107	\$/kWh
Natural Gas	\$	1.51	\$/therm
Residual Oil Rate	\$	2.22	\$/gal
Dist. Fuel Oil Rate	\$	-	\$/gal
Propane	\$	-	\$/gallon
Oil Loss Value Rate	\$	-	\$/bbl

Notes:

1. Propane = 95,152 Btu/gal
2. Nat. Gas = 144,000 Btu/gal
3. Pricing is average for the campus

Table 2 - Operating Costs

Existing	90 MMBtu/yr cooling output	6.00 EER	2.00 kW/ton
Cooling			1.76 COP
	14,970 kWh/yr		
Proposed	90 MMBtu/yr cooling	9.00 EER	1.33 kW/ton
Cooling			2.64 COP
	9,980 kWh/yr		
	4,990 kWh/yr		Savings

Existing
Seven of the nine RTU units serving the Recs and Parks building are original. The existing units are 14 to 15 years old and are not as efficient as current units. Data logging of five rooftop units (four existing and one new unit) was completed to verify the increase in efficiency of the units. The new units consume 40% less energy during cooling operation

Proposed
The existing rooftop units will be replaced with new, high efficiency (EER = 9.0) York Predator rooftop units. Three 1,200 units with 1 1/2 HP fans.

Advantages
• Energy savings from higher efficiency units

Assumptions:
- Average increase in energy consumption is based on 40% increase in cooling efficiency. Heating efficiency (gas-fired) remains equal.

Facility: Howard County Gov. Detention Building Night Shift
 CR: Night Time Shut-Off RTUs - 2,3,4,5,7,8,10,11
 Engineer: RBC

Item	Quantity	Unit	Price	Total
1. Shut-Off RTUs	128.427	each	113.209	14,548.18
2. Controls	62.263	each	34.817	2,168.18
Total				16,716.36

Notes:
 1. All RTU average annual energy consumption during all peak years.
 2. All RTU average annual energy consumption during all peak years.
 3. All RTU average annual energy consumption during all peak years.

Item	Quantity	Unit	Price	Total
1. Shut-Off RTUs	128.427	each	113.209	14,548.18
2. Controls	62.263	each	34.817	2,168.18
Total				16,716.36

Existing

Heating and Cooling Consumption Analysis

Item	Quantity	Unit	Price	Total
1. Shut-Off RTUs	128.427	each	113.209	14,548.18
2. Controls	62.263	each	34.817	2,168.18
Total				16,716.36

Notes:
 1. All RTU average annual energy consumption during all peak years.
 2. All RTU average annual energy consumption during all peak years.
 3. All RTU average annual energy consumption during all peak years.

Proposed Occupied

Heating and Cooling Consumption Analysis

Item	Quantity	Unit	Price	Total
1. Shut-Off RTUs	128.427	each	113.209	14,548.18
2. Controls	62.263	each	34.817	2,168.18
Total				16,716.36

Notes:
 1. All RTU average annual energy consumption during all peak years.
 2. All RTU average annual energy consumption during all peak years.
 3. All RTU average annual energy consumption during all peak years.

Time	Run Speed (RPM)	CA RPM
0.00	1000	1000
0.05	1000	1000
0.10	1000	1000
0.15	1000	1000
0.20	1000	1000
0.25	1000	1000
0.30	1000	1000
0.35	1000	1000
0.40	1000	1000
0.45	1000	1000
0.50	1000	1000
0.55	1000	1000
0.60	1000	1000
0.65	1000	1000
0.70	1000	1000
0.75	1000	1000
0.80	1000	1000
0.85	1000	1000
0.90	1000	1000
0.95	1000	1000
1.00	1000	1000

Time	Run Speed (RPM)	CA RPM
0.00	1000	1000
0.05	1000	1000
0.10	1000	1000
0.15	1000	1000
0.20	1000	1000
0.25	1000	1000
0.30	1000	1000
0.35	1000	1000
0.40	1000	1000
0.45	1000	1000
0.50	1000	1000
0.55	1000	1000
0.60	1000	1000
0.65	1000	1000
0.70	1000	1000
0.75	1000	1000
0.80	1000	1000
0.85	1000	1000
0.90	1000	1000
0.95	1000	1000
1.00	1000	1000

Time	Run Speed (RPM)	CA RPM
0.00	1000	1000
0.05	1000	1000
0.10	1000	1000
0.15	1000	1000
0.20	1000	1000
0.25	1000	1000
0.30	1000	1000
0.35	1000	1000
0.40	1000	1000
0.45	1000	1000
0.50	1000	1000
0.55	1000	1000
0.60	1000	1000
0.65	1000	1000
0.70	1000	1000
0.75	1000	1000
0.80	1000	1000
0.85	1000	1000
0.90	1000	1000
0.95	1000	1000
1.00	1000	1000

Fan Power Calculations

Time	Run Speed (RPM)	CA RPM
0.00	1000	1000
0.05	1000	1000
0.10	1000	1000
0.15	1000	1000
0.20	1000	1000
0.25	1000	1000
0.30	1000	1000
0.35	1000	1000
0.40	1000	1000
0.45	1000	1000
0.50	1000	1000
0.55	1000	1000
0.60	1000	1000
0.65	1000	1000
0.70	1000	1000
0.75	1000	1000
0.80	1000	1000
0.85	1000	1000
0.90	1000	1000
0.95	1000	1000
1.00	1000	1000

Proposed Unoccupied

Time	Run Speed (RPM)	CA RPM
0.00	1000	1000
0.05	1000	1000
0.10	1000	1000
0.15	1000	1000
0.20	1000	1000
0.25	1000	1000
0.30	1000	1000
0.35	1000	1000
0.40	1000	1000
0.45	1000	1000
0.50	1000	1000
0.55	1000	1000
0.60	1000	1000
0.65	1000	1000
0.70	1000	1000
0.75	1000	1000
0.80	1000	1000
0.85	1000	1000
0.90	1000	1000
0.95	1000	1000
1.00	1000	1000

Table 1 - Utility Rates

Electric Rate	\$ 0.107	\$/kWh
Natural Gas	\$ 1.51	\$/Therm
Residual Oil Rate		
Dist. Ind. Oil Rate	\$ 2.22	\$/gal
Propane	\$ -	\$/gal
Chilled Water Rate		\$/tonhr

Notes:

1. Propane = 95,152 Btu/gal
2. Nat Gas = 144,000 Btu/gal
3. Pricing is average for the campus

Table 2 - Operating Costs

Existing			
Cooling			
1,992	MMBtu/yr cooling output		
5.50	EER	2.18	kW/ton
362,010	kWh/yr	1.61	COP
Proposed			
Cooling			
1,992	MMBtu/yr cooling		
10.00	EER	1.20	kW/ton
199,106	kWh/yr	2.93	COP
Savings		162,905	kWh/yr

Existing

The Dorsey Building is conditioned by 21 separate rooftop air handlers. Four original air handlers are VAV Mammoth RTU's that are over 25 years old. These units are leaking air from the unit seams to the outdoors, refrigerant lines are leaking and being repaired, coils are dirty.

Proposed

The existing rooftop units will be replaced with new, high efficiency (EER = 10.0) Trane Packaged Industrial Rooftop air handlers. The units will operate with a VFD instead of IGV. Replace units RTU-1, 3, 4.

Advantages

- Energy savings from higher efficiency units

Assumptions:

- Average increase in energy consumption is based on 45 to 50% increase in cooling efficiency due to the increase in the EER, reduction in air leakage and increase in efficiency due to dirty coils on the existing units. Heating efficiency remains the same (electric coils)

Table 1 - Utility Rates			
Electric Rate	\$	0.107	\$/kWh
Natural Gas	\$	1.51	\$/therm
Refrigerant Oil Rate	\$		
Distilled Oil Rate	\$	2.22	\$/gal
Propane	\$	-	\$/gal
Chilled Water Rate	\$		\$/ton-hr
Notes:			
1. Propane = 95,182 Btu/gal			
2. Nat Gas = 100,000 Btu/therm			
3. Pricing is average for the campus			

Table 2 - Operating Costs			
Existing			
Cooling	1,411 MMBtu/yr cooling output		
	5.50 EER	2.18	kWh/ton
		268,308	kWh/yr
			1.61 COP
Proposed			
Cooling	1,411 MMBtu/yr cooling		
	10.00 EER	1.20	kWh/ton
		140,989	kWh/yr
			2.93 COP
		115,339	savings, kWh/yr

Existing

The Dorsey Building is conditioned by 21 separate rooftop air handlers. Four original air handlers are VAV Mammoth RTU's that are over 25 years old. These units are leaking air from the unit seams to the outdoors, refrigerant lines are leaking and being repaired, coils are dirty.

Proposed

The existing rooftop units will be replaced with new, high efficiency (EER = 10.0) Trane Packaged Industrial Rooftop air handlers. The units will operate with a VFD instead of IGV. Replace units RTU-1, 3, 4.

Advantages

- Energy savings from higher efficiency units

Assumptions:

- Average increase in energy consumption is based on 45 to 50% increase in cooling efficiency due to the increase in the EER, reduction in air leakage and increase in efficiency due to dirty coils on the existing units. Heating efficiency remains the same (electric coils)

Howard County Gov. - ESG (Gateway Building)
VFD for AHU-1 (Check Calculation)

Project Description

Install VFD to control AHU-1 with 20HP fan. Four units each have 20HP fan. Units operate year round for cooling and heating.

Fan HP
Fan Hours/yr

Fan kW

			Base Case			Proposed Case			Savings		
db Temp	% Spd	% hrs/yr	% Load	kW	kWh	% Load	kW	kWh	kW	kWh	
97	100%	5%	100%	14.7	4,586	100%	14.7	4,586	0.0	0	
92	90%	20%	100%	14.7	18,346	90%	13.2	16,511	1.5	1,835	
87	80%	25%	100%	14.7	22,932	75%	11.0	17,199	3.7	5,733	
82	70%	20%	100%	14.7	18,346	60%	8.8	11,007	5.9	7,338	
77	60%	20%	100%	14.7	18,346	50%	7.4	9,173	7.4	9,173	
72	50%	10%	100%	14.7	9,173	35%	5.1	3,210	9.6	5,962	
67	40%	0%	100%	14.7	0	25%	3.7	0	0.0	0	
62	30%	0%	100%	14.7	0	25%	3.7	0	0.0	0	
57	20%	0%	100%	14.7	0	25%	3.7	0	0.0	0	
52	10%	0%	100%	14.7	0	25%	3.7	0	0.0	0	
TOTAL		100%			91,728				61,687	kWh / Yr =	30,041

Howard County Gov. - ESG (Gateway Building)
VFD for AHU-1 (Check Calculation)

Project Description

Install VFD to control AHU-5 with 25HP fan. Four units each have 20HP fan. Units operate year round for cooling and heating.

Fan HP
Fan Hours/yr

Fan kW

			Base Case			Proposed Case			Savings	
db Temp	% Spd	% hrs/yr	% Load	kW	kWh	% Load	kW	kWh	kW	kWh
97	100%	5%	100%	18.3	5,710	100%	18.3	5,710	0.0	0
92	90%	20%	100%	18.3	22,838	90%	16.5	20,555	1.8	2,284
87	80%	25%	100%	18.3	28,548	75%	13.7	21,411	4.6	7,137
82	70%	20%	100%	18.3	22,838	60%	11.0	13,703	7.3	9,135
77	60%	20%	100%	18.3	22,838	50%	9.2	11,419	9.2	11,419
72	50%	10%	100%	18.3	11,419	35%	6.4	3,997	11.9	7,422
67	40%	0%	100%	18.3	0	25%	4.6	0	0.0	0
62	30%	0%	100%	18.3	0	25%	4.6	0	0.0	0
57	20%	0%	100%	18.3	0	25%	4.6	0	0.0	0
52	10%	0%	100%	18.3	0	25%	4.6	0	0.0	0
TOTAL		100%			114,192			76,794	kWh / Yr =	37,398

Howard County Gov. - ESG (Gateway Building)

VFD for Cooling Tower Fan

Project Description

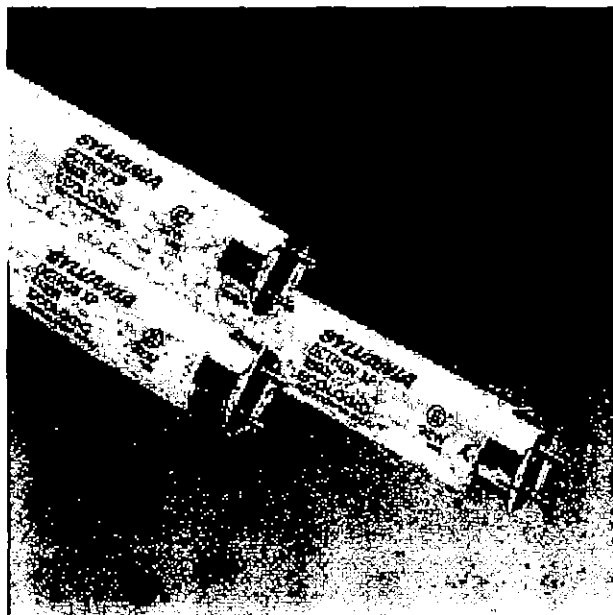
Install VFD to control cooling tower fan operation.

Fan HP Fan kW
 Fan Hours/yr Occupied Hrs per Yr. (16 hours per day operation)

db Temp	% Spd	% hrs/yr	Base Case			Proposed Case			Savings	
			% Load	kW	kWh	% Load	kW	kWh	kW	kWh
97	100%	5%	100%	36.7	4,228	100%	36.7	4,228	0.0	0
92	90%	15%	100%	36.7	12,684	90%	33.0	11,415	3.7	1,268
87	80%	20%	100%	36.7	16,911	75%	27.5	12,684	9.2	4,228
82	70%	30%	100%	36.7	25,367	60%	22.0	15,220	14.7	10,147
77	60%	15%	100%	36.7	12,684	50%	18.4	6,342	18.4	6,342
72	50%	10%	50%	18.4	4,228	35%	12.8	2,959	5.5	1,268
67	40%	5%	50%	18.4	2,114	25%	9.2	1,057	9.2	1,057
62	30%	0%	50%	18.4	0	25%	9.2	0	0.0	0
57	20%	0%	50%	18.4	0	25%	9.2	0	0.0	0
52	10%	0%	50%	18.4	0	25%	9.2	0	0.0	0
TOTAL		100%	due to cycling of fan		78,215			53,905 kWh / Yr =		24,310

LIGHTING

OCTRON® 700 and 800 ECOLOGIC® Fluorescent Lamps



- Designed to pass Federal TCLP test*
- Energy efficient T8 lamp
- OCTRON 700 and 800 Series linear 2, 3, and 4 foot lamps
- Color temperatures: 3000K, 3500K and 4100K in all sizes
- FO32 available with 78 or 85 CRI
- FO17 and FO25 available with 75 or 82 CRI
- 20,000-hour average rated life (longer for 4 foot lamps)
- Compatible with QUICKTRONIC® electronic ballasts
- QUICK 60+® System Warranty

ECOLOGIC® is a comprehensive program of OSRAM SYLVANIA focused on addressing environmental issues at all stages of lamp life.



SYLVANIA OCTRON T8 ECOLOGIC fluorescent lamps are designed to meet the Federal Toxicity Characteristic Leaching Procedure (TCLP) criteria for classification as non-hazardous waste in most states*.

The OCTRON 700 Series ECOLOGIC lamps, with color rendering index (CRI) of 75 (78 for the FO32) and 20,000 hours average rated life (or more for FO32), deliver T8 efficiency at a more affordable price. The OCTRON 800

Series ECOLOGIC lamps deliver higher lumens per watt and an improved CRI of 82 (85 for the FO32) compared to the 700 Series lamps.

Pair lamps from either family with QUICKTRONIC electronic ballasts for energy efficient systems backed by the QUICK 60+ system warranty from OSRAM SYLVANIA.

*Regulations may vary. Check your local and state regulations.

2-Lamp System Comparison

Lamp Type	Lamp Lumens	Ballast	Ballast Factor	System Wattage	System Lumens	Mean System Lumens	LPW	% Energy Savings
F40/D41	3200	Magnetic ¹	0.95	86	6080	5290	62	0%
F40/CW/SS	2650	Magnetic ¹	0.88	72	4665	4010	56	16%
FO32/800/ECO	2950	System ISN ²	0.88	59	5192	4932	84	31%
FO32/800/ECO	2950	System ISH ²	1.20	78	7080	6726	86	9%
FO32/800/ECO	2950	System 32ISL ²	0.78	51	4602	4372	86	41%

1. Energy saving magnetic ballasts.

2. ISN = instant start, normal ballast factor; ISH = instant start, high ballast factor; ISL = instant start, low ballast factor

Application Information

Applications	Application Notes
Office	1. Lamps starting down to -20°F (dependent on ballast)
Schools	2. Operation below 50°F may affect lumen output or lamp operation.
Retail	3. For cold temperature applications, use in enclosed fixture or use tube to maximize lamp performance.
Other general lighting	4. For rapid start operation, check with ballast manufacturer for ground plane requirement.
	5. For maximum energy savings, operate on electronic instant start ballast.

Product Availability

Lamp Type	Wattage	Lumens	CRI
F017/700/ECO	17	1300	75
F025/700/ECO	25	1950	75
F032/700/ECO	32	2800	78
F017/800/ECO	17	1350	82
F025/800/ECO	25	2150	82
F032/800/ECO	32	2950	85



Sample Specification

Lamp(s) shall be an OCTRON ECOLOGIC lamp(s) (F017/ECO, F025/ECO, F032/ECO) having medium bi-pin bases. Lamp(s) shall be designed to pass the Federal TCLP test in force at the time of manufacture. Lamp(s) shall have a correlated color temperature of (3000K, 3500K, 4100K, 5000K, or 6500K) and a CRI of (75, 78, 80, 82 or 85). The OCTRON lamp(s) shall be operated on dedicated QUICKTRONIC ballast(s) with complete system warranty from one manufacturer covering lamp(s) and ballast(s).

Warranty Information

QUICK 60+ warranty OSRAM SYLVANIA lamp and ballast combination Limited 30 month lamp warranty and a five year ballast warranty is possible if both lamps and ballasts are provided by OSRAM SYLVANIA. See the QUICK 60+[®] warranty for details and restrictions.

Ordering and Specification Information

Item Number	Ordering Abbreviation	Nominal Length	Base	Bulb	Avg. Rated Life (hrs) ^{1,2}	Initial Lumens	Mean Lumens ³	Color Temp.	CRI
21918	F017/730/ECO	24	Medium Bi-Pin	T8	20,000	1300	1170	3000K	75
21769	F017/735/ECO	24	Medium Bi-Pin	T8	20,000	1300	1170	3500K	75
21770	F017/741/ECO	24	Medium Bi-Pin	T8	20,000	1300	1170	4100K	75
21937	F025/730/ECO	36	Medium Bi-Pin	T8	20,000	1950	1755	3000K	75
21941	F025/735/ECO	36	Medium Bi-Pin	T8	20,000	1950	1755	3500K	75
21942	F025/741/ECO	36	Medium Bi-Pin	T8	20,000	1950	1755	4100K	75
21997	F032/730/ECO	48	Medium Bi-Pin	T8	25,000	2800	2520	3000K	78
21998	F032/735/ECO	48	Medium Bi-Pin	T8	25,000	2800	2520	3500K	78
21999	F032/741/ECO	48	Medium Bi-Pin	T8	25,000	2800	2520	4100K	78
22141	F032/750/ECO	48	Medium Bi-Pin	T8	25,000	2650	2385	5000K	78
22175	F032/765/ECO	48	Medium Bi-Pin	T8	25,000	2700	2430	6500K	78
22135	F017/830/ECO	24	Medium Bi-Pin	T8	20,000	1350	1242	3000K	82
22136	F017/835/ECO	24	Medium Bi-Pin	T8	20,000	1350	1242	3500K	82
22137	F017/841/ECO	24	Medium Bi-Pin	T8	20,000	1350	1242	4100K	82
22138	F025/830/ECO	36	Medium Bi-Pin	T8	20,000	2150	1978	3000K	82
22139	F025/835/ECO	36	Medium Bi-Pin	T8	20,000	2150	1978	3500K	82
22140	F025/841/ECO	36	Medium Bi-Pin	T8	20,000	2150	1978	4100K	82
22177	F032/830/ECO	48	Medium Bi-Pin	T8	30,000	2950	2802	3000K	85
22179	F032/835/ECO	48	Medium Bi-Pin	T8	30,000	2950	2802	3500K	85
21781	F032/841/ECO	48	Medium Bi-Pin	T8	30,000	2950	2802	4100K	85
22143	F032/850/ECO	48	Medium Bi-Pin	T8	30,000	2800	2660	5000K	80

- Based on 3 hrs/start on rapid start ballasts. Life is 15,000 hours on instant start ballasts except for F032 lamps, which are 24,000.
- Instant start life of 24,000 hours (28,000 hours for F032) at 12 hrs/start. Programmed start life of 28,000 hours (30,000 hours for F032/700; 35,000 hours for F032/800) at 12 hrs/start.
- Mean lumens measured at 8000 hours.

Ordering Guide

F0	32	/	7	35	/	ECO
Fluorescent	Wattage:		7 = 75-78 CRI	30 = 3000K		ECOLOGIC
OCTRON	17, 25 or 32 watts		8 = 80-85 CRI	35 = 3500K		
				41 = 4100K		
				50 = 5000K		
				65 = 6500K		

OSRAM SYLVANIA
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Fax: 1-800-762-7192

Display/Optic

Phone: 1-888-677-2627
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OSRAM SYLVANIA

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In Canada

OSRAM SYLVANIA LTD.
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2001 Drew Road
Mississauga, ON L5S 1S4

Industrial Commercial

Phone: 1-800-263-2852
Fax: 1-800-667-6772

Special Markets

Phone: 1-800-265-2852
Fax: 1-800-667-6772

FO06 8-foot OCTRON ECOLOGIC lamps also available.

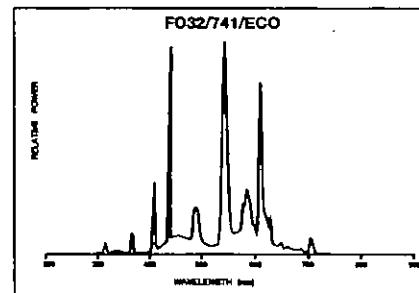
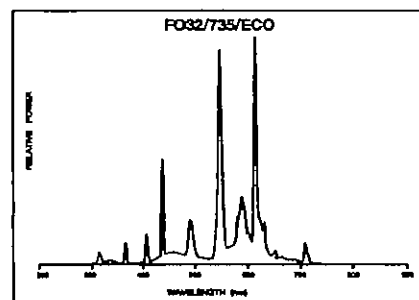
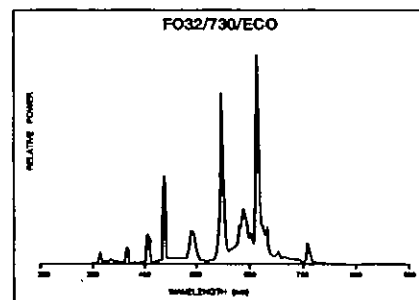
For longer life, higher initial lumens, better lumen maintenance and improved color rendition, please consider the OCTRON[®] 800XP[®] ECOLOGIC family of lamps.

Technical Information

Typical Fluorescent Lamp Mortality



Spectral Power Distribution

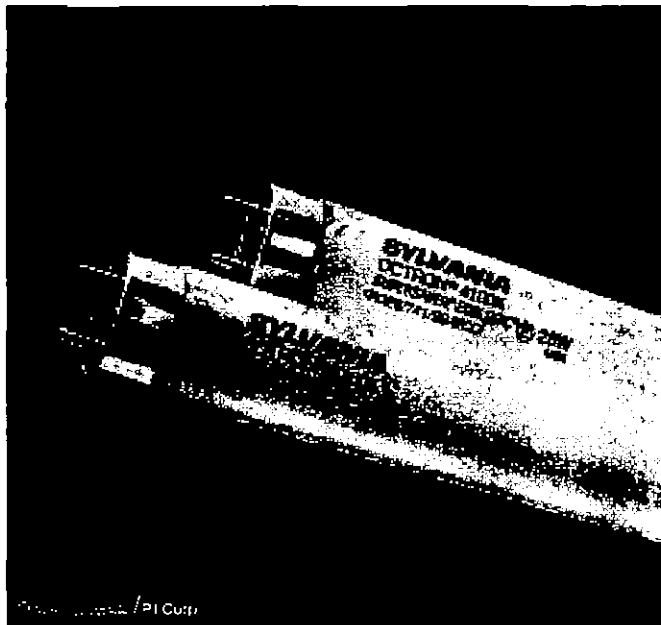


Visit our website: www.sylvania.com

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Product Information Bulletin

OCTRON® FOUR FOOT FO28 XP™ SUPERSAVER® ECO® Fluorescent Lamps



SYLVANIA 28 Watt OCTRON FO28 XP SUPERSAVER ECOLOGIC lamps operate on standard T8 instant start systems and provide 12.5% energy savings over standard 32 Watt OCTRON lamps. At \$.10/kWh and 4000 hours of operation per year, the 12.5% savings translates to a savings of \$5.70 per fixture per year for a 4-lamp fixture with a normal ballast factor, instant start ballast. The 94% lumen maintenance of the OCTRON FO28/800XP/SS/ECO lamp assures that light levels are maintained while energy is saved. These lamps pass the Federal TCLP test, classifying them as non-hazardous waste in most states. Group relamp to realize the benefits of these OCTRON lamps in your facility.

- 28 Watt, 4-foot, SUPERSAVER energy saving, T8 lamp
- 12.5% energy savings compared to standard 32W T8 lamp
- ECOLOGIC – Designed to pass TCLP¹
- Initial lumens - 2725
- 94% lumen maintenance
- 3000K, 3500K & 4100K
- 82 CRI
- Retrofit lamp for existing T8 instant start systems
 - 18,000 hour average rated life @ 3 hrs per start
- Operation on OSRAM SYLVANIA QUICKTRONIC® PSX Ballast possible, check for suitable applications
 - 24,000 hour average rated life at 3 hrs per start
- Minimum starting temperature: 60°F
- Not dimmable

SYLVANIA OCTRON T8 ECOLOGIC fluorescent lamps are designed to pass the Federal Toxicity Characteristic Leaching Procedure (TCLP) criteria for classification as non-hazardous waste in most states²



1. TCLP test results are based on NEMA LL Series standards and are available on request.
2. Lamp disposal regulations may vary; check your local & state regulations.

Product Availability

Lamp Type	Wattage	Color Temperature	CRI
F028/830XP/SS/ECO	28	3000K	82
F028/835XP/SS/ECO	28	3500K	82
F028/841XP/SS/ECO	28	4100K	82

Application Information

Applications

Retail
Office
Schools
Hospitals
Industrial

Many applications with T8 instant start ballasts currently using 32W T8 lamps

Fixtures

Contact your local fixture agent for available fixtures.

Ballast Information

Contact your OSRAM SYLVANIA representative for a list of compatible electronic operating systems.

Application Notes

1. Recommended to be used on T8 F32 Instant Start circuit with minimum starting voltage of 550V rms.

Application Notes (continued)

2. Not recommended to be used: (1) with Rapid Start circuits unless the open circuit voltage is greater than 550V, (2) at lamp ambient temperatures below 60°F or in drafty locations, (3) reduced current/reduced light output ballasts, (4) on low power factor ballasts, (5) dimming ballasts, or (6) Inverter operated emergency lighting systems unless any of the above equipment is specifically listed for 28 watt lamps. Any of the above situations could result in lamp starting and stabilization problems, or system compatibility issues.
3. Can operate on QUICKTRONIC® PSX ballast, check for suitable applications.
4. Fixture must conform to ANSI C78.1 – 1991 requirements for luminaire design.

SEE THE WORLD IN A NEW LIGHT **SYLVANIA**



Sample Specification

Lamp(s) shall be OCTRON F028 XP SUPERSAVER ECOLOGIC 4-foot lamp(s) having medium bi-pin bases. Lamp(s) shall be designed to pass the Federal TCLP test in force at the time of manufacture. Lamp(s) shall have an average rated life of 18,000 hours at 3 hours per start when operated on T8 instant start ballasts, 2725 initial lumens, 94% lumen maintenance at 40% of rated life, a correlated color temperature of (3000K, 3500K or 4100K) and a CRI of 82. The OCTRON SUPERSAVER ECOLOGIC lamp(s) shall be operated on QUICKTRONIC electronic, high frequency ballasts with complete system warranty from the manufacturer covering lamps and ballast.

Warranty Information

QUICK 60+™ warranty
for OSRAM SYLVANIA lamp and ballast combination
Limited 36 month lamp warranty and a five year ballast warranty is possible if both lamps and ballast are provided by OSRAM SYLVANIA. See the QUICK 60+ warranty for details and restrictions.

OSRAM SYLVANIA
National Customer
Support Center
18725 N. Union Street
Westfield, IN 46074

Industrial & Commercial

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Fax: 1-800-255-5043

National Accounts

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Fax: 1-800-562-4674

OEM & Special Markets

Phone: 1-800-762-7191
Fax: 1-800-762-7192

Photo-Optic

Phone: 1-888-677-2627
Fax: 1-800-762-7192

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System Comparison

4-Lamp Instant Start Systems: F028/800XP/SS/ECO vs F032/700/ECO

Lamp Type	Initial Lumens	Average Rated Life (hrs.)	Ballast	Ballast Factor	System Watts	Mean System Lumens	Relative Lumens	Relative Lamp Life	% Energy Savings	LPW
F032/741/ECO	2800	15,000	4-lamp IS	.90	114	9070	100%	100%	-	80
F028/841XP/SS/ECO	2725	18,000	4-lamp IS	.90	100	9221	102%	120%	12.5	90
F032/741/ECO	2800	15,000	4-lamp IS-L	.77	98	7760	100%	100%	-	79
F028/841XP/SS/ECO	2725	18,000	4-lamp IS-L	.77	86	7889	102%	120%	12.5	90
F028/841XP/SS/ECO	2725	24,000	4-lamp PSX	.71	82/80'	7275	94%	160%	17/19'	90/92'

1. Ballast is universal input, data is presented 120V/277V

Ordering and Specification Information

Item Number	Ordering Abbreviation	Watts	Bulb	Base	Initial Lumens	Mean Lumens ¹	Avg. Rated Life (hrs.) ²	CCT	CRI
22177	F028/830XP/SS/ECO	28	T8	Medium bi-pin	2725	2560	18,000	3000K	82
22178	F028/835XP/SS/ECO	28	T8	Medium bi-pin	2725	2560	18,000	3500K	82
22179	F028/841XP/SS/ECO	28	T8	Medium bi-pin	2725	2560	18,000	4100K	82

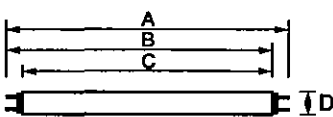
1. Measured @ 8000 hours

2. Based on 3 hours per start on instant start ballasts. At 12 hours/start, average rated life = 28,000 hours on instant start ballasts.

Ordering Guide

F0	28	/	8	35	XP	/	SS	/	ECO
Fluorescent OCTRON	Wattage = 28		CRI = 82	Color Temperature 30 = 3000K 35 = 3500K 41 = 4100K	Extended Performance		SUPERSAVER		ECOLOGIC

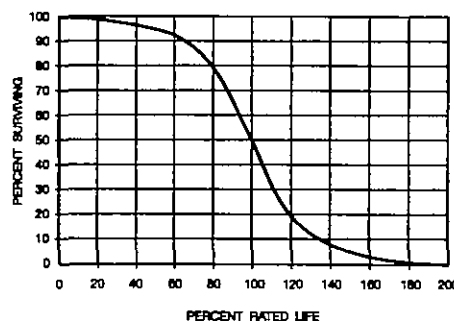
Dimensions



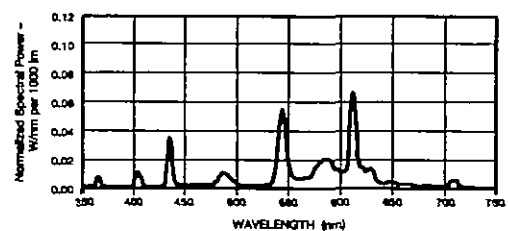
	(A) Maximum Overall Length (in.)	(B) Base Face to Opposite Pin (in.)	(C) Max. Base Face to Base Face (in.)	(D) Max. Outside Diameter (in.)
F028	47.78"	Min. 47.41" Max. 47.50"	47.22"	1.1"

Technical Information

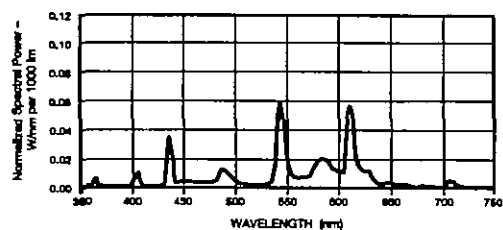
Typical Fluorescent Lamp Mortality



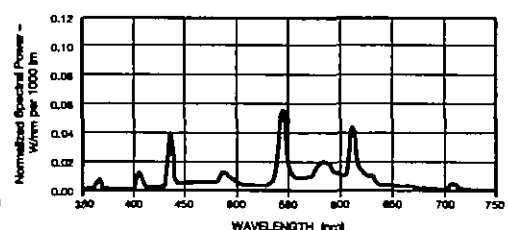
Octron 830



Octron 835



Octron 841



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QUICKTRONIC® T8 Instant Start UNIVERSAL VOLTAGE

High Efficiency Series

Normal Ballast Factor

Lamp/Ballast Guide

32W T8 - OCTRON®

QHE ISN SC Models

- 1-lamp QHE1x32T8/UNV
- 2-lamp QHE2x32T8/UNV
- 3-lamp QHE3x32T8/UNV
- 4-lamp QHE4x32T8/UNV

Also operates:

- FBO32, FBO31, FO25, FBO24, FO17, FBO16, FO30/SS (30W), FBO30/SS (30W), FBO29/SS (29W), FO28/SS (28W) & FO25/SS (25W)

FO40T8 operation:

- 1 lamp on 2L ballast
- 2 lamps on 3L ballast
- 3 lamps on 4L ballast

Note: FO40T8 0°F Starting Temp.

SYLVANIA QUICKTRONIC High Efficiency (QHE) energy-saving electronic T8 ballasts save up to 6% over standard electronic ballasts without compromising light output or lamp life. The added energy savings also provides for a quicker payback. QHE ballasts also meet the most demanding utility rebate standards.

SYLVANIA QUICKTRONIC High Efficiency (QHE)

operates OCTRON T8 lamps with maximum efficacy and high lumen output, and provides 30-44% energy savings when compared to F40T12 magnetic systems.

Small can enclosure allows for low profile fixture design. Small size also provides transportation, inventory and ergonomic benefits.

This product is also offered in new banded packaging and pallet packs.



SYLVANIA QUICKTRONIC High Efficiency (QHE) is also covered by our QUICK 60+® warranty, the first and most comprehensive lamp & ballast system warranty in the industry.

Parallel circuitry is utilized to keep the remaining lamps lit if one or more should go out.

Key System Features

- High Efficiency Systems over 90% efficient
- Over 100 LPW (lumens/watt) with OCTRON SUPERSAVER® lamps
- Lowest power T8 L.S. Systems
- Universal voltage (120-277)
- Small Can enclosure size
- 30-50% Energy savings
- -20°F (-29°C) min. starting temp. for OCTRON lamps
- 60°F (16°C) min. starting temperature with OCTRON SUPERSAVER lamps
- <10% THD
- Virtually eliminates lamp flicker

System Information

SYLVANIA QUICKTRONIC High Efficiency (QHE) operates from 120V through 277V, eliminating "wrong voltage" wiring errors and reducing the number of models in inventory by half.

SYLVANIA QUICKTRONIC High Efficiency (QHE) uses instant start operation to provide the highest system efficacy and to assure low temperature starting capability. Instant start also provides for maximum remote wiring distances.

SYLVANIA QUICKTRONIC High Efficiency (QHE) electronic ballasts have very low harmonic distortion (<10% THD) for high system performance.

Ballast operates at >42kHz to reduce potential interference with infrared control systems.

A complete OSRAM SYLVANIA System Performance Guide showing performance characteristics for all combinations of lamps and ballasts is available upon request.

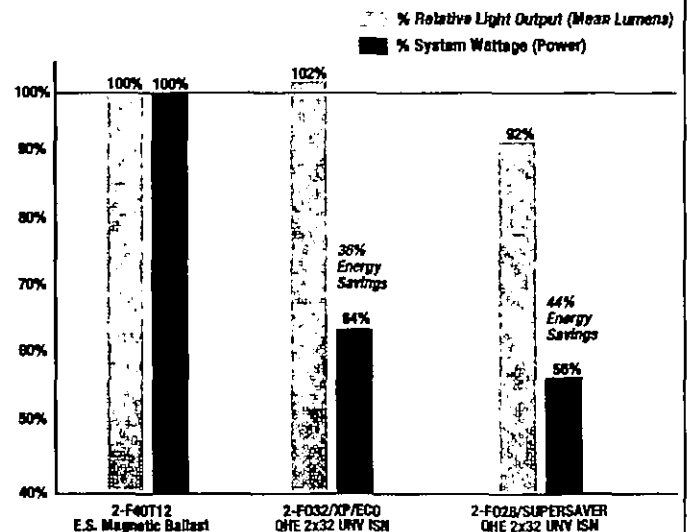
System Type (2-lamp)	Input Wattage	Initial Lumens	System LPW	Mean Lumens	Energy Savings
F40T12 - E.S. Magnetic Ballast	86	5795	67	4930	Baseline
F34T12 - E.S. Magnetic Ballast	72	4660	65	3960	16%
FO32/XP - QHE2x32T8/UNV ISN-SC	55	5280	96	5015	36%
FO28/SS - QHE2x32T8/UNV ISN-SC	48	4800	100	4580	44%

Application Information

SYLVANIA QUICKTRONIC High Efficiency

is ideally suited for:

- Any applications where the lowest power T8 systems are needed for maximum energy savings
- Energy Retrofits
- Commercial & Retail
- Hospitality & Institutional
- New Construction



ECS066R1

SEE THE WORLD IN A NEW LIGHT



Normal Ballast Factor T8 Instant Start UNV VOLTAGE High Efficiency Systems

<10% THD High Efficiency Electronic T8 Fluorescent Systems (Normal Ballast Factor)

Item Number	OSRAM SYLVANIA Description	Input Voltage (VAC)	Input Current (AMPS)	Lamp Type	Rated Lumens (lm)	No. of Lamps	Ballast Factor (BF)	System Lumens	Input Wattage (W)	System Efficacy (lm/W)
49851	QHE 1X32T8/UNV ISN-SC	120-277	0.25/0.11	F032/XP	3000	1	0.88	2640	28	94
			0.22/0.09	F030/SS	2850	1	0.88	2510	26	97
			0.21/0.09	F028/SS	2725	1	0.88	2400	25	96
			0.19/0.09	F025/SS	2475	1	0.88	2175	22	99
49853	QHE 2X32T8/UNV ISN-SC	120-277	0.47/0.20	F032/XP	3000	2	0.88	5280	55	96
			0.44/0.19	F030/SS	2850	2	0.88	5015	52	96
			0.40/0.18	F028/SS	2725	2	0.88	4800	48	100
			0.36/0.16	F025/SS	2475	2	0.88	4355	43	101
49855	QHE 3X32T8/UNV ISN-SC	120-277	0.69/0.30	F032/XP	3000	3	0.88	7920	83/82	95/97
			0.66/0.28	F030/SS	2850	3	0.88	7525	78/77	96/98
			0.61/0.26	F028/SS	2725	3	0.88	7195	72	100
			0.55/0.23	F025/SS	2475	3	0.88	6530	65/64	101/102
49857	QHE 4X32T8/UNV ISN-SC	120-277	0.91/0.39	F032/XP	3000	4	0.88	10560	108/107	98/99
			0.86/0.37	F030/SS	2850	4	0.88	10030	102/101	98/99
			0.80/0.35	F028/SS	2725	4	0.88	9680	95	101
			0.71/0.30	F025/SS	2475	4	0.88	8710	84/83	104/105

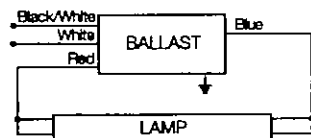
Products listed above are 10 pieces.

840 PC Pallet Packs

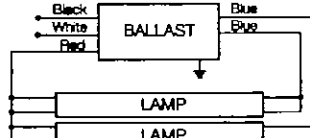
49852 QHE1X32T8/UNV-ISN-SC-PAL 49854 QHE2X32T8/UNV-ISN-SC-PAL
49856 QHE3X32T8/UNV-ISN-SC-PAL 49858 QHE4X32T8/UNV-ISN-SC-PAL

10 PC Banded Packs

49968 QHE1X32T8/UNV-ISN-SC-B 49969 QHE2X32T8/UNV-ISN-SC-B
49970 QHE3X32T8/UNV-ISN-SC-B 49971 QHE4X32T8/UNV-ISN-SC-B

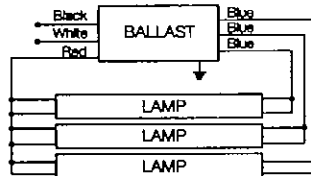


QUICKTRONIC 1x32



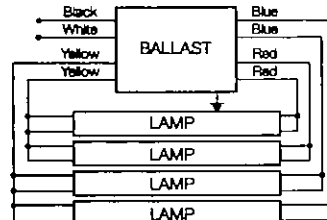
Note: For one lamp application, cap any blue lead. Insulate to 800 volts.

QUICKTRONIC 2x32



Note: For two lamp application, cap any blue lead. Insulate to 800 volts.

QUICKTRONIC 3x32



Note: For three lamp application, cap any yellow/blue lead. Insulate to 800 volts.

QUICKTRONIC 4x32

Specifications¹

Starting Method: Instant Start

Ballast Factor: 0.88

Circuit Type: Parallel

Lamp Frequency: > 40KHz

Lamp CCF: Less than 1.7

Starting Temp:¹

-20°F for OCTRON T8 lamps;

60°F for SUPERSAVER® T8 lamps

0°F for F040T8

Input Frequency: 50/60 Hz

Low THD: < 10%

Power Factor: > 98%

Voltage Range: 108-305V

UL Listed Class P, Type 1 Outdoor

CSA Certified (where applicable)

70°C Max Case Temperature

FCC 47CFR Part 18 Non-Consumer

Class A Sound Rating

ANSI C62.41 Cat. A Transient Protection

Remote Mounting up to 20 feet¹

¹ Operation below 50°F may affect light output or lamp operation - see "Low Temp. Starting" definition.

Dimensions:

Overall: 9.5" L x 1.68" W x 1.18" H

Mounting: 8.90"

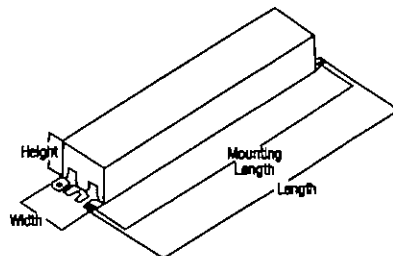
Packaging:

Quantity: 10 pieces/840 pieces

Weight: 1.6 lbs each (approx)

Wiring:

Leads only (no connectors provided)



System Life / Warranty

QUICKTRONIC products are covered by our QUICK 60+® warranty, a comprehensive lamp and ballast system warranty. For additional details, refer to our QUICK 60+ warranty bulletin.

Ordering Guide

Specifications subject to change without notice.

Item Number: 49855 QHE 3 x 32T8 / UNV ISN-SC Case Size
QUICKTRONIC High Efficiency Starting/Ballast Factor
Number of Lamps Line Voltage (120-277V)
Primary Lamp Wattage

QUICKTRONIC® PROStart® T5HO UNIVERSAL High Ambient Temp.

<10% THD Electronic T5HO Fluorescent Programmed Rapid Start Ballasts

Professional Series

Normal Light Output

Lamp/Ballast Guide

54W T5 - PENTRON® HO
1 or 2 lamp
QTP2x54T5HO/UNV PSN HT
QTP4x54T5HO/UNV PSN HT W

3 or 4 lamp
QTP4x54T5HO/UNV PSN HT W

Also operates:
FT55DL, FPC55, LS8

Four lamp switchable model can be wired for four, three, two or one lamp operation.

Two lamp fixed output model can be wired for one lamp operation.

Key System Features

- 90°C maximum case temp.
- Universal voltage (120-277)
- Low-profile (1.00" High)
- 100% Ballast factor
- QUICKSENSE ballast technology (end-of-lamp-life sensing)
- PROStart programmed start
- Occupancy sensor applications
- UL type CC rated
- -20°F Starting
- Operates at >40 KHz to reduce potential interference with infrared control systems
- High power factor
- Low harmonic distortion
- Lightweight
- UL, CSA, FCC

Application Information

SYLVANIA QUICKTRONIC PHO

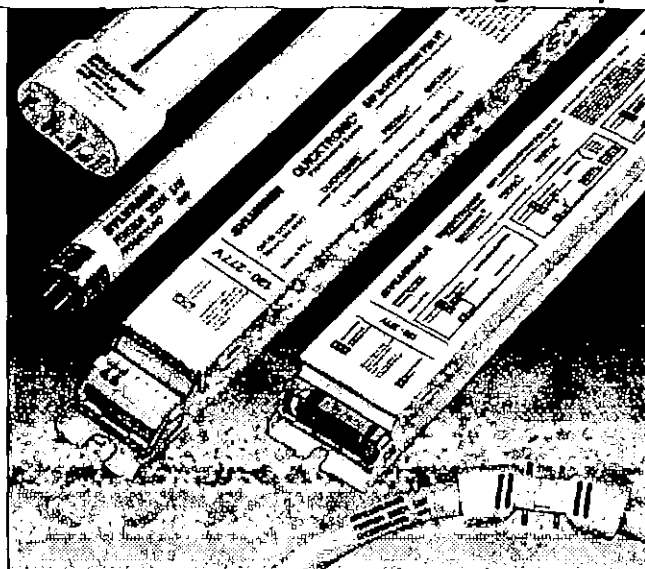
is ideally suited for:

- Industrial high-bay
- Commercial
- Retail
- Hospitality
- Institutional
- New construction
- Direct lighting
- Indirect lighting
- Surface mount
- Cove lighting

SYLVANIA QUICKTRONIC HIGH AMBIENT (HT) PHO operates PENTRON HO, PENTRON HO Circline, and DULUX® L T5 lamps with full lumen output and optimal system performance.

SYSTEM PHO High Ambient Temperature ballasts are specifically designed for applications where the ballast is subjected to higher ambient temperatures, as in high bay industrial installations. The four lamp UNV (120-277V) ballast system provides 18,600 mean lumens, which, when factoring in lumen maintenance and typical T5HO fixture efficiency, can be considered as a direct replacement for standard 400W MH. As such, the family is ideally suited to replace 250W and 400W metal halide installations.

Unique to the family is the 120-277V 4-lamp "switching" ballast, designed to switch from 4- to 3-, 3- to 2-, 3- to 1- or 2- to 1-lamps. The switching feature can be accessed through a second input power terminal. This feature allows for a range of



control interfaces, including an occupancy sensor, mounted inside a fixture.

SYSTEM PHO HT ballasts contain QUICKSENSE® ballast technology, a patented circuitry designed to shut down the system reliably and safely when lamps reach end-of-life.

Setting the standard for quality, SYSTEM PHO HT is also covered by our QUICK 60+® warranty, the first and most comprehensive system warranty in the industry.

SYSTEM PHO HT is available in four and two lamp models to cover a wide range of applications.

System Information

SYSTEM PHO HT operates on 120V through 277V, 50 or 60Hz current, eliminating "wrong voltage" wiring errors and reducing the number of ballast models in inventory by half.

PROStart ballasts provide optimum starting conditions and provide up to 100,000 switching cycles for use on occupancy sensors and building control systems.

QUICKSENSE ballast technology helps to protect against overheated bases and sockets, as well as cracking of the lamp glass wall, and uses dynamic end-of-lamp-life sensing to avoid

System Type	Input Wattage	Initial Lumens	System LPW
F40T12 - E.S. Magnetic Ballast (4-lamp)	172	11590	67
F34T12 - E.S. Magnetic Ballast (4-lamp)	144	9500	66
F032T8/XP - QT4x32IS (4-lamp)	114	10800	95
FP54T5 - QTP2x54T5HO/UNV PSN HT (2-lamp)	121	10000	83
FP54T5 - QTP4x54T5HO/UNV PSN HTW (4-lamp)	241	20000	83

false shutdowns caused by some static sensing methods. QUICKSENSE ballast technology will auto reset when spent lamps are replaced with new ones.

The four lamp unit can be wired for four, three, two or one lamp operation. The two lamp unit can be wired for one lamp operation, allowing for an additional 50% reduction in inventory model numbers.

SYSTEM PHO HT has a 25.4H (mm) profile. PENTRON T5 lamps are designed to provide peak performance at 35°C fixture ambient, allowing for smaller and more innovative fixtures.

<10% THD Electronic T5 HO High Ambient Fluorescent Systems

PROstart® T5HO UNV HIGH TEMP. Fixed Output & Switchable

Performance Guide

Item Number	Description	Input Voltage (VAC)	Input Current (AMPS)	Lamp Type	Rated Lumens (lm)	No. of Lamps	Ballast Factor (BF)	System Lumens	Input Power (Watts)	System Efficacy (lm/W)
QTP 2x54 T5HO Fixed Output BF 1.0										
49136	QTP 2x54T5HO/UNV PSN HT	120-277	1.00/0.43	FP54T5HO	5000	2	1.00	10000	121/118	83/85
(49135)*						1	1.00	5000	61	82
QTP 4x54 T5HO Switchable Model										
49161	QTP 4x54T5HO/UNV PSN HTW	120-277	2.00/0.85	FP54T5HO	5000	4	1.00	20000	241/236	83/85
(49160)**						3	1.00	15000	182/178	83/85
						2	1.00	10000	121/118	83/85
						1	1.00	5000	61	82

1 Also compatible with other manufacturer's equivalent lamp types that meet ANSI standards.
2 Rated lamp lumens and performance data based on PENTRON® HO lamps.
3 At 35°C lamp ambient temperature.

* (49135) QTP 2x54T5HO/UNV PSN HT: same as 49136, with leads.

** (49160) QTP 4x54T5HO/UNV PSN HTW: same as 49161, with leads.

Installation Notes

Switching: Simultaneously disconnect all ungrounded line conductors.
Install in accordance with National & Local Electric Code. Ground ballast case.

Dimensions:

Model QTP2x54 T5HO/UNV PSN HT enclosure size:

Overall: 16.73"L x 1.18"W x 1.0"H (425mm L x 30mm W x 25.4mm H)

Mounting: 16.34" (415mm)

Wiring:

Push-in connectors (no leads provided)

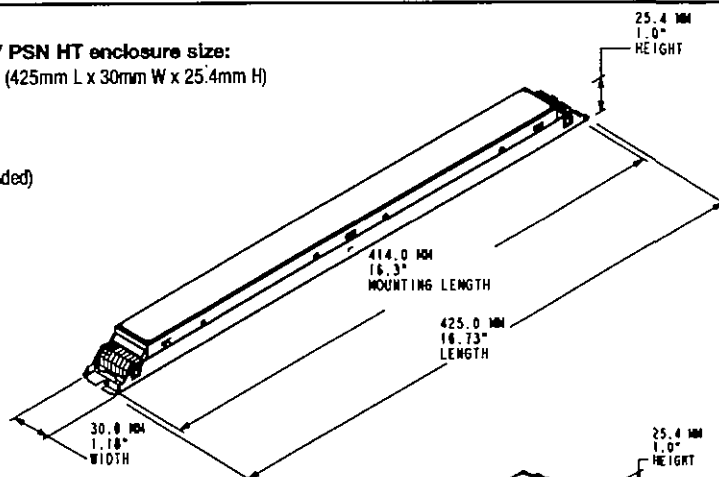
Use 18AWG solid copper wire only

See page 44 for wiring diagram.

Packaging:

Quantity: 20 (2-lamp)

Weight: 2L: 0.88 lbs each (approx)



Dimensions:

Model QTP4x54 T5HO/UNV PSN HT W enclosure size:

Overall: 16.73"L x 2.32"W x 1.0"H (425mm L x 59mm W x 25.4mm H)

Mounting: 16.34" (415mm)

Wiring:

Push-in connectors (no leads provided)

Use 18AWG solid copper wire only

See page 45 for wiring diagram.

Packaging:

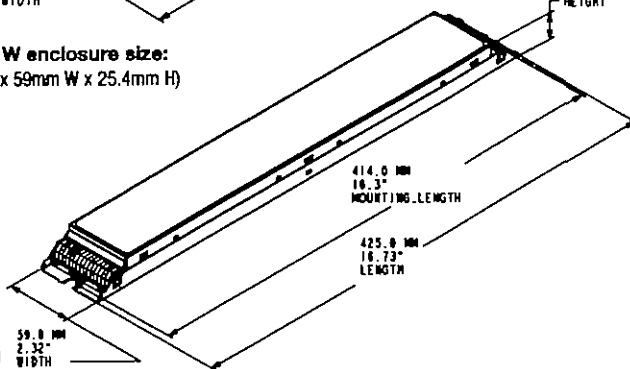
Quantity: 2-Lamp: 20 (no leads)

10 (with leads)

4-Lamp: 10 (leaded and non-leaded)

Weight: 2L: 0.88 lbs, 0.40kg each (approx)

4L: 1.68 lbs, 0.76kg each (approx)



Specifications¹

Starting Method: Programmed Start

Ballast Factor: 1.00

Circuit Type: Series

Lamp Frequency: > 40 KHz

Lamp CCF: Less than 1.6

Starting Temp: -20°F minimum⁵

Input Frequency: 50/60 Hz

Low THD: < 10%

Power Factor: > 98%

Voltage Range: +/-10% of Rated Input

UL Listed Class P, Type 1, Outdoor, Type CC
CSA Certified

High Ambient Applications:

90°C Max. Case Temp. (3 yr. warranty)

Standard Ambient Applications:

70°C Max. Case Temp. (5 yr. warranty)

FCC 47CFR Part 18 Non-Consumer

Class A Sound Rating

ANSI C62.41 Cat. A Transient Protection

Dynamic End-of-Lamp-Life Sensing

Remote Mounting up to 18 feet⁵

4 Data based on PENTRON HO lamp types for primary ballast application.

5 Operation below 50°F may affect light output or lamp operation - see "Low Temp. Starting" definition. Remote red and brown leads up to 18 feet. Keep blue and yellow (for 4-lamp model only) leads <10 feet.

System Life / Warranty

QUICKTRONIC® products are covered by our QUICK 60+® warranty, a comprehensive lamp and ballast system warranty. For additional details, refer to our QUICK 60+ warranty bulletin.

Ordering Guide

Specifications subject to change without notice.

Item Number	49161	QTP 4 x 54 T5HO/UNV PSN HTW	High Ambient Temperature (Case)
QUICKTRONIC PROFESSIONAL			Starting/Ballast Factor
Number of Lamps			Line Voltage (120-277V)
			Primary Lamp Wattage

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OSRAM SYLVANIA National Customer Service and Sales Center

1-800-LIGHTBULB (1-800-544-4828)

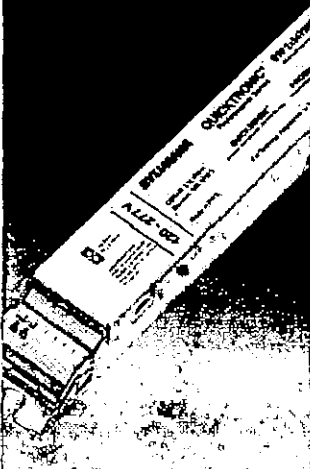
www.sylvania.com

the system solution®

2 LAMP T5HO UNV HT Fixed Output Ballast

<10% THD Electronic 2 Lamp T5HO High Ambient Fluorescent Systems

Lamp/Ballast Guide



Installation Notes

- Install in accordance with National & Local Electric Code
- Ground ballast case
- Switching: Simultaneously disconnect all ungrounded line conductors

Specifications

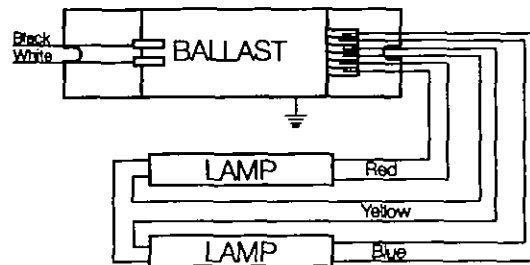
Refer to the last page of this Product Information Bulletin for full detail specifications.

Ordering Guide

Item Number 49136 QTP 2 x 54 T5HO/UNV PSN HT High Ambient Temperature
QUICKTRONIC PROFESSIONAL Starting/Ballast Factor
Number of Lamps (1, 2) Line Voltage (120-277V)
Primary Lamp Wattage

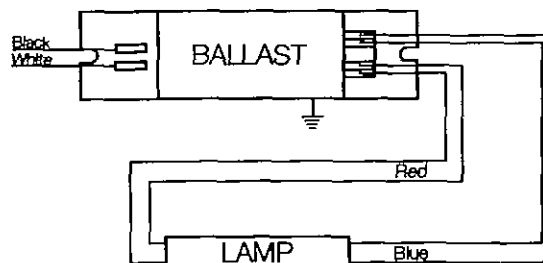
New high ambient model (90°C case temp.)
49136 QTP 2x54T5HO/UNV PSN HT

Wiring diagram for 2-Lamp model



2 LAMP

2-Lamp model can be wired for one lamp operation.



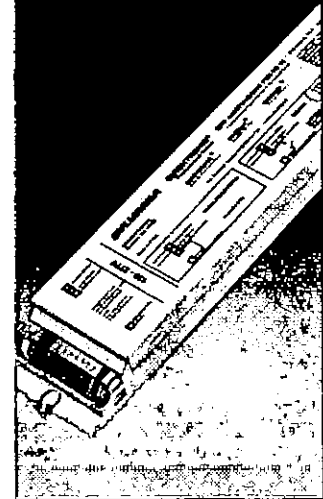
1 LAMP

SEE THE WORLD IN A NEW LIGHT



4 LAMP T5HO UNV HT Switchable Ballast

Switching Schematics



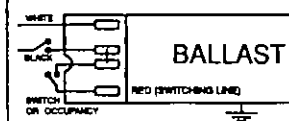
Installation Notes

- Install in accordance with National & Local Electric Code
- Ground ballast case
- Switching: Simultaneously disconnect all ungrounded line conductors
- The AC line inputs must be connected to the same phase of the line voltage
- DO NOT CONNECT two separate phases of line voltage to the input of the ballast

Input wiring for non-switching operation
(install jumper between black & red switching line terminals)



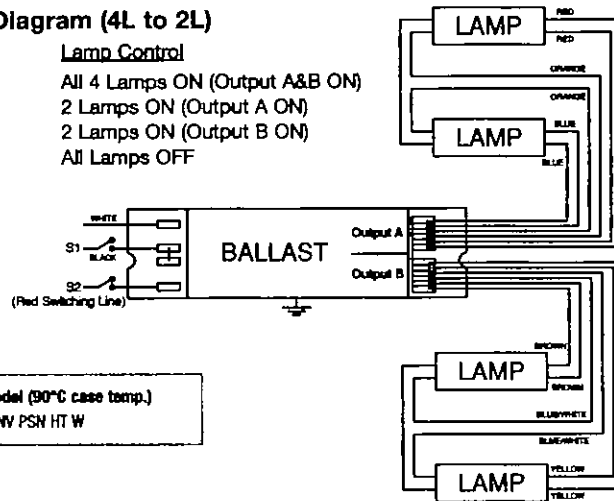
Input wiring for occupancy sensors
(install occupancy sensor/switch between black & red line terminals)



<10% THD Electronic 4 Lamp T5HO High Ambient Fluorescent Systems

4-Lamp Switching Wiring Diagram (4L to 2L)

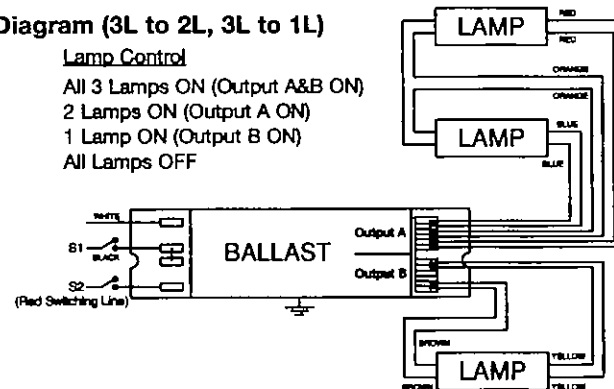
S1 (Output A)	S2 (Output B)	Lamp Control
Closed (ON)	Closed (ON)	All 4 Lamps ON (Output A&B ON)
Closed (ON)	Open (OFF)	2 Lamps ON (Output A ON)
Open (OFF)	Closed (ON)	2 Lamps ON (Output B ON)
Open (OFF)	Open (OFF)	All Lamps OFF



New high ambient switchable model (90°C case temp.)
49161 QTP 4x54T5HO/UNV PSN HT W

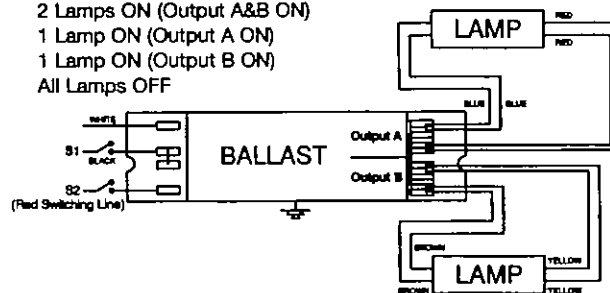
3-Lamp Switching Wiring Diagram (3L to 2L, 3L to 1L)

S1 (Output A)	S2 (Output B)	Lamp Control
Closed (ON)	Closed (ON)	All 3 Lamps ON (Output A&B ON)
Closed (ON)	Open (OFF)	2 Lamps ON (Output A ON)
Open (OFF)	Closed (ON)	1 Lamp ON (Output B ON)
Open (OFF)	Open (OFF)	All Lamps OFF



2-Lamp Switching Wiring Diagram (2L to 1L)

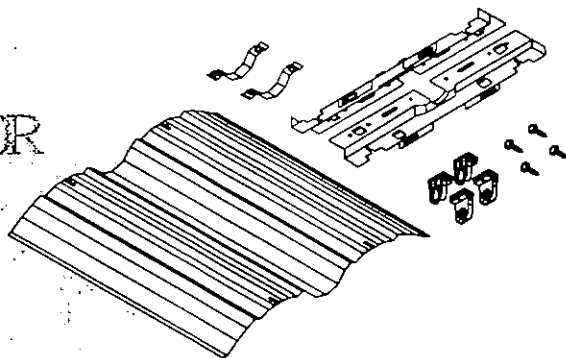
S1 (Output A)	S2 (Output B)	Lamp Control
Closed (ON)	Closed (ON)	2 Lamps ON (Output A&B ON)
Closed (ON)	Open (OFF)	1 Lamp ON (Output A ON)
Open (OFF)	Closed (ON)	1 Lamp ON (Output B ON)
Open (OFF)	Open (OFF)	All Lamps OFF



Item Number: 49161 QTP 4 x 54 T5HO/UNV PSN HTW — High Ambient Temperature (Case)
QUICKTRONIC PROFESSIONAL — Starting/Ballast Factor
Number of Lamps: — Line Voltage (120-277V)
Primary Lamp Wattage

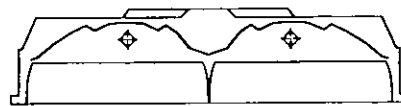
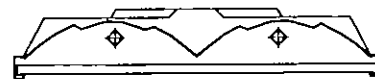
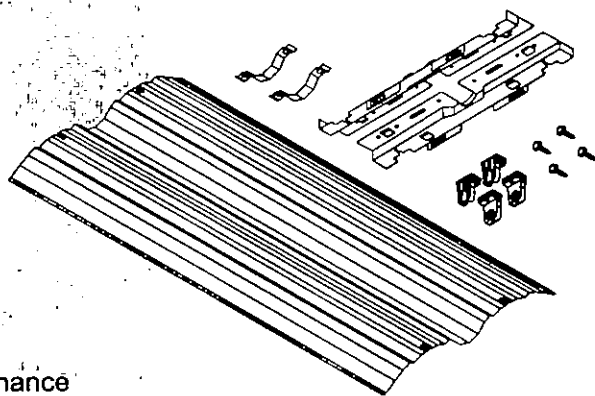
reflect-a-light™

SKLF1 SERIES REFLECTOR KIT



Application

Full coverage reflectors for 2x4 and 2x2 luminaires being converted to a 2-lamp configuration. Maximizes fixture efficiency, providing uniform light distribution. The reflector becomes the new ballast cover and easily snaps in and out for ballast maintenance. Kit contains reflector, mounting brackets, wire way guards, fasteners and shunted sockets.



Features

Increased fixture efficiency

Reduced maintenance costs

25 year warranty on specular reflectors.

Computer designed reflectors generate maximum light output and even light distribution

Kits include all parts needed for retrofit

Construction

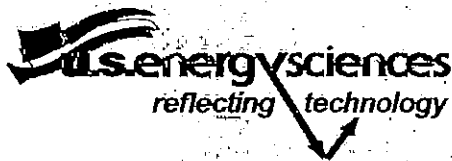
Reflectors are aluminum with a wide range of finish options to meet a full array of lighting needs. Brackets are constructed from die formed code gauge steel, embossed for strength and uniformity. All painted metal parts are pre-treated with a phosphate bonding process and painted with electrostatically applied high temperature baked white enamel for superior quality and durability. Material form, fit and thickness meet or exceed UL 1598 standards. Components are Underwriters Laboratories. classified for use in retrofit applications. Computer assisted design results in maximum light output, uniform light distribution, rigid strength and ballast access without the use of tools.

Installation

Installation of the retrofit kit is simple and easy. The process involves removing the existing lamps, sockets and ballast cover then installing the new brackets and sockets. Wireway guards and reflector are then easily snapped onto brackets.

GSA





SKLF1 Series

Photometric Data

All photometric reports and IES files are compiled by independent testing laboratories and are available either as a download from U.S. Energy Science's web site (<http://www.usenergysciences.com/ies.asp>) or are available on the CD-ROM Catalog.

Catalog Number: SKLF1T-C/EA/4
 Luminaire: Formed steel housing, formed aluminum specular reflector, prismatic lens
 Lamps: Two F32T8
 Ballast: Electronic 2-F32IS

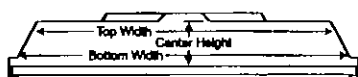
Coefficients of Utilization Zonal Cavity Method Reflectance: Floor Ceiling Walls 0.20 0.20 0.20												
RC	80%				70%				50%			
RW	70%	50%	30%	10%	70%	50%	30%	10%	50%	30%	10%	
0	96	96	96	96	94	94	94	94	89	89	89	
1	89	86	84	81	87	85	82	80	81	79	77	
2	83	78	73	70	81	76	72	69	74	70	67	
3	77	70	65	61	75	69	64	60	67	63	59	
4	72	64	58	53	70	63	57	53	61	56	52	
5	66	58	51	47	65	57	51	47	55	50	46	
6	62	53	46	42	60	52	46	42	50	45	41	
7	58	48	42	37	56	47	41	37	46	41	37	
8	53	43	37	33	52	43	37	33	42	36	33	
9	49	39	33	29	48	39	33	29	38	33	29	
10	46	36	30	26	45	36	30	26	35	30	26	

Plane: 0-DEG 90-DEG
 Spacing Criteria: 1.1 0.9
 Efficiency: 83.20%

Photometric Certified by: Luminaire Testing Laboratory
 Report No. 1311

Dimensional Guide

SKLF1T Series is available in many different profiles. Profile is determined by luminaire's internal body dimensions. WHILE THE C STYLE REFLECTOR will fit most applications, dimension sheets can be completed and faxed to the factory for correct sizing. Reflector dimensions are available in the table to the immediate right.



Profile Dimensions		Top Width	Center Height	Bottom Width
SKLF1-A		14.000	21.125	1.875
SKLF1-C		14.000	19.500	1.875
SKLF1-H		14.000	20.500	1.875

Ordering Guide

SKLF1T - A - SA - 4

Reflector Kit	Reflector Style	Reflector Material	Luminaire Length
---------------	-----------------	--------------------	------------------

Reflector Series

See dimension specifications for correct application and reflector nomenclature

SKLF1T = Socketed Kit includes shunted sockets, one piece reflector, brackets and self-tapping screws.

KLF1T = Non-socketed kit includes one piece reflector, brackets and self-tapping screws.

RLF1 = One piece reflector only.

Kit/Reflector Style

SKLF1T-A or KLF1T-A or RLF1-A
 SKLF1T-C or KLF1T-C or RLF1-C
 SKLF1T-H or KLF1T-H or RLF1-H

Reflector Material

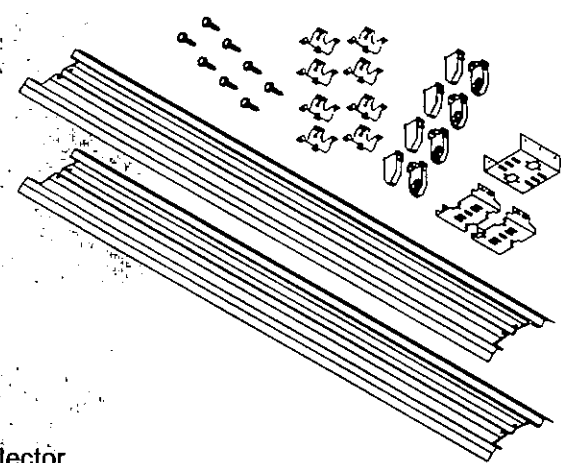
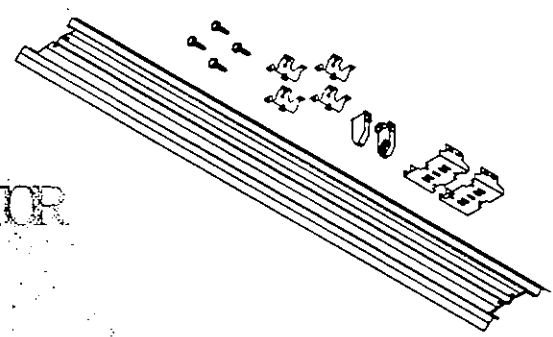
SA = Specular Aluminum
 EA = Enhanced Aluminum
 WP = White Paint

Luminaire Length

2 = 2 feet
 4 = 4 feet

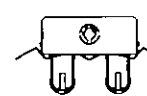


SKSS SERIES REFLECTOR KIT



Application

The SKSS reflector kits are designed to convert standard two lamp T12 strip luminaires to highly efficient one or two lamp T8 or T5 luminaires. The SKSS configuration provides optimum performance for heights up to 12 feet. Retrofit maximizes fixture efficiency and provides uniform light distribution. The reflector can be easily removed for maintenance without tools. Kit contains reflector, mounting brackets, fasteners and shunted locking sockets.



Features

- Easy Installation
- Highly efficient reflector
- Reduced maintenance costs
- Increased lamp and ballast life
- 25 year warranty on specular reflectors
- Computer designed reflectors create maximum light output and even light distribution
- Kits include all parts needed for retrofit

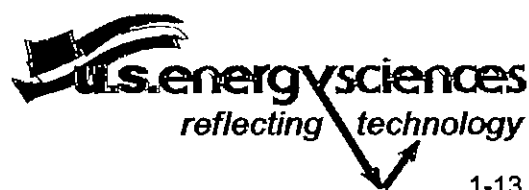
Construction

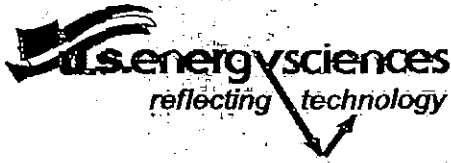
Reflectors are aluminum with a wide range of finish options to meet a full array of lighting needs. Brackets are constructed from die formed code gauge steel. All painted metal parts are pre-treated with a phosphate bonding process and painted with electrostatically applied high temperature baked white enamel for superior quality and durability. Material form, fit and thickness meet UL 1598 standards. Components are Underwriters Laboratories classified for use in retrofit applications. Computer assisted design results in maximum light output uniform light distribution, rigid strength and ballast access without the use of tools.

Installation

Installation of the retrofit kit is simple and easy. The process involves removing the existing lamps and sockets and then installing the new brackets and sockets. The reflector is then easily attached to the brackets with quarter-turn fasteners. The reflector will serve as the ballast cover. Universal end brackets as shown can be used with either one or two lamp conversions.

GSA





SKSS Series

Photometric Data

All photometric reports and IES files are compiled by independent testing laboratories and are available either as a download from U.S. Energy Science's web site (<http://www.usenergysciences.com/ies.asp>) or are available on the CD-ROM Catalog

Catalog Number: SKSS4/SA/4-1BE or SKSS4/SA/8-2BE
 Luminaire: Formed steel housing, formed aluminum specular reflector
 Lamps: 4-1BE - One F32T8
 8-2BE - Two F32T8
 Ballast: Electronic 1-F32IS or 2-F32IS

Catalog Number: SKSS4/SA/4-2BE or SKSS4/SA/8-4BE
 Luminaire: Formed steel housing, formed aluminum specular reflector
 Lamps: 4-2BE - One F32T8
 8-4BE - Two F32T8
 Ballast: Electronic 2-F32IS or 4-F32IS

Coefficients of Utilization - Zone Cavity Method Effective Room Cavity Ratio Reference 0.20												
RC	80%				70%				50%			
RW	70%	50%	30%	10%	70%	50%	30%	10%	50%	30%	10%	
0	111	111	111	111	107	107	107	107	101	101	101	
1	99	94	89	85	96	91	86	83	85	82	79	
2	89	81	74	68	86	78	72	66	74	68	64	
3	81	71	62	56	78	69	61	55	65	58	53	
4	74	62	53	47	71	60	52	46	57	50	44	
5	67	54	45	39	65	53	44	38	50	43	37	
6	61	48	39	33	59	47	38	32	44	37	31	
7	56	43	34	28	54	42	33	27	40	32	27	
8	52	38	29	24	50	37	29	23	35	28	23	
9	47	34	26	20	46	33	25	20	31	24	19	
10	44	31	23	17	42	30	22	17	28	22	17	

Coefficients of Utilization - Zone Cavity Method Effective Room Cavity Ratio Reference 0.20												
RC	80%				70%				50%			
RW	70%	50%	30%	10%	70%	50%	30%	10%	50%	30%	10%	
0	103	103	103	103	101	101	101	101	96	96	96	
1	93	88	84	80	90	86	82	79	82	79	76	
2	84	76	69	64	81	74	68	63	71	66	62	
3	78	66	59	53	74	65	58	52	62	56	51	
4	70	59	50	44	68	57	50	44	55	49	43	
5	63	51	43	37	61	50	43	37	48	42	36	
6	58	46	38	32	56	45	37	31	43	36	31	
7	53	41	33	27	52	40	33	27	39	32	27	
8	49	37	29	23	48	36	28	23	35	28	23	
9	45	33	25	20	44	32	25	20	31	24	20	
10	42	30	22	17	41	29	22	17	28	22	17	

Plans: 0-DEG 90-DEG
 Spacing Criteria: 1.2 1.7
 Efficiency: 94.2%

Photometric Certified by: **Luminaire Testing Laboratory**
 SKSS4/SA/4-1BE Report No. 1655A
 SKSS4/SA/8-2BE Report No. 1656B

Plans: 0-DEG 90-DEG
 Spacing Criteria: 1.2 1.7
 Efficiency: 86.8%

Photometric Certified by: **Luminaire Testing Laboratory**
 SKSS4/SA/4-2BE Report No. 1657A
 SKSS4/SA/8-4BE Report No. 1657B

Ordering Guide

SKSS - 4 - SA - 4 - 2 B

Reflector Series	Channel Width	Reflector Material	Luminaire Length	No. of Lamps	Socket Pin Option
------------------	---------------	--------------------	------------------	--------------	-------------------

Reflector Series
 SKSS = Reflector Kit w/ sockets
 KSS = Reflector Kit w/o sockets

Channel Width
 4 = 4.25 inch width
 5 = 5 inch width
 (Specify if other width)
 A = Adj brkts

Reflector Material
 SA = Specular Aluminum
 EA = Enhanced Aluminum
 WP = White Paint Aluminum

Luminaire Length
 4 = 4 feet or 48 inches
 8 = 8 feet or 96 inches

Number of Lamps
 1 = One Lamp
 2 = Two Lamps (4 ft. & 8 ft.)
 4 = Four Lamps (8 ft. Only)

Socket Pin Option
 B = T8 Bi-pin Socket
 C = T5 Bi-pin Socket
 S = Slimline Socket



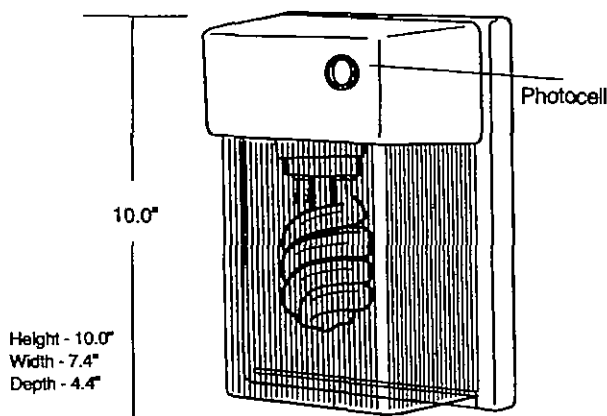


570 Series Outdoor Wall Pack Specifications

2-Piece SpringLamp®

- 4 pin, NPF Compact Fluorescent, 10,000 Hours lamp life

Item #	Watts	Incandescent Wattage Comparison	Description	Initial Lumens	Input Line Current	Height (Inches)	Width (Inches)	Replacement Lamps
57026BK	26	100	Wall Pack, Black, Prismatic diffuser	1750	.45A	10.0	7.4	35026
57026WH	26	100	Wall Pack, White, Prismatic diffuser	1750	.45A	10.0	7.4	35026
57026BPC	26	100	Wall Pack, Black, Prismatic diffuser, Photocell	1750	.45A	10.0	7.4	35026
57026WPC	26	100	Wall Pack, White, Prismatic diffuser, Photocell	1750	.45A	10.0	7.4	35026
57032BK	32	120	Wall Pack, Black, Prismatic diffuser	2100	.49A	10.0	7.4	35032
57032WH	32	120	Wall Pack, White, Prismatic diffuser	2100	.49A	10.0	7.4	35032
57032BZ	32	120	Wall Pack, Bronze, Prismatic diffuser	2100	.49A	10.0	7.4	35032
57032BPC	32	120	Wall Pack, Black, Prismatic diffuser, Photocell	2100	.49A	10.0	7.4	35032
57032WPC	32	120	Wall Pack, White, Prismatic diffuser, Photocell	2100	.49A	10.0	7.4	35032
57032BZPC	32	120	Wall Pack, Bronze, Prismatic diffuser, Photocell	2100	.49A	10.0	7.4	35032



2 Piece
SpringLamp



Specifications (at full brightness)

End of Life Protection	Yes
Ballast Type	Electronic
Starting Method	Modified Rapid Start
Input Line Voltage	120VAC
Input Line Frequency	50/60HZ
Lamp Life (rated)	10,000 Hours
Ballast Life (rated)	50,000 Hours
Color Temperature	2700°K
Color Rendering Index	84
Minimum Starting Temperature	-20 ° F
Maximum Operating Temperature	160 ° F
U.L. / C.U.L. Listed	Yes
FCC Compliance	Part 18, Subpart C
Lamp Operating Frequency	45 KHZ
Lamp Current Crest Factor	< 1.60
Maximum Open Circuit Voltage	600V
Power Factor	>.50
Total Harmonic Distortion	< 150%
Dimming Range	N/A

Applications:

- Use outdoors, mounts flush to a wall
- Perfect for: Porches, Door ways, Garages

Features and Benefits

- UL approved for wet locations
- Long life, 10,000 hour average rated lamp life
50,000 hour average rated ballast life
- Lasts 7 years, based on 3 hours use per day
- Lasts 10-13 times longer than similar incandescent
- Replace less often, ideal for hard to reach places
- Lower maintenance and labor costs for lamp replacements
- 2700°K color temperature closest to incandescent light
- Quick run-up time
- Instant start, flicker free
- End of Life logic guards against violent failures
- World class phosphor insures high lumen output and excellent lumen maintenance



ISO 9002
CERTIFIED

2 YEAR FIXTURE
WARRANTY

1 YEAR LAMP
WARRANTY

lamina®

Bright Lights. Bright Ideas.®

SōL™ SERIES



DESCRIPTION

The Lamina SōL MR16 (GU5.3) is a LED Bi-Pin base lamp that delivers light output typical of most halogens while consuming 70% less energy. These MR16 lamps are designed for lighting applications powered by low voltage supplies (12V AC/DC) ensuring reliable operation for 50,000 hours (25X more than a halogen) making them ideal for long duty cycle, "always-on" applications and hard to reach locations.

The Lamina SōL MR16 LED is also fully dimmable, emits no UV and generates very little heat allowing it to be placed in highly temperature sensitive areas.

Lamina is the only energy-efficient lighting company that provides certified CO₂ avoidance metrics for all of its solid state LED products, thereby offering valuable decision criteria relating to environmental stewardship.

APPLICATIONS

Track Lighting / Down Lighting / Accent Lighting / General / Architectural / Landscape / Display Case / Cabinet / Signage / Back / Aerospace / Industrial OEM Equipment / Bio-Medical / Medical Lighting



PENDANT



WALL



SUSPENSION



CEILING



CHANDLIER



HEAD



RECESSED



TRACK



MONORAIL

WARNING: Not for use in fully enclosed fixtures. For use in open-air fixtures only. See Data Sheet for transformer compatibility.



SPECIFICATIONS

Part Number	Color	Color Temp. Typical (K)	CRI TYP / MIN	Forward Voltage	Power Consumption Typical (W)	Beam Type	Beam Angle	Luminous Flux¹ (lm) TYP / MIN	Wavelength (nm) MIN / MAX
RL-16D2-0496	Warm White	3050	58 / 48	12V AC/DC	7.4	Narrow	38°	200 / 175	—
RL-16D0-0460	Daylight White	4700	66 / 60	12V AC/DC	7.4	Narrow	32°	200 / 170	—
RL-16D1-0518	TruColor	3050	81 / 74	12V AC/DC	7.4	Wide	57°	120 / 104	—
RL-16A0-0524	Red	—	—	12V AC/DC	6.6	Wide	57°	125 / 93	619 / 631
RL-16E0-0527	Amber	—	—	12V AC/DC	7.4	Wide	57°	72* / TBD	584 / 596
RL-16B1-0525	Blue	—	—	12V AC/DC	7.4	Wide	57°	63* / TBD	460 / 470
RL-16C1-0526	Green	—	—	12V AC/DC	7.4	Wide	57°	205* / TBD	515 / 535

* Preliminary Data

Base: GU5.3

Wattage: 8W

Rated Life: 10+ Years / >50,000 Hours

Operating Temperature: 40°C

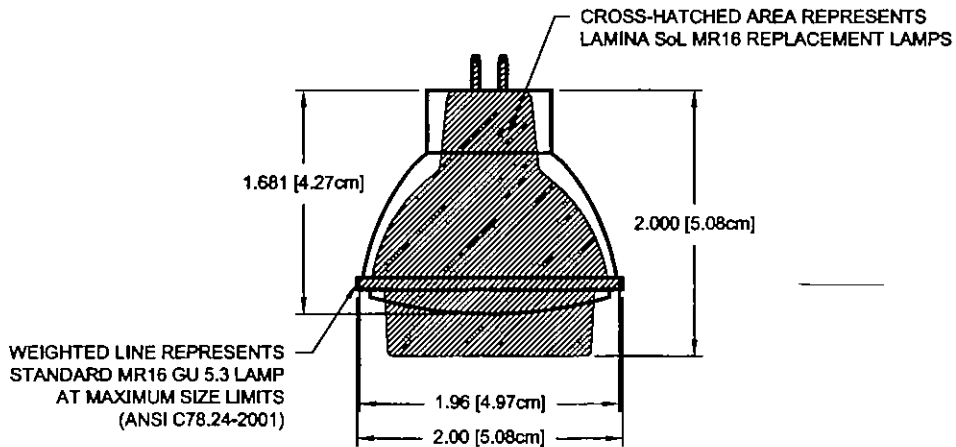
Warranty: 1 Year

No Mercury / No Lead / Dimmable

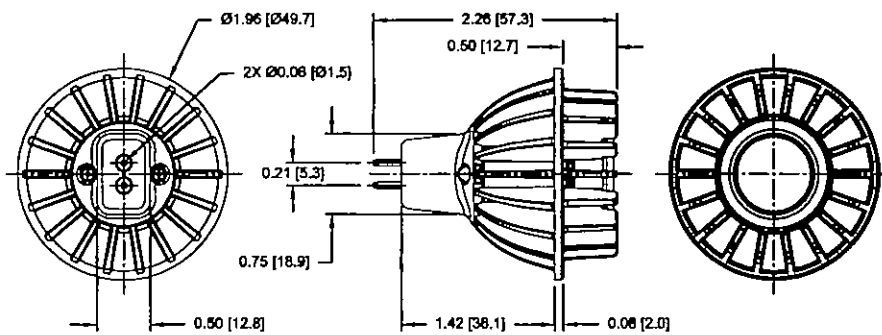
TECHNICAL SPECIFICATIONS

MECHANICAL OVERLAY

Overlay of a S&L MR16 GU5.3 with a typical halogen MR16.



MECHANICAL DIMENSIONS





ENERGY EFFICIENT LIGHTING PRODUCTS

PRODUCT FOCUS

MICROMAX-SPIRAL

Compact Fluorescent Lamp

FOR >> TABLE AND FLOOR LAMP
>> CEILING FIXTURES
>> WALL SCONE



MLM23SH-L 2700K*
MLM23SH 2700K*

MLM20S & PD 2700K
MLM20S & PD 5000K
MLM20S & PD 4100K

MLM30S 2700K*
MLM30S 5000K

MLM25S & PD 2700K*
MLM25S & PD 5000K
MLM25S & PD 4100K

MLM30S & PD 2700K*
MLM30S & PD 5000K
MLM30S & PD 4100K

MLM42S 2700K
MLM42S 5000K
MLM42S 4100K



* ENERGY STAR qualified

- Ultra mini size fits most fixtures
- Long life – lasts up to 10,000 hours
- Saves up to 75% in energy costs
- Instant-on, flicker-free electronics
- Available in Warm White, Cool White and Daylight

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PRODUCT FOCUS MICROMAX-SPIRAL

Compact Fluorescent Lamp



MLM20SWW/SP* 10,000 Hour (7) 6762741040 (6)*	MLM20SWW/TR* 10,000 Hour (7) 6762741040 (6)*	MLM23SH-LWW/TR* 12,000 Hour (7) 6762741029 (1)*	MLM25SWW/SP* 10,000 Hour (7) 6762741060 (4)*	MLM30SWW/SP* 10,000 Hour (7) 6762741030 (7)*	MLM30SWW* 10,000 Hour (7) 6762741022 (2)*	MLM42SWW 8,000 Hour (7) 6762741023 (9)*
MLM20SDL/SP 10,000 Hour (7) 6762701423 (8)*	MLM20SWW* 10,000 Hour (7) 6762701426 (0)*	MLM23SHWW/TR* 12,000 Hour (7) 6762741017 (8)*	MLM25SWW/TR* 10,000 Hour (7) 6762741060 (4)*	MLM30SDL/SP 10,000 Hour (7) 6762701463 (5)*	MLM30SDL 10,000 Hour (7) 6762711152 (0)*	MLM42SDL 8,000 Hour (7) 6762741026 (0)*
MLM20SDL 10,000 Hour (7) 6762711129 (7)*	MLM20SCW 10,000 Hour (7) 6762701427 (7)*		MLM25SDL/SP 10,000 Hour (7) 6762701453 (6)*		MLM30SCW 10,000 Hour (7) 6762701465 (9)*	MLM42SCW 8,000 Hour (7) 6762741021 (5)*
		MLM25SWW* 10,000 Hour (7) 6762701456 (7)*	MLM25SDL 10,000 Hour (7) 6762711151 (8)*	MLM25SCW 10,000 Hour (7) 6762701457 (4)*		

MICROMAXSPECIFICATIONS

Watts	Order Code	Description	Incandescent Equivalent	Lumens	Lamp Life (Hrs)	Pack Type	Case Pack	Dimensions (W" x MOL")	K
★ 20	41040	MLM20SWW/SP Single Pack	75	1200	10,000	Card	24	2.4 x 4.9	2700
★ 20	90005	MLM20SWW/TR Tray Pack	75	1200	10,000	Card	72	2.4 x 4.9	2700
20	01423	MLM20SDL/SP Single Pack Daylight	75	1200	10,000	Card	12	2.4 x 4.9	5000
★ 20	01426	MLM20SWW Mini Spiral	75	1200	10,000	Box	48	2.4 x 4.9	2700
20	11129	MLM20SDL Mini Spiral Daylight	75	1200	10,000	Box	48	2.4 x 4.9	5000
20	01427	MLM20SCW Mini Spiral Cool White	75	1200	10,000	Box	48	2.4 x 4.9	4100
★ 23	41029	MLM23SH-LWW/TR High Lumen Tray Pack	100	1650	12,000	Card	72	2.4 x 5.2	2700
★ 23	41017	MLM23SHWW/TR HPF Tray Pack	100	1650	12,000	Card	72	2.4 x 5.2	2700
★ 25	41060	MLM25SWW/SP Single Pack	100	1800	10,000	Card	24	2.4 x 5.1	2700
★ 25	90007	MLM25SWW/TR Tray Pack	100	1800	10,000	Card	72	2.4 x 5.1	2700
25	01453	MLM25SDL/SP Single Pack Daylight	100	1800	10,000	Card	12	2.4 x 5.1	5000
★ 25	01456	MLM25SWW Mini Spiral	100	1800	10,000	Box	48	2.4 x 5.1	2700
25	11151	MLM25SDL Mini Spiral Daylight	100	1800	10,000	Box	48	2.4 x 5.1	5000
25	01457	MLM25SCW Mini Spiral Cool White	100	1800	10,000	Box	48	2.4 x 5.1	4100
★ 30	41030	MLM30SWW/SP Single Pack	100	1920	8,000	Card	12	2.4 x 5.6	2700
30	01463	MLM30SDL/SP Single Pack Daylight	120	1920	10,000	Card	12	2.4 x 5.6	5000
★ 30	41022	MLM30SWW Mini Spiral	100	1920	8,000	Box	48	2.4 x 5.6	2700
30	11152	MLM30SDL Mini Spiral Daylight	120	1920	10,000	Box	48	2.4 x 5.6	5000
30	01465	MLM30SCW Mini Spiral Cool White	120	1920	10,000	Box	48	2.4 x 5.6	4100
42	41023	MLM42SWW Mini Spiral	150	2600	8,000	Box	24	2.8 x 6.2	2700
42	41026	MLM42SDL Mini Spiral Daylight	150	2600	8,000	Box	24	2.8 x 6.2	5000
42	41021	MLM42SCW Mini Spiral Cool White	150	2600	8,000	Box	24	2.8 x 6.2	4100

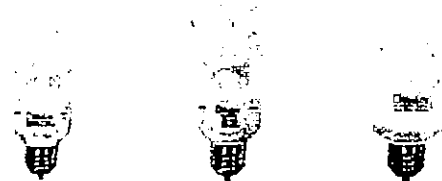


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* UPC Codes
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PRODUCT FOCUS MICROMAX-SPIRAL

Compact Fluorescent Lamp



MLM20SWWPD* 10,000 Hour (7) 6762701421 (5)*	MLM25SWWPD* 10,000 Hour (7) 6762701451 (2)*	MLM30SWWPD* 8,000 Hour (7) 6762741020 (8)*
MLM20SDLPD 10,000 Hour (7) 6762701424 (8)*	MLM25SDLPD 10,000 Hour (7) 6762701454 (3)*	MLM30SDLPD 10,000 Hour (7) 6762701464 (2)*
MLM20SCWPD 10,000 Hour (7) 6762701422 (2)*	MLM25SCWPD 10,000 Hour (7) 6762701452 (8)*	MLM30SCWPD 10,000 Hour (7) 6762701462 (8)*

MICROMAX PERMA DISKSPECIFICATIONS

Watts	Order Code	Description	Incandescent Equivalent	Lumens	Lamp Life (Hrs)	Pack Type	Case Pack	Dimensions (W" x MOL")	K
★ 20	01421	MLM20SWWPD Mini Spiral with disk	75	1200	10,000	Box	48	2.4 x 4.9	2700
20	01424	MLM20SDLPD Mini Spiral with disk	75	1200	10,000	Box	48	2.4 x 4.9	5000
20	01422	MLM20SCWPD Mini Spiral with disk	75	1200	10,000	Box	48	2.4 x 4.9	4100
★ 25	01451	MLM25SWWPD Mini Spiral with disk	100	1800	10,000	Box	48	2.4 x 5.1	2700
25	01454	MLM25SDLPD Mini Spiral with disk	100	1800	10,000	Box	48	2.4 x 5.1	5000
25	01452	MLM25SCWPD Mini Spiral with disk	100	1800	10,000	Box	48	2.4 x 5.1	4100
★ 30	41020	MLM30SWWPD Mini Spiral with disk	100	1920	8,000	Box	48	2.4 x 5.6	2700
30	01464	MLM30SDLPD Mini Spiral with disk	120	1920	10,000	Box	48	2.4 x 5.6	5000
30	01462	MLM30SCWPD Mini Spiral with disk	120	1920	10,000	Box	48	2.4 x 5.6	4100

SPECIAL NOTES	APPLICATIONS	LOCATIONS
>> Do not use on circuits with dimmers, timers or other control devices >> Not for use in totally enclosed fixtures	• Table and Floor lamp • Ceiling fixture • Wall sconce	• Residential • Office • Restaurant • School/Hospital • Retail • Hotel/Motel

BENEFITS	SPECIFICATIONS
• Ultra mini size fits most fixtures • Long life – lasts up to 10,000 hours • Saves Energy – up to 75% savings • Instant-on, flicker-free electronics • Available in Warm White, Cool White and Daylight	• Ballast Type >> Electronic • Starting Method >> Modified Rapid Start • Input Line Voltage >> 120VAC • Input Line Frequency >> 50/60HZ • Mini. Starting Temp. >> 0°F • Max. Operating Temp. >> 100°F • Color Rendering Index >> 84



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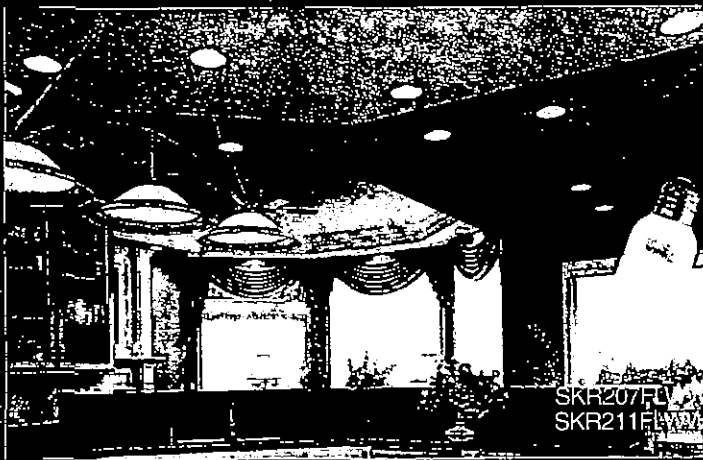
ENERGY EFFICIENT LIGHTING PRODUCTS

PRODUCT FOCUS

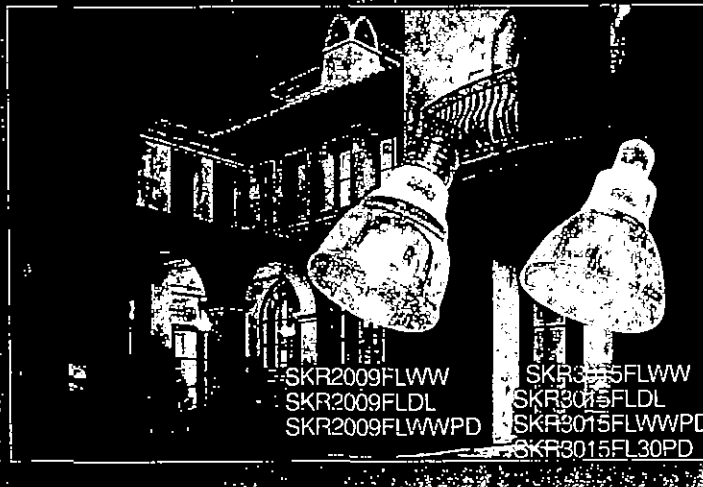
PARs & Rs

Compact Fluorescent Flood Lamp

FOR >> RECESSED CANS & HIGH HATS
>> CEILING MOUNTED STRIP
LIGHTING



SKR207FLW
SKR211FLW



SKR2009FLWW
SKR2009FLDL
SKR2009FLWWPD

SKR3015FLWW
SKR3015FLDL
SKR3015FLWWPD
SKR3015FL30PD



SKR315FLWW*
SKR315FLDL
SKR315FLCW
SKR315FLWWPD*
SKR315FLCWPD
SKR315FLDLPD



SKR423FLWW*
SKR423FLDL
SKR423FLWWPD*
SKR423FLCWPD
SKR423FLDLPD



SKR3820FLWW*
SKR3820FLWWPD*



SKR3823FLWW
SKR3823FLDL
SKR3823FLWWPD
SKR3823FL30PD

* ENERGY STAR® qualified



- Fits flush with standard recessed can fixtures
- Same size and shape as incandescent lamps
- Long life, 8,000 hours; saves up to 75% in energy costs
- Par lamps suitable for indoor/outdoor use
- Frosted glass on R20, R30, and R40 for softer lighting

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ENERGY EFFICIENT LIGHTING PRODUCTS

PAR & R LAMP SPECIFICATIONS

PARs & Rs

Compact Fluorescent Flood Lamp



R LAMPS

SKR207FLWW 8,000 Hour (7) 6762707007 (5)*	SKR315FLWW* 8,000 Hour (7) 6762733015 (5)*	SKR423FLWW* 8,000 Hour (7) 6762733023 (9)*
SKR211FLWW 8,000 Hour (7) 6762707011 (2)*	SKR315FLCW 8,000 Hour (7) 6762733019 (3)*	SKR423FLCW 8,000 Hour (7) 6762733030 (8)*
	SKR315FLDL 8,000 Hour (7) 6762733019 (3)*	



PAR LAMPS

SKR2009FLWW 8,000 Hour (7) 6762711197 (6)*	SKR3015FLWW 8,000 Hour (7) 6762733010 (0)*	SKR3820FLWW* 8,000 Hour (7) 6762733032 (2)*	SKR3823FLWW 8,000 Hour (7) 6762733016 (2)*
SKR2009FLDL 8,000 Hour (7) 6762711199 (0)*	SKR3015FLDL 8,000 Hour (7) 6762733020 (9)*		SKR3823FLDL 8,000 Hour (7) 6762711150 (1)*

R LAMPSPECIFICATIONS

Watts	Order Code	Description	Incandescent Equivalent	Lumens	Lamp Life (Hrs)	Pack Type	Case Pack	Dimensions (W" x MOL")	K
7	07007	SKR207FLWW R20 FloodMax	30	245	8,000	Box	25	2.5 x 5	2600
11	07011	SKR211FLWW R20 FloodMax	40	400	8,000	Box	25	2.5 x 5	2700
★ 15	33015	SKR315FLWW R30 FloodMax	75	580	8,000	Box	12	3.75 x 5.6	2700
15	33031	SKR315FLCW R30 FloodMax Cool White	75	580	8,000	Box	12	3.75 x 5.6	4100
15	33019	SKR315FLDL R30 FloodMax Daylight	75	580	8,000	Box	12	3.75 x 5.6	5000
★ 23	33023	SKR423FLWW R40 FloodMax	100	1100	8,000	Box	12	5 x 6	2700
23	33030	SKR423FLCW R40 FloodMax Cool White	100	1100	8,000	Box	12	5 x 6	4100

PAR LAMPSPECIFICATIONS

Watts	Order Code	Description	Incandescent Equivalent	Lumens	Lamp Life (Hrs)	Pack Type	Case Pack	Dimensions (W" x MOL")	K
9	11197	SKR2009FLWW Par20 Indoor/Outdoor	60	425	8,000	Box	12	2.45 x 3.8	2700
9	11199	SKR2009FLDL Par20 Indoor/Outdoor	60	425	8,000	Box	12	2.45 x 3.8	5000
15	33010	SKR3015FLWW Par30 Indoor/Outdoor	75	650	8,000	Box	12	3.75 x 5.6	2700
15	33020	SKR3015FLDL Par30 In-Outdoor Daylight	75	650	8,000	Box	12	3.75 x 5.6	5000
★ 20	33032	SKR3820FLWW Par38 Indoor/Outdoor	75	900	8,000	Box	12	5 x 6.2	2700
23	33016	SKR3823FLWW Par38 Indoor/Outdoor	100	1200	8,000	Box	12	5 x 6.2	2600
23	11150	SKR3823FLDL Par38 In-Outdoor Daylight	100	1200	8,000	Box	12	5 x 6.2	5000



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ISO 9002 Certified
US * UPC Codes
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PARS & RS

Compact Fluorescent Flood Lamp



SKR315FLWWPD* SKR423FLWWPD* SKR2009FLWWPD SKR3015FLWWPD SKR3820FLWWPD* SKR3823FLWWPD

8,000 Hour (7) 6762734010 (3)* 8,000 Hour (7) 676273022 (3)* 8,000 Hour (7) 6762711198 (4)* 8,000 Hour (7) 6762711198 (1)* 8,000 Hour (7) 6762733034 (3)*

SKR315FLCWPD SKR423FLCWPD SKR3015FL30PD SKR3823FL30PD

8,000 Hour (7) 6762733025 (1)* 8,000 Hour (7) 6762733033 (3)* 8,000 Hour (7) 6762733033 (3)* 8,000 Hour (7) 6762733034 (3)*

SKR315FLDLPD SKR423FLDLPD

8,000 Hour (7) 6762734020 (5)* 8,000 Hour (7) 6762734040 (5)*

PAR LAMP PERMA DISKSPECIFICATIONS

Watts Order	Description	Incandescent Equivalent	Lumens	Lamp Life (Hrs)	Pack Type	Case Dimensions (W x H x D)
-------------	-------------	-------------------------	--------	-----------------	-----------	-----------------------------

* 15 34010 SKR315FLWWPD R30 with disk 75 580 8,000 Box 12 3.75 x 5.6 2700

15 33014 SKR315FLCWPD R30 w/disk Cool White 75 580 8,000 Box 12 3.75 x 5.6 4100

15 34020 SKR315FLDLPD R30 w/disk Daylight 75 580 8,000 Box 12 3.75 x 5.6 5000

* 23 33022 SKR423FLWWPD R40 with disk 100 1100 8,000 Box 12 5 x 6 2700

23 33026 SKR423FLCWPD R40 w/disk Cool White 100 1100 8,000 Box 12 5 x 6 4100

23 34040 SKR423FLDLPD R40 w/disk Daylight 100 1100 8,000 Box 12 5 x 6 5000

PAR LAMP PERMA DISKSPECIFICATIONS

Watts Order	Description	Incandescent Equivalent	Lumens	Lamp Life (Hrs)	Pack Type	Case Dimensions (W x H x D)
-------------	-------------	-------------------------	--------	-----------------	-----------	-----------------------------

9 11198 SKR2009FLWWPD Par20 with disk 60 425 8,000 Box 12 2.45 x 3.8 2700

15 11188 SKR3015FLWWPD Par30 with disk 75 650 8,000 Box 12 3.75 x 5.6 2700

15 33033 SKR3015FL30PD Par30 with disk 75 650 8,000 Box 12 3.75 x 5.6 3000

* 20 11189 SKR3820FLWWPD Par38 with disk 75 900 8,000 Box 12 5 x 6.2 2700

23 11190 SKR3823FLWWPD Par38 with disk 100 1200 8,000 Box 12 5 x 6.2 2600

23 33034 SKR3823FL30PD Par38 with disk 100 1200 8,000 Box 12 5 x 6.2 3000

SPECIAL NOTES

>> Uses amalgam advanced technology for higher lumen maintenance and consistent color.

- Recessed cans & high hats
- Ceiling mounted strip lighting
- Outdoor

APPLICATIONS

- Residential/Office/Retail
- Hotel/Motel/Restaurant
- School/Hospital/Property Management

BENEFITS

- Same size and shape as incandescent lamps
- Fully flush with standard high hat or recessed can applications
- Par lamps suitable for indoor/ outdoor use
- Patented Air-Gap on 30/40 guarantees longer life in hot locations
- Frosted glass on R20/30/40 generates softer, natural lighting

SPECIFICATIONS

- Ballast Type
- >> Electronic
- Starting Method
- >> Modified Rapid Start
- Input Line Voltage
- >> 120VAC
- Input Line Frequency
- >> 50/60HZ
- Mini. Starting Temp.
- >> 0°F
- Max. Operating Temp.
- >> 100°F
- Color Rendering Index
- >> 84



Product Specification Bulletin

320 Watt

NATURAL WHITE™

UNI-FORM®
PULSE START SYSTEM

e-Lamp™ - Featuring UV Shield®
Open or Enclosed Luminaire
Clear - 950 Series - 5000K



BASE UP ± 15°

MPSE 320W/BU/ED37/UVS/950

Product Number 28712

Lamp Type

SINGLE ENDED METAL HALIDE

ANSI Designation

M___/O

Performance Data

* Effective Lumens @ 100 Hours	27000
* Effective Mean Lumens	24500
Rated Life (Hours @ 10 Hrs./ Start)	20000++
Correlated Color Temperature K	5000
Chromaticity (CIE -X,Y)	.346 .359
Color Rendering Index (CRI)	90+
Typical Warm Up Time (Minutes)	2-3
Typical Hot Restart Time (Minutes)	5-8
Burning Position	BASE UP ± 15°

Physical Data / Requirements

Base Designation	MOGUL (EX39)
Bulb Designation	ED37
Bulb Diameter	4 5/8"
Max. Overall Length (MOL)	11 1/2"
Light Center Length (LCL)	7"
Effective Arc Length	25 mm
Max. Base Temperature (°C)	210
Max. Bulb Temperature (°C)	400
Luminaire Type	OPEN/ENCLOSED
Socket Pulse Rating (KV)	4
Socket Type	OPEN RATED EX39

Electrical Data / Requirements

Lamp Wattage	320
Operating Voltage (Nominal)	135
Operating Current (Amps)	2.63
Min. Open Circuit Voltage (RMS)	254
Min. -Max. Starting Pulse (Peak V)	3000-4000
Min. Pulse Width At 2700 Volts (u sec)	1
Min. Pulse Rate Per 1/2 Cycle	1
Pulse Position (Min. % OCV Peak)	90

Revision: 8/17/2007

2547 - 2

Notes

- ▶ These lamps are Type-O (open luminaire) rated and contain shrouded arc tubes.
- ▶ UV Shield eliminates nearly all UV emissions; reducing color fading and lens yellowing.
- ▶ * For indoor lighting, initial and mean effective lumens are scotopically enhanced relative to standard 4000K lamps - (S/P)*0.5 = 1.13
- ▶ Electronic high frequency ballast starting specifications: Minimum 3.1KV peak, Sine Wave Pulse Train width >.5 secs, Repeat Pulse Train <10 secs.

Lamps

THIS LAMP CONFORMS TO FEDERAL STANDARD 21 CFR 1040.30

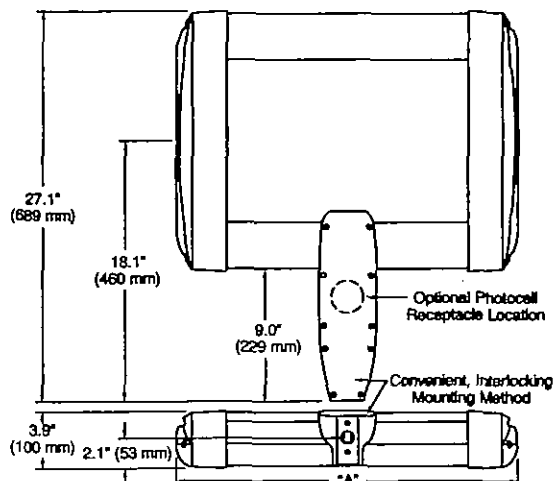
Warning: This lamp can cause skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used. Lamps that will automatically extinguish when outer envelope is broken or punctured are commercially available.

Beta Catalog Number:



LED Performance Class A Specs

Light Bars	Initial Delivered Lumens	System Watts	Dim. "A"/In.
2	2,900	54	11.75
3	4,350	81	13.75
4	5,800	108	15.75
5	7,250	135	17.75
6	8,700	162	19.75
7	10,150	189	21.75
8	11,600	216	23.75
9	13,050	243	25.75
10	14,500	270	27.75
11	15,950	297	29.75
12	17,400	324	31.75



Notes:

Product Family	Housing Indicator	Optics	Mounting	Initial Delivered Lumens	LED Driver Performance	Ballast Voltage	Color Options	Factory-Installed Options
BLD	ARE	T3 ¹	DA ²	028	LED-A	UL	BZ	EM-Emergency ³
				042		(120-277V	BK	F-Fuse
				056		Universal)	WH	P-Photocell ⁴
				070		12	SV	R-NEMA Photocell Receptacle
				084		27	PB	
				098				
				112				
				126				
				140				
				154				
				168				

Field-Installed Accessories

NO
PHOTO
AVAILABLEBird Spikes
XA-BRDSPK

- 1-IESNA Type III distribution
 2-Direct mounting arm
 3-Consult Factory
 4-Must specify voltage other than UL.

General Description

Slim, low profile design minimizes wind load requirements. Fixture sides are rugged cast aluminum with integral, weather-tight LED driver compartments and high performance aluminum heatsinks. Convenient, interlocking mounting method. Mounting housing is rugged die cast aluminum and mounts to 3 - 6" square or round pole. Includes leaf/debris guard. Five year limited warranty on fixture.

Electrical

Modular design accommodates varied lighting output from high brightness, white, 6000K, minimum 75 CRI, long life LED sources. 120-277V 50/60 Hz LED drivers are standard. 347-480V 50/60 Hz driver is optional. LED drivers have power factor >90% and THD <20% of full load. Integral weather-tight electrical box with terminal strip for easy power hook-up.

Factory-Installed Options

Fuse
 Integrated Internal Battery Backup
 NEMA Photocell Receptacle
 Photocell

Finish

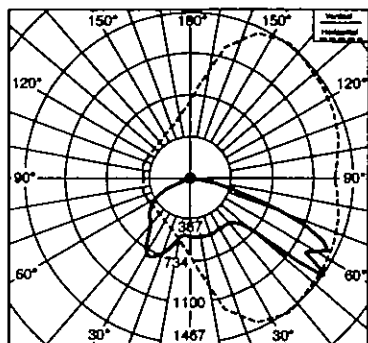
Exclusive Colorfast DeltaGuard™ finish features an E-Coat epoxy primer with an ultra-durable silver powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Bronze, black and white powder topcoats are also available. The finish is covered by our 10 year limited warranty.

Labels

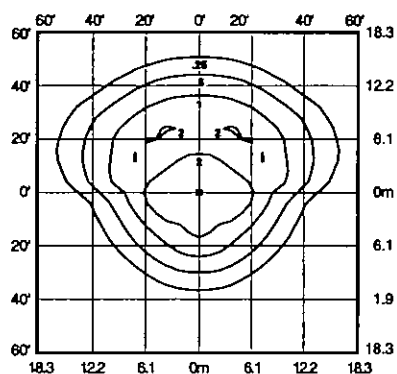
Listed in the U.S. and Canada for wet locations and enclosure classified IP66 per IEC 529.

Patents

Pending



Independent Testing Laboratories certified test.
Report No. ITL 59234.
Candlepower distribution curve of 2 light bar
luminaire with 2863 initial delivered lumens.



Isofootcandle plot of 6 light bar Type
III LED luminaire at 20' A.F.G. Initial
delivered lumens at 8589. Initial FC
at grade.

Isofootcandle plots shown are initial at grade.

LED Area Light EPA Calculations

	LIGHT BARS										
	2	3	4	5	6	7	8	9	10	11	12
Fixed Arm Mount											
1 fixture	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.61	0.65	0.69
2 fixtures (180°)	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.21	1.29	1.38
2 fixtures (90°)	0.87	0.92	0.96	1.00	1.04	1.08	1.12	n/a	n/a	n/a	n/a
3 fixtures (90°)	1.47	1.51	1.55	1.60	1.64	1.68	1.72	n/a	n/a	n/a	n/a
4 fixtures (90°)	1.75	1.83	1.91	2.00	2.08	2.16	2.24	n/a	n/a	n/a	n/a





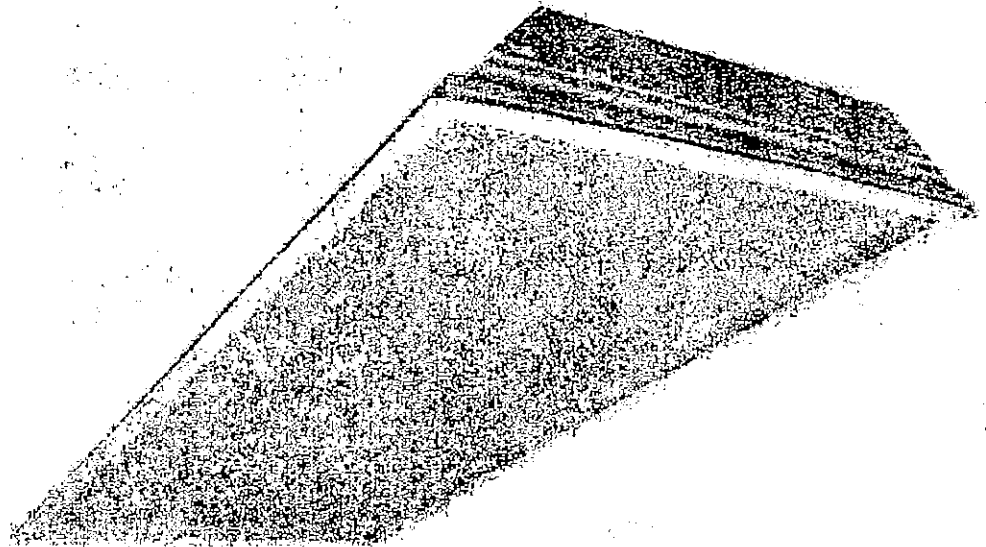
RF Recessed Fixture

Application:

This fixture is designed for quick installation into inverted "T" bar ceilings. This static troffer is suitable for use in all office, commercial, and industrial areas that use the T Bar grid. There is a wide variety of options available for customizing this fixture to your specific needs.

Construction:

The housing for the RF fixture is die formed from heavy gauge steel, and is finished in a baked white enamel, or post powder coating for maximum reflectivity and durability. Hinged door frame with mitered corners come with swivel motion cam latches for easy access to fixture interior for re-lamping or ballast maintenance. Standard lens is prismatic acrylic pattern 12, which provides uniform light distribution.



Electrical:

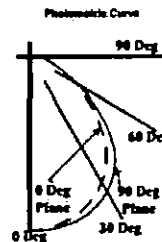
All fixtures are furnished with UL Listed Class P thermally protected ballast. This fixture meets all requirements for UL Standard # 1598. In addition, the RF fixture complies with National Energy Standards.

Mounting:

All units are stamped with 7/8" knockouts in the top and sides and access plates. For addition safety, this fixture has "earthquake clips" integrated in the housing.

Confidentially Unpublished
Special Circuit Method

	17	28	32	40	54	64	72	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990	1000
17	17	28	32	40	54	64	72	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990	1000



Picture Length

T12	T8	T5	Length
F20112	F1772	F1472	36"
F40112	F2772	F2172	60"

Lamp	Ballast	Length
F0110	---	36"
F3210	F40BX	36"
F40112	---	60"

Ballast	Length	Length	Length
A	36"	60"	96"
B	36"	60"	96"

Housing	# Lamps	Lamp Type	Ballast	Voltage	Options
RF - 22	2 = Two	17 = F17 T8	T8	120 = 120V	EMB = Emergency Ballast
RF - 24	3 = Three	31U = F031U (1 5/8")	EN = NP.88 BF	277 = 277V	A12 = Prismatic Acrylic Lens .125
	4 = Four	32U = F032U (6")	EL = LP.77 BF	MV = Multi-Volt	A15 = Prismatic Acrylic Lens .156
		40BX = F40T5 BiAx	EH = HP.1.18 BF		PC = Polycarbonate Lens .125
		32 = F32 T8	T5		WG = 11 Gauge Wire Guard
		28 = F28 T5	EBUN 1.0 BF		FP = Flange Pan Drop Dish (White or Clear Prismatic)
		54 = F54 T5HO			SL1 - 1/2" Silver Parabolic (Acrylic or Styrene)
					SL2 - 3/4" Silver Parabolic (Acrylic or Styrene)
					SL3 - 1 1/2" Silver Parabolic (Acrylic or Styrene)
					DM = Dimming Ballast
					REF = Reflector (86%, 92%, or 95% Reflectivity)
					NYC = 20 Gauge NYC Housing

Monmouth Lighting Corp.

92 N. Main Street, Bldg 18B, Windsor, NJ 08561

PH (609) 448-0600 Fax (609) 613-5586 Monmouthlighting@aol.com

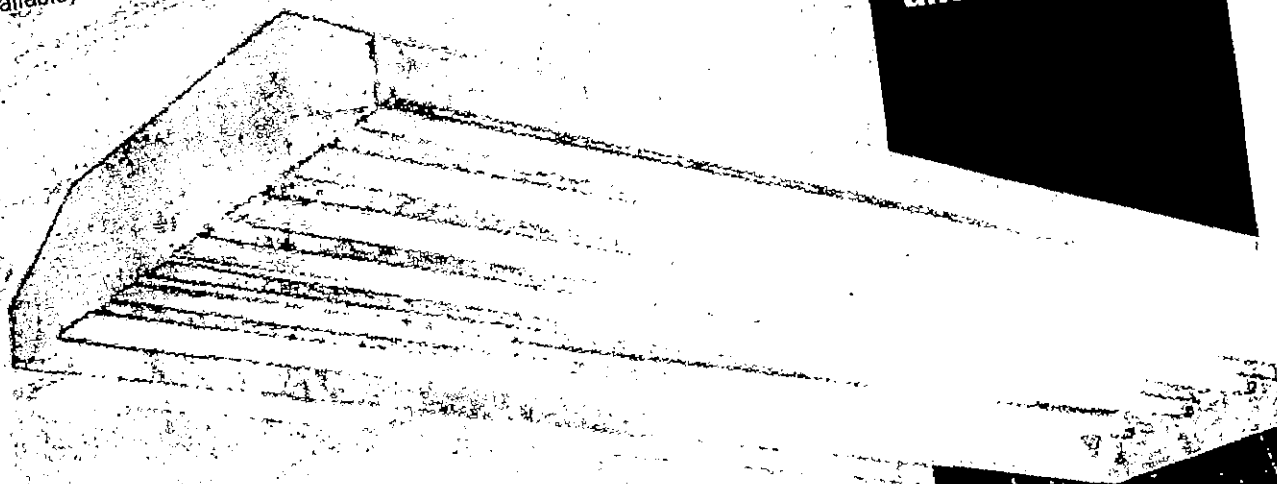
Consult factory for other options.

NU-LITE™

Commerce City, CO 80222

FEATURES

- Instant On (no warm-up or restrike)
- No Color Shift Lamp to Lamp
- No Stroboscopic Effect
- Dimming Available
- Emergency Battery Pack Available
- Multi-level Switching Available
- Standard Electronic
- Program Start Technology
- Minimum Start Temperature 0°F (-20°F available)
- Low Noise (Sound Rated A)
- Low Harmonic Distortion (<10%THD)
- Shallow Housing Depth
- Optional Shielding and Protection Media
- Optional Motion Sensor
- Quick Access Plate for Wiring Simplicity



SPECIFICATIONS

Housing : Die Formed Aluminum for durable impact and corrosion resistant construction. Featuring quick access plate, KO's, and integrated mounting holes.

Finish : Standard after fabrication white baked polyester powder coating. Other colors and materials available. (Consult factory per application.)

Reflector : Quick access unitized one piece die formed highly specular anodized Miro-4® aluminum.

Optional Door Frame & Shielding Material : Die formed steel door frame that is retained by captive screws. Shielding media as directed by others.

Electrical Components : Reliable cool operating U.L. approved electronic program start T5HO Class P rated ballasts, other ballasts required for specific application are available. (Consult factory.)

Lamp Holders : T5 rotary locked miniature bipinbase

Mounting : Surface, pendant.

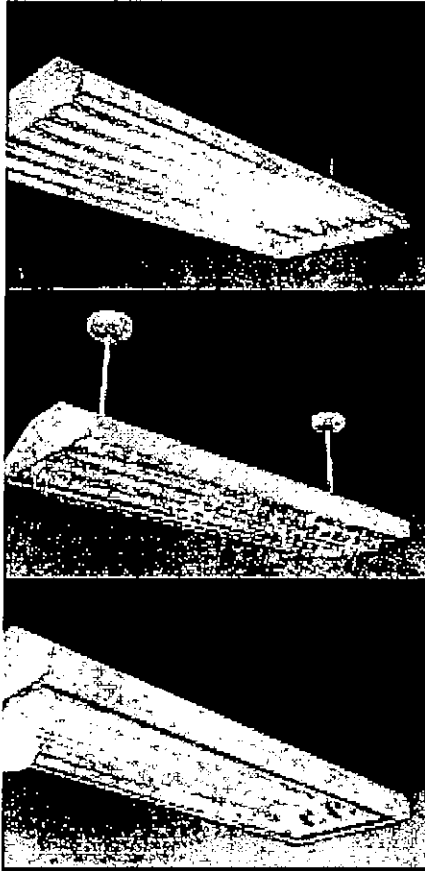
Labels : U.L./C

Nu-Bay

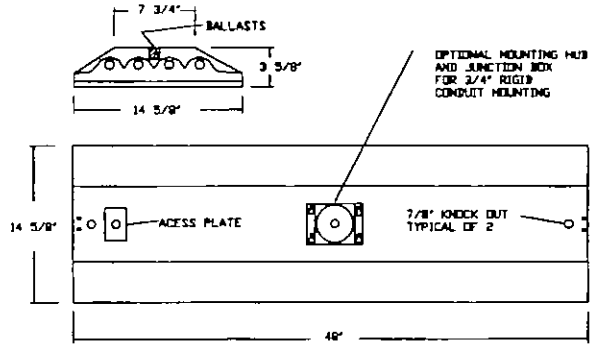
The output
of traditional
H.I.D. Hi-Bays
using the
latest
fluorescent
lamp-ballast
technology
to achieve
superior
performance
and flexibility.

Nu-Bay

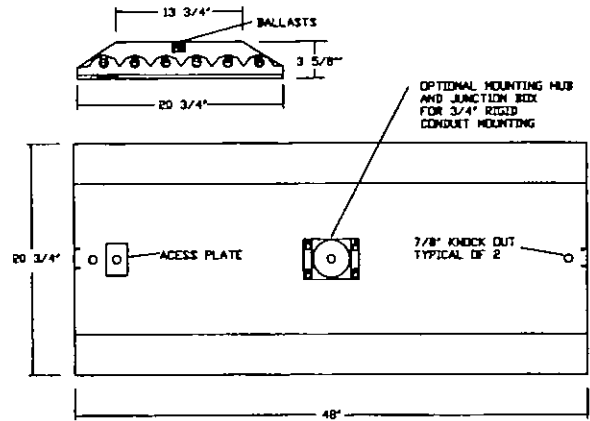
NU-LITE



4-LIGHT



6-LIGHT



ORDERING INFORMATION

Catalog Number:

T5H0	Lamps	Length	Width
TH254T5H0	2-F54T5H0	4'	14 5/8"
TH354T5H0	3-F54T5H0	4'	14 5/8"
TH454T5H0	4-F54T5H0	4'	14 5/8"
TH654T5H0	6-F54T5H0	4'	20 3/4"
TH354-8T5H0	6-F54T5H0	8'	14 5/8"

T8	Lamps	Length	Width
TH232EB8	2-F32T8	4'	14 5/8"
TH332-1EB8	3-F32T8	4'	14 5/8"
TH432-1EB8	4-F32T8	4'	14 5/8"
TH632-2EB8	6-F32T8	4'	20 3/4"
TH332-8-2EB8	6-F32T8	8'	14 5/8"

Options:

Door Frame / Clear Lens	CL
Open, No Frame or Lens	O
Acrylic Prismatic	K12
Wire Guard	WG
Damp Location	DL
Fusing	GLR
RFI Filter	RFI
Galvanized Finish	GAL
Stainless Steel	SS
Custom Color	CC
Emergency Battery	EM
Dimming Ballast	DIM
Multi-Level Switching	MLS
Occupancy Sensor	OS
Hook / Cord / Plug	HCP

Mounting:

3' Chain Set	3C
3' Stem & Canopy	3S
Surface Flush Mounting	SF
Hub Mounting	HM



TH2

Photometric Filename: ITL53511.IES

Characteristics

TH-454SH OPEN

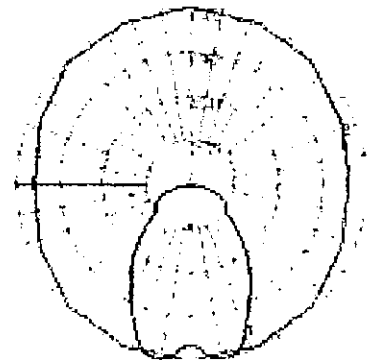
Fabricated aluminum housing with white painted interior
Formed multi-faceted metal reflector |specular finish,
Four 54-watt T-5 Sylvania FP54/835/ho linear fluorescents.

Total Luminaire Efficiency	89.20 %
Spacing Criteria (0-180)	1.24
Spacing Criteria (90-270)	1.14

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	106	106	106	106	104	104	104	104	99	99	99	95	95	95	91	91	91	89
1	98	94	91	88	96	92	89	86	88	86	84	85	83	81	82	80	79	77
2	90	83	78	73	88	82	76	72	78	74	71	76	72	69	73	70	67	66
3	83	74	67	62	81	73	66	61	70	65	60	68	63	59	65	62	58	56
4	76	66	59	53	74	65	58	53	63	57	52	61	56	52	59	55	51	49
5	70	60	52	47	69	59	52	46	57	51	46	55	50	45	54	49	45	43
6	65	54	47	41	64	53	46	41	52	45	41	50	45	40	49	44	40	38
7	61	49	42	37	59	49	42	37	47	41	36	46	40	36	45	40	36	34
8	57	45	38	33	55	45	38	33	44	37	33	42	37	33	41	36	32	31
9	53	42	35	30	52	41	35	30	40	34	30	39	34	30	38	33	30	28
10	50	39	32	27	49	38	32	27	37	31	27	37	31	27	36	31	27	26



Lumen Output is Based on 35 Deg, C Ambient Case Temperature

Photometric Filename: ITL53512.IES

Characteristics

TH-654SH OPEN

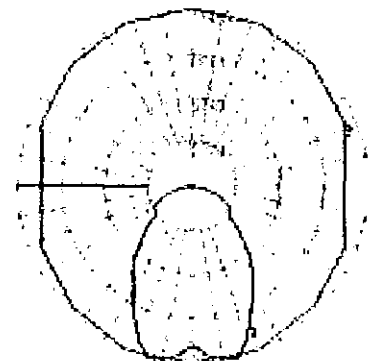
Fabricated aluminum housing with white painted interior
Multi-faceted metal reflector with specular finish,
Six 54-watt T-5 Sylvania FP54/835/ho linear fluorescents.

Total Luminaire Efficiency	85.00 %
Spacing Criteria (0-180)	1.24
Spacing Criteria (90-270)	1.14

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	101	101	101	101	99	99	99	99	94	94	94	90	90	90	87	87	87	85
1	93	90	87	84	91	88	85	82	84	82	80	81	79	77	78	76	75	73
2	86	79	74	70	84	78	73	69	75	71	67	72	69	66	70	67	64	62
3	79	70	64	59	77	69	63	58	67	62	57	64	60	56	62	59	55	54
4	73	63	56	51	71	62	55	50	60	54	50	58	53	49	56	52	48	47
5	67	57	50	44	65	56	49	44	54	48	44	52	47	43	51	46	43	41
6	62	51	44	39	61	51	44	39	49	43	39	48	42	38	46	42	38	36
7	58	47	40	35	56	46	40	35	45	39	35	44	38	34	43	38	34	32
8	54	43	36	31	53	42	36	31	41	35	31	40	35	31	39	34	31	29
9	51	40	33	28	49	39	33	28	38	32	28	37	32	28	36	32	28	27
10	48	37	30	26	46	36	30	26	35	30	26	35	29	26	34	29	26	24



TECHNICAL DATA

APPLICATION and PERFORMANCE SPECIFICATION

Electronic ballast for (½) T54T5H0

Description:

- Line Voltage: 120 – 277 – 480 vac, < 10%, 50/60Hz
- Series Lamp Operation
- Auto Reset after Lamp Replacement
- Programmed Rapid Start
- Active Power Factor Correction
- End of Lamp Life Shutdown Circuitry

Technical:

Line Volts	No. of Lamps	Lamp Type	Input Watts	Nominal Line Amps	Ballast Factor	Harmonic Total	Crest Factor
120	2	F54T5H0	121	1.03	1.00	< 10%	< 1.7
120	1	F54T5H0	64	0.64	1.10	< 10%	< 1.7
277	2	F54T5H0	117	0.43	1.00	< 10%	< 1.7
277	1	F54T5H0	64	0.24	1.10	< 10%	< 1.7

Performance:

- Meets ANSI standard C82.11-1993
- Meets ANSI standard C62.41-1991
- Meets FCC Part 18 (Class A) for EMI and RFI

Application:

- Minimum Starting Temperature: 0 deg F, -18 deg C
- Maximum Ambient Temperature: 104 deg F, 40 deg C
- Maximum Case Temperature: 167 deg F, 75 deg C
- Sound Rating: Class A
- Remote Mounting: 18 ft.

Safety:

- No PCB's
- UL listed (Class P, Type 1 Outdoor)
- CSA Certified

Lamp Data:

- Initial Lumens: 5000 Lumens @ 35 deg C Ambient Case Temperature
- Life: 20,000 Hrs. @ 3 Hrs./Start

NULITE

Commerce City, Colorado 80022
 Telephone 303-287-9646
 Fax 303-287-0316

COOPER LIGHTING - METALUX®

DESCRIPTION

The BC Series is an energy efficient luminaire designed for versatility in application and performance. The BC Series features an opal white acrylic refractor that produces a 180° uniform light distribution pattern.

The versatile BC Series combines quality and economy in a multi-purpose wall bracket. The luminaire is perfect for illuminating corridors, stairwells, lavatories, dressing rooms, patient rooms, utility/task and area lighting.

Catalog #		Type	
Project			
Comments		Date	
Prepared by			

SPECIFICATION FEATURES

A ... Construction

Housing channel die formed code gauge prime cold rolled steel. Sturdy positive lampholder mounting bracket. Reflector/channel wireway cover secured by quarter-turn fastener for easy wireway access. Channel back has numerous KO's for easy installation. Decorative white opaque injection molded end plates.

B ... Electrical

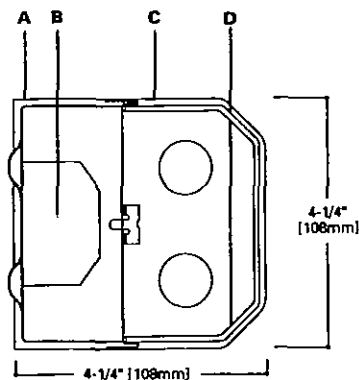
Ballast are CBM/ETL Class "P" and positively secured by mounting bolts. Pressure lock lampholders. UL/CUL listed. Suitable for damp locations.

C ... Finish

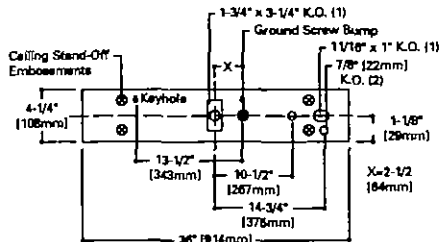
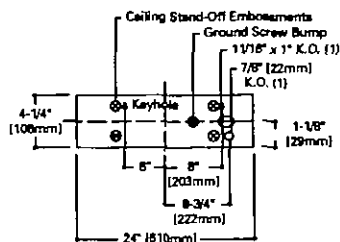
Painted after fabrication. Electrostatically applied baked white polyester powder enamel finish. Multistage cleaning cycle, Iron phosphate coating with rust inhibitor. Conveyorized application and baking time accurately controlled at an elevated temperature.

D ... Frame/Shielding

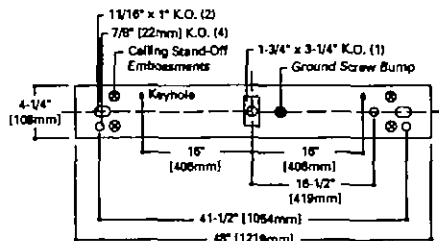
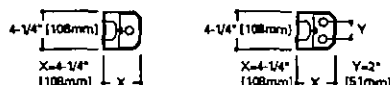
Smooth opal 100% virgin acrylic refractor. 180° uniform light distribution (Uplight, Frontal & Downlight). Refractor is securely held in place by removable decorative injection molded white end plates. Refractor can be easily removed for installation and maintenance.



MOUNTING DATA



LAMP CONFIGURATIONS



BC
120
117
130
125
140
132
220
217
230
225
240
232

ALL PURPOSE WALL BRACKET
2' Wall Bracket
1 or 2 Lamp LTS or HTS
3' or 4' Wall Bracket
1 or 2 Lamp

ENERGY DATA

Input Watts:

EB Ballast & STD Lamps

117 (20), 130 (31), 125 (28), 140 (38)
132 (30), 217 (38), 230 (60), 225 (47)
240 (72), 232 (61)

ES Ballast & STD Lamps

120 (32), 117 (23), 130 (46), 125 (33)
140 (38), 132 (30), 220 (58), 217 (45)
230 (74), 225 (65), 240 (88), 232 (71)

Luminaire Efficacy Rating

LER = FL-65

Catalog Number: BC-232A

Yearly Cost of 1000 lumens,

3000 hrs at .08 KWH = \$3.69

LAMPS CONTAIN MERCURY. DISPOSE ACCORDING TO LOCAL, STATE OR FEDERAL LAWS

LINEAR DISCONNECT

Safe and convenient means of disconnecting power



Energy Saving Ballast, F32T8/35K lamps rated at 2850 lumens.
Spacing criterion: (H) 1.3 x mounting heights, (L) 1.5 x mounting height.

Light Loss Factor .74. For complete photometric report BC232A.IES

BC-232A

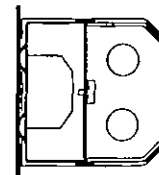
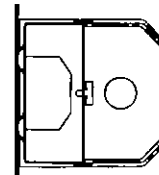
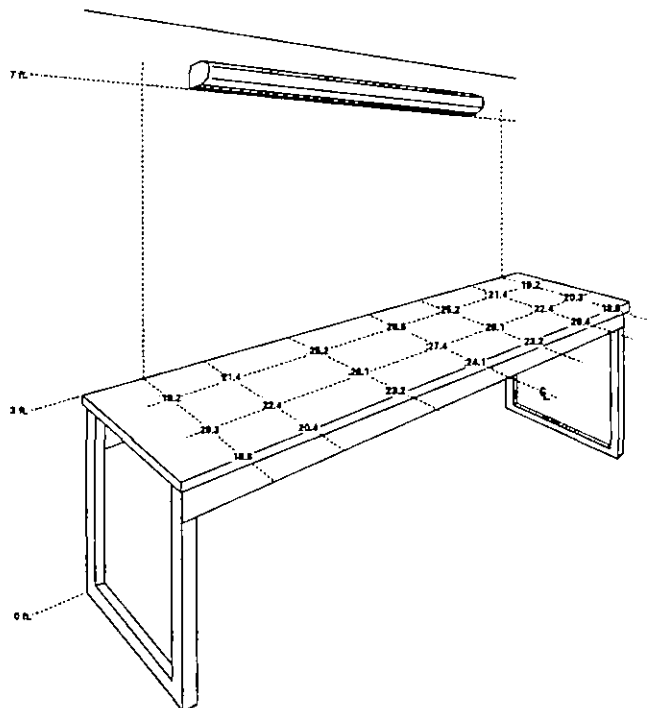
(H) Lamps (2) F32T8/35K
Lumens 2850 Each

Conditions

Ceiling Height 8'-0"
Mounting Height 7'-43/64"
Work Plane 12'-0"

Reflectance

Ceiling 80%
Walls 50%
Floor 20%



Scale is Exaggerated on Fixture
Application and Mounting

ORDERING INFORMATION

Sample Number: BC-232-120V-EB81-U

Sample Number: BC-232-120V-EB81-U									
Series BC* All Purpose Wall Bracket		Ballast Start Type LTS* Low Trigger Start (20W only) (120V only) HTS* High Trigger Start (20W only)		Ballast Type ¹ * Standard Magnetic T12 Ballast LES* T12 Magnetic Energy Saving EB* Electronic Instant Start ER* T8 Electronic Program Rapid Start, Total Harmonic Distortion < 10%		Options PLUS* Higher Ballast Factor > 1.13, Total Harmonic Distortion < 20% RLS* Rotor Lock Socket (T8 Lamp only) CO* Convenience Outlet (120V only) RS1* Rotary Switch (1 Circuit, 120V only) PS1* Pull Switch (1 Circuit)		Packaging UP* Unit Pack	
Number of Lamps 1 Lamp (Not Included) 2 Lamps (Not Included)		Voltage ¹ 120V* 120 Volt 277V* 277 Volt 347V* 347 Volt UNV* Universal Voltage ² 120-277		Lamp Size 2* T12 8* T8					
Wattage 20* 20W T12 (24") 17* 17W T8 (24") 25* 25W T8 (36") 30* 30W T12 (36") 32* 32W T8 (48") 40* 40W T12 (48")		Options GL* Single Element Fuse GM* Double Element Fuse Emergency* EM Installed ³		Number of Ballasts 1* 1 Ballast 2* 2 Ballast					

Notes: 1 Products also available in non-US voltage and frequencies for international markets
2 Not Available when specifying emergencies, voltage must be specific
3 Non available for 2" version.

SHIPPING INFORMATION

Catalog No.	Wt.
BC-117	8 lbs.
BC-125	10 lbs.
BC-132	11 lbs.
BC-217	8 lbs.
BC-225	10 lbs.
BC-232	11 lbs.

NULITE

NULITE LIMITED

Commerce City CO 80022

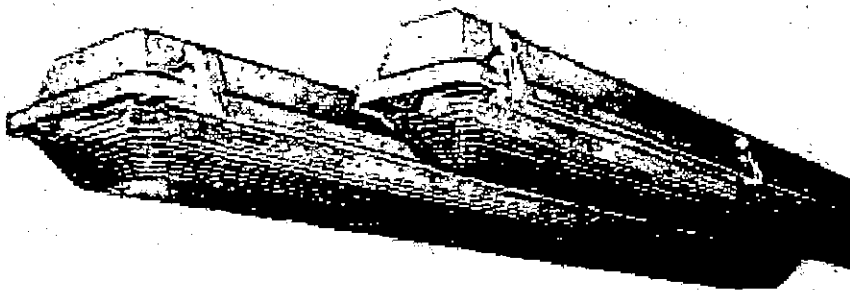
(303) 287-9646

(303) 287-0316 Fax

T5 T8

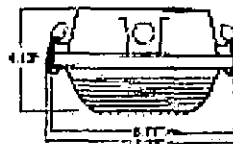
INT

For Environments
Where Dust or
Moisture is a Problem

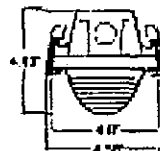


Optional Stainless Steel mounting hardware available. No holes have to be drilled in the housing for installation.

DIMENSIONAL DATA



Two Lamp



One Lamp

PHOTOMETRIC DATA

One Lamp T5HO ITL51889.IES

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50				30				10				0
RW	70	60	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	50	30	10	0
0	103	103	103	103	99	99	99	99	83	93	93	87	87	87	81	81	81	78			
1	90	84	79	75	86	81	77	72	76	72	68	70	67	64	65	63	61	58			
2	81	72	64	58	77	69	62	57	64	59	54	60	55	51	56	52	48	46			
3	73	62	54	47	70	60	52	46	58	49	44	52	46	42	46	44	40	37			
4	66	54	46	39	63	52	44	38	49	42	37	46	40	35	43	38	33	31			
5	61	48	40	33	58	47	38	32	44	37	31	41	35	30	38	33	29	26			
6	56	43	35	29	53	42	34	28	39	32	27	37	31	26	34	29	25	23			
7	52	39	31	25	49	38	30	25	35	29	24	33	27	23	31	26	22	20			
8	48	35	28	22	46	34	27	22	32	26	21	30	25	20	29	23	20	18			
9	45	32	25	20	43	31	24	19	30	23	19	28	22	18	28	21	18	16			
10	42	30	23	18	40	29	22	17	27	21	17	26	20	16	25	19	16	14			

Two Lamp T5HO ITL52813.IES

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50				30				10				0
RW70	50	30	10		70	50	30	10		50	30	10		50	30	10		50	30	10	0
0	76	76	76	76	74	74	74	74		70	70	70		67	67	67		64	64	64	62
1	68	64	61	58	66	62	59	56		59	56	54		56	54	52		53	52	50	48
2	61	55	50	45	59	53	49	45		50	47	43		48	45	42		46	43	40	39
3	55	47	41	37	53	46	41	38		44	39	35		42	38	34		40	36	33	32
4	50	42	35	31	48	40	35	30		38	33	29		37	32	29		35	31	28	27
5	46	37	31	28	44	36	30	26		34	29	25		33	28	25		31	27	24	23
6	42	33	27	22	41	32	26	22		31	26	22		29	25	21		28	24	21	19
7	39	30	24	20	38	29	23	19		28	23	19		27	22	19		26	21	18	17
8	36	27	21	17	35	26	21	17		25	20	17		24	20	17		23	19	16	15
9	34	25	19	15	33	24	19	15		23	18	15		22	18	15		22	18	15	13
10	32	23	17	14	31	22	17	14		21	17	14		21	18	13		20	16	13	12



SPECIFICATIONS

Gasketed enclosures protect fluorescent lighting in wet or dusty environments. The enclosures are comprised of fiberglass housings with continuous closed cell gasket, ribbed acrylic diffusers, toggle latches and end plugs. Ballast pan is formed of 20 gauge cold rolled steel with a white powder coat finish. Ballasts are Electronic and CBM-ETL certified.

ORDERING INFORMATION:

T5 AND T5HO

Catalog No.	Lamps	Size
INT-114T5	1-F14T5	28"
INT-214T5	2-F14T5	28"
INT-128T5	1-F28T5	52"
INT-228T5	2-F28T5	52"
INT-328T5	3-F28T5	52"
INT-135T5	1-F35T5	64"
INT-235T5	2-F35T5	64"
INT-228T5-8	4-F28T5	100"
INT-328T5-8	6-F28T5	100"
INT-124T5HO	1-F24T5HO	28"
INT-224T5HO	2-F24T5HO	28"
INT-154T5HO	1-F54T5HO	52"
INT-254T5HO	2-F54T5HO	52"
INT-254T5HO-8	4-F54T5HO	100"
INT-180T5HO	1-F80T5HO	64"
INT-280T5HO	2-F80T5HO	64"

T8

Catalog No.	Lamps	Size
INT-117	1-F17T8	28"
INT-217	2-F17T8	28"
INT-132	1-F32T8	52"
INT-232	2-F32T8	52"
INT-332	3-F32T8	52"
INT-1040T8	1-F040T8	64"
INT-2040T8	2-F040T8	64"
INT-232-8	4-F32T8	100"
INT-332-8	6-F32T8	100"
INT-296T8	2-F96T8	100"
INT-396T8	3-F96T8	100"

ACCESSORIES AND ADDERS:

ELECTRICAL

277 Volt
Emergency Battery Pack
Standard 20% THD Electronic Ballast
Optional 10% THD Electronic Ballast
Fusing
U.L. Damp Location
U.L. Wet Location (Optional)
100% Polycarbonate Diffuser
Stainless Steel Mounting Bracket
Stainless Steel Latches


277V
EM
EB8
EB10
HLR/GLR
Standard
WL
POLY
SS-BKT
SSL

LED

Exit Sign – LED – UL Listed



OUR BEST SELLING EXIT SIGN!

A simple, efficient and secure  listed EXIT sign that meets energy star rating of 5 watts energy consumption.

Highly configurable design includes additional faceplate (with knock-out left/right chevron arrows) to install fixture as double-sided. Universal mounting kit allows top, side or flush mount installation.

The Self-Testing option is available. Federal and state guidelines require that all exit signs be routinely tested. The Self-Test option allows the exit sign to self-test every 28 days for 5 minutes, and 90 minutes every 6 months (as per regulations).

Allow 2 additional weeks for delivery of self-testing signs.

Features:









- Injection-molded, flame retardant, high impact construction
- UL listed for USA & Canada
- AC indicator light
- Charge rate indicator (Battery Backup configuration only)
- Push-to-test switch (Battery Backup configuration only)
- 120 or 277 VAC operation
- LED lamp life of 25 years plus
- Listed for damp location
- Chevron style knock-out arrows
- Universal mounting kit (top/side/flush mount)
- Ni-cad 4.8v 700mAh battery provides 90 minute emergency run time (Battery Backup configuration only)

Dimensions:

- Width: 12"
- Height: 7 1/2"
- Depth: 1 1/2"



Catalog Code:

	Configuration	AC Only	Battery Backup
	White Housing Red Lettering	LEDRAC	LEDRBB
	White Housing Green Lettering	LEDGAC	LEDGBB
	Black Housing Red Lettering	LEDRBAC	LEDR3B
	Black Housing Green Lettering	LEDGBAC	LEDG3B
	White Housing Red Lettering Self Testing Units	N/A	LEDRBB-ST
	White Housing Green Lettering Self Testing Units	N/A	LEDGBB-ST
	Black Housing Red Lettering Self Testing Units	N/A	LEDR3B-ST
	Black Housing Green Lettering Self Testing Units	N/A	LEDG3B-ST

(Note: AC Only units are usually installed in a facility with a generator).

Shipping Weight - 5 lbs ea.

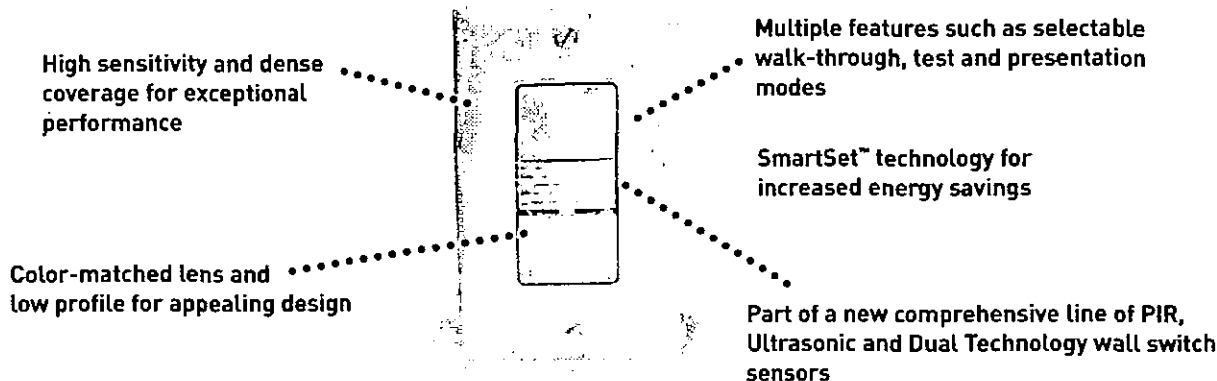
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THE EXIT LIGHT COMPANY, INC.

3525 Del Mar Heights Rd, #304, San Diego, CA 92130
760-598-3948 phone / 760-598-3941 fax
Info@exitlightco.com • www.exitlightco.com



PW-100 Passive Infrared Wall Switch Sensor



PROJECT
LOCATION/TYPE

Product Overview

Description

The PW-100 passive infrared (PIR) wall switch sensor turns lights ON and OFF based on occupancy. It is characterized by high sensitivity to small and large movements, appealing aesthetics, and variety of features.

Operation

The PW-100 replaces existing wall switches and fits in a single gang junction box. It uses advanced PIR technology to detect occupancy and turns lighting ON. Once the space is vacated and the time delay elapses, lights automatically turn OFF. DIP switch settings allow for a variety of control options such as Auto-ON or Manual-ON operation, walk-through, and test modes.

SmartSet™

Using SmartSet technology, the PW-100 continuously monitors the controlled space to identify usage patterns and automatically adjust the time delay for optimal energy efficiency. The sensor assigns short delays (as low as seven minutes) for times when the space is usually vacant, and longer delays (up to 30 minutes) for busier times. SmartSet is also able to differentiate electrical noise from human motion for greater performance.

Applications

The PW-100 sensor is well suited for small, enclosed spaces with clear line of sight of the occupant. Common applications include small office, small conference room and lunch/break rooms.

Features

- Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
- Zero-crossing for long relay life
- Vandal resistant lens combines precise coverage with durability
- Choice of Auto-ON or Manual-ON operation
- Selectable SmartSet automatically adjusts time delay for maximum savings
- Selectable walk-through mode turns lights off three minutes after the room is initially occupied if no motion is detected after the first 30 seconds
- Selectable test mode allows quick and easy adjustments
- Selectable audible and/or visual alerts for impending shutoff
- In automatic mode, sensor returns automatically to Auto-ON after lights are turned off manually; ideal for presentations
- LED indicates occupancy detection
- Features built-in light level sensing with simple, one-step setup
- Override mode allows sensor to operate as a service switch in the unlikely event of a failure
- NEMA WD 7 guideline utilized for coverage testing

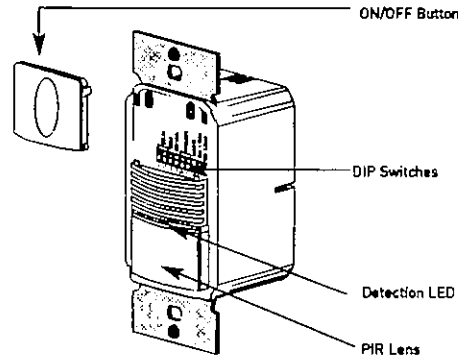
Specifications

- PW-100: 120/230/277 VAC; 50/60 Hz
@ 120 VAC, 0-800 W ballast or tungsten, 1/6 hp
@ 230/277 VAC, 0-1200 W ballast
- PW-100-347: 347 VAC; 50/60Hz, 0-1500 W ballast
- Time delays: SmartSet [automatic], fixed [5, 10, 15, 20, 25 or 30 minutes], walk-through, test-mode

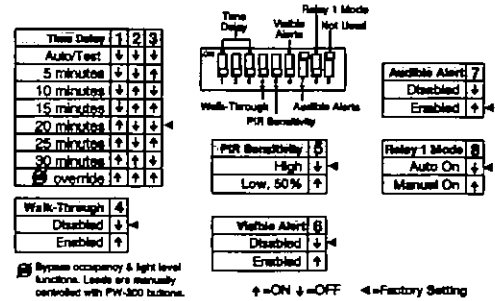
- Coverage: Major motion 35' x 30'
Minor motion 20' x 15'
- Sensitivity adjustment: PIR (high/low)
- Dimensions: 2.73" x 1.76" x 1.83"
(69.3mm x 44.7mm x 46.5mm) L x W x D
- UL and CUL listed; five year warranty

Controls & Settings

Product Controls

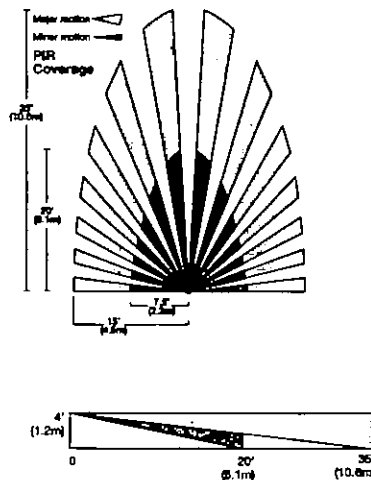


DIP Switch Settings



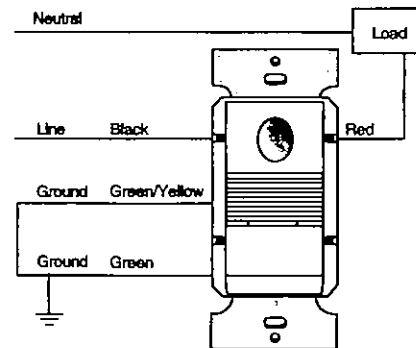
Coverage & Wiring

Coverage Pattern



* For best performance, Watt Stopper/Legrand recommends using this sensor in spaces no larger than 15' x 12'

PW-100/347 Single Level Lighting

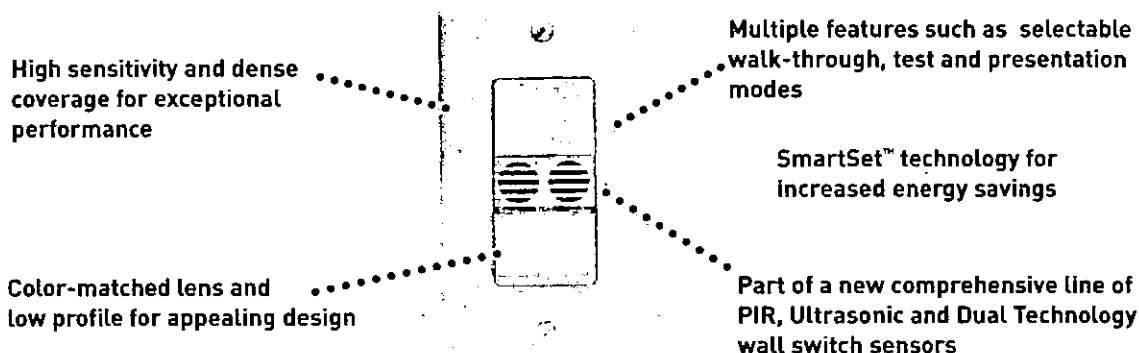


Ordering Information

Catalog No.	Color	Voltage	Load Rating
<input type="checkbox"/> PW-100-W	White	120/230/277 VAC; 50/60 Hz	@ 120 VAC, 0-800 W ballast or tungsten, 1/6 hp @ 230/277 VAC, 0-1200 W ballast
<input type="checkbox"/> PW-100-LA	Lt. Almond		
<input type="checkbox"/> PW-100-I	Ivory		
<input type="checkbox"/> PW-100-G	Grey		
<input type="checkbox"/> PW-100-B	Black		
<input type="checkbox"/> PW-100-347-W	White	347 VAC; 50/60 Hz	0-1500 Watt Ballast
<input type="checkbox"/> PW-100-347-LA	Lt. Almond		
<input type="checkbox"/> PW-100-347-I	Ivory		
<input type="checkbox"/> PW-100-347-G	Grey		
<input type="checkbox"/> PW-100-347-B	Black		

One ASP-211 single-gang cover plate included. Order ASP-422 for blank 2-gang cover plate, ASP-432 for 2-gang cover plate with switch option [specify color].

DW-100 Dual Technology Wall Switch Sensor



Product Overview

Description

The DW-100 dual technology wall switch sensor combines the benefits of passive infrared (PIR) and ultrasonic technologies to turn lights ON and OFF based on occupancy. It is characterized by high sensitivity to small and large movements, appealing aesthetics, and variety of features.

Operation

The DW-100 fits in a single gang junction box. By default, when both PIR and ultrasonic technologies detect occupancy, lights turn ON automatically. Once the lights are ON, detection by either technology holds lights ON until occupancy is no longer detected and the time delay elapses. Through DIP switch settings, the user can customize the sensor by choosing the combination of technologies to turn -ON and hold-ON lights. Additional DIP switch settings allow for a variety of control options such as Auto-ON or Manual-ON, walk-through, and test mode.

Features

- Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
- Zero-crossing for long relay life
- Vandal resistant lens combines precise coverage with durability
- Choice of Auto-ON or Manual-ON operation
- Selectable SmartSet automatically adjusts time delay for maximum savings
- Selectable walk-through mode turns lights off three minutes after the room is initially occupied if no motion is detected after the first 30 seconds
- Selectable test mode allows quick and easy adjustments
- Selectable audible alert for impending shutoff
- In automatic mode, sensor returns automatically to Auto-ON after lights are turned off manually; ideal for presentations
- Four occupancy logic options give users the ability to customize control to meet application needs
- Features built-in light level sensing with simple, one-step setup
- Override mode allows sensor to operate as a service switch in the unlikely event of a failure
- NEMA WD 7 guideline utilized for coverage testing

PROJECT
LOCATION/TYPE

SmartSet™

Using SmartSet technology, the DW-100 continuously monitors the controlled space to identify usage patterns and automatically adjust the time delay for optimal energy efficiency. The sensor assigns short delays (as low as seven minutes) for times when the space is usually vacant, and longer delays (up to 30 minutes) for busier times. SmartSet is also able to differentiate electrical noise from human motion for greater performance.

Applications

Watt Stopper's dual technology has the flexibility to work in a variety of applications where one technology alone may not be sufficient. Common applications include small and executive offices, small and medium conference rooms and lunch/break rooms. In addition, dual technology sensors are the perfect choice for ADA compliant buildings due to lower mounting height requirements.

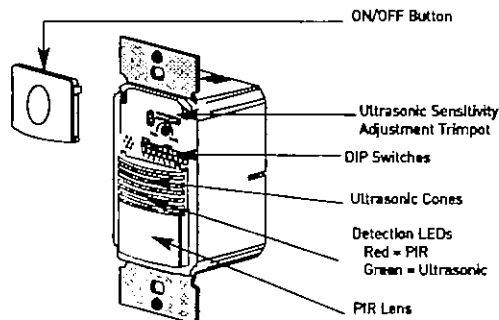
Specifications

- DW-100: 120/230/277 VAC; 50/60 Hz
@ 120 VAC, 0-800 W ballast or tungsten, 1/6 hp
@ 230/277 VAC, 0-1200 W ballast
- DW-100-347: 347 VAC; 50/60Hz, 0-1500 W ballast
- Time delays: SmartSet (automatic), fixed (5, 15 or 30 minutes), walk-through, test-mode

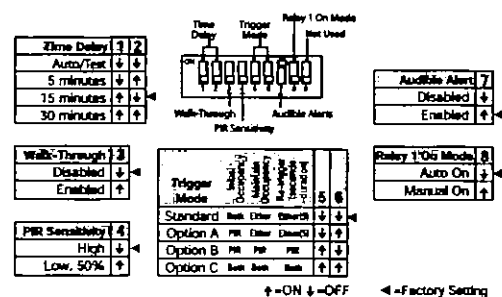
- Coverage: PIR Major motion 35' x 30'
PIR Minor motion 20' x 15'
Ultrasonic Major motion 20' x 20'
Ultrasonic Minor motion 15' x 15'
- Sensitivity adjustment: PIR (high/low), Ultrasonic (fully variable)
- Dimensions: 2.73" x 1.76" x 1.83"
(69.3mm x 44.7mm x 46.5mm) L x W x D
- UL and CUL listed; five year warranty

Controls & Settings

Product Controls

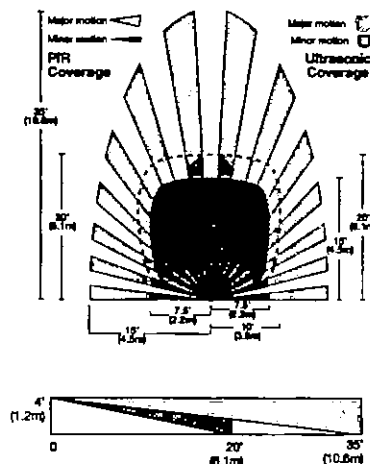


DIP Switch Settings



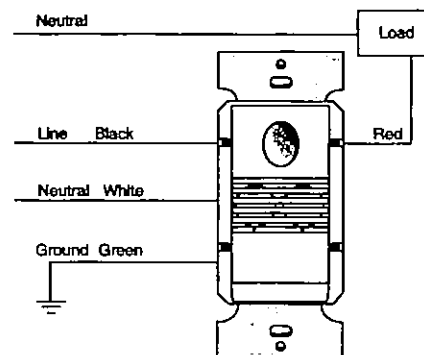
Coverage & Wiring

Coverage Pattern



* For best performance, Watt Stopper/Legrand recommends using this sensor in spaces no larger than 18' x 15'

DW-100/347 Single Level Lighting



Ordering Information

Catalog No.	Color	Voltage	Load Rating
<input type="checkbox"/> DW-100-W	White	120/230/277 VAC; 50/60 Hz	@ 120 VAC, 0-800 W ballast or tungsten, 1/6 hp @ 230/277 VAC, 0-1200 W ballast
<input type="checkbox"/> DW-100-LA	Lt. Almond		
<input type="checkbox"/> DW-100-I	Ivory		
<input type="checkbox"/> DW-100-G	Grey		
<input type="checkbox"/> DW-100-B	Black		
<input type="checkbox"/> DW-100-347-W	White	347 VAC; 50/60 Hz	0-1500 Watt Ballast
<input type="checkbox"/> DW-100-347-LA	Lt. Almond		
<input type="checkbox"/> DW-100-347-I	Ivory		
<input type="checkbox"/> DW-100-347-G	Grey		
<input type="checkbox"/> DW-100-347-B	Black		

One ASP-211 single-gang cover plate included. Order ASP-422 for blank 2-gang cover plate, ASP-432 for 2-gang cover plate with switch option (specify color).

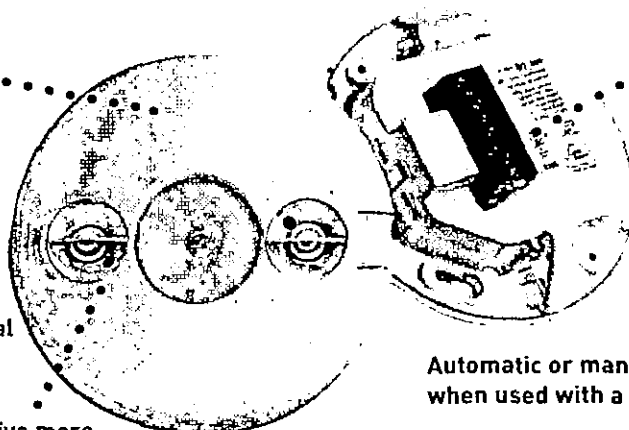
DT-300 Series Dual Technology Ceiling Sensors

Architecturally appealing
low-profile appearance • • • • •

SmartSet™ automatically
selects optimal settings
for each space

Walk-through mode
increases savings potential

Ultrasonic diffusers give more
comprehensive coverage



Plug terminal wiring for
quick and easy installation

Accepts low-voltage
switch input for
manual-on operation

Automatic or manual-on operation
when used with a BZ-150 Power Pack

PROJECT
LOCATION/TYPE

Product Overview

Description

The DT-300 Series Dual Technology Ceiling Sensors combine the benefits of passive infrared (PIR) and ultrasonic technologies to detect occupancy. Sensors have a flat, unobtrusive appearance and provide 360 degrees of coverage.

Operation

Low voltage DT-300 Series sensors utilize a Watt Stopper/Legrand power pack to turn lights on when both PIR and ultrasonic technologies detect occupancy. They can also work with a low voltage switch for manual-on operation. PIR technology senses motion via a change in infrared energy within the controlled area, whereas ultrasonic uses the Doppler Principle and 40KHz high frequency ultrasound. Once lights are on, detection by either technology holds them on. When no occupancy is detected for the length of the time delay, lights turn off. DT-300 Series Sensors can also be set to trigger lights on when either technology or both detect occupancy, or to require both technologies to hold lighting on.

SmartSet™

DT-300 Series Sensors require no adjustment at installation, as SmartSet technology continuously monitors the controlled space to identify usage patterns. Based on these patterns, the unit automatically adjusts time delay and sensitivity settings for optimal performance and energy efficiency. Sensors assigns short delays (as low as five minutes) for times when the space is usually vacant, and longer delays (up to 30 minutes) for busier times.

Application

DT-300 Series Dual Technology Sensors have the flexibility to work in a variety of applications, where one technology alone could cause false triggers. Ideal applications include classrooms, open office spaces, large offices and computer rooms. The DT-300 Series mounting system makes them easy to install in ceiling tiles or to junction boxes, providing the flexibility to be used in a wide range of spaces.

Features

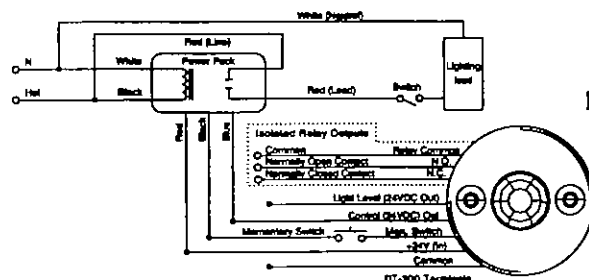
- Advanced control logic based on RISC microcontroller provides:
 - Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
 - SmartSet automatically adjusts sensitivity and time delay settings to fit occupant patterns
 - Walk-through mode turns lights off three minutes after the area is initially occupied – ideal for brief visits such as mail delivery
 - Available with built-in light level sensor featuring simple, one-step setup
- Sensors work with low-voltage momentary switches to provide manual control
- Patented ultrasonic diffusion technology spreads coverage to a wider area
- LEDs indicate occupancy detection
- Uses plug terminal wiring system for quick and easy installation
- Eight occupancy logic options provide the ability to customize control to meet application needs
- Available with isolated relay for integration with BAS or HVAC

Specifications

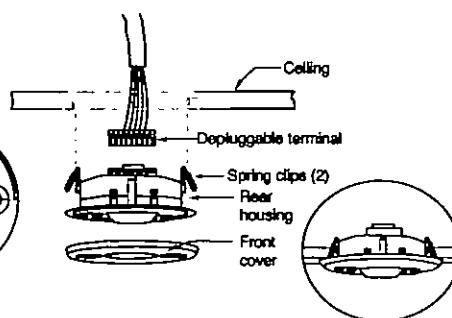
- 24 VDC/VAC
- Ultrasonic frequency: 40kHz
- Time delays: SmartSet (automatic), fixed (5, 10, 15, 20, or 30 minutes), Walk-through/Test Modes
- Sensitivity adjustment: SmartSet (automatic); reduced sensitivity (PIR); variable with trim pot (ultrasonic)
- DT-300's built-in light level sensor: ten to 300 footcandles (107.6 to 3,229.2 lux)
- Low-voltage, momentary switch input for manual on or off operation
- DT-300 contains an isolated relay with N/O and N/C outputs; rated for 1 Amp @ 30 VDC/VAC
- Multilevel Fresnel lens provides 360° coverage for superior occupancy detection
- Mounting options: ceiling tile; 4" square junction box with double-gang mud ring
- Max DT-300s per power pack: B=2, BZ=3
- Max DT-305s per power pack: B=3, BZ=4
- Dimensions: 4.50" diameter x 1.02" deep (114.3mm x 25.9mm)
- UL and CUL listed; five-year warranty

Wiring & Mounting

Wiring Diagram

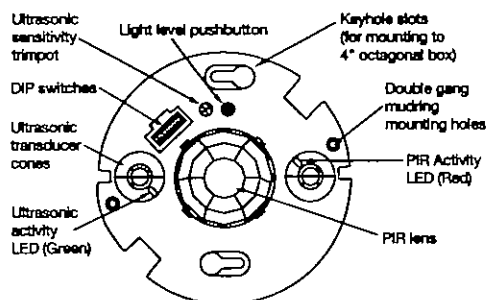


Ceiling Mounting



Controls & Settings

Product Controls



DIP Switch Settings

1 = Factory Setting
● = ON
— = OFF

Logic	Switch 1	Switch 2	Switch 3
Occupancy Standard	—	—	—
Option 1	●	—	—
Option 2	—	●	—
Option 3	—	—	●
Option 4	●	●	—
Option 5	—	●	●
Option 6	—	—	●
Option 7	●	—	—

Time Delay	4	5	6
5 sec/SmartSet	—	—	—
5 minutes	—	—	—
10 min.	—	—	—
15 min.	—	—	—
20 minutes	—	—	—
30 min.	—	—	—

↑ = walk-through mode

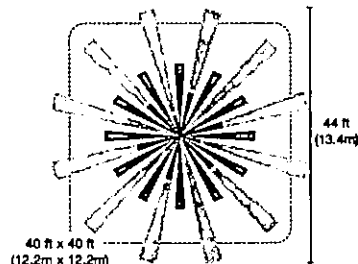
Trigger	Initial Occupancy	Main Occupancy	Relay-Trigger (seconds duration)
Standard	●	—	—
Option 1	—	●	—
Option 2	—	—	●
Option 3	—	—	—
Option 4	—	—	—
Option 5	—	—	—
Option 6	—	—	—
Option 7	—	—	—

LEDs	7
Disabled	—
Enabled	●

PIR Sensitivity	8
Minimum	—
Max/SmartSet	●

The technology control (occupancy logic) options are adjustable by user. The standard setting recommended for most applications requires both technologies to trigger on, either to hold on.

Coverage



Coverage shown is maximum and represents half-step walking motion. Under ideal conditions, coverage for half-step walking motion can reach up to 1000 ft².

Ordering Information

Catalog No.	Voltage	Current	Coverage	Features
<input type="checkbox"/> DT-300	24 VDC/VAC	43 mA	up to 1000 ft² (92.9 m²)	Isolated relay, light level
<input type="checkbox"/> DT-305	24 VDC/VAC	35 mA	up to 1000 ft² (92.9 m²)	

Sensors are white and use Watt Stopper power packs. Current consumption can be slightly higher when only one sensor per power pack is used.

Pub. No. 14906

www.wattstopper.com
800.879.8585

DW-200 Dual Technology Dual Relay Wall Switch Sensor

High sensitivity and dense coverage for exceptional performance

Two relays for control of two separate lighting loads or circuits

Color-matched lens and low profile for appealing design

Multiple features such as selectable walk-through, test and presentation modes

SmartSet™ technology for increased energy savings

Part of a new comprehensive line of PIR, Ultrasonic and Dual Technology wall switch sensors



Product Overview

Description

The DW-200 dual technology wall switch sensor combines the benefits of passive infrared (PIR) and ultrasonic technologies to turn lights ON and OFF based on occupancy. It contains two relays for controlling two independent lighting loads or circuits and features our innovative SmartSet™ technology.

Operation

The DW-200 fits in a single gang junction box. By default, when both PIR and ultrasonic technologies detect occupancy, lights turn ON automatically. Once the lights are ON, detection by either technology holds lights ON until occupancy is no longer detected and the time delay elapses. Each of the DW-200's relays can control a separate lighting load and each can be set for either automatic or manual-ON. Dual ON/OFF buttons allow the user to manually turn on and off each of the loads. DIP switch settings allow for a variety of control options such as Auto-ON or Manual-ON, walk-through, and test mode.

Features

- Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
- Zero-crossing on both relays for long relay life
- Vandal resistant lens combines precise coverage with durability
- Choice of Auto-ON or Manual-ON operation, selectable for each relay
- Selectable SmartSet automatically adjusts time delay for maximum savings
- Selectable walk-through mode turns lights off three minutes after the room is initially occupied if no motion is detected after the first 30 seconds
- Selectable test mode allows quick and easy adjustments

PROJECT

LOCATION/TYPE

Bi-Level Control

The DW-200 features a built-in light level sensor that controls the second (secondary) relay. If adequate daylight is present, the sensor will hold secondary lights off until daylight levels drop, providing increased energy savings. The DW-200 satisfies energy codes requiring bi-level or daylight control switching. The two relays in the sensor give it the ability to control two lighting loads independently. This provides A/B switching where the user can achieve half-lighting (or another desired portion) from a single switch.

Applications

The DW-200 has the flexibility to work in a variety of applications where one technology alone may not be sufficient. In addition, its dual relays allow bi-level switching or control of a secondary load. Common applications include small and executive offices, small and medium conference rooms and lunch/break rooms. This sensor is also a perfect choice for ADA compliant buildings due to lower mounting height requirements.

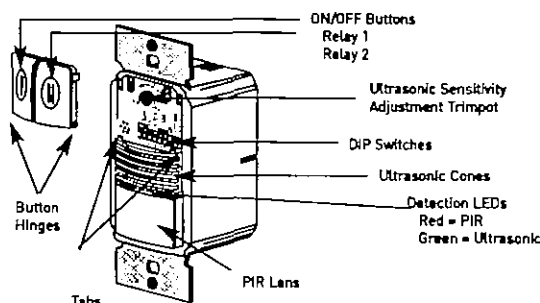
- Selectable audible alert for impending shutoff
- In automatic mode, sensor returns automatically to Auto-ON after lights are turned off manually; ideal for presentations
- Four occupancy logic options give users the ability to customize control to meet application needs
- Features built-in light level sensing with simple, one-step setup
- Override mode allows sensor to operate as a service switch in the unlikely event of a failure
- NEMA WD 7 guideline utilized for coverage testing

Specifications

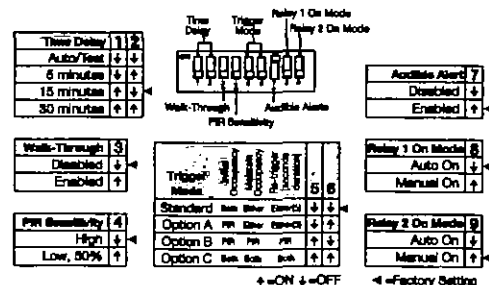
- 120/230/277 VAC; 50/60 Hz
 \varnothing 120 VAC, 0-800 W ballast or tungsten, 1/6 hp
 \varnothing 230/277 VAC, 0-1200 W ballast
- Time delays: SmartSet (automatic), fixed (5, 15 or 30 minutes), walk-through, test-mode
- Coverage: PIR Major motion 35' x 30'
 PIR Minor motion 20' x 15'
 Ultrasonic Major motion 20' x 20'
 Ultrasonic Minor motion 15' x 15'
- Sensitivity adjustment: PIR (high/low), Ultrasonic (fully variable)
- Dimensions: 2.73" x 1.76" x 1.83"
 [69.3mm x 44.7mm x 46.5mm] L x W x D
- UL and CUL listed; five year warranty

Controls & Settings

Product Controls

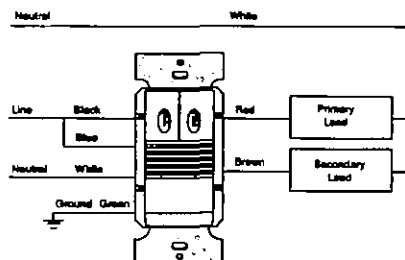


DIP Switch Settings

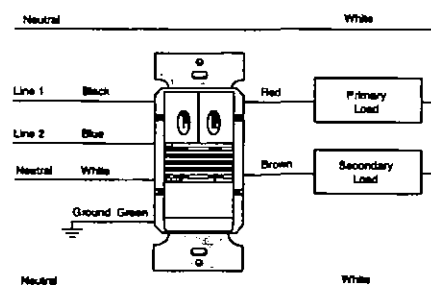


Wiring

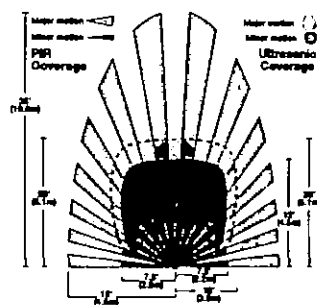
DW-200 Bi-level Level Wiring



DW-200 Two Circuit Level Wiring



Coverage



* For best performance, Watt Stopper/Legrand recommends using this sensor in spaces no larger than 18' x 15'

Ordering Information

Catalog No.	Color	Voltage	Load Rating
<input type="checkbox"/> DW-200-W	White	120/230/277 VAC; 50/60 Hz	\varnothing 120 VAC, 0-800 W ballast or tungsten, 1/6 hp \varnothing 230/277 VAC, 0-1200 W ballast
<input type="checkbox"/> DW-200-LA	Lt. Almond		
<input type="checkbox"/> DW-200-I	Ivory		
<input type="checkbox"/> DW-200-G	Grey		
<input type="checkbox"/> DW-200-B	Black		

One ASP-211 single-gang cover plate included. Order ASP-422 for blank 2-gang cover plate, ASP-432 for 2-gang cover plate with switch option (specify color).

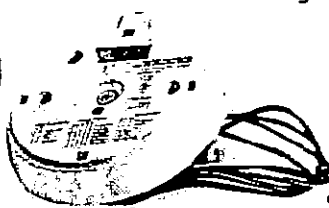
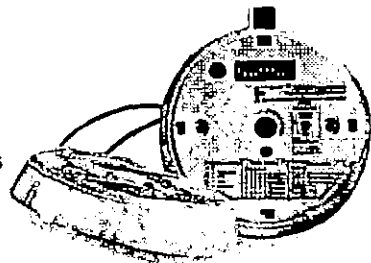
OCCUPANCY SENSORS

High Bay Occupancy Sensor Standard Module

Compatible with all
electronic ballasts

Convenient access to
digital adjustments

Multiple fixture
mounting choices



Modular design with mix and match
module, lens and accessories

Flying leads for easy installation

PROJECT
LOCATION/TYPE

Product Overview

Description

The HB300, HB330, HB340, HB350, HB340-B and HB350-B sensors control lighting in high mount areas. The sensors turn lights on and off based on occupancy, and install directly to industrial T5 or T8 fixtures via surface mount, a snap-in connector which mounts through a 1/2" knockout with 18" leads to the back box, or optional Extender Module. The modular lenses required to operate (ordered separately) are specially designed to provide reliable coverage from a wide range of mounting heights.

Operation

The HB sensors utilize Passive Infrared (PIR) technology to sense occupancy. Detection occurs when the HB senses the difference between infrared energy in motion and the background space. Lighting automatically turns on when occupancy is detected. After a user-specified length of time when no occupancy is detected, lighting automatically switches off.

Modular Design

The HB sensors are modular and are comprised of a line or low voltage sensor module (HB300, HB330, HB340, HB350), a lens (HBL1, HBL1M, HBL3, HBL4) and any mounting accessories needed. Modularity ensures the ability to get exactly the right voltage control and coverage pattern required. Substituting different snap-on lenses during field installation allows customers to easily adapt the HB sensor to any application, or for fixture manufacturers to install the module directly onto the fixture at the plant, leaving the snap-on lens for field installation.

Applications

The variety of interchangeable lenses for multiple coverage patterns, choice of line or low voltage modules, and accessories that provide alternate installation options give Watt Stopper HB sensors the flexibility to maximize energy savings in most high mount areas or warehouse applications to support sustainable 'green' building practices such as LEED.

Features

- Front access to DIP switch settings for time and sensitivity adjustment
- ASIC technology reduces components and enhances reliability
- Pulse Count Processing eliminates false offs without reducing sensitivity
- Detection Signature Analysis eliminates false triggers; provides immunity to RFI and EMI
- LED indicator of occupancy detection for easy verification of coverage
- Utilizes Watt Stopper/Legrand Zero Crossing Circuitry to reduce stress on the relay and increase sensor life
- Compatible with all electronic ballasts
- No leakage to load in off mode for safety

 **Watt Stopper** 

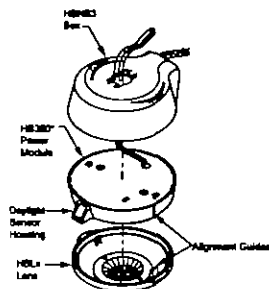
www.wattstopper.com
800.879.8585

Specifications

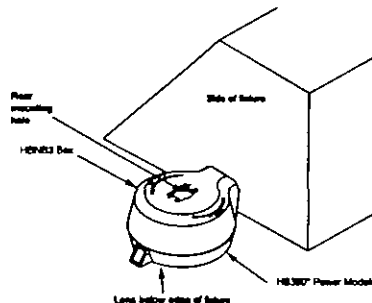
- HB300: 24 VDC
HB330: 208/240 VAC multi-phase, 60 Hz
HB340: 347/480 VAC single/multi-phase 60 Hz
HB350: 120/277 VAC single phase, 60 Hz
HB340-B: 347/480 VAC single/multi-phase 60 Hz
w/Back Box
HB350-B: 120/277 VAC single phase, 60 Hz
w/Back Box
- Time delay adjustable 15 seconds to 30 minutes
- 18" tinned wire leads, 18 AWG
- Dimensions HB3XX Module: 3.93" x .73" [100mm x 18.6mm] Diameter x Height
- Dimensions HB3XX-B w/junction box: 3.93" x 1.91" [100mm x 48.6mm] Diameter x Height
- Dimensions with junction box and lens HB3XX-Lx-B: 3.93" x 2.68" [99.8mm x 68mm] Diameter x Height
- UL and CUL listed; five-year warranty

Assembly & Mounting

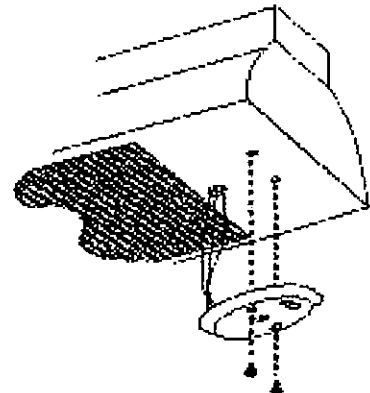
HB3xx Assembly



HB3xx Fixture Mount

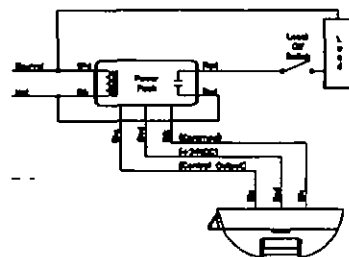


HB3xx Surface Mount

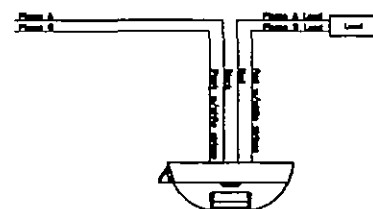


Wiring & Connections

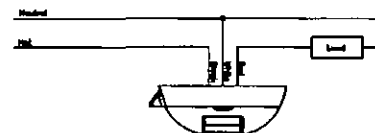
HB300 Low Voltage Wiring





HB330 & 340 Wiring



HB350 Line Voltage Wiring



Ordering Information High Bay Occupancy Sensor Standard Modules

	Catalog No.	Description	Voltage	Load Capacity
	<input type="checkbox"/> HB300	HB Standard Module Only	24 VDC/VAC	Consumes 16 mA [use WS Power Pack]
	<input type="checkbox"/> HB330	HB Standard Module Only	208/240 VAC	0-1200 W Ballast
	<input type="checkbox"/> HB340	HB Standard Module Only	347/480 VAC	0-1200 W Ballast
	<input type="checkbox"/> HB350	HB Standard Module Only	120/277 VAC	0-800 W Ballast and tungsten or 0-1200 W Ballast or 1/6 hp
	<input type="checkbox"/> HB340-B	HB Stand. Module w/Back Box	347/480 VAC	0-1200 W Ballast
	<input type="checkbox"/> HB350-B	HB Stand. Module w/Back Box	120/277 VAC	0-800 W Ballast and tungsten or 0-1200 W Ballast or 1/6 hp

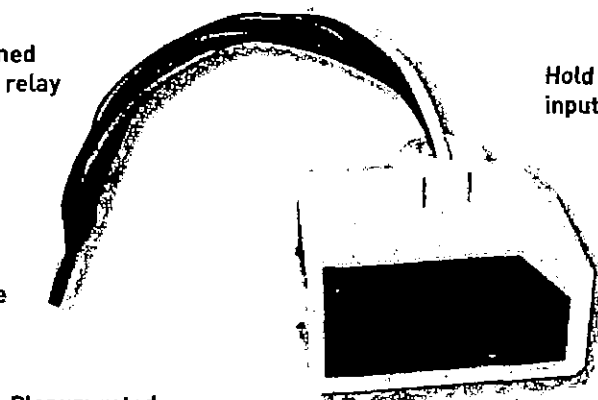
PLEASE NOTE:

1. For a complete working system, separately order the correct lens for your application (see Lenses cut sheet).
2. When preparing P.O., order parts as separate line items (e.g., HB350, HBL1, HBEM3)
3. Parts shipped separately.

BZ-100 Dual Voltage Power Pack

Fully self-contained
transformer and relay

Zero crossing for
reliability and
increased product life



Plenum rated

Hold ON and Hold OFF
inputs

Overcurrent protection
(low voltage)

Dual 120/277 VAC

PROJECT
LOCATION/TYPE

Product Overview

Description

The BZ-100 is a full-featured power pack, providing 24 VDC operating voltage to Watt Stopper's low voltage occupancy sensors. In addition, the BZ enables special hold-ON, hold-OFF and load shed applications when used with lighting control panels or building management systems.

Operation

The BZ consists of a transformer and a high-current relay. The transformer has a primary high voltage input of 120 or 277 VAC. The secondary output, which provides the operating power for Watt Stopper occupancy sensors, is 24 VDC, 150 mA. This 150 mA output is available with the power pack's relay connected. The power packs receive input from occupancy sensors or light level sensors and switch lighting on and off. For example, when an occupancy sensor detects motion, it electrically closes an internal circuit which sends 24 VDC to the power pack. This closes the power pack relay and turns the lights on.

Plenum Rated

The BZ is UL 2043 plenum rated with teflon coated low voltage leads and plenum rated plastic. This means that the power packs do not need to be installed in the junction box, but can be installed in the plenum. They are housed in ABS, UL-rated 94V-0 plastic enclosures.

Applications

BZ power packs can control lighting circuits, self-contained air conditioners, pumps, fans, motors, VAV systems, motorized damper controls and setback thermostats. The hold-OFF input can be used to perform load shedding. During a power alert or during peak demand, a signal from a BMS or utility meter triggers the BZ to shed non-critical lighting loads. The hold-OFF function also works with a security system to hold some lights off during a security walk-through. The hold-ON input is ideal for retail and commercial facilities that want to hold certain lighting ON during normal business hours. After-hours, a time clock signals the BZ to no longer hold lights ON, allowing occupancy sensors to resume control.

Features

- Self-contained transformer relay system
- Primary high voltage input of 120 or 277 VAC
- LED indicates status of relay or if there is a low voltage overcurrent
- Hold-ON and hold-OFF inputs integrate with lighting control panels, BMS and other building systems
- Hold-OFF input can provide load shedding function
- Hold-ON input enables method to override occupancy sensor and hold lighting ON
- Zero crossing circuitry for reliability and increased product life
- UL 2043 plenum rated
- Can be installed directly in plenum for cost-effective installation
- 1/2 inch snap-in nipple attaches to standard electrical enclosures through 1/2 inch knockouts

WattStopper | a legend

www.wattstopper.com
800.879.8585



OCCUPANCY SENSORS

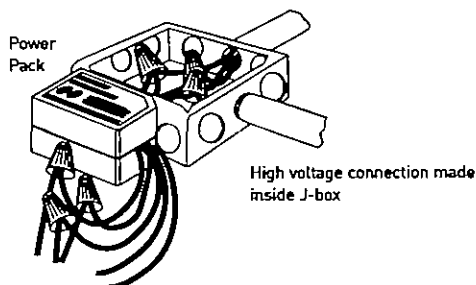
POWER PACKS

Specifications

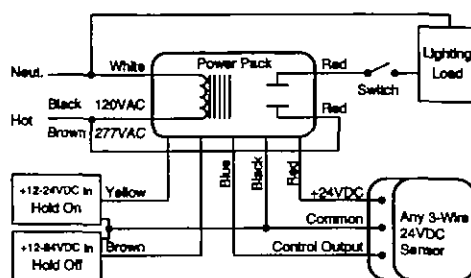
- 120/277 VAC voltage input
- Secondary voltage of 24 VDC
- Secondary output of 150 mA (with relay connected)
- Low voltage leads are rated for 300 volts
- Hold-ON and hold-OFF inputs for integration with lighting control panels, BMS, and other building systems 12-24 VDC
- UL-rated 94 V-0 plastic enclosure; units are grey
- UL 2043 plenum rated
- Dimensions: 1.6" x 2.75" x 1.6" (40.6mm x 69.9mm x 40.6mm) with a 1/2 inch snap-in nipple
- UL and CUL listed; Five year warranty

System Layout & Wiring

Installation Diagram

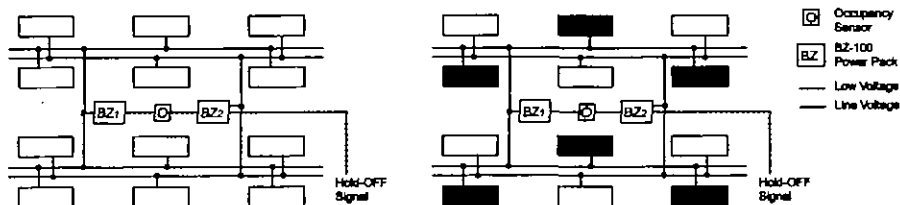


Wiring with Occupancy Sensor



Hold-OFF & Hold-ON Applications

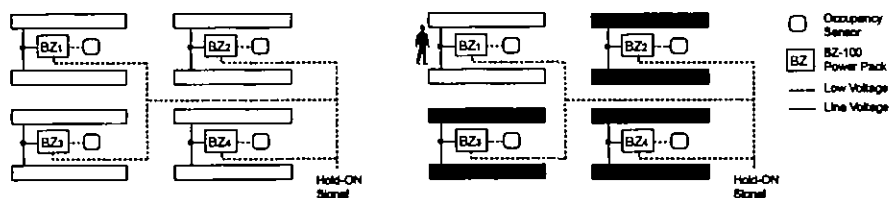
Load Shed (Hold-OFF) Application for Open Office Spaces



The occupancy sensor, connected to each BZ, keeps all lights on when the space is occupied.

When the load shed command is given (by utility meter, BMS, etc.), lights connected to the BZ2 are held off. Remaining lights, (BZ1) are controlled by occupancy sensor.

Hold-ON Retail Application



During store hours, a signal from a time clock to the BZ holds lights on, regardless of occupancy.

After hours, the clock schedule cancels the hold on and occupancy sensor control takes over.

Ordering Information

Installation Notes

Pub. No. 14406

Catalog No.	Input Voltage	Load Ratings			Output
		Ballast [A]	Incan [A]	Motor [HP]	
<input type="checkbox"/> BZ-100	120/277 VAC; 60 Hz	20	20	1*	24 VDC; 150 mA**

* 1 Hp rated at 120/250 VAC. ** Output is 150 mA with relay connected.

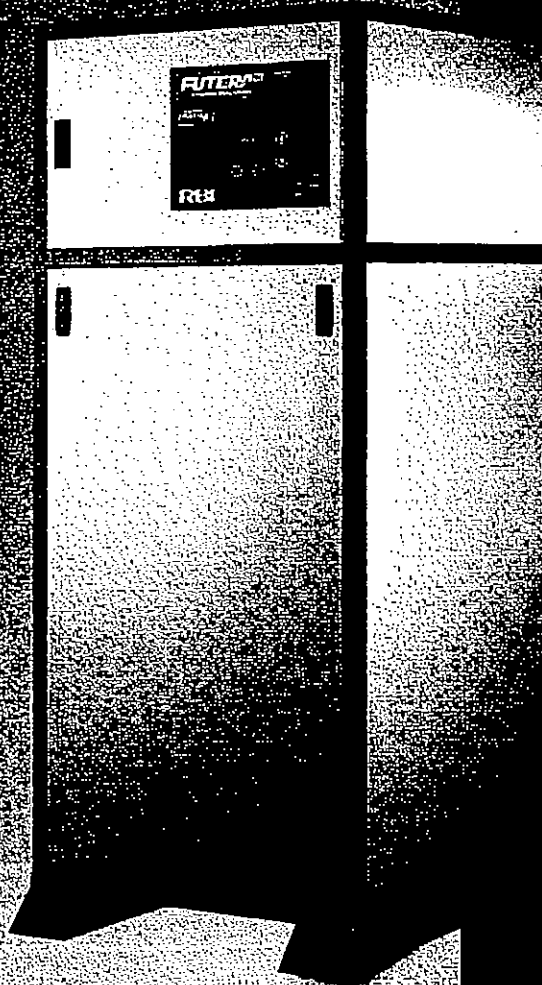
1. All Watt Stopper power packs should be installed in accordance with state, local, and national electrical codes and requirements.
2. Power packs are designed to attach to existing or new electrical enclosures with .5" (25.40mm) knockouts. (Check electrical codes in your area.)
3. Most applications require UL listed, 18-22 AWG, 3-conductor, Class 2 cable for low voltage wiring. For plenum return ceilings use UL listed plenum-approved cables.

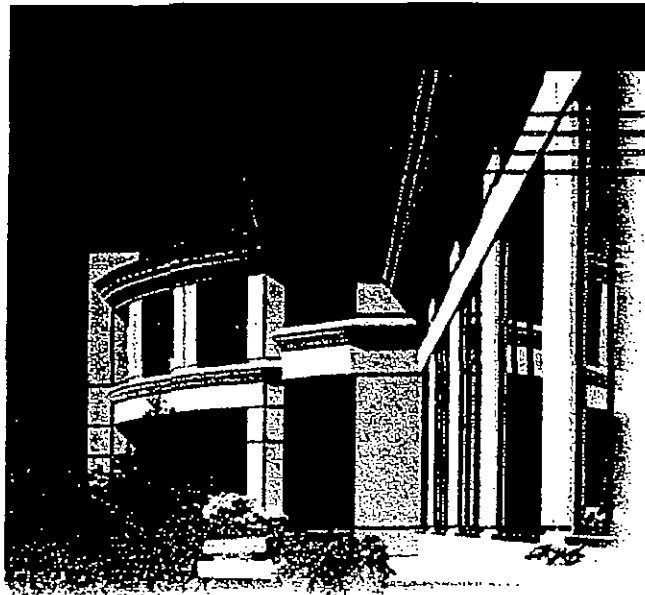
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MECHANICAL

FUTERA^{III}
SERIES

Domestic Hot Water Heaters and Boilers

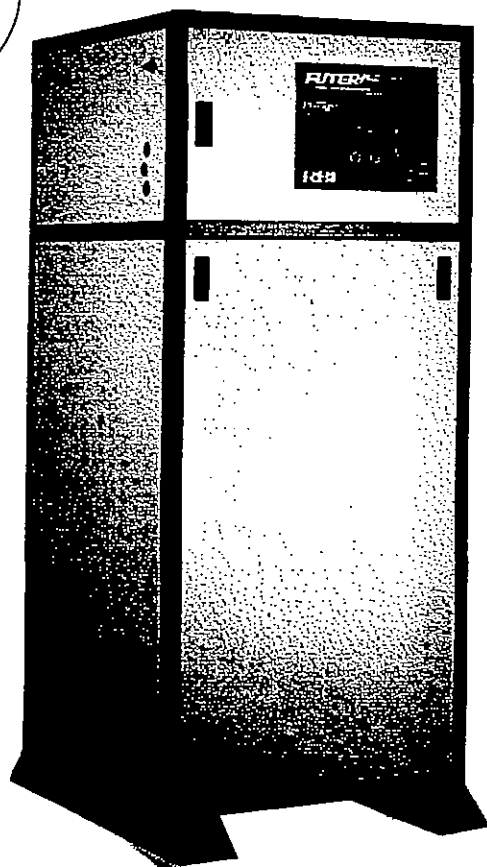




FUTERA^{III} **MODULATION**

FULL MODULATION, HIGH EFFICIENCY HOT WATER SUPPLY AND HYDRONIC HEATING BOILERS

The gas-fired Futera III brings the field-proven performance of Futera Series boilers and water heaters to even higher levels of efficiency and reliability. Featuring full modulation with 4:1 turndown, the Futera III supplies the precise amount of heat necessary to maintain desired building temperature by matching heating demand without over-firing and wasting energy. These dependable, easy-to-service boilers feature rugged construction and sleek, stainless steel jacket design. Models range from 500 – 1999 MBH. If you're looking to maximize efficiency, reliability and flexibility in domestic hot water and hydronic heating applications, the Futera III is your heating solution.



STANDARD FEATURES

- 500 – 1999 MBH
- Finned copper tube heat exchanger, ASME 160 psi max WP, 4-pass design
- Stainless steel jacket panels
- Solid bronze headers
- Variable speed blower
- Digital text annunciator
- Mounted & wired flow switch
- Flame safeguard control
- Quick-release service latches
- Small vent sizes
- Seismic restraint base assembly
- HeatNet integrated boiler management system
- Modbus protocol for BMS communications

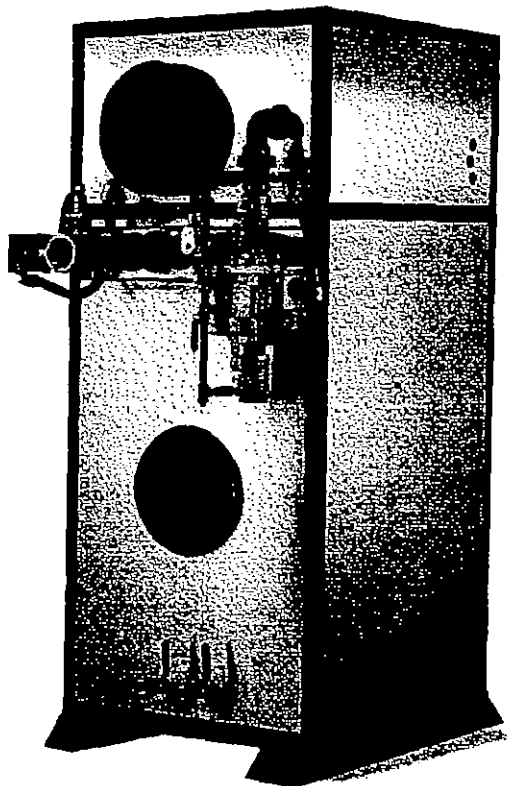
DEPENDABLE, EFFICIENT PERFORMANCE

- High efficiency, up to 88%
- Full modulation with smooth, 4:1 turndown
- Sealed combustion/direct vent
- Symmetrically air/fuel coupled
- Commercial quality combustion controls
- Linked operating control system for multiple unit applications
- Gasketless heat exchanger assembly

OPTIONAL FEATURES

- Cupro-Nickel Finned Tubes
- Freeze protection package
- BACnet or LonWorks Interface module
- Honeywell keyboard display module S7800
- Outdoor sensor with housing
- Outdoor installation





Smart Service Design

Large capacity in a small footprint offers greater flexibility and ease of installation in a space-saving design that leaves more elbowroom in the mechanical room. The rugged framework base is designed to fit through a standard doorway. A variety of venting options provides added installation flexibility. Quick-release latches allow for easy access to all components to make short work of service and maintenance.

Proven Pilot Ignition System

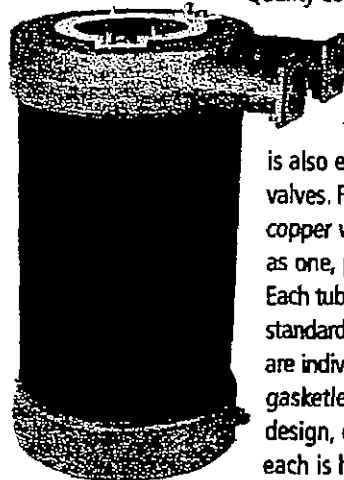
The Futera III modulation series uses a proven pilot with interrupted spark ignition and UV flame detection. The UV detector and igniter assembly provide highly reliable ignition and easy service. This important design feature provides long-life reliability. An observation port allows easy inspection of the flame at the top of the boiler.



The metal fiber burner delivers excellent performance using the latest in fiber technology. The robust, pre-mix burner allows seamless modulating turndown. The burner ensures ultra-low emission levels, noise-free with extremely high efficiency. Ignition components can be easily removed, serviced and reinstalled without removal of the burner assembly.

Reliable Heat Exchanger

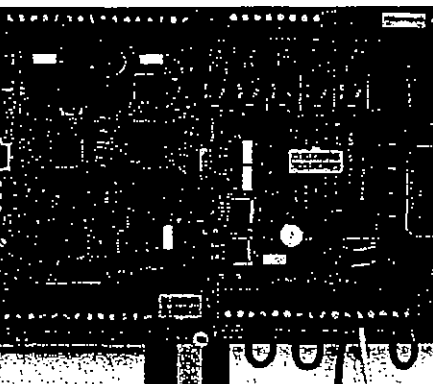
Quality components include a rugged, 4-pass design, heat exchanger with bronze headers and fittings that prevent rust and corrosion for the life of the heater. The unit is also equipped with heavy-duty drain valves. Finned tubes are industrial grade copper with fins and tubewalls formed as one, providing better heat transfer. Each tube is rolled into all-bronze headers – standard on all Futera boilers. The tubes are individually field replaceable. The gasketless heat exchanger is superior in design, durability and serviceability – each is hydrostatically tested, approved and stamped for 160 psi ASME operation.



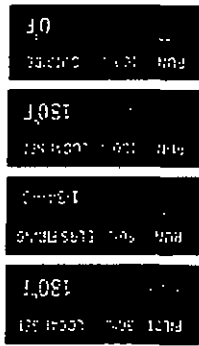
'On Board' control integrated with Building Management Systems

HeatNet controls are built into each Futera III boiler to enhance efficiency and provide constant communication with the Building Management System (BMS). 'On board' in every Futera III boiler, HeatNet eliminates the need for bulky, wall-mounted control panels. HeatNet maximizes operating efficiency and turnaround rates to create substantial energy savings for Futera III boiler plants. The control provides flexible operation in a variety of set-up configurations -- as a stand-alone boiler, a boiler in a

Master/Member network using HeatNet protocol, or as a member in a system for up to 16 boilers. HeatNet provides a higher level of

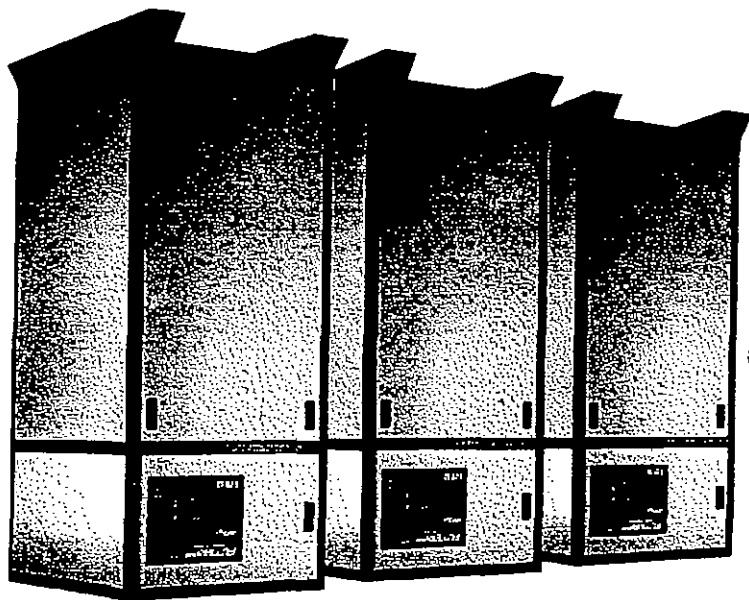


control precision, repeatability and feedback with digital communications control, featuring four (4) temperature sensor inputs: outside air, supply (outlet) temperature, return (inlet) temperature and header temperature. HeatNet is fully compatible with Modbus Building Management System (BMS) protocol. An optional 'ProtoCessor' board can also be installed for compatibility with BACnet and LonWorks BMS protocols with no redesign of the HeatNet control.



Space-saving Footprint

The compact footprint of Futera III boilers allows for multiple boiler installation while still conserving valuable boiler room space and maintaining ease of access for service and maintenance.

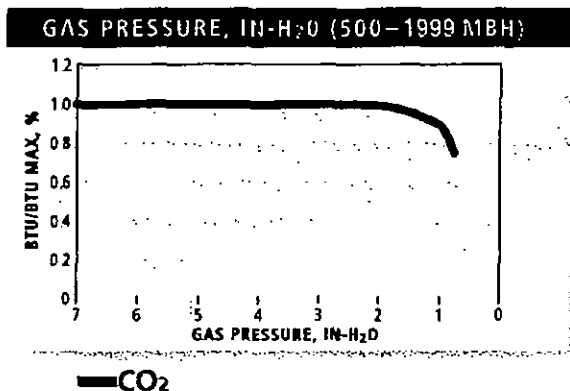
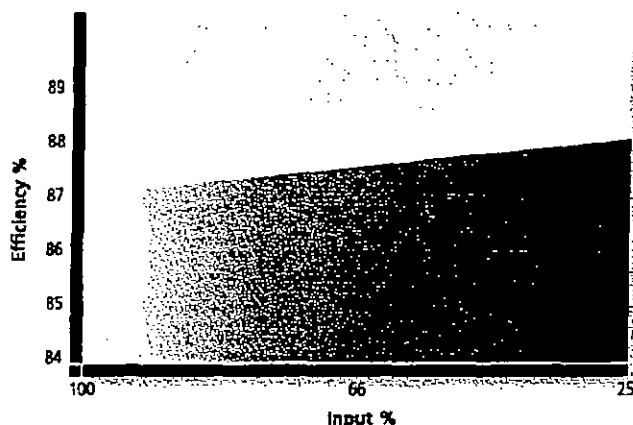


FUTERA^{III}

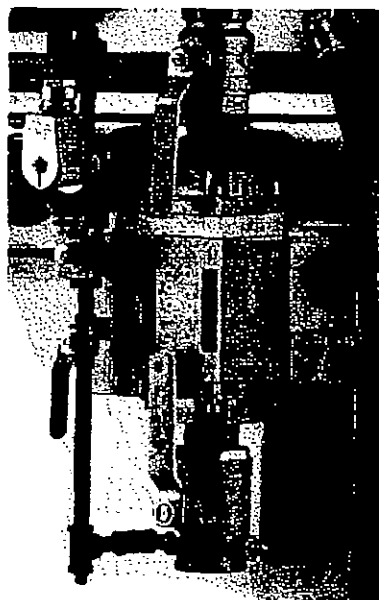
MODULATION

Symmetric Air/Fuel Coupling

The boiler will operate without producing dangerous emissions with the flue or air inlet significantly blocked. The Futera III will react to a change in air or fuel flow, from any cause, by reducing its input while maintaining high combustion quality. This feature, while providing a high degree of safety, reduces sensitivity to flue installation and allows use in areas of variable air inlet pressures with no degradation in performance.



The Futera III provides high tolerance for real world conditions as it maintains 100% full input down to 2"wc.



Advanced gas train design monitors and regulates gas input based on combustion air, which in turn provides highly repeatable air/fuel ratio throughout the operating range.



7555 Tranmere Dr., Mississauga, Ontario L5S 1L4
Tel (905) 670-5888 Fax (905) 670-5782

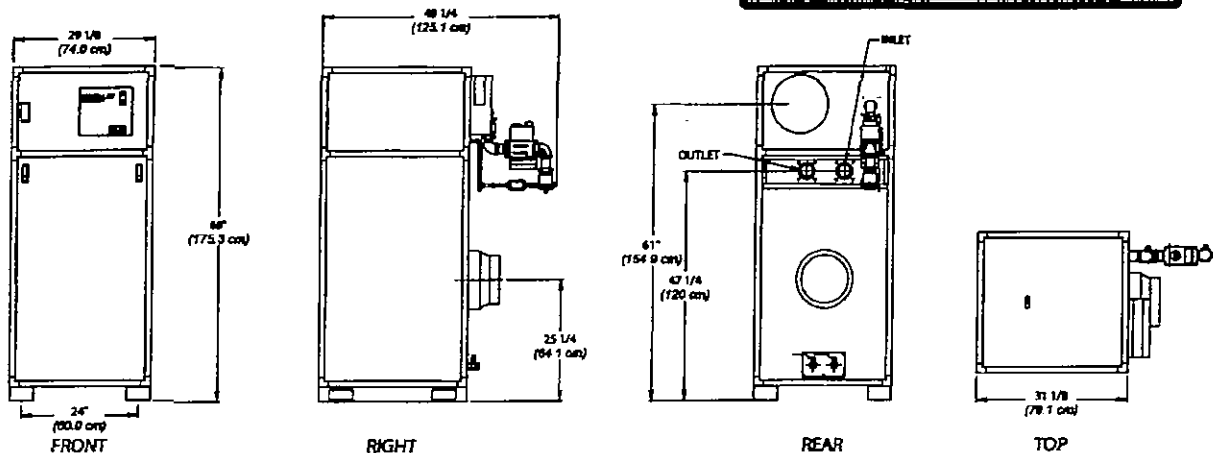
280 North Elm Street, Westfield, MA 01085
Tel (413) 568-9571 Fax (413) 568-9613

A MESTEK COMPANY www.rbiwaterheaters.com

In the interest of product improvement, RBI reserves the right to make changes without notice.

FUTERA^{III} MODULATION

FUTERA III 2000



DIMENSIONS & RATINGS

Model	Flow Vent				Air Intake				Connections		Weight	
	Input		Output		(Cat II) Negative	(Cat IV) Positive (Up to 60")	For Vertical	For Horizontal (Up to 60")	Gas	Water	Lbs	Kg
	MBH	kW	MBH	kW								
MB/MW 500	500	147	435	127	6"	5"	8"	6"	1"	2"	421	191
MB/MW 750	750	220	653	191	6"	5"	8"	6"	1"	2"	550	250
MB/MW 1000	1,000	293	870	255	7"	6"	8"	6"	1 1/4"	2"	560	254
MB/MW 1250	1,250	366	1,088	319	8"	6"	10"	8"	1 1/4"	2 1/2"	615	280
MB/MW 1500	1,500	440	1,305	382	8"	8"	10"	10"	1 1/4"	2 1/2"	678	308
MB/MW 1750	1,750	513	1,523	446	10"	10"	12"	12"	1 1/2"	2 1/2"	738	333
MB/MW 2000	1,999	586	1,739	510	10"	10"	12"	12"	1 1/2"	2 1/2"	817	343

HOURLY RECOVERY CAPACITY ΔT (GPH & LPH)

Model	Temperature Rise											
	40° F	22° C	60° F	33° C	80° F	44° C	100° F	56° C	120° F	67° C	140° F	78° C
MB/MW 500	1,306	4,942	870	3,295	653	2,471	522	1,977	435	1,647	373	1,412
MB/MW 750	1,958	7,413	1,306	4,942	9,790	3,706	783	2,965	653	2,471	560	2,118
MB/MW 1000	2,611	9,884	1,741	6,589	1,306	4,942	1,044	3,954	870	3,295	746	2,824
MB/MW 1250	3,264	12,355	2,176	8,237	1,632	6,177	1,306	4,942	1,088	4,118	933	3,530
MB/MW 1500	3,917	14,826	2,611	9,884	1,958	7,413	1,567	5,930	1,306	4,942	1,149	4,236
MB/MW 1750	4,569	17,297	3,046	11,531	2,285	8,648	1,828	6,919	1,523	5,766	1,306	4,942
MB/MW 2000	5,219	19,758	3,480	13,172	2,610	9,879	2,088	7,903	1,740	6,586	1,491	5,645

TEMPERATURE RISE/PRESSURE DROP

Model	Temperature Rise Across Heat Exchanger															
	20° F		11.1° C		25° F		13.9° C		30° F		16.7° C		35° F		19.4° C	
	Flow Rate GPM	Pres. Drop ft.	Flow Rate L/s	Pres. Drop kPa	Flow Rate GPM	Pres. Drop ft.	Flow Rate L/s	Pres. Drop kPa	Flow Rate GPM	Pres. Drop ft.	Flow Rate L/s	Pres. Drop kPa	Flow Rate GPM	Pres. Drop ft.	Flow Rate L/s	Pres. Drop kPa
MB/MW 500	43.5	0.55	2.7	1.6	34.8	0.36	2.2	1.1	—	—	—	—	—	—	—	—
MB/MW 750	65.3	1.63	4.1	4.8	52.2	1.08	3.3	3.2	43.5	0.77	2.7	2.3	37.3	0.58	2.4	1.7
MB/MW 1000	87.0	3.59	5.5	10.6	69.6	2.37	4.4	7.0	58.0	1.69	3.7	5.0	49.7	1.27	3.1	3.8
MB/MW 1250	108.8	2.21	6.9	6.5	87.0	1.46	5.5	4.3	72.5	1.04	4.6	3.1	62.1	0.78	3.9	2.3
MB/MW 1500	130.5	3.73	8.2	11.0	104.4	2.46	6.6	7.3	87.0	1.76	5.5	5.2	74.6	1.32	4.7	3.9
MB/MW 1750	—	—	—	—	121.8	3.84	7.7	11.3	101.5	2.74	6.4	8.1	87.0	2.06	5.5	6.1
MB/MW 2000	—	—	—	—	139.2	5.63	8.8	16.6	116.0	4.01	7.3	11.8	99.4	3.02	6.3	8.9



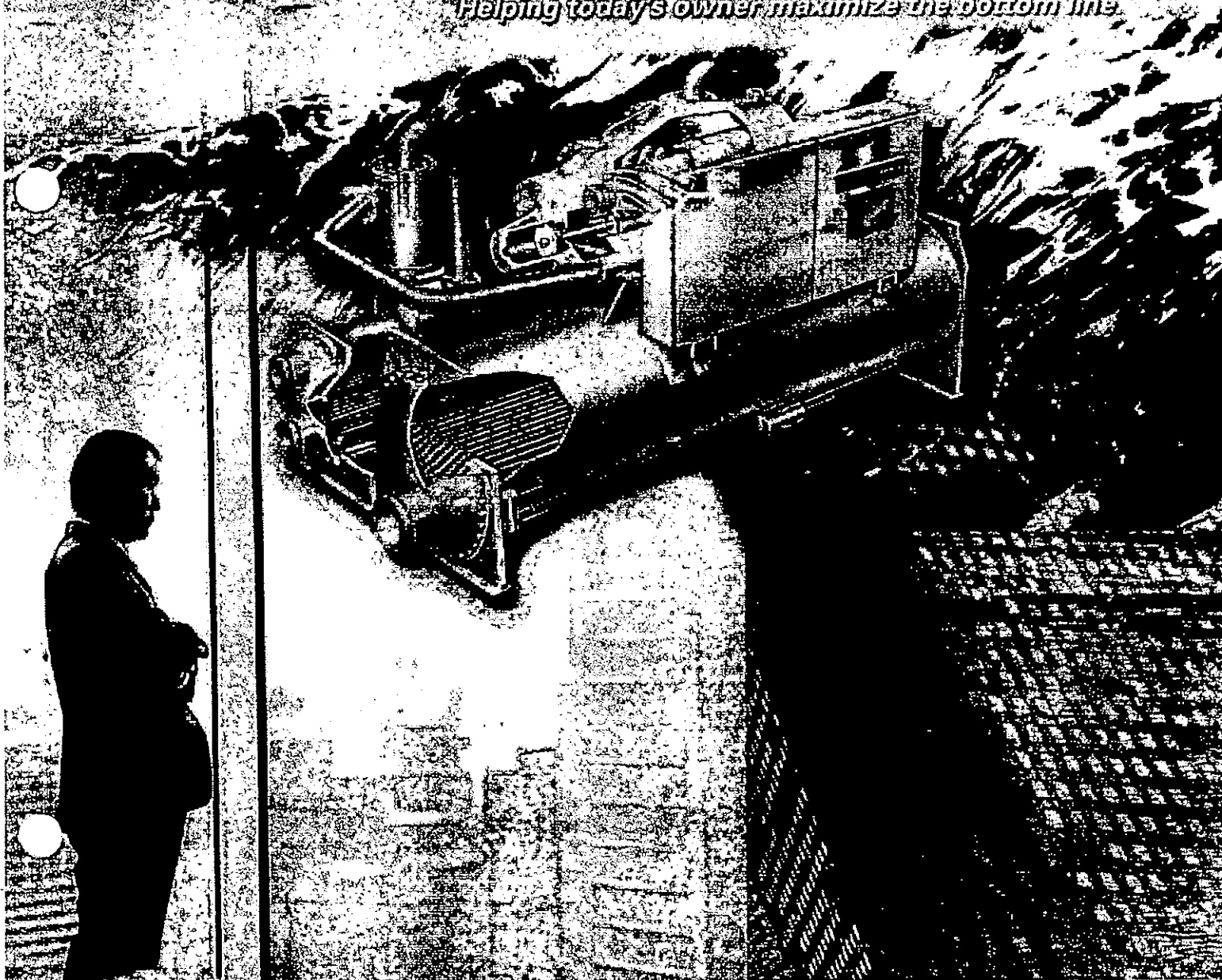
TRANE

Water-cooled Series R[™] Chiller

Model RTHD

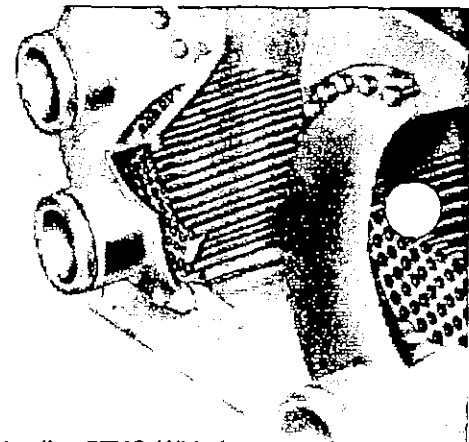
175-450 Tons 60 Hz, 125-450 Tons 50 Hz

Helping today's owner maximize the bottom line.





TRANE



Reliability is achieved through the use of a direct-drive, low-speed, semi-hermetic compressor with only three moving parts.

The RTHD chiller offers high reliability, improved energy efficiency, low sound levels, improved controls capability, increased application flexibility, and ease of installation. This is all due to its advanced design, low speed-direct drive compressor, and proven Series R™ chiller performance.

The Next Generation—Designed for You

The fourth generation of the successful water-cooled Series R chiller products has several benefits over the previous design. Your suggestions led to the improvements we've incorporated, including:

- Higher full-load energy efficiency for lower operating and life cycle costs
- CH530 controls, with touch-screen display and LonTalk® capability
- Less sensitivity to water temperatures, alleviating concerns based on startup temperatures
- Lighter weight for easier and less-expensive handling and installation

Reliability

Trane is the world's largest manufacturer of large helical-rotary compressors. Continuous, extensive research and development, testing,

and advanced manufacturing processes provide excellent reliability.

Trane's helical-rotary compressor has an excellent reliability rate of over 99 percent in the first year of operation. Over 60,000 commercial and industrial chiller installations and 100,000 compressors operate worldwide. This reliability is achieved through the use of a direct-drive, low-speed, semi-hermetic compressor with only three moving parts.

With no gearboxes, shaft seals, or shaft-alignment problems, there is less chance of failure. In addition, the semihermetic design means that the compressor motor operates in a cool,

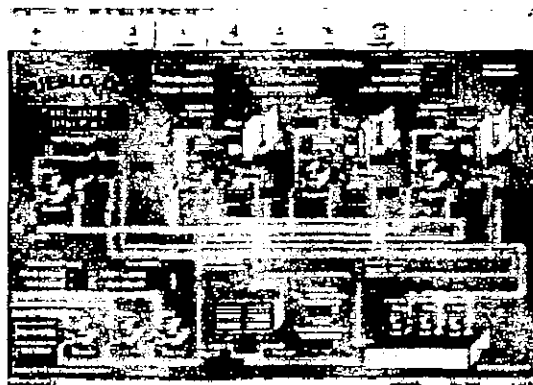
industry-leading RTHC. With the Series R Compressor, control over the chilled-water temperature is increased, simultaneously reducing annual operating costs.

Trane offers superior full-load performance and optimized part-load performance. Energy efficiencies at or below .60 kW/ton at ARI conditions are available throughout the product tonnage range. These full load efficiencies are comparable to most centrifugals, with part load efficiencies exceeding most.

Sound—Lower Sound Levels Through Compressor and Chiller Design

Trane has a proven track record of continuously improving the sound levels of water chillers. With the RTHD, sound generation is less of a consideration in the choice of compressor technologies.

One primary design goal of the RTHD was to further reduce sound levels over previous marketplace designs. To meet this goal, the compressor was designed to minimize sound generation, and



clean, and constant-temperature environment.

The CH530 controller features the Adaptive Control microprocessor, which has the ability to keep the chiller online, producing reliable cold water during extreme operating conditions when other chillers would usually trip off.

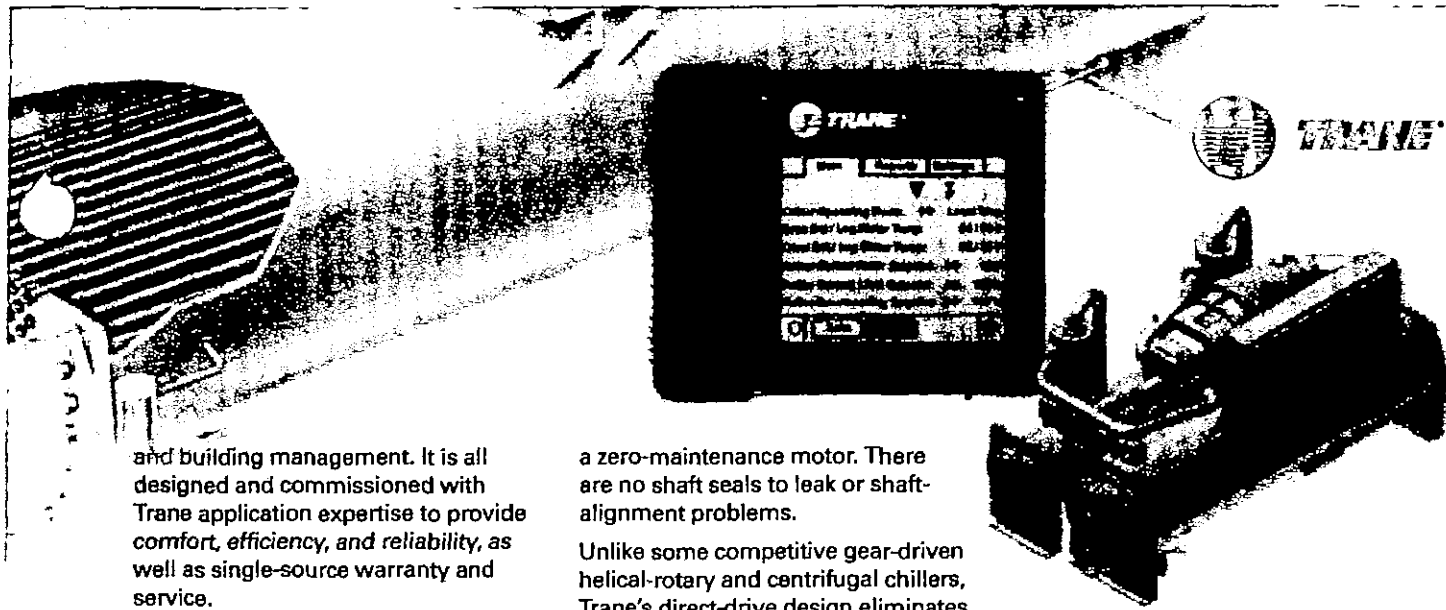
Energy Efficiency—Reduced Annual Operating Expenses

The use of advanced heat-transfer technology with innovations in refrigerant distribution has allowed the Series R chiller to achieve record efficiency levels, even higher than the

chiller components were optimized to reduce sound propagation throughout the system, using isolation mounts and system configuration optimization. The result is a water chiller with reduced sound and vibration levels and improved tonal qualities.

The Integrated Comfort System

The water-cooled Series R chiller, with the CH530, makes a powerful combination with the Trane Tracer Summit Building Management System to become part of a Trane Integrated Comfort system (ICS). An Integrated Comfort system is a building comfort system comprised of Trane HVAC equipment, integral unit controllers,



and building management. It is all designed and commissioned with Trane application expertise to provide comfort, efficiency, and reliability, as well as single-source warranty and service.

Whether you are replacing a chiller or adding one to any centrally controlled plant, the Tracer CH530 chiller controller offers a wide range of interface options. Its ability to communicate with other systems using industry-standard control signals allows you to upgrade the control of your chiller plant regardless of your current control system.

LEED™ Certification

Due to its energy efficiency and use of HFC-134a, the fourth generation Series R Chiller can move you forward on your path to LEED Building Certification. Both full- and part-load performance of the RTHD exceed the ASHRAE 90.1 standard, which LEED uses as a baseline.

The RTHD has features and capabilities that can contribute to LEED points in these additional areas:

1. Water-use reduction
2. Renewable energy
3. Measurement and verification

Quality

The Trane facility in Pueblo, Colorado, is ISO9001 Certified. This level of dedication to quality is what chiller owners have come to expect from Trane chillers. Each Series R chiller goes through extensive factory testing, virtually eliminating startup problems.

Reduced Maintenance—Less Time and Money Every Year

The only required maintenance for the RTHD is an annual oil analysis. The only recommended maintenance includes cleaning the condenser tubes as needed. The semihermetic design allows the compressor to be driven by

a zero-maintenance motor. There are no shaft seals to leak or shaft-alignment problems.

Unlike some competitive gear-driven helical-rotary and centrifugal chillers, Trane's direct-drive design eliminates the need for a gearbox, thus eliminating the need for gear maintenance.

The Adaptive Control™ microprocessor also helps reduce unnecessary maintenance by monitoring, protecting, and taking corrective action so that the chiller stays on-line when you need it the most. Service calls for nuisance trip-outs are virtually eliminated.

Ease of Installation

The compact Series R chiller is an excellent choice for any retrofit or replacement job. It is smaller than most chillers it might replace, and easier to fit into existing buildings. All units fit through a standard double-width door. For extremely tight installations, the standard bolt-together design allows for easy unit disassembly.

The decreased weight of the new generation Series R reduces the requirements for lifting, rigging, and installation.

Extensive factory testing helps ensure trouble-free startup, resulting in lower installation costs and faster job completion.

Controls

Trane's CH530 chiller control with Adaptive Control microprocessor is one of the most advanced chiller controllers available in the industry. With LCD touch-screen access, all operating information and reports are viewed using a scrolling display, with easy access to inputs and outputs. This makes it one of the most versatile and user-friendly control panels on the market. The CH530 display is also available with a choice of multiple languages.

Adaptive Controls provide internal control logic that monitors operation of the chiller and keeps it running during extreme operating conditions. While controls on other chillers generally shut the machine down, the Trane Series R chiller modulates system components, keeping the chiller online producing reliable chilled water, while optimizing chiller performance and providing notification of the condition.

Applications—Operation and Control Advantages for Most Any Application

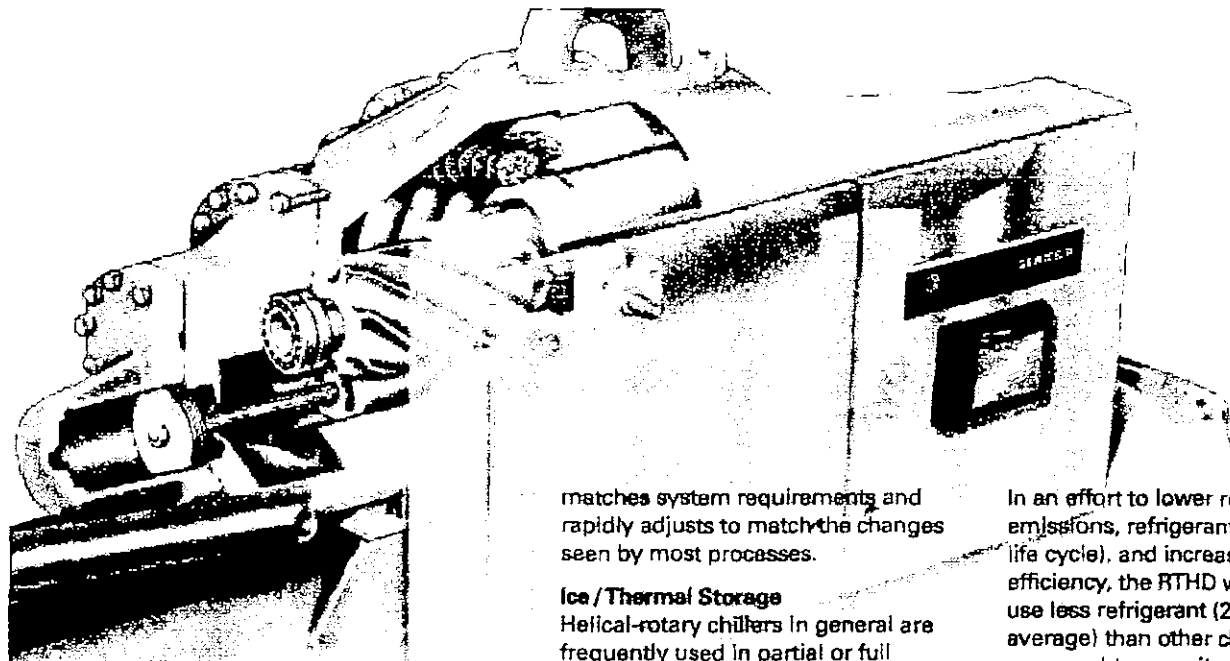
The highly reliable semi-hermetic design with excellent lift and linear-unloading capabilities, as well as CH530 feedforward and Adaptive Controls™, and the Electronic Expansion Valve, allow the Series R chiller to be used in a wide variety of applications including:

Comfort Cooling—Designed for Reliability, Energy Efficiency, and System Design Optimization

Most comfort-cooling applications consider reliability and energy efficiency above all else in the design requirements. With proven reliability and industry-leading chiller efficiency, the RTHD is perfectly suited for these applications.

Industrial Process Cooling/Low Temperature Process—Reliable Operation with Tight Control of Temperatures

The Trane Water-Cooled Series R™ has the proven reliability required to keep the process running, eliminating concerns for chiller and resulting process downtime. The RTHD chiller



The only required maintenance for an RTHD is an annual oil analysis.

matches system requirements and rapidly adjusts to match the changes seen by most processes.

Ice / Thermal Storage

Helical-rotary chillers in general are frequently used in partial or full thermal-storage applications because of their excellent compressor lift (operating temperature range) capability. High reliability and low maintenance means thermal storage applications are possible without a full-time operation/maintenance staff, and Summit Controls can notify a computer or pager of any system issues.

Heat Recovery

The RTHD compressor lift capabilities also play well in heat recovery, or just high-temperature condenser applications. Building energy saving initiatives such as using condenser water for reheat (dehumidification), preheating boiler water, and providing domestic hot water are compatible with its temperature capabilities.

Refrigerant— The Right Refrigerant for the Chiller

The Model RTHD medium-pressure chiller was the second generation of the Water-Cooled Series R™ chiller specifically engineered to use the medium-pressure alternative refrigerant HFC-134a. This choice allows the RTHD to meet your performance requirements.

In an effort to lower refrigerant emissions, refrigerant cost (unit and life cycle), and increase energy efficiency, the RTHD was designed to use less refrigerant (2 lb/ton on average) than other chillers of comparable capacity. This also means less service time to evacuate and charge the refrigerant system, as well as lower replacement costs.

System Design and Control— Greater Application Flexibility for Increased Savings

First-cost- and operating-cost-minimizing system-design concepts are catching on as their validity is proven through applications. These designs can provide lower equipment costs and more efficient system operation than those possible with the traditional design methods and past chiller technologies. The concepts include:

- Lower-than-normal design chilled leaving-water temperature (higher evaporator delta T)
- Higher-than-normal design condenser leaving-water temperature (higher condenser delta T)
- Thermal storage
- Variable primary (evaporator) chilled-water flow
- Series evaporator and/or condenser arrangements



TRANE

Trane
A business of American Standard Companies
www.trane.com

For more information, contact your local Trane office or e-mail us at comfort@trane.com

Literature Order Number	RLC-SLB009-EN
Date	May 2003
Supersedes	New
Stocking Location	Inland

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

**TRANE**

Proposal

Trane U S Inc

PROPRIETARY AND CONFIDENTIAL PROPERTY OF TRANE
DISTRIBUTION TO OTHER THAN THE NAMED RECIPIENT IS PROHIBITED

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Prepared For:
All Bidders

Date: July 09, 2008

Proposal Number: E1-48885-1

Job Name:
Howard County Detention Center

Engineer:

Bid Date: April 18, 2008

Delivery Terms:
Freight Allowed and Prepaid - F.O.B. Factory

Payment Terms:
Net 30 Days

Trane is pleased to provide the enclosed proposal for your review and approval.

Tag Data - Water-Cooled Series R(TM) (Qty: 2)

Item	Tag(s)	Qty	Description	Model Number
A1	150 Ton opt#2	2	Water-Cooled Series R(TM) (RTHD)	RTHD

Product Data - Water-Cooled Series R(TM)

Item: A1 Qty: 2 Tag(s): 150 Ton opt#2
Water-Cooled Series R(TM)
Water Chiller Business Unit, Pueblo, CO
North America distribution - Canada & US
C/UL Listing
ASHRAE 90 1 compliant
ARI certified
ASME Pressure Vessel Code
Refrigerant Isolation Valves
Factory Insulation - All Cold Parts
English
Standard Safety Devices
Full Factory Refrigerant Charge (134a)
Shrink Wrap
C1 Evaporator
Internal and External Enhanced Evap Tube
3 Pass Evaporator
Fluid type = water
Left Hand Evaporator Connection
Standard Grooved Pipe
150psi/10 5Bar Evaporator Water Pressure
D1 Condenser
Enhanced Fin - Copper
2 Pass Condenser
Fluid type = water
Left Hand Condenser Connection
Standard Grooved Pipe Connection
150psi/10 5Bar Condenser Water Pressure
200 Volt/60 Hertz/3 Phase

Wye-Delta Closed Transition Starter
598 Max RLA Unit Mounted Starter
Mech Disconnect Switch
Nema 1 Enclosure with MRLA 598
Dyna-View/English
Ext. Ch Water & Curr Lim Setp - 4-20mA
Programmable Relays
Chilled Water Reset - Return Water Temp
150 psi NEMA-1 Flow Switch x 2 (Fld)
1st Year Labor Warr Whole Unit
Factory Startup

Item: A1 Qty: 2 Tag(s): 150 Ton opt#2

[illegible]

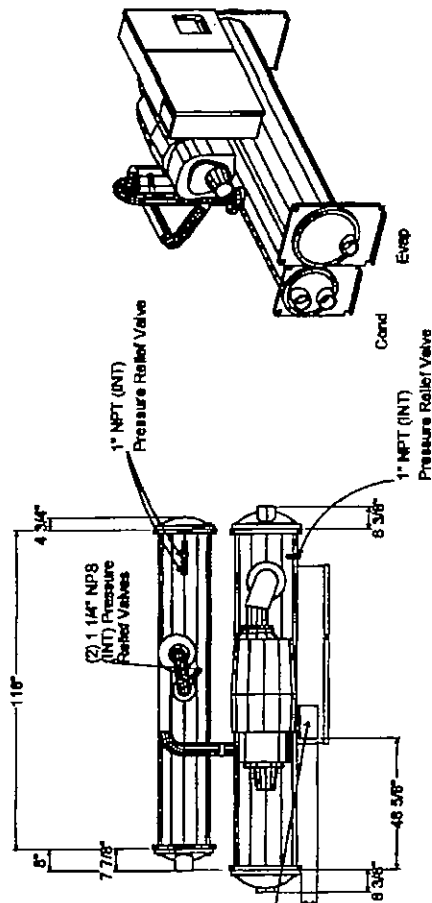
Terminal/Disconnect Connection Size	800	AMP®
--	-----	------

Electrical Lug Size L1-L3 (Each Phase)	(3) 1/0 - 500 MCM	
Evaporator Water Connection Size	6"	NPS Pipe Size
Condenser Water Connection Size	6"	NPS Pipe Size
Short Circuit Withstand Rating (RMS Symmetrical ANPS)		15000

NOTES:

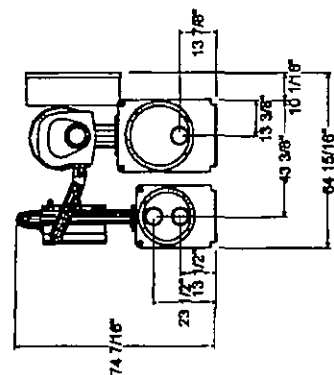
1. Dimensional Tolerance $\pm 1/4"$ (6.35 mm)
2. Evaporator and Condenser Entering Fluid Connection is the Bottom Connection. Evaporator and Condenser Leaving Fluid Connection is the Top Connection.

6.5" x 12.1" (173 mm x 307 mm)
Electric Connection Top

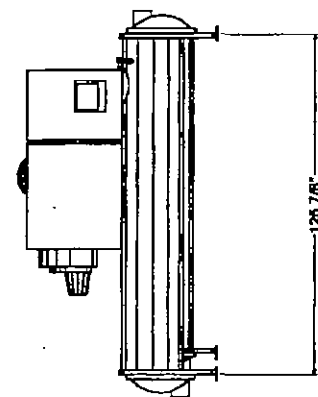


PLAN VIEW

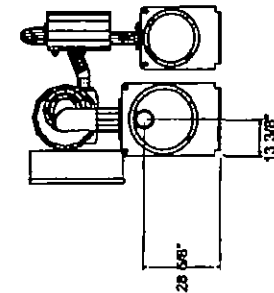
ISOMETRIC VIEW



LEFT END VIEW



FRONT VIEW



RIGHT END VIEW

RTHD B1C1D1 Tag: 150 Ton opt#2

Part Load Performance
NPLV = 0.568

%LoadCapacity		LWT Evap	EWT Evap	Flow Evap	WPD Evap	EWT Cond	LWT Cond	Flow Cond	WPD Cond	Efficiency	
100	150.0	44.0	56.0	298.6	5.9	85.0	96.4	375.0	8.5	97.5	0.650
75	112.5	44.0	52.8	298.6	5.9	75.0	83.4	375.0	8.7	64.8	0.576
50	75.0	44.0	49.8	298.6	5.9	65.0	70.5	375.0	9.0	39.6	0.528
25	37.5	44.0	47.3	298.6	5.9	65.0	68.0	375.0	9.0	27.7	0.739

Note: 1. $NPLV = 1 / ((0.01 / A) + (0.42 / B) + (0.45 / C) + (0.12 / D))$

Where: A = kW/Ton at 100% at user defined entering condenser water with 1% weighting

B = kW/Ton at 75% at user defined entering condenser water with 42% weighting

C = kW/Ton at 50% at user defined entering condenser water with 45% weighting

D = kW/Ton at 25% at user defined entering condenser water with 12% weighting

2. NPLV is defined using the input design conditions, outside of ARI conditions.

Selected reports

Available pages

Version: 2.6

July 10, 2008

TRANE Water-Cooled Series R(TM) Chiller

25% point is calculated per ARI standard. Minimum chiller load point is greater than 25%.

Tag Data - Commercial Rooftop Air Conditioning Units (Midrange) (Qty: 3)

Item	Tag(s)	Qty	Description	Model Number
B1	RTU-1	1	20-75 Ton Packaged Industrial Rooftop (SEHFF404
B2	RTU-4	1	20-75 Ton Packaged Industrial Rooftop (SEHFF404
B3	RTU-3	1	20-75 Ton Packaged Industrial Rooftop (SEHFF304

Product Data - Commercial Rooftop Air Conditioning Units (Midrange)**All Units**

DX Cooling With Electric Heat
 40 Ton Unit
 460 Volt-60 Hertz-3 Phase
 High-efficiency throwaway filters
 0-100% Economizer
 Econ Control w/comparative enthalpy
 2.00" [51mm] Spring Isolators
 Supply and Return n with VFD and Bypass
 Programmable Night Setback Sensor with System Function Lights for VAV (Fld)
 Low Ambient Damper(s) Control
 UL approval
 Nonfused Unit Disconnect Switch
 High capacity evaporator coil
 Generic Building Automation System Module
 Access doors
 Solid double wall construction
 Adapter Curbs to Mammoth units

Item: B1, B2 Qty: 2 Tag(s): RTU-1, RTU-4

70 kW Electric heat
 100% Exhaust - 7 1/2 Hp with Statitrac
 600 rpm - Exhaust fan
 15 Hp - Supply motor
 900 rpm - Supply fan

Item: B3 Qty: 1 Tag(s): RTU-3

50 kW Electric heat
 100% Exhaust - 5 Hp with Statitrac
 500 rpm - Exhaust fan
 10 Hp - Supply motor
 800 rpm - Supply fan

Total Net Price (Excluding Sales Tax) Two Chillers.
 Deduct to go to 150 Opt#1 675 kW/Ton

Three Rooftop Units.
 Deduct to provide exhaust fans in lieu of return fans. . .

This proposal and pricing are based on shipment of all products (not including field labor) by no later than 3rd quarter of 2008 year.

Sincerely,

Darryl Hockstra - Trane

9603 Deereco Road, Suite 400
 Lutherville Timonium, MD 21093-2155
 Phone: (410) 252-8100
 Fax: (410) 252-7330

This proposal is subject to your acceptance of the attached Trane terms and conditions.



NXS Variable Frequency Drives

Variable Frequency Drives (VFD) accept a control input and then output tailored control signal(s) to operate as many as six devices (fans, pumps, etc.) with maximum efficiency. The VFD can be field-programmed without any extra devices or computer connections.

SPECIFICATIONS

Wiring:

- ☐ Wire Type and Size is Model and Application Dependant.
- ☐ For NXS details, see form 63-2600.

Power Supply:

- ☐ 208-240 Vac, 45-66 Hz, +10%, -15%.
- ☐ 380-500 Vac, 45-66 Hz, +10%, -15%.
- ☐ 525-690 Vac, 45-66 Hz, +10%, -15%.

Ambient Ratings:

- ☐ Temperature Ranges:
 - ☐ Operating: 14°F to 104°F (-10°C to 40°C).
 - ☐ Storage: -40°F to 140°F (-40°C to 60°C).
- ☐ Humidity Range: 5 to 95% RH (non-condensing).

Control Inputs:

- ☐ Voltage (Analog): 0-10 Vdc, 200k ohm differential.
 - ☐ Resolution: 0.1%, ±1% accuracy.
- ☐ Current (Analog): 4-20 mA, 250 ohm differential.
- ☐ Digital: up to six, 24 Vdc, positive or negative logic.

Control Output:

- ☐ Reference Voltage: 10V, +3%; maximum load 10 mA.
- ☐ Auxiliary Voltage: 24V, ±15%; maximum 250 mA.
- ☐ Current (Analog): 0-20 mA, 500 ohm maximum.
 - ☐ Resolution: 10 bit.
 - ☐ Accuracy: ±2%.
- ☐ Relay: Two programmable changeover relay outputs.
 - ☐ Switching Capacity: 24 Vdc, 8A; 250 Vac, 8A; 125 Vdc, 0.4A.
- ☐ Digital: Open collector output, 50 mA, 48V.

Motor Connection:

- ☐ Continuous Output Overload Current:
 - ☐ Low: Maximum ambient temperature: 104°F (40°C); 1.1 x I_L (low overload current).
 - ☐ High: Maximum ambient temperature: 122°F (50°C); 1.5 x I_H (high overload current).
- ☐ Starting Torque:
 - ☐ Low Overload: 150%.
 - ☐ High Overload: 200%.
- ☐ Starting Current: 2.0 x I_H 2 seconds every 20 seconds if output frequency is less than 30 Hz and temperature of heatsink is less than 140°F (up to 400k W).
- ☐ Frequency:
 - ☐ Range: 0-320 Hz.
 - ☐ Resolution: 0.01 Hz.

Switching Frequency Range:

- ☐ Up to and including 40 HP: 1 to 16 KHz (default: 10 kHz).
- ☐ 50 HP and higher: 1 to 10 KHz (default: 3.6 kHz).

SPECIFICATION DATA

FEATURES

- Seven configurable applications built in.
- Easy commissioning through software or control panel.
- Devices can be wall-mounted or panel-mounted.
- Eleven protective functions (see Form 63-2600, Users Manual, Technical Data section).
- Compact Size.
- Insulated gate bi-polar transistor (IGBT) technology.

Mounting:

- ☐ Mount vertically on a wall or other flat surface using four screws or bolts sized for the particular unit.

Approvals (Model Dependant):

- ☐ NEMA1.
- ☐ NEMA12.
- ☐ Underwriters Laboratories, Inc. (UL)
- ☐ Canadian Underwriters Laboratories, Inc. (CUL).
- ☐ CE.

Accessories:

- ☐ 32006627-001 RFI Filter for NXL units up to 3HP, 460V.
- ☐ 32006628-001 Panel Mount Kit, NEMA12, 6 ft.
- ☐ 32006629-001 Blank Display.
- ☐ 32006629-002 Alphanumeric Display.
- ☐ 32006629-003 Seven-Segment Display for NXL.
- ☐ 32006630-001 Lonbus Card.
- ☐ 32006630-002 Modbus Card.
- ☐ 32006630-003 I/O Expander Card, 2RO (NO/NC).
- ☐ 32006630-004 I/O Expander Card, 6DI/DO Programmable.
- ☐ 32006630-005 I/O Expander Card, 6DI, 1DO, 2AI, 1AO.
- ☐ 32006630-006 I/O Expander Card, 1RO (NO/NC), 1RO (NO).
- ☐ 32006630-007 I/O Expander Card, 3RO (NO/NC), 1RO (NO).
- ☐ 32006630-008 I/O Expander Card, 1AI (mA), 2AO (mA).
- ☐ 32006662-001 NXL Demo Case.
- ☐ 32006662-002 NXS Demo Case.
- ☐ 32006803-001 Control Module, NXS.
- ☐ 32006803-002 Fan Assembly, up to 7.5HP.
- ☐ 32006803-003 Fan Assembly, 10-20HP.
- ☐ 32006803-004 Fan Assembly, 25-40HP.
- ☐ 32006803-005 Fan Assembly, 50-75HP.
- ☐ 32006803-006 Fan Assembly, 100-150HP.
- ☐ 32006803-007 Power Module, 1.5HP, 460V.
- ☐ 32006803-008 Power Module, 2HP, 460V.
- ☐ 32006803-009 Power Module, 3HP, 460V.
- ☐ 32006803-010 Power Module, 4HP, 460V.
- ☐ 32006803-011 Power Module, 5HP, 460V.
- ☐ 32006803-012 Power Module, 7.5HP, 460V.
- ☐ 32006803-013 Power Module, 10HP, 460V.
- ☐ 32006803-014 Power Module, 15HP, 460V.
- ☐ 32006803-015 Power Module, 20HP, 460V.



Accessories (continued):

- 32006803-016 Power Module, 25HP, 460V.
- 32006803-017 Power Module, 30HP, 460V.
- 32006803-018 Power Module, 40HP, 460V.
- 32006803-019 Power Module, 50HP, 460V.
- 32006803-020 Power Module, 60HP, 460V.
- 32006803-021 Power Module, 75HP, 460V.
- 32006803-022 Power Module, 100HP, 460V.
- 32006803-023 Power Module, 125HP, 460V.
- 32006803-024 Power Module, 150HP, 460V.

Dimensions [In In. (mm)]:

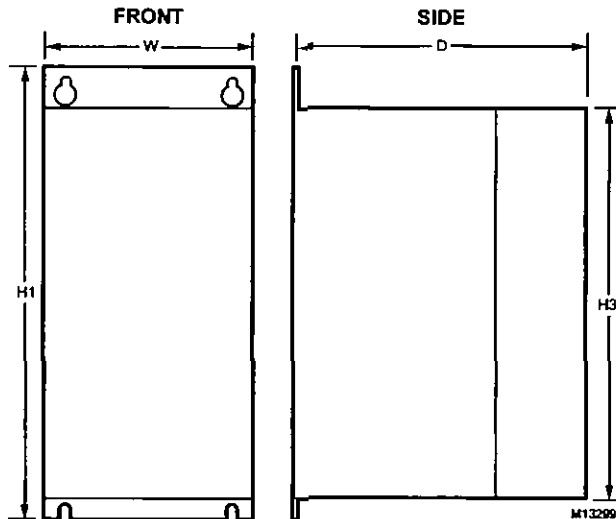


Fig. 1. Dimensions of the NXS Variable Frequency Drives
(See Table 1).

Table 1. NXS VFD Dimension Details.

Model Number	HP	Weight (lbs)	H1	W	D	H3	Motor Terminal Torque Rating (lb-in.)	Volts AC
			(Inches)					
NXS0015A	1.5	53	12-7/8	5-1/16	7-1/2	11-1/2	18 - 20	480
NXS0020A	2							
NXS0030A	3							
NXS0040A	4							
NXS0050A	5							
NXS0075A	7.5	68						
NXS0100A	10	70	16-1/2	5-11/16	8-7/16	15-3/8		
NXS0150A	15							
NXS0200A	20	98						
NXS0250A	25	98	22	7-11/16	9-5/16	20-7/16	32 - 35	
NXS0300A	30							
NXS0400A	40	150						
NXS0500A	50	150	24-13/16	9-5/16	10-1/8	23-1/4	45 - 50	
NXS0600A	60							
NXS0010B	1	53	12-7/8	5-1/16	7-1/2	11-1/2	18 - 20	230
NXS0015B	1.5							
NXS0020B	2							
NXS0030B	3	68						
NXS0040B	4							
NXS0050B	5	70	16-1/2	5-11/16	8-7/16	15-3/8		
NXS0075B	7.5							
NXS0100B	10	98						
NXS0150B	15	98	22	7-11/16	9-5/16	20-7/16	32 - 35	
NXS0200B	20	150						
NXS0250B	25	150	24-13/16	9-5/16	10-1/8	23-1/4	45 - 50	
NXS0300B	30							

Dimensions [In in. (mm)]:

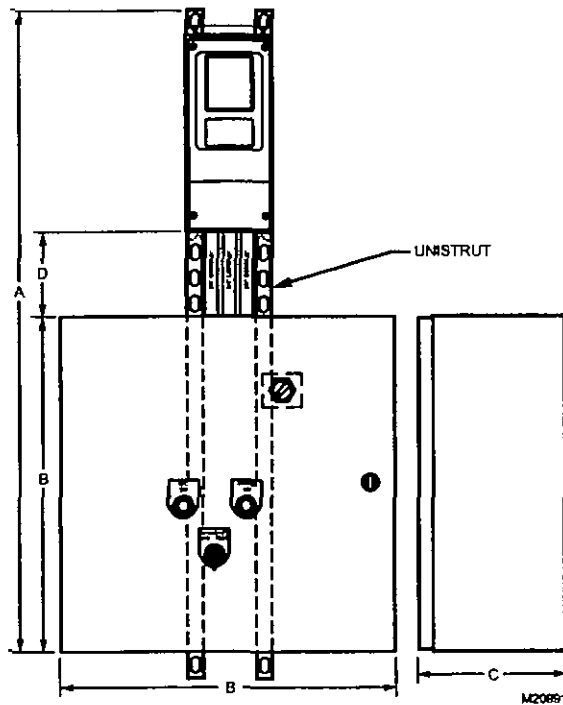


Fig. 2. Dimensions of the NXS NEMA1 Assemblies
(See Table 2).

Table 2. NXS/Bypass Assembly Dimension Details.

Model Number	HP	Weight (lbs)	A	B	C	D	Motor Terminal Torque Rating (lb-in.)	Volts AC			
			(Inches)								
NXS0015J	1.5	53	33-1/2	16	7	5	18 - 20	480			
NXS0020J	2										
NXS0030J	3										
NXS0040J	4										
NXS0050J	5										
NXS0075J	7.5	68									
NXS0100J	10	70									
NXS0150J	15	70	37-1/2	16	9						
NXS0200J	20	98	41-1/2	20							
NXS0250J	25	98	41-1/2	20	9				5	32 - 35	
NXS0300J	30	98	46-1/2								
NXS0400J	40	150	46-1/2						24		
NXS0500J	50	150	46-1/2	24	9	6	45 - 50	230			
NXS0600J	60	150	49-1/2								
NXS0010S	1	53	33-1/2	16	7	5	18 - 20				
NXS0015S	1.5										
NXS0020S	2										
NXS0030S	3	68									
NXS0040S	4										
NXS0050S	5	70						33-1/2			
NXS0075S	7.5	70						37-1/2	16	9	
NXS0100S	10	98	41-1/2	20							
NXS0150S	15	98	41-1/2	20				9	5	32 - 35	
NXS0200S	20	150	46-1/2	24							
NXS0250S	25	150	46-1/2	24	9	6	45 - 50	200 / 208			
NXS0300S	30	150	49-1/2								
NXS0010K	1	53	33-1/2	16	7	5	18 - 20				
NXS0015K	1.5										
NXS0020K	2										
NXS0030K	3	68									
NXS0040K	4										
NXS0050K	5	70									
NXS0075K	7.5	98						41-1/2	20	9	
NXS0100K	10	98	41-1/2	20	9	5	32 - 35				
NXS0150K	15	150	46-1/2	24							
NXS0200K	20	150	46-1/2	24					9	6	45 - 50
NXS0250K	25	150	49-1/2								
NXS0300K	30										

Models:

NXS	Variable Frequency Drive, includes standard RFI filter		
	0007	Motor Power	0.75 HP
	0010		1.0 HP
	0015		1.5 HP
	0020		2.0 HP
	0030		3.0 HP
	0040		4.0 HP
	0050		5.0 HP
	0075		7.5 HP
	0100		10 HP
	0150		15 HP
	0200		20 HP
	0250		25 HP
	0300		30 HP
	0400		40 HP
	0500		50 HP
	0600		60 HP
	0750		75 HP
	1000		100 HP
	1250		125 HP
	1500		150 HP
	1750		175 HP
	2000		200 HP
	A	460V, three-phase circuitry	
	B	208/230V, three-phase circuitry	
	C	575V, three-phase circuitry	
	J	460V, with bypass	
	K	208V with bypass	
	S	230V, with bypass	
	10	NEMA 1 Enclosure	
	12	NEMA 12 Enclosure	
	XX	Varies by model	
NXS	0100	A	10
			XX

NOTE: Refer also to the Quick Selection Guide (form 63-9251)

TYPICAL SPECIFICATION

Alternating current (AC) motors with squirrel-cage rotors require a variable frequency control. The variable frequency drive (VFD) shall generate the required variable frequency through three main input voltage lines connected to an LC filter and diode bridge. This shall produce a DC voltage for an insulated gate bi-polar transistor (IGBT) bridge. The IGBT bridge shall produce a pulse-width modulated (PWM) AC voltage for the motor. A microprocessor shall control the motor according to measured signals and control commands set from the VFD control panel.

The VFD shall have seven programmable applications which can be modified using a personal computer-based commissioning tool with an optional software package, or a control panel with either an alpha-numeric or graphic LCD.

The VFD shall be UL and CE approved. The VFD shall include built-in RFI filters and all models with 3 HP or more shall include an AC choke.

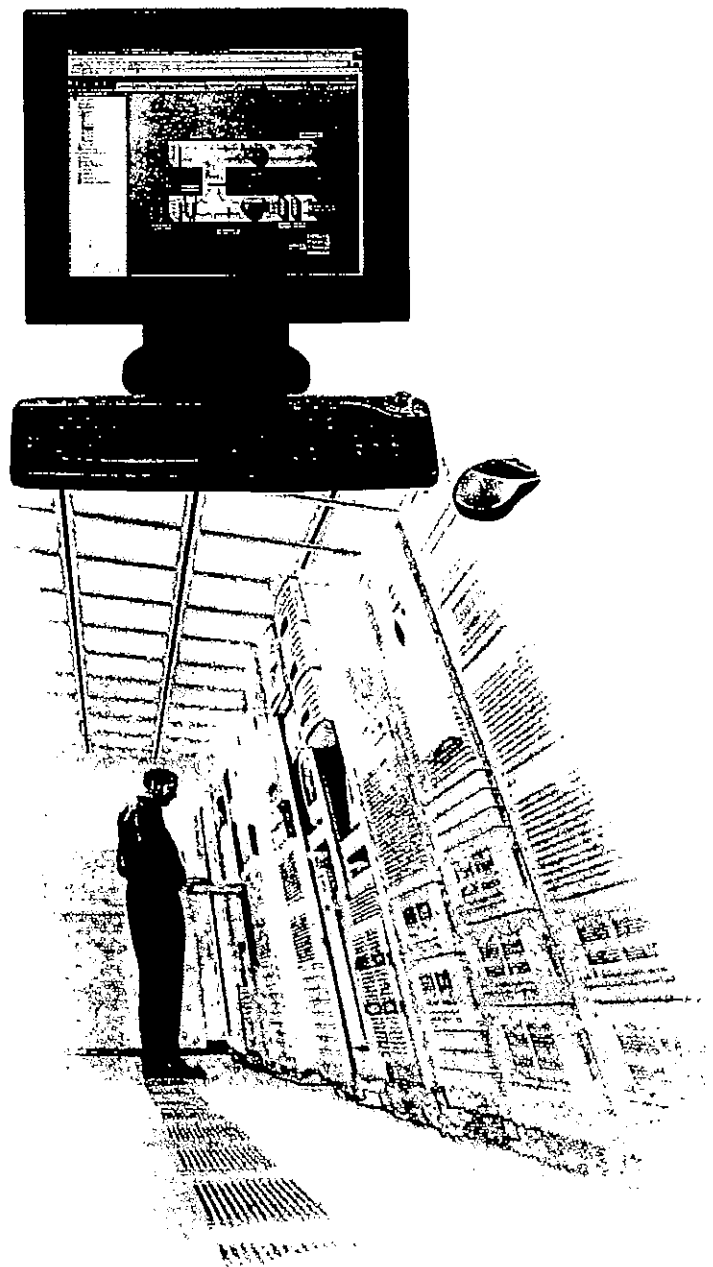


FX SERVER

FACILITY EXPLORER

BY JOHNSON CONTROLS

The Facility Explorer FX Server expands the capabilities of the FX40 Supervisor by providing additional storage capacity and the ability to tie multiple FX40s together over the local Ethernet or the internet. FX Server is a software package that can be loaded onto a variety of third party PC or server hardware platforms, providing flexibility and options when designing the system.



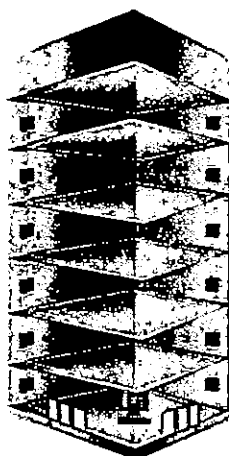
Expanding FX40 Applications

For projects requiring more data storage capacity, more concurrent users, and/or more graphics than a single FX40 can provide, the FX Server can be used to provide:

- Additional data (alarm, trend) storage capability
- Support for an additional number of concurrent users
- Increased capacity for graphical user interface

For a larger project, one that requires more than the 100 device capacity of a single FX40, the FX Server can be used to tie multiple FX40s together over Ethernet to provide:

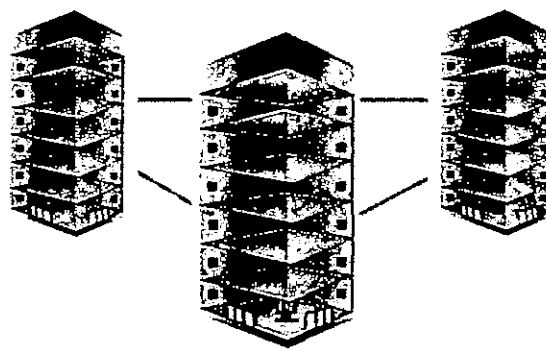
- A single seat user interface for all interconnected FX40s
- A master scheduler for all of the interconnected FX40s
- A central alarm and trend history repository for all interconnected FX40s



Single Building Installation

For projects consisting of multiple buildings, each run by an FX40 (e.g. school district, bank branches), the FX Server can be used to tie these FX40s together over the Internet to provide:

- A single seat user interface for all interconnected FX40s
- A master scheduler for all of the interconnected FX40s
- A central alarm and trend history repository for all interconnected FX40s



Multiple Building Installation

System Requirements

- Each FX40 must be licensed with FX Enterprise Connectivity Station Pack

PC Platform

- Intel Pentium IV, 1 GHz or higher
- Windows NT 4.0 with Service Pack 4.0 or higher or Windows 2000 or Windows XP Professional
- Internet Explorer 5.0 or later or Netscape Communicator 4.5 or later
- 512 Mb minimum memory
- 1 Gb minimum hard drive
- Video card capable of displaying 1024 x 768 pixel resolution
- Ethernet adapter (10/100 Mb) with RJ-45 connector

JOHNSON
CONTROLS

FX40 SUPERVISORY CONTROLLER

FACILITY EXPLORER

BY JOHNSON CONTROLS

The Facility Explorer FX40 Supervisory Controller offers a powerful and flexible supervisory control solution for a wide variety of system control requirements. The FX40 is designed to supervise a network of field controllers to form a complete building automation system, and to allow intranet/internet access to the system via a standard web browser.

Supported Inputs/Outputs

Up to 10 inputs and outputs can be directly connected to the FX40, including:

Four Digital Outputs

- All form C, SPDT 24 VAC/DC @2A relays
- LED indication

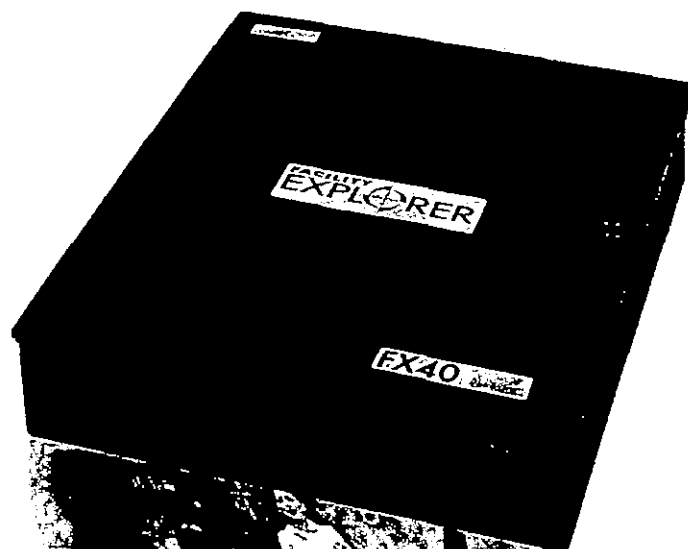
Six universal inputs, which can be any of the following types:

- 10k NTC
- 0-10V
- 4-20 mA
- Dry contact binary input

Communication Interfaces

The FX40 features multiple communication interfaces with support for the most popular HVAC field device protocols. Included with the FX40 are the following communication ports:

- 1 Ethernet port (10/100 Mb) supporting
 - TCP/IP
 - HTTP
 - BACnet® IP/Ethernet
- 1 RS-485 port with N2 driver
- 1 LonWorks® FTT-10A port
- 1 RS-232 port or optional internal modem (56k baud autodial/autoanswer)



FX40 SUPERVISORY CONTROLLER

FACILITY EXPLORER

Supported Device Types

The FX40 supports up to 100 devices on its communication trunks, including any combination of the following supported device types:

- N2
 - FX field devices fitted with N2 communication cards
 - N2 ASCs (VMA, DX-9100, UNT, VAV, AHU)
 - N2 compatible devices (VND)
- LonWorks
 - FX field devices fitted with LonWorks communication cards
 - Third party LonMark® compliant devices
- BACnet IP/Ethernet
 - N30
 - Third party BACnet devices compatible with FX40's PICs statement

Full Suite of Building Automation and Control Features

The FX40 features a comprehensive suite of building automation and control features including the following:

- Event/occupancy scheduling
- Trending
- Alarming
- Totalization
- Energy management
- Network wide data sharing
- User access with password protection
- Rich, graphical representation of system information
- Time synchronization
- Custom control

FX Workbench

The FX40 can be easily engineered using FX Workbench. FX Workbench can operate as a standalone application on a PC, or it can be served up by the FX40 and be accessed using a standard Web browser. FX Workbench

features online automatic device discovery for LonWorks and BACnet devices, and an assisted import feature for N2 devices.

The FX Workbench includes several labor saving features to assist the engineering of the system, when using standard Facility Explorer applications, including:

- Automatic linking of the field devices' occupancy point to the FX40's scheduler
- Using check boxes to enable/disable point extensions
- Automatic system graphic creation and linking to point information.

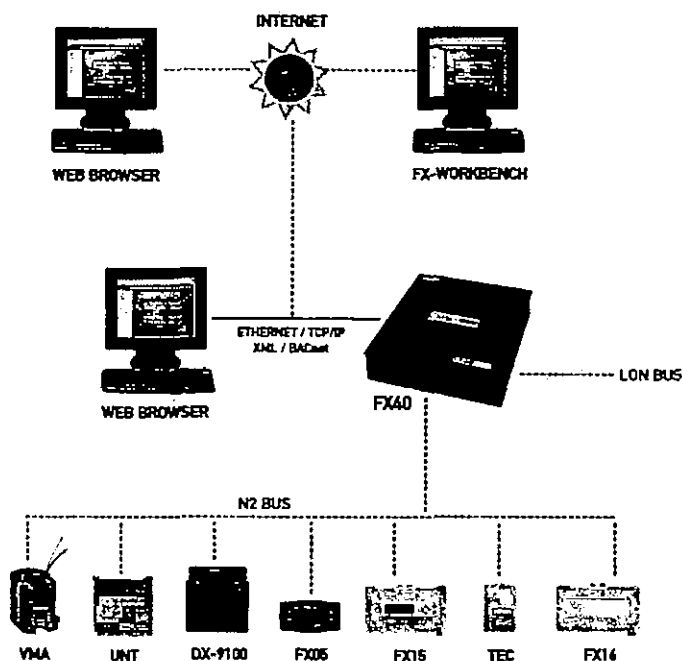
Specifications:

General

- 120 VAC, 50/60 Hz.
- 25 VA

Ambient Operating Conditions

- 32° to 122° F (0° to 50° C)
- 5-95% RH (non condensing)



LonWorks® and LonMark® are registered trademarks of Echelon Corporation
BACnet® is a registered trademark of American Society of Heating,
Refrigerating and Air Conditioning Engineers (ASHRAE)
Niagara Framework is a registered trademark of Tridium, Inc.



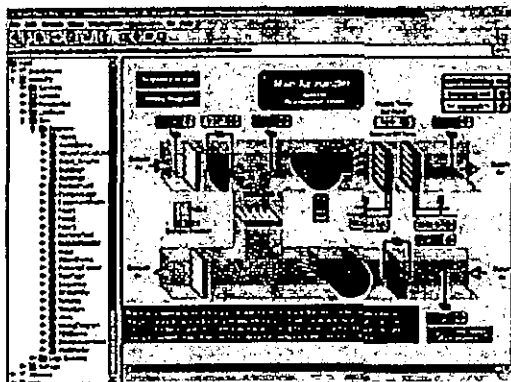
JOHNSON CONTROLS

Overview

Vykon®, powered by the revolutionary Niagara Framework®, is a suite of Java™-based products designed to integrate a variety of devices and protocols into a common distributed automation system. It incorporates the industry's first software technology to integrate LonWorks™, BACnet™, and various Internet standards in a common object model, embedded at the controller level and supported by a standard web browser interface. Vykon also includes integrated network management tools to support the design, configuration, installation, and maintenance of interoperable networks.

Applications

The Vykon Web Supervisor™ is a flexible network server for systems with multiple connected JACE stations, and provides optional direct communication to third party systems via popular IP based protocols. The Web Supervisor is designed to harness the power of the Internet and provide efficient integration of diverse systems. The Web Supervisor creates a powerful network environment with comprehensive database management, alarm management, and messaging services. In addition, the Web Supervisor provides an engineering environment and graphical user interface. A new optional feature supports Ethernet based drivers directly in the Web Supervisor. These include BACnet IP, OPC (client), Modbus TCP, and SNMP.



Features

- Direct Ethernet based driver support for BACnet IP, OPC (Client), Modbus TCP, and SNMP. Twenty-five points for each driver are included with the WS-OSD option; additional point blocks for each driver may be purchased individually.
- Java-enabled user interface.
- Supports an unrestricted number of users over the Internet / Intranet with a standard web browser.
- Enterprise-level information exchange using an SQL database and HTTP/HTML/XML text formats.
- "Audit Trail" of database changes, database storage and backup, global time functions, calendar, central scheduling, control, and energy management routines.
- Sophisticated alarm processing and routing, including e-mail and paging.
- Provides access to alarms, logs, graphics, schedules, and configuration data with a standard web browser.
- Password protection and security using standard Java authentication and encryption techniques.
- HTML-based help system that includes comprehensive on-line system documentation.
- Supports multiple JACE-NX, JACE-512, JACE-545, or JACE-403 stations connected to a local Ethernet network, or the Internet.
- Provides online/offline use of the Niagara Framework WorkPlace Pro™ graphical application configuration tool and a comprehensive Java Object Library.
- Optional drivers available for exporting archived trend and alarm data to SQL Server, MSDE, and Oracle. IBM Cloudscape included as standard.

Web Supervisor™ Data Sheet

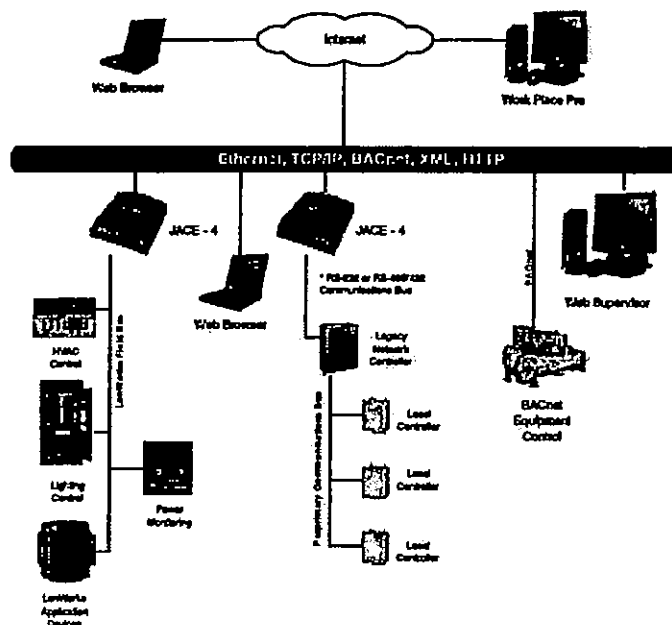
Platform Requirements

- Processor: Intel Pentium™ IV, 3 GHz or higher
- Operating System: Microsoft Windows™ NT 4.0 with Service Pack 4 or higher or Windows 2000™ or Windows XP Professional (preferred), Windows 2003 Server (if Microsoft IIS is disabled), Internet Explorer™ 5.0 or later, or Netscape Communicator™ 4.5 or later.
- Memory: 2 GB minimum
- Hard Drive: 10 GB minimum, 25 GB for applications that need more archiving capacity
- Display: Video card and monitor capable of displaying 1024 x 768 pixel resolution or greater
- Network Support: Ethernet adapter (10/100 Mb with RJ-45 connector)
- Network Connection: full time high speed ISP connection recommended for remote site access (i.e. T1, ADSL, cable modem); 56 KB modem minimum for dialup connection to a JACE

TRiD!UM®

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VYKON®
BY TRiD!UM



Specifications

Platform – JACE-403 (JACE-403I International)

Motorola RISC Processor @ 250MHz

- JACE Control Engine- with direct I/O support objects
- 128 MB Ram, 32 MB Flash for database backup
- One 10/100 Mb Ethernet RJ-45 connector
- FCC Class "A" computing Device

Communications

- One 10/100 Mb Ethernet port – RJ-45 connection
- One RJ-45 connector for RS-232 port
- One RS-485 port (up to 76,800 baud) with Weidmuller connector
- One LonWorks port – FTT-10 with Weidmuller connector
- Optional auto-dial /auto-answer 56K modem; RJ-11 connector (uses the RS-232 port when installed)

Operating System

- Wind River VxWorks® Operating System with Jeode™ Java Virtual Machine
- JACE (Control Engine) Software with I/O control objects

Inputs/Outputs

- Four form C (SPDT) relay outputs rated for 24 VAC/DC @ 2 Amps resistive
- One LED Indicator for each relay
- Six Universal Inputs for 10K ohm Type III (10K 4A1-International) Thermistor, 4/20 mA current loop, 0 to 10 volt, or dry contact
- 12-bit A/D converter
- Thermistor Sensor Range -23.3°C to 57.2°C (-10° to 135° F). Input

Vykon JACE-403®

accuracy is in the range of $\pm 1\%$ of span, type III thermistor curve supported

- 0–10 volt or 4/20 mA accuracy is $\pm 2\%$ of span, without user calibration. Uses an external resistor for current input (four provided). Self powered or board powered sensors accepted
- Dry contacts (on UI) 20 Hz max. frequency (25 ms minimum pulse width). 3V open circuit, 300 mA short-circuit current
- Board provides 20 VDC @ 80 mA to drive 4/20 mA powered sensors
- 24 VDC terminal and external resistor can be used if monitoring contacts that require higher voltages or higher current
- All I/O uses screw terminals on 0.2" centers

Battery Backup

- Battery backup provided for all on board functions including I/O
- Battery is monitored and trickle charged
- Battery maintains processor operation through power failures for a pre-determined interval, then writes all data to flash memory, shuts processor down, and maintains clock for a minimum of five years

Power Supply

- 120VAC, 50/60 Hz (JACE-403I 240 VAC, 50/60 Hz)
- 25 VA maximum
- Lead wires for hot/neutral (wire nut), stud for ground connection

Chassis - Housed in metal enclosure

- Intended for indoor wall mounting only
- Cooling: Internal air convection
- Dimensions: 11" wide X 14" high X 2.5" deep (27.94 cm wide X 35.56 cm high X 6.35 cm deep)
- Weight: Net 4 lbs. (1.814 kg), Gross 5 lbs. (2.268 kg)

Resource Capacities

- Java Resource count maximum is 600,000
- Maximum MSTP devices per RS-485 port = 31 (depending upon device); requires one MSTP driver per port. More devices may be possible but are not guaranteed

Environment

- Operating temperature range: 0°C to 50°C (32°F to 122°F)
- Storage Temperature range: 0°C to 70°C (32°F to 158°F)
- Relative humidity range: 5% to 95%, non-condensing

Agency Listings

UL 918, C-UL listed to Canadian Standards Association (CSA) C22.2 No. 205-M1983 "Signal Equipment", CE, FCC part 15 Class A

Ordering Information

The JACE-403 has a 27-node limit for networked devices such as BACnet, LON, and OPC. The JACE-403-EXT provides similar functionality with the 27-node limit removed. The JACE-403-EXUP provides an upgrade that removes the 27-node limitation on existing JACE-403 controllers. The MDM-401 is an optional dial-up modem for the JACE 403.

www.tridium.com

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ENGINEER'S REPORT
ULTRA HIGH EFFICIENCY GAS/ELECTRIC UNIT

Date 05/08/2008 Page 4
Order No

Project Name HOWARD COUNTY PARK AND REC BLDG
Architect

Engineer
Submitted By

Quantity: 1 Model No: DJ038N04P4AAA2

O.D. Schedule No:

RTU & I.D. Schedule No:

COOLING PERFORMANCE

Total Capacity*	37.0	MBH
Sensible Capacity	25.0	MBH
Efficiency (at ARI)	13.60	SEER
Part Load Efficiency	0.00	IPLV
Power Input (w/o blower)	2.70	KW
Elevation	0	ft
Leaving DB Temperature	59.94	F
Leaving WB Temperature	57.31	F

Ambient DB Temperature	95.0	F
Entering DB Temperature	80.0	F
Entering WB Temperature	67.0	F

*Net Capacity for all Affinity units; Gross Capacity for others.

SUPPLY AIR BLOWER PERFORMANCE

Total Supply Air	1200	CFM
Outside Air	120	CFM
External Static Pressure	0.60	INWG

Duct Location	-Bottom
Blower Speed	901 RPM
Motor Rating	1.5 HP
Power Input (blower only)	0.58 KW
Brake Horsepower	0.60 BHP
Indoor Fan Motor Heat	1.9 MBH

PACKAGE UNIT CLEARANCES

Front	32 in	Back	36 in
Bottom	0 in	Top	72 in
Left Side (filter access)			36 in
Right Side (outdoor coil)			24 in

INDOOR UNIT CLEARANCES

Side with RETURN AIR opening	in
Side with SUPPLY AIR opening	in
Side with PIPING CONNECTIONS	in
Side Opposite PIPING CONN.	in

SOUND POWER PERFORMANCE

Sound Power	84 Dbels
-------------	----------

HEATING PERFORMANCE

Entering Air Temperature	60.0	F
Leaving Air Temperature	80.8	F
Air Temperature Rise	30.9	F

☐ Electric Heat

Capacity	N/A	MBH
Power Input	N/A	KW

☒ Gas Heat

Gas Fired Input	50	MBH
Gas Fired Output	40	MBH

AFUE 80.9 %

☐ Heat Pump

Capacity: 47F	N/A	MBH
17F	N/A	MBH
COP: 47F	N/A	
17F	N/A	
HSPF:	N/A	

ELECTRICAL DATA

Single Package

Power Supply	460-3-60
Minimum Circuit Ampacity	10.3 Amps
Maximum Overcurrent Device	
Fuse Size	15 Amps
HACR Breaker Size	15 Amps

APPROXIMATE DIMENSIONS & WEIGHT*
PACKAGE UNITS

Height	33 in	Width	82 in	Depth	45 in
Total Weight (including factory options)	685 Lbs*				

SPLIT SYSTEMS

Outdoor Unit: Height	in	Width	in	Depth	in
Outdoor Unit Total Weight	Lbs				
Indoor Unit: Height	in	Width	in	Depth	in
Indoor Unit Total Weight	0 Lbs				

* Rigging Weight

Engineer's Notes:



ENGINEER'S REPORT
ULTRA HIGH EFFICIENCY GAS/ELECTRIC UNIT

Date 05/06/2008 Page 3
Order No

Project Name **HOWARD COUNTY PARK AND REC BLDG**
Architect

Engineer
Submitted By

Quantity: **1** Model No: **D2NP030N03608**
O.D. Schedule No:

RTU & I.D. Schedule No:

COOLING PERFORMANCE

Total Capacity*	28.4	MBH
Sensible Capacity	21.5	MBH
Efficiency (at ARI)	13.40	SEER
Part Load Efficiency	0.00	IPLV
Power Input (w/o blower)	2.40	KW
Elevation	0	Ft
Leaving DB Temperature	80.09	F
Leaving WB Temperature	58.14	F

Ambient DB Temperature	95.0	F
Entering DB Temperature	80.0	F
Entering WB Temperature	67.0	F

*Net Capacity for all Affinity units; Gross Capacity for others

SUPPLY AIR BLOWER PERFORMANCE

Total Supply Air	1000	CFM
Outside Air	100	CFM
External Static Pressure	0.43	IWG

Duct Location	Bottom	
Blower Speed	High	
Motor Rating	0.75	HP
Power Input (blower only)	0.40	KW

Indoor Fan Motor Heat	1.4	MBH
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PACKAGE UNIT CLEARANCES

Front	38 in	Back	0 in
Bottom	0 in	Top	36 in
Left Side (filter access)	24 in		
Right Side (outdoor coil)	12 in		

INDOOR UNIT CLEARANCES

Side with RETURN AIR opening	in
Side with SUPPLY AIR opening	in
Side with PIPING CONNECTIONS	in
Side Opposite PIPING CONN.	in

SOUND POWER PERFORMANCE

Sound Power	80	Dbels
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HEATING PERFORMANCE

Entering Air Temperature	60.0	F
Leaving Air Temperature	93.3	F
Air Temperature Rise	33.3	F

<input type="checkbox"/> Electric Heat		
Capacity	N/A	MBH
Power Input	N/A	KW

<input checked="" type="checkbox"/> Gas Heat		
Gas Fired Input	45	MBH
Gas Fired Output	36	MBH

AFUE	80.2	%
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<input type="checkbox"/> Heat Pump		
Capacity: 47F	N/A	MBH
17F	N/A	MBH
COP: 47E	N/A	
17F	N/A	
HSPF:	N/A	

ELECTRICAL DATA

Single Package

Power Supply	208-1-60
Minimum Circuit Ampacity	20.8 Amps
Maximum Overcurrent Device	
Fuse Size	25 Amps
HACR Breaker Size	25 Amps

APPROXIMATE DIMENSIONS & WEIGHT*

PACKAGE UNIT'S

Height	34 in	Width	49 in	Depth	48 in
Total Weight (including factory options)	466	Lbs*			

SPLIT SYSTEMS

Outdoor Unit Height	in	Width	in	Depth	in
Outdoor Unit Total Weight	Lbs				
Indoor Unit Height	in	Width	in	Depth	in
Indoor Unit Total Weight	0	Lbs			

* Rigging Weight

Engineer's Notes:



ENGINEER'S REPORT

PREDATOR

Date 05/08/2008 Page 2

Order No

Project Name: HOWARD COUNTY PARK AND REC BLDG

Engineer

Architect

Submitted By

Quantity: 1 Model No: DM102N15P4AAA4

O.D. Schedule No:

RTU & I.D. Schedule No:

COOLING PERFORMANCE

Total Capacity (Gross)	103	MBH
Sensible Capacity (Gross)	74.7	MBH
Elevation	0	Ft
Efficiency (at ARI)	9.00	EER
Part Load Efficiency	10.04	IPLV
Power Input (w/o blower)	8.60	KW
Leaving DB Temp	59.66	F
Leaving WB Temp	57.49	F

Ambient DB Temperature	85.0	F
Entering DB Temperature	80.0	F
Entering WB Temperature	67.0	F

HEATING PERFORMANCE

Entering Air Temperature	60.0	F
Air Temperature Rise	39.2	F
Leaving Air Temperature	99.2	F

☒ Gas Heat

Gas Fired Input	180	MBH
Gas Fired Output	144	MBH

Steady State Efficiency	80.0	%
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☐ Electric Heat

Power Input		KW
Heating Capacity	N/A	MBH

☐ Heat Pump

Capacity: 47F	N/A	MBH
17F	N/A	MBH
COP: 47F	N/A	
17F	N/A	

SUPPLY AIR BLOWER PERFORMANCE

Supply Air	3400	CFM
Outside Air	340	CFM
External Static Pressure	0.60	IWG

Duct Connection	Bottom	
Blower Speed	1375	RPM
Motor Rating	3.0	HP
Brake Horsepower	2.78	BHP
Power Input	2.60	KW

SOUND POWER PERFORMANCE

Sound Power	90	Dbels
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APPROXIMATE DIMENSIONS & WEIGHT*

Height	42 in.
Width	89 in.
Depth	59 in.

Total Rigging Weight (including factory accessories)	1050 Lbs*
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ELECTRICAL DATA

Power Supply	460-3-60	
Minimum Circuit Ampacity	22.9	Amps
Maximum Fuse Size	25	Amps
Maximum HACR Breaker Size	25	Amps

CLEARANCES

Front	36 in.	Back	36 in.
Left	12 in.	Right	36 in.
Bottom	0 in.	Top	72 in.

Engineer's Notes:



ENGINEER'S REPORT *PREPATOR*

Date 05/08/2008 Page 1
Order No

Project Name HOWARD COUNTY PARK AND REC BLDG
Architect

Engineer
Submitted By

Quantity: 2 Model No: DM120N20P4AAA3
O.D. Schedule No:

RTU & I.D. Schedule No:

COOLING PERFORMANCE

Total Capacity (Gross)	124	MBH
Sensible Capacity (Gross)	89.0	MBH
Elevation	0	Ft
Efficiency (at ARI)	8.00	EER
Part Load Efficiency	9.10	IPLV
Power Input (w/o blower)	11.70	KW
Leaving DB Temp	59.40	F
Leaving WB Temp	57.25	F
Ambient DB Temperature	95.0	F
Entering DB Temperature	80.0	F
Entering WB Temperature	67.0	F

HEATING PERFORMANCE

Entering Air Temperature	60.0	F
Air Temperature Rise	44.4	F
Leaving Air Temperature	104.4	F

☒ Gas Heat

Gas Fired Input	240	MBH
Gas Fired Output	192	MBH

Steady State Efficiency	80.0	%
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☐ Electric Heat

Power Input		KW
Heating Capacity	N/A	MBH

☐ Heat Pump

Capacity: 47F	N/A	MBH
17F	N/A	MBH
COP: 47F	N/A	
17F	N/A	

SUPPLY AIR BLOWER PERFORMANCE

Supply Air	4000	CFM
Outside Air	400	CFM
External Static Pressure	0.60	INWG
Duct Connection	Bottom	
Blower Speed	970	RPM
Motor Rating	3.0	HP
Brake Horsepower	2.34	BHP
Power Input	2.19	KW

APPROXIMATE DIMENSIONS & WEIGHT*

Height	51 in.
Width	89 in.
Depth	59 in.

Total Rigging Weight (including factory accessories)	1331 Lbs*
---	-----------

SOUND POWER PERFORMANCE

Sound Power	90 Dba's
-------------	----------

ELECTRICAL DATA

Power Supply	460-3-60
Minimum Circuit Ampacity	34.4 Amps
Maximum Fuse Size	45 Amps
Maximum HACR Breaker Size	45 Amps

CLEARANCES

Front	36 in.	Back	36 in.
Left	12 in.	Right	36 in.
Bottom	0 in.	Top	72 in.

Engineer's Notes:

PACKAGED ROOF TOP UNITS WITH GAS HEAT																						
SCHEDULE	EVAPORATOR FAN					COOLING										HTG			ELECTRICAL			
	SA	OA	HP	ESP (IN)	RPM	TEMP. (°F)					Capacity MBH	SEER	ALT. (FT.)	IN.	OUT.	Voltage	MCA	Max Phase	MODEL NO.	REMARKS		
						DB W/B DB W/B AMB DB W/B AMB DB W/B AMB DB W/B AMB																
						ENT. AIR LYG. AIR O.D.																
	1200	120	1.5	0.60	801	80.0	67.0	58.9	57.3	85.0	37.0	28.0	13.50	0	50	40	460-3-60	10.3	16	DJ036N04P4AAA2	13.6	
	1000	100	0.75	0.43	Hgh	80.0	67.0	60.1	58.1	85.0	28.4	21.5	13.40	0	45	36	208-1-60	20.8	25	O2NFP030N03606	7.8,9,10	
	3400	340	3.0	0.60	1376	80.0	67.0	58.7	57.5	85.0	108	74.7	8.00	0	180	144	460-3-60	22.8	25	DM102N1SP4AAA4	14.5	
	4000	400	3.0	0.60	870	80.0	67.0	58.4	67.3	85.0	124	88.0	8.00	0	240	182	460-3-80	34.4	45	DM120N20P4AAA3	12.4	

REMARKS:

- 1 Factory installed Single Input Economizer
- 2 Factory installed Oversized Blower Motor
- 3 Factory installed Belt Drive
- 4 Factory installed Barometric Relief Damper
- 5 Factory installed High Static Drive
- 6 Factory installed Barometric Relief Damper
- 7 Field installed Dry Bulb Economizer
- 8 Field installed Single Enthalpy Sensor
- 9 Field installed Filter / Frame Kit
- 10 Field installed Transformer Kit

20-75 Ton Packaged Industrial Rooftop

Job Information

(U98)Unassigned



TRANE

Tag	RTU-1	Model number	SEHFF40
Nominal Capacity	40 ton	Unit Function	Electric Heat

Model Description

Unit airflow	H: Single Zone	Development sequence	F
Power Supply	460/60/3	Heating Capacity	70 kW Electric Heat
Exhaust	100% - 7 1/2 Hp	Exhaust Fan Drive Selection	600 rpm
Filter	High-Efficiency	Supply Fan Hp	15 Hp
Supply Fan Drive Selection	900 rpm	Outside Air Selection	0-100% Economizer
System Control	VFD Supply & Exhaust	Evaporator coil	High Capacity Evap Coil
Min operating weight	6260.0 lb	Max operating weight	9056.0 lb

Cooling

Gross total capacity	523.54 MBh	Gross latent capacity	57.34 MBh
Gross sensible capacity	466.21 MBh	Net total capacity	489.95 MBh
Net sensible capacity	432.62 MBh	Net sensible heat ratio	88.30 %
Leaving coil DB	55.40 F	Leaving coil WB	55.32 F
Leaving unit DB	57.51 F	Leaving unit WB	56.16 F

Power

Total static pressure	2.54 in H2O	Supply duct static pressure	1.00 in H2O
Roof curb (for static pressure)		Return duct static pressure	0.60 in H2O
Actual supply motor power	11.68 bhp	Actual supply fan speed	871 rpm
Actual exhaust motor power	4.09 bhp	Actual exhaust fan speed	565 rpm
System power	54.57 kW		


Electrical

Max overcurrent protection	125.00 A	Min circuit ampacity	124.32 A
Min disconnect switch size	133.00 A	Recommended dual element	125.00 A
Compressor 1 count	4.00 Each	Compressor 1 RLA	18.20 A
Supply fan motor FLA	19.30 A	Supply fan count	1.00 Each
Condenser fan FLA	7.20 A	Exhaust fan motor FLA	9.80 A
Electric heater FLA	84.20 A	Other FLA	1.00 A
IPLV @ ARI	12.5 IPLV	EER @ ARI	10.0 EER
Crankcase heater FLA	2.00 A		

Electrical values provided are estimated only and are subject to change without notice and may differ from nameplate values.

20-75 Ton Packaged Industrial Rooftop

Job Information

(U98)Unassigned		 TRANE	
Tag	RTU-1	Model number	SEHFF40
Nominal Capacity	40 ton	Unit Function	Electric Heat

Entering Conditions

Design airflow	14350 cfm	Exhaust fan airflow	14350 cfm
Ambient temp	95.00 F	Cooling EDB	84.60 F
Ent air relative humidity	39.90 %	Cooling EWB	67.00 F
Elevation		Heating EAT	70.00 F

Coil Specification

Evaporator rows	4.00 Each	Evaporator face area	32.50 sq ft
Evaporator fin spacing	148 Per Foot		

Heating

Input htg capacity		Output htg capacity	239.05 MBh
Heating delta T	15.42 F	Heating LAT	85.42 F
Output htg capacity w/fan	268.80 MBh	Entering water temp	

Acoustical Performance

Octave band	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Discharge duct	91 dB	88 dB	83 dB	81 dB	79 dB	76 dB	73 dB	69 dB
Return duct	83 dB	82 dB	76 dB	72 dB	70 dB	68 dB	62 dB	58 dB
Exhaust fan	75 dB	73 dB	72 dB	70 dB	66 dB	58 dB	55 dB	51 dB

Ducted Sound Power Rated in Accordance with ARI Standard 260.

Octave Band Sound Power in dB re 1 pWatt.

"Discharge duct" is supply fan discharge sound power in the supply duct.

"Return duct" is supply fan inlet sound power in the return duct.

"Exhaust fan" is exhaust fan inlet sound power in the return duct.

"Return duct" and "Exhaust fan" sound data must be added logarithmically to get total sound power in the return duct.

Refer to RT-EB-80 for further details on indoor sound of Intellipak rooftop units.

Electrical values provided are estimated only and are subject to change without notice and may differ from nameplate values.

20-75 Ton Packaged Industrial Rooftop

Job Information

(U98) Unassigned



TRANE

Tag	RTU-3	Model number	SEHFF30
Nominal Capacity	30 ton	Unit Function	Electric Heat

Model Description

Unit airflow	H: Single Zone	Development sequence	F
Power Supply	460/60/3	Heating Capacity	50 kW Electric Heat
Exhaust	100% - 5 Hp w/Statitrac	Exhaust Fan Drive Selection	800 rpm
Filter	High-Efficiency Thruway Filter	Supply Fan Hp	10 Hp
Supply Fan Drive Selection	1000 rpm	Outside Air Selection	0-100% Economizer
System Control	VFD Supply & Exhaust Fan w/ Runner	Evaporator coil	High cap evap coil & high eff cond coil
Min operating weight	4800.0 lb	Max operating weight	6786.0 lb

Cooling

Gross total capacity	390.74 MBh	Gross latent capacity	57.03 MBh
Gross sensible capacity	333.71 MBh	Net total capacity	387.90 MBh
Net sensible capacity	310.86 MBh	Net sensible heat ratio	84.50 %
Leaving coil DB	54.64 F	Leaving coil WB	54.63 F
Leaving unit DB	56.66 F	Leaving unit WB	55.44 F

Power

Total static pressure	2.58 in H2O	Supply duct static pressure	1.05 in H2O
Roof curb (for static pressure add)		Return duct static pressure	0.66 in H2O
Actual supply motor power	7.89 bhp	Actual supply fan speed	961 rpm
Actual exhaust motor power	3.43 bhp	Actual exhaust fan speed	759 rpm
System power	40.05 kW		

Electrical

Max overcurrent protection	110.00 A	Min circuit ampacity	87.62 A
Min disconnect switch size	94.00 A	Recommended dual element	100.00 A
Compressor 1 count	2.00 Each	Compressor 1 RLA	27.30 A
Supply fan motor FLA	13.20 A	Supply fan count	1.00 Each
Condenser fan FLA	5.40 A	Exhaust fan motor FLA	6.60 A
Electric heater FLA	60.10 A	Other FLA	1.00 A
IPLV @ ARI	13.4 IPLV	EER @ ARI	10.3 EER
Crankcase heater FLA	1.00 A		

Electrical values provided are estimated only and are subject to change without notice and may differ from nameplate values.

20-75 Ton Packaged Industrial Rooftop

Job Information

(U98)Unassigned



TRANE

Tao	RTU-3	Model number	SEHFF30
Nominal Capacitv	30 ton	Unit Function	Electric Heat

Entering Conditions

Design airflow	10160 cfm	Exhaust fan airflow	10160 cfm
Ambient temp	95.00 F	Cooling EDB	84.10 F
Ent air relative humidity	41.00 %	Cooling EWB	67.00 F
Elevation		Heating EAT	70.00 F

Coil Specification

Evaporator rows	4.00 Each	Evaporator face area	24.40 sq ft
Evaporator fin spacing	148 Per Foot		

Heating

Input hta capacity		Output hta capacity	170.75 MBh
Heating delta T	15.56 F	Heating LAT	85.56 F
Output hta capacity w/fan	190.86 MBh	Entering water temp	

Acoustical Performance

Octave band	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Discharge duct	90 dB	87 dB	81 dB	80 dB	79 dB	75 dB	72 dB	68 dB
Return duct	81 dB	81 dB	75 dB	72 dB	70 dB	68 dB	60 dB	56 dB
Exhaust fan	73 dB	72 dB	72 dB	69 dB	66 dB	61 dB	60 dB	53 dB

Ducted Sound Power Rated in Accordance with ARI Standard 260.

Octave Band Sound Power in dB re 1 picroWatt.

"Discharge duct" is supply fan discharge sound power in the supply duct.

"Return duct" is supply fan inlet sound power in the return duct.

"Exhaust fan" is exhaust fan inlet sound power in the return duct.

"Return duct" and "Exhaust fan" sound data must be added logarithmically to get total sound power in the return duct.

Refer to RT-EB-80 for further details on indoor sound of Intellipak rooftop units.

Electrical values provided are estimated only and are subject to change without notice and may differ from nameplate values.

20-75 Ton Packaged Industrial Rooftop

Job Information

(U98)Unassigned



TRANE

Tag	RTU-4	Model number	SEHFF40
Nominal Capacity	40 ton	Unit Function	Electric Heat

Model Description

Unit airflow	H: Single Zone	Development sequence	F
Power Supply	460/60/3	Heating Capacity	70 kW Electric Heat
Exhaust	100% - 7 1/2 Hp	Exhaust Fan Drive Selection	600 rpm
Filter	High-Efficiency Throughway Filter	Supply Fan Hp	15 Hp
Supply Fan Drive Selection	900 rpm	Outside Air Selection	0-100% Economizer
System Control	VFD Supply & Exhaust	Evaporator coil	High Capacity Evap Coil
Min operating weight	6260.0 lb	Max operating weight	9056.0 lb

Cooling

Gross total capacity	526.99 MBh	Gross latent capacity	49.78 MBh
Gross sensible capacity	477.21 MBh	Net total capacity	491.36 MBh
Net sensible capacity	441.58 MBh	Net sensible heat ratio	89.87 %
Leaving coil DB	55.88 F	Leaving coil WB	55.75 F
Leaving unit DB	58.03 F	Leaving unit WB	58.59 F

Power

Total static pressure	2.60 in H2O	Supply duct static pressure	1.00 in H2O
Roof curb (for static pressure)		Return duct static pressure	0.60 in H2O
Actual supply motor power	12.39 bhp	Actual supply fan speed	882 rpm
Actual exhaust motor power	4.43 bhp	Actual exhaust fan speed	575 rpm
System power	55.26 kW		

Electrical

Max overcurrent protection	125.00 A	Min circuit ampacity	124.32 A
Min disconnect switch size	133.00 A	Recommended dual element	125.00 A
Compressor 1 count	4.00 Each	Compressor 1 RLA	18.20 A
Supply fan motor FLA	19.30 A	Supply fan count	1.00 Each
Condenser fan FLA	7.20 A	Exhaust fan motor FLA	9.80 A
Electric heater FLA	84.20 A	Other FLA	1.00 A
IPLV @ ARI	12.5 IPLV	EER @ ARI	10.0 EER
Crankcase heater FLA	2.00 A		

Electrical values provided are estimated only and are subject to change without notice and may differ from nameplate values.

20-75 Ton Packaged Industrial Rooftop

Job Information

(U98)Unassigned



TRANE

Taa	RTU-4	Model number	SEHFF40
Nominal Capacity	40 ton	Unit Function	Electric Heat

Entering Conditions

Design airflow	14950 cfm	Exhaust fan airflow	14950 cfm
Ambient temp	95.00 F	Cooling EDB	84.80 F
Ent air relative humidity	39.90 %	Cooling EWB	67.00 F
Elevation		Heating EAT	70.00 F

Coil Specification

Evaporator rows	4.00 Each	Evaporator face area	32.50 sq ft
Evaporator fin spacing	148 Per Foot		

Heating

Input hta capacity		Output hta capacity	239.05 MBh
Heating delta T	14.80 F	Heating LAT	84.80 F
Output hta capacity w/fan	270.61 MBh	Entering water temp	

Acoustical Performance

Octave band	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Discharge duct	91 dB	88 dB	83 dB	82 dB	79 dB	76 dB	73 dB	69 dB
Return duct	83 dB	82 dB	76 dB	73 dB	70 dB	68 dB	62 dB	58 dB
Exhaust fan	75 dB	73 dB	72 dB	70 dB	66 dB	58 dB	56 dB	51 dB

Ducted Sound Power Rated in Accordance with ARI Standard 260.

Octave Band Sound Power in dB re 1 piconWatt.

"Discharge duct" is supply fan discharge sound power in the supply duct.

"Return duct" is supply fan inlet sound power in the return duct.

"Exhaust fan" is exhaust fan inlet sound power in the return duct.

"Return duct" and "Exhaust fan" sound data must be added logarithmically to get total sound power in the return duct.

Refer to RT-EB-80 for further details on indoor sound of Intellipak rooftop units.

Electrical values provided are estimated only and are subject to change without notice and may differ from nameplate values.

Tag Data - Commercial Rooftop Air Conditioning Units (Midrange) (Qty: 3)

Item	Tag(s)	Qty	Description	Model Number
B1	RTU-1	1	20-75 Ton Packaged Industrial Rooftop (SEHFF404
B2	RTU-4	1	20-75 Ton Packaged Industrial Rooftop (SEHFF404
B3	RTU-3	1	20-75 Ton Packaged Industrial Rooftop (SEHFF304

Product Data - Commercial Rooftop Air Conditioning Units (Midrange)**All Units**

DX Cooling With Electric Heat
 40 Ton Unit
 460 Volt-60 Hertz-3 Phase
 High-efficiency throwaway filters
 0-100% Economizer
 Econ Control w/comparative enthalpy
 2.00" [51mm] Spring Isolators
 Supply and Return n with VFD and Bypass
 Programmable Night Setback Sensor with System Function Lights for VAV (Fld)
 Low Ambient Damper(s) Control
 UL approval
 Nonfused Unit Disconnect Switch
 High capacity evaporator coil
 Generic Building Automation System Module
 Access doors
 Solid double wall construction
 Adapter Curbs to Mammoth units

Item: B1, B2 Qty: 2 Tag(s): RTU-1, RTU-4

70 kW Electric heat
 100% Exhaust - 7 1/2 Hp with Statitrac
 600 rpm - Exhaust fan
 15 Hp - Supply motor
 900 rpm - Supply fan

Item: B3 Qty: 1 Tag(s): RTU-3

50 kW Electric heat
 100% Exhaust - 5 Hp with Statitrac
 500 rpm - Exhaust fan
 10 Hp - Supply motor
 800 rpm - Supply fan

Total Net Price (Excluding Sales Tax) Two Chillers.
 Deduct to go to 150 Opt#1 675 kW/Ton

Three Rooftop Units.
 Deduct to provide exhaust fans in lieu of return fans. ...

This proposal and pricing are based on shipment of all products (not including field labor) by no later than 3rd quarter of 2008 year.

Sincerely,

Darryl Hocketra - Trane
 9603 Deereco Road, Suite 400
 Lutherville Timonium, MD 21093-2155
 Phone: (410) 252-8100
 Fax: (410) 252-7330

This proposal is subject to your acceptance of the attached Trane terms and conditions.

RTHD B1C1D1 Tag: 150 Ton opt#2

Part Load Performance

NPLV = 0.568

%LoadCapacity	LWT	EWT	Flow	WPD	EWT	LWT	Flow	WPD	Efficiency	
		Evap	Evap	Evap	Cond	Cond	Cond	Cond		
100	150.0	44.0	56.0	298.6	5.9	85.0	96.4	375.0	8.5	97.5 0.650
75	112.5	44.0	52.8	298.6	5.9	78.0	83.4	375.0	8.7	84.8 0.576
50	75.0	44.0	49.8	298.6	5.9	65.0	70.5	375.0	9.0	39.6 0.528
25	37.5	44.0	47.3	298.6	5.9	65.0	68.0	375.0	9.0	27.7 0.739

Note: 1. $NPLV = 1 / ((0.01 / A) + (0.42 / B) + (0.45 / C) + (0.12 / D))$

Where: A = kW/Ton at 100% at user defined entering condenser water with 1% weighting

B = kW/Ton at 75% at user defined entering condenser water with 42% weighting

C = kW/Ton at 50% at user defined entering condenser water with 45% weighting

D = kW/Ton at 25% at user defined entering condenser water with 12% weighting

2. NPLV is defined using the input design conditions, outside of ARI conditions.

Selected reports
Available pages

Version: 2.6

July 10, 2008

TRANE Water-Cooled Series R(TM) Chiller

25% point is calculated per ARI standard. Minimum chiller load point is greater than 25%.

BUILDING ENVELOPE

Product Data Sheet FOAM SEALANT One-Component Polyurethane

ZERO DRAFT

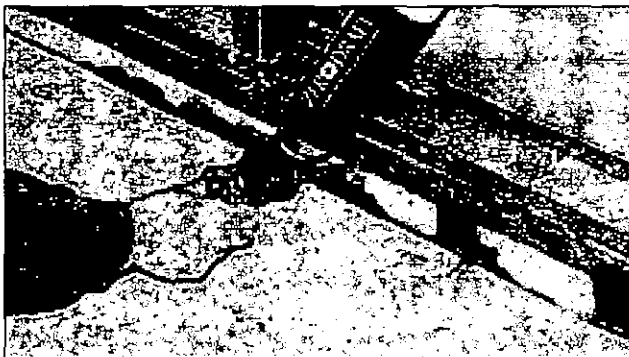
Professional Weatherization Materials

EXPLANATION

Buildings with gaps, cracks, and "holes" in them that suffer from uncontrolled air flow (air leakage) cost more money to heat and air condition, are drafty and uncomfortable, have poorer quality indoor air, deteriorate faster, and generate more occupant complaints than buildings where air leakage is properly controlled.

Air leakage through openings in the building envelope is caused by air pressure differences due to stack effect, wind and ventilation. Alone, or in combination, the three effects typically represent 15 to 40% of the building's thermal load, or roughly 4 - 8% of the total energy requirement (ASHRAE Handbook).

Uncontrolled air flow is responsible for the corrosion and decay of building materials (thereby reducing life expectancy), increased maintenance costs, poor appearance - and in the event of a fire - the rapid spread of flames and smoke.



Zerodraft Foam Sealant being applied to base of wall.

Zerodraft Foam Sealant seals gaps and cracks in walls, roof-wall connections, the perimeter of door and window openings, mechanical and electrical penetrations, and similar locations to help provide a continuous, impermeable barrier to air infiltration or loss.

DESCRIPTION

Zerodraft Foam Sealant is a polyurethane foam consisting of a single mix of chemicals (MDI Monomer and Isobutane/Propane propellant) in one pressurized container and is formulated so that it will cure when exposed to the moisture present in air.

The material mix is ejected from a gun foam container as a sticky 6 mm (1/4") to 50 mm (2") diameter bead and provides high yield and quick curing. For application purposes, the gun foam system is the most efficient means of

dispensing foam, offers the greatest control, optimum accuracy and unlimited range of applicator motion - an installer convenience when going up and down ladders, around corners, or moving from room to room.

USES

Zerodraft Foam Sealant is intended to be installed at junctions between different building elements and around penetrations in a building assembly to control air leakage. Zerodraft Foam Sealant is dispensed as a bead for crack and gap filling. A "gap" is generally between 6 mm (1/4") and 50 mm (2") wide. A "crack" is less than 6 mm (1/4") wide. Zerodraft is generally used where appearance is not critical however the foam sealant can also be trimmed and painted.



Example areas of use for Zerodraft Foam Sealant include:



- crevices in walls



- roof-wall connections



- perimeter of door and window openings



- mechanical and electrical penetrations in walls, floors and roofs (pipe, duct, conduit, etc.)

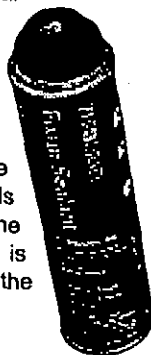
- similar locations, to provide a continuous impermeable barrier to air infiltration or loss

Note: See Zerodraft Insulating Air Sealant product data sheet literature (two-component polyurethane) for sealing "holes" larger than 50mm(2").

LIMITATIONS

Do not use Zerodraft Foam Sealant:

- where subject to a continuous service temperature outside the range of -60°C to +80°C (-47°F to 176°F) such as in contact with chimneys, heater vents, steam pipes, etc. unless the sealant has been designed for use at other service temperatures as specified by Zerodraft.
- on or in the vicinity of heat emitting devices such as recessed lighting fixtures, at a lesser distance than 75 mm (3") or as specified by the authority having jurisdiction.
- inside electrical outlets or junction boxes
- left exposed to continuous ultraviolet light
- immersed in water for long periods of time

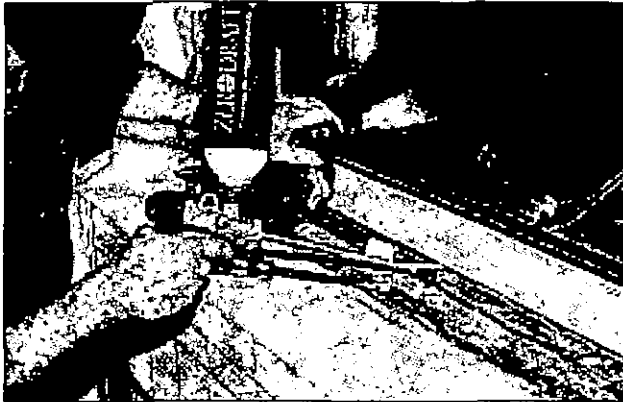


FEATURES

High yield; a standard 24 oz. (682 ml) container of gun foam will produce 280 linear metres (918 lin. ft.) of 13 mm (1/2") diameter bead.

Quick cure; tack-free in 8 minutes and cut-through in 45 minutes (50% RH).

Fire retardant; self-extinguishing in absence of flame. Produces Flame Spread Rating of less than 25 and Smoke Developed Rating of less than 50 when tested to CAN/ULC-S102 and ASTM E-84 in a range of bead sizes. (Not a fire stop; see Zerodraft Air Seal/Fire Stop Systems literature).



Zerodraft Foam Sealant being applied to seal gap between window frame and rough opening.

Safe formula; does not contain ureaformaldehyde, CFC's (chlorofluorocarbons), or solvents.

Excellent insulating properties; 70% closed cell content provides RSI Value of 0.951 per 305 mm thickness (R Value of 5.4 per 1" thickness) which helps in reducing heating and cooling costs.

STANDARDS CONFORMANCE

Zerodraft Foam Sealant conforms to:

CAN/ULC-S710.1 Standard For Thermal Insulation – Bead Applied One-Component Polyurethane Air Sealant Foam, Part 1: Material Specification.

CAN/ULC-S710.2 Standard For Thermal Insulation – Bead Applied One-Component Polyurethane Air Sealant Foam, Part 2: Application.

CCMC 09552 Product Evaluation (Canadian Construction Materials Centre, NRC).

INSTALLATION

Storage/Shelf Life: Do not expose to heat or store above 50°C (120°F). Do not leave in vehicle. Shelf life is 18 months.

Surface Preparation: Apply to clean substrates free of oil, grease or excessive moisture.

Application: Zerodraft Foam Sealant is applied only by

accredited Zerodraft applicators.

Essentially, these specialist contractors seal gaps, cracks and holes with appropriate materials and systems thereby ensuring a continuous plane of airtightness in the building envelope.

In addition, the specialist contractors are familiar with the need for "decoupling" and "compartmentalization" within buildings. Floors are decoupled from each other to prevent vertical leakage while other areas of the building are compartmentalized to help equalize pressure differences.

For example, at the top of the building mechanical rooms are isolated and compartmentalized by weatherstripping doors, fire stopping relevant penetrations through fire rated walls, reducing the size of cable holes in the elevator shafts and door controller cable penetrations, as well as busbar and other electrical penetrations through the floor of the elevator rooms. At the bottom of the building, the many penetrations found in the underground parking areas are effectively sealed. Doors are weatherstripped. Open cable conduit duct and pipe penetrations and gaps between block infill and slabs are sealed. Vertical shafts, where fire doors with large gaps – some up to 50 mm (2") – are weatherstripped, thereby decoupling floor to floor areas and reducing stack effect pressures.

Other areas to consider include fire cabinets, garbage disposal rooms, electrical rooms and other service shafts.

Zerodraft Foam Sealant is also effective in sealing and insulating thermal "bridges" at roof-wall junctions, beam penetrations, and other interruptions affecting the integrity of wall and roof systems.

Zerodraft Foam Sealant is only one product used in the air leakage sealing process. Zerodraft Insulating Air Sealant for larger holes, Zerodraft Air Seal/Fire Stop Systems, and Zerodraft Door and Window Weatherstripping are all employed for sealing, decoupling and compartmentalization work. See other Zerodraft literature.

Finishing: Zerodraft Foam Sealant, a cream coloured product, is typically covered up with interior finishes such as plaster, drywall, paneling, trim or other finish. Alternatively the sealant may be cut smooth (trimmed) and painted. In plenum or other areas not exposed to ultraviolet radiation, Zerodraft Foam Sealant may be left exposed.

Building Codes: Zerodraft Foam Sealant complies with the following Sections of the National Building Code:

- 3.1.5.2 Minor Combustible Components (Zerodraft Foam Sealant is permitted in buildings required to be of non-combustible construction).
- 5.4.1.2 Air Barrier System Properties (Zerodraft Foam Sealant falls within the maximum allowable air leakage rate of 0.02 l/s·m² measured at an air pressure difference of 75 Pa. (See Appendix A reference following).

TECHNICAL DATA*

PROPERTY	TEST METHOD (ASTM)	RESULT
Density	D-1622	1.3 to 1.8 lbs./cu. ft.
Compressive Strength	D-1621	11 psi
Tensile Strength	D-1623	26 psi
% Elongation at Break	-	12%
Shear Strength	C-273	18 psi
Shear Strain	C-273	38 psi
% Closed Cell Content	D-2856	70%
Thermal Resistance	C-518	R4.5
Water Vapour Transmission	E-96	3.3 perm inch
Max. Service Temperature of Cured Foam	-	115°C (240°F)
Ideal Application Temperature	-	15.6°C to 32.2°C (60° to 90°F)
Surface Burning Characteristics	E-84	Flame Spread 20 Smoke Developed 25 (contains fire retardant, Class 1 foam)

* Test reports are available upon request.

- A-6.4.1.2 (1) and (2) Air Leakage Through The Air Barrier System (Zerodraft Foam Sealant falls within the recommended maximum allowable leakage rates as related to warm and cold side temperatures and humidity conditions).

Health/Safety: A Material Safety Data Sheet is provided with every case of Zerodraft Foam Sealant. Instructions for the safe handling, use and disposal of the materials and/or containers is provided on the label of each container.

Packaging: 24 oz. (682 ml) containers, 12 containers per case.

WARRANTY

Normal 1 year construction warranty.

MAINTENANCE

No maintenance required.

AVAILABILITY & BUDGET PRICING

Zerodraft products and services are available throughout North America. Zerodraft will review drawings (and/or the building for retrofit work) and provide budget pricing on a project-by-project basis. Ultimately, the cost of sealing is estimated on a lineal metre, square metre and/or unit cost basis for doors, windows and different types of penetrations.

TECHNICAL SERVICES

Zerodraft provide air leakage control advisory services from preliminary design through to application, including the following:

- Air sealing recommendations and technical advice for both new work and retrofit applications (asset protection).
- Design and specification assistance.

- Air leakage investigation/testing, including energy audits and pay back projections.

RELATED DATA

- Zerodraft Insulating Air Sealant literature (for larger "holes").
- Zerodraft Air Seal/Fire Stop Systems literature (for ULC fire rated assemblies).
- Zerodraft Door and Window Weatherstripping literature.
- CSC (Construction Specifications Canada) Air Barriers "Digest" and "Master Specification", March 1990.
- "Does Your Building Suck?", CONDOBUSINESS Magazine, September 2001.
- "Sealing the Envelope", Canadian Property Management Magazine, September 2001.
- "Urethane Foams as Insulating Sealants", Construction Canada Magazine, March/April 1997.
- "Urethane Foams and Air Leakage Control", Home Energy Magazine, July/August 1995.

SPECIFICATION (Short Form)

SPEC NOTE: Zerodraft Foam Sealant is often used with Zerodraft Insulating Air Sealant, Zerodraft Air Seal/Fire Stop Systems and Zerodraft Door and Window Weatherstripping. Collectively, with the main air barrier, these products provide a complete system to achieve a continuous impermeable barrier to air infiltration or loss. Refer to the respective Zerodraft literature and Zerodraft Insulating Air Seal/Fire Stop Master Specification.

Air sealant foam: Zerodraft Foam Sealant bead applied gun foam one-component polyurethane sealant to CAN/ULC-S710.1 (Material Specification) as manufactured and distributed by Zerodraft (Division of Canam Building Envelope Specialists Inc.), 125 Traders Blvd. E., Unit # 4, Mississauga, ON, L4Z 2H3. Tel. 1-877-272-2626.

Sealant to be installed by accredited Zerodraft applicators in accordance with manufacturer's instructions and CAN/ULC-S710.2 (Application Standard). Install sealant where indicated on the drawings and/or as specified in the Air Barrier Section (07270) of the Specification.



Professional Weatherization Materials

125 Traders Blvd. East, Unit 4, Mississauga, Ont, L4Z 2H3, Canada www.zerodraft.com
(905) 890-5866 Toll Free: 1-877-272-2626 Fax: (905) 890-8114

MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT INFORMATION

Product: ZERODRAFT Z1-24 FOAM SEALANT

Manufactured in
the U.S. for: ZERODRAFT
125 Traders Blvd. East, Unit 4
Mississauga, Ont,
L4Z 2H3, Canada

Emergency Number: 1-800-424-9300 (Chemtrec)
Information Number: 1-877-272-2626 (Zerodraft)

AUGUST 13, 2005

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

CHEMICAL NAME	CAS NO.	OSHA PEL	ACGIH TLV	PERCENTAGE
Methylene bisphenyl isocyanate **	101-68-8	0.02 ppm	0.005 ppm	6 - 12
Polymethylene Polyphenyl isocyanate	9016-87-9	*NE	*NE	21 -28
Chlorinated paraffin	61788-76-9	*NE	*NE	18 -24
Chlorinated Phosphate	13674-84-5	*NE	*NE	6 - 10
Dimethylether	115-10-6	*NE	*NE	1 - 3
Isobutane	75-28-5	*NE	*NE	6 - 10
Polyether Polyol	Mixture	*NE	*NE	18 -23

HMIS Health 3 Flammability 4 Reactivity 1

*Not established

**This product is a toxic chemical (or chemicals) subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (40 CFR 372).

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point	-43.7°F (-42°C) (Estimated for Propellant)
Vapor Pressure	85 psig @ 73°F
Vapor Density (AIR = 1)	Heavier than Air
Specific Gravity (H ₂ O = 1)	1.01 g/ml at 25°C
Solubility in Water	N/A
Appearance and Odor	Gel under pressure/faint hydrocarbon odor
VOC	106 g/l

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point	Estimated: -156°F (-82°C)
Flammable Limits in air % by Volume	LEL Lower 1.8% (Estimated) UEL Upper 10% (Estimated)
Extinguishing Media	Water fog, foam, CO ₂ , or dry chemical
Fire Fighting Procedures	Fire fighters should wear full self-contained breathing apparatus and full protective clothing.
Unusual Hazards	Avoid storage temperatures above 120°F to prevent can explosions. Avoid water contamination in closed container.

SECTION V - REACTIVITY DATA

Stability	Stable under normal storage and handling conditions. Do not store above 120°F. Cured adhesive will deteriorate when exposed to UV light.
Incompatibility	Water, alcohols, strong bases, finely powdered metal such as aluminum, magnesium or zinc, and strong oxidizers.
Conditions/Hazards to Avoid	Contamination with water may form CO ₂ . Avoid high heat; i.e., flames, extremely hot metal surfaces, heating elements, combustion engines, etc. Do not store in auto or direct sunlight.

SECTION VI - HEALTH HAZARD DATA

Toxicology Test Data

MDI:

- Rat, 4 hr Inhalation LC50 - Aerosol 490 mg/m³
Highly Toxic
- Rat, 4 hr Inhalation LC50 - Vapor 11 mg/l
Toxic
- Rat, Oral LD50 - > 10,000 mg/kg
Practically Nontoxic
- Rat, Inhalation Oncogenicity Study - @ ~0.2, 1, 6 mg/m³
URT irritant; Carcinogenic @ 6 mg/m³

Polyurethane Resin NE*

Acute Overexposure Effects

Eye contact with MDI may result in conjunctival irritation and mild corneal opacity. Skin contact may result in dermatitis, either irritative or allergic. Inhalation of MDI vapors may cause irritation of the mucous membranes of the nose, throat or trachea, breathlessness, chest discomfort, difficult breathing and reduced pulmonary function. Air-borne overexposure well above the PEL may result additionally in eye irritation, headache, chemical bronchitis, asthma-like findings or pulmonary edema. Isocyanates have also been reported to cause hypersensitivity pneumonitis, which is characterized by flu-like symptoms, the onset of which may be delayed. Gastrointestinal symptoms include nausea, vomiting and abdominal pain.

Polyurethane resin forms a quick bond with skin. Cured foam is hard to remove from skin. May cause eye damage.

Chronic Overexposure Effects

Acute or chronic overexposure to isocyanates may cause sensitization in some individuals, resulting in allergic symptoms of the lower respiratory tract (asthma-like), including wheezing, shortness of breath and difficulty breathing. Subsequent reactions may occur at or substantially below the PEL and TLV. Asthma caused by isocyanates, including MDI, may persist in some individuals after removal from exposure and may be irreversible. Some isocyanate sensitized persons may experience asthma reactions upon exposure to non-isocyanate containing dusts or irritants. Cross sensitization to different isocyanates may occur. Long-term overexposure to isocyanates has also been reported to cause lung damage, including reduced lung function, which may be permanent. An animal study indicated that MDI may induce respiratory hypersensitivity following dermal exposure.

Carcinogenicity

Results from a lifetime inhalation study in rats indicate that MDI aerosol was carcinogenic at 6 mg/m³, the highest dose tested. This is well above the recommended TLV of 5 ppb (0.05 mg/m³). Only irritation was noted at the lower concentration of 0.2 and 1 mg/m³.

Medical Conditions Generally Aggravated by Exposure

Breathing difficulties, chest discomfort, headache, eye and nose membrane irritation.

Emergency and First Aid Procedures

Inhalation - Remove to fresh air. Give oxygen. If not breathing, give artificial respiration.

Keep victim quiet. Do not give stimulants. Get immediate medical attention.

Skin - If frostbitten, warm skin slowly with water; otherwise, wash affected areas with soap and water. Remove contaminated clothing and launder before reuse. Remove wet foam immediately from skin with acetone or nail polish remover. Dried foam is hard to remove from skin. If foam dries on skin, apply generous amounts of petroleum jelly or lanolin, leave on for one hour, wash thoroughly, and repeat process until foam is removed. Do not attempt to remove dried foam with solvents.

Eye - In case of eye contact, flush with water for 15 minutes. Get immediate medical attention.

Ingestion - In case of ingestion, get immediate medical attention.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Spills/Leaks	If can ruptures, protect area from heat, sparks, flames, or static electricity. Turn off sources of ignition. Vapors are heavier than air. Make sure area is adequately ventilated. Allow curing process to complete; then dispose according to federal, state, and local regulation.
Waste Disposal	Dispose of cured adhesive per federal, state, and local regulations.
Container Disposal	Dispose according to federal, state, and local regulations.
Storage	Always store upright. Storage temperatures: min. 0°F, max. 100°F. Do not store containers in direct sunlight.
Unused Product	Dispense onto a newspaper or plastic sheeting. Let cure and dispose per federal, state and local regulations

Engineering Controls Use only with adequate ventilation. Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines. Exhaust systems should be designed to move the air away from the source of vapor/aerosol generation and people working at this point

SECTION VIII - PERSONAL PROTECTION

Respiratory Protection	Not applicable
Clothing	Wear gloves and safety glasses. Use in well ventilated areas only. See section IV.
Eye Protection	Safety glasses.
Ventilation	Maintain local exhaust rate to keep below TLV.

SECTION IX - REGULATORY INFORMATION

SARA - This product contains a toxic chemical (or chemicals) subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (40CFR 372).

NAME	CAS NO.	AMOUNT
Methylene bisphenyl isocyanate	101-68-8	6 - 12%

CERCLA - Reportable Quantity - yes (5,000 lb. of Methylene bisphenyl isocyanate)

RCRA Hazardous Waste - No

DOT Proper Shipping Name - Consumer Commodity

The above information is accurate to the best of our knowledge. However, since data, safety standards, and government regulations are subject to change and the conditions of handling and use or misuse are beyond our control, Zerodraft makes no warranty, either express or implied, with respect to the completeness or continuing accuracy of the information contained herein and disclaims all liability for reliance thereon. User should satisfy himself that he has all current data relevant to his particular use.

*NE - Not Established NA - Not Applicable

Product Data Sheet INSULATING AIR SEALANT Two-Component Polyurethane

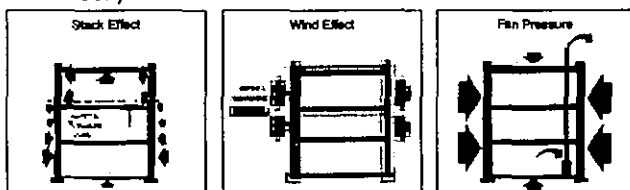
ZERODRAFT

Professional Weatherization Materials

EXPLANATION

Buildings with gaps, cracks, and "holes" in them that suffer from uncontrolled air flow (air leakage) cost more money to heat and air condition, are drafty and uncomfortable, have poorer quality indoor air, deteriorate faster, and generate more occupant complaints than buildings where air leakage is properly controlled.

Air leakage through openings in the building envelope is caused by air pressure differences due to stack effect, wind and ventilation. Alone, or in combination, the three effects typically represent 15 to 40% of the building's thermal load, or roughly 4 - 8% of the total energy requirement (ASHRAE Handbook).



Uncontrolled air flow is responsible for the corrosion and decay of building materials (thereby reducing life expectancy), increased maintenance costs, poor appearance - and in the event of a fire - the rapid spread of flames and smoke.

Zerodraft Insulating Air Sealant seals gaps, cracks, and holes in walls, roof-wall connections, the perimeter of door and window openings, mechanical and electrical penetrations, and similar locations to help provide a continuous, impermeable barrier to air infiltration or loss.

DESCRIPTION

Zerodraft Insulating Air Sealant is a polyurethane foam consisting of a mix of chemicals (MDI Monomer and Isobutane/Propane propellant) in a pressurized container and is formulated so that it will react and cure chemically in ambient air.

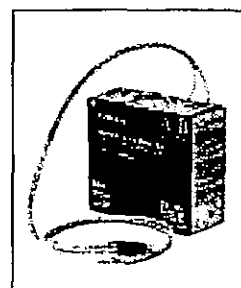


Zerodraft Insulating Air Sealant being applied at roof-wall junction.

The material mix is ejected from a portable/disposable self-contained applicator with an advanced metering system that controls foam flow, prevents over-application and

reduces waste. Zerodraft Insulating Air Sealant also provides high yield and quick curing. For application purposes, the gun foam system is the most efficient means of dispensing foam, offers the greatest control, optimum accuracy and unlimited range of applicator motion - an installer convenience when going up and down ladders, around corners, or moving from room to room.

Zerodraft Insulating Air Sealant is available in two convenient size containers - Z2-200 and Z2-600, and the gun applicator



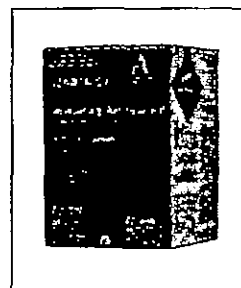
Z2-200 A B

is available with three types of accessory nozzles i.e. Fan, High Velocity, and Pour-In-Place, to suit a variety of installer requirements.

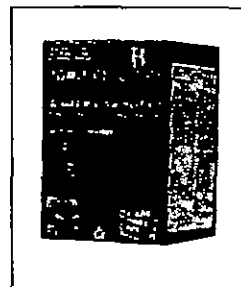
USES

Zerodraft Insulating Air Sealant is intended to be installed at junctions between different building elements, in voids, and around penetrations in a building assembly to control air leakage.

Zerodraft Insulating Air Sealant is dispensed as a high yield foam for filling "holes" over 50mm (2") width in size. Zerodraft is generally used where appearance is not critical however the foam sealant can be trimmed and painted.



Z2-600 A



Z2-600 B

Note: Zerodraft Foam Sealant - another Zerodraft product - is dispensed as a bead for crack and gap filling. A "gap" is generally between 6 mm (1/4") and 50 mm (2") wide. A "crack" is less than 6 mm (1/4") wide.

Example areas of use for Zerodraft Insulating Air Sealant include:

- drill and inject applications, e.g. window and curtainwall mullions, beam and column enclosures, and other hidden cavities.
- voids in walls and at roof-wall connections.
- at beams and columns to eliminate thermal bridging.
- perimeter of door and window openings.
- spray application for continuity in other insulation

systems i.e. gaps in board insulation and surrounding surfaces.

- mechanical and electrical penetrations in walls, floors and roofs (pipe, duct, conduit, etc.).
- similar locations, to provide a continuous impermeable barrier to air infiltration or loss.



Zerodraft Insulating Air Sealant being applied behind window frame.

In addition to general construction, other industries where Zerodraft Insulating Air Sealant is used include agricultural, boating and marine, cold storage, mining, petrochemical, pools and spas, refrigeration, transportation, and utilities.

LIMITATIONS

Do not use Zerodraft Insulating Air Sealant:

- where subject to a continuous service temperature outside the range of -60°C to $+80^{\circ}\text{C}$ (-47°F to 176°F) such as in contact with chimneys, heater vents, steam pipes, etc. unless the sealant has been designed for use at other service temperatures as specified by Zerodraft.
- on or in the vicinity of heat emitting devices such as recessed lighting fixtures, at a lesser distance than 75 mm (3") or as specified by the authority having jurisdiction.
- inside electrical outlets or junction boxes.
- left exposed to continuous ultraviolet light.
- immersed in water for long periods of time.

FEATURES

High yield; expands 3 times from initial application or injection. See Packaging on back page.

Quick cure; cures in 45 seconds.

Fire retardant; self-extinguishing in absence of flame. Produces Flame Spread Rating of less than 25 and Smoke Developed Rating of less than 50 when tested to CAN/ULC-S102 and ASTM E-84 in a range of bead sizes. (Not a fire stop; see Zerodraft Air Seal/Fire Stop Systems literature).

Safe formula; does not contain ureaformaldehyde, CFC's (chlorofluorocarbons), or hazardous solvents.

Excellent insulating properties; over 90% closed cell content provides RSI Value of 1.057 per 305 mm thickness (R Value of 6.0 per 1" thickness) which helps in reducing heating and cooling costs.

STANDARDS CONFORMANCE

Zerodraft Insulating Air Sealant conforms to:

CAN/ULC-S711.1 Standard For Thermal Insulation – Bead Applied Two-Component Polyurethane Air Sealant Foam, Part 1: Material Specification.

CAN/ULC-S711.2 Standard For Thermal Insulation – Bead Applied Two-Component Polyurethane Air Sealant Foam, Part 2: Application.

INSTALLATION

Storage/Shelf Life: Do not expose to heat or store above 50°C (120°F). Do not leave in vehicle. Shelf life is 12 months.

Surface Preparation: Apply to clean substrates free of oil, grease or excessive moisture.

Application: Zerodraft Insulating Air Sealant is applied only by accredited Zerodraft applicators.

Essentially, these specialist contractors seal gaps, cracks and holes with appropriate materials and systems thereby ensuring a continuous plane of airtightness in the building envelope.

In addition, the specialist contractors are familiar with the need for "decoupling" and "compartmentalization" within buildings. Floors are decoupled from each other to prevent vertical leakage while other areas of the building are compartmentalized to help equalize pressure differences.

For example, at the top of the building mechanical rooms are isolated and compartmentalized by weatherstripping doors, fire stopping relevant penetrations through fire rated walls, reducing the size of cable holes in the elevator shafts and door controller cable penetrations, as well as busbar and other electrical penetrations through the floor of the elevator rooms. At the bottom of the building, the many penetrations found in the underground parking areas are effectively sealed. Doors are weatherstripped. Open cable, conduit, duct, and pipe penetrations and gaps between block infill and slabs are sealed. Vertical shafts, where fire doors with large gaps – some up to 50 mm (2") – are weatherstripped, thereby decoupling floor to floor areas and reducing stack effect pressures.

Other areas to consider include fire cabinets, garbage disposal rooms, electrical rooms and other service shafts.

Zerodraft Insulating Air Sealant is also effective in sealing and insulating thermal "bridges" at roof-wall junctions, beam penetrations, and other interruptions affecting the integrity of wall and roof systems.

Zerodraft Insulating Air Sealant is only one product used in the air leakage sealing process. Zerodraft Foam Sealant for smaller holes (cracks and gaps), Zerodraft Air Seal/Fire Stop Systems, and Zerodraft Door and Window Weatherstripping are all employed for sealing, decoupling and compartmentalization work. See other Zerodraft literature.

TECHNICAL DATA*

PROPERTY	TEST METHOD (ASTM)	RESULT
Density	D-1622	1.75 ± 0.2 pcf
K-Factor	C-177	0.144
R-Factor	C-177	6.9/in
Compressive Strength 10%, parallel 10%, perpendicular	D-1621	19 psi 13.4 psi
Tensile Strength parallel perpendicular	D-1623	34 psi 24.1 psi
Dimensional Stability -40°F, 2-wks 158°F, 100% RH 2-wks	D-2126	+0.88%, vol. change +14%, vol. change
Water Absorption	D-2842	1 – 3.5%
Closed Cell Content	D-2856	90%, min.

* Test reports are available upon request.

Finishing: Zerodraft Insulating Air Sealant, a cream coloured product, is typically covered up with interior finishes such as plaster, drywall, paneling, trim or other finish. Alternatively the sealant may be cut smooth (trimmed) and painted. In plenum or other areas not exposed to ultraviolet radiation, where it is used strictly as an air sealant, Zerodraft Insulating Air Sealant may be left exposed.

Building Codes: Zerodraft Insulating Air Sealant complies with the following Sections of the National Building Code:

- 3.1.5.2 Minor Combustible Components (Zerodraft Insulating Air Sealant is permitted in buildings required to be of non-combustible construction).
- 5.4.1.2 Air Barrier System Properties (Zerodraft Insulating Air Sealant falls within the maximum allowable air leakage rate of 0.02 l/s·m²) measured at an air pressure difference of 75 Pa. (See Appendix A reference following).
- A-6.4.1.2 (1) and (2) Air Leakage Through The Air Barrier System (Zerodraft Insulating Air Sealant falls within the recommended maximum allowable leakage rates as related to warm and cold side temperatures and humidity conditions).

Health/Safety: A Material Safety Data Sheet is provided with every Zerodraft Insulating Air Sealant kit. Instructions for the safe handling, use and disposal of the materials and/or containers are provided on the label of each container.

WARRANTY

Normal 1 year construction warranty.

MAINTENANCE

No maintenance required.

AVAILABILITY & BUDGET PRICING

Zerodraft products and services are available throughout North America. Zerodraft will review drawings (and/or the building for retrofit work) and provide budget pricing on a project-by-project basis. Ultimately, the cost of sealing is estimated on a lineal metre, square metre and/or unit cost basis for doors, windows and different types of penetrations.

TECHNICAL SERVICES

Zerodraft provide air leakage control advisory services from preliminary design through to application, including the following:

- Air sealing recommendations and technical advice for both new work and retrofit applications (asset protection).
- Design and specification assistance.
- Air leakage investigation/testing, including energy audits and pay back projections.

RELATED DATA

- Zerodraft Foam Sealant literature (for smaller cracks and gaps).
- Zerodraft Air Seal/Fire Stop Systems literature (for ULC fire rated assemblies).
- Zerodraft Door and Window Weatherstripping literature.
- CSC (Construction Specifications Canada) Air Barriers "Digest" and "Master Specification", March 1990.
- "Does Your Building Suck?", CONDOBUSINESS Magazine, September 2001.
- "Sealing the Envelope", Canadian Property Management Magazine, September 2001.

Packaging:

CONTAINER SIZE	YIELD				CONTAINER DIMENSIONS (L x W x H)		KITS PER PALLET
	Cubic m	Board m*	Board Ft.	Cubic Ft.	mm (Nominal)	Inches (Nominal)	
Z2-200	0.47	5.66	200	16.67	380 x 190 x 368	15 x 7-1/2 x 14-1/2	36
Z2-600 (1A + 1B)	1.400	16.99	600	50.00	318 x 305 x 432	12-1/2 x 12 x 17	16 (8A + 8B)

* Board metres = board feet x 0.02832

- "Urethane Foams as Insulating Sealants", Construction Canada Magazine, March/April 1997.
- "Urethane Foams and Air Leakage Control", Home Energy Magazine, July/August 1995.

Insulating air sealant: Zerodraft Insulating Air Sealant bead applied gun foam two-component polyurethane sealant to CAN/ULC-S711.1 (Material Specification) as manufactured and distributed by Zerodraft (Division of Canam Building Envelope Specialists Inc.), 125 Traders Blvd. E., Unit # 4, Mississauga, ON, L4Z 2H3 Tel. 1-877-272-2626.

SPECIFICATION (Short Form)

SPEC NOTE: Zerodraft Insulating Air Sealant is often used with Zerodraft Foam Sealant, Zerodraft Air Seal/Fire Stop Systems and Zerodraft Door and Window Weatherstripping. Collectively, with the main air barrier, these products provide a complete system to achieve a continuous impermeable barrier to air infiltration or loss. Refer to the respective Zerodraft literature and Zerodraft Insulating Air Seal/Fire Stop Master Specification.

Sealant to be installed by accredited Zerodraft applicators in accordance with manufacturer's instructions and CAN/ULC-S711.2 (Application Standard). Install sealant where indicated on the drawings and/or as specified in the Air Barrier Section (07270) of the Specification.

ZERODRAFT

Professional Weatherization Materials

125 Traders Blvd. East, Unit 4, Mississauga, Ont, L4Z 2H3, Canada www.zerodraft.com
(905) 890-5866 Toll Free: 1-877-272-2626 Fax: (905) 890-8114

330-1075

MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT INFORMATION

Product: ZERODRAFT Insulating Air Seal Kit
Z2-200, Z2-600 A Component and B Component

Manufactured in
the U.S. for: ZERODRAFT
125 Traders Blvd. East, Unit 4
Mississauga, Ont,
L4Z 2H3, Canada

Emergency Number: 1-800-424-9300 (Chemtrec)
Information Number: 1-877-272-2626 (Zerodraft)

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

A Component

CHEMICAL NAME	CAS NO.	OSHA PEL	ACGIH TLV	PERCENTAGE
Polymeric Diphenylmethane Diisocyanate (MDI)	9016-87-9	NE*	NE*	40-50
4,4-Diphenylmethane Diisocyanate	101-68-8	0.02ppm CEIL	0.005ppm TWA	25-35
Chlorodifluoromethane (HCFC-22)	75-45-6	1,000ppm TWA	1,000ppm TWA	5-30

B Component

CHEMICAL NAME	CAS NO.	OSHA PEL	ACGIH TLV	PERCENTAGE
Polyol Blend	Proprietary Mixture NE*	NE*	NE*	35-75
Flame Retardant	Proprietary Mixture NE*	NE*	NE*	3-30
Catalyst	Proprietary Mixture NE*	NE*	NE*	< 1
1,1-Dichloro-1-Fluoroethane (HCFC-141b)	1717-00-6	NE*	NE*	2-18
Chlorodifluoromethane (HCFC-22)	75-45-6	1,000ppm TWA	1,000ppm TWA	5-30

*Not established

None of the ingredients in both A and B component are listed by IARC, NTP, OSHA, or ACGIH as a carcinogenic substance.

Hazard Rating : HMIS	A Component	Health 2	Flammability 1	Reactivity 1
	B Component	Health 1	Flammability 1	Reactivity 0

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

	A Component		B Component	
Boiling Point	HCFC-22 MDI	-41.4°F at 1 ATM 392°F at 5 mm Hg	HCFC-22 HCFC-141b Polyol Blend	-41.4°F at 1 ATM 89.6°F NE*
Vapor Pressure	HCFC-22 MDI	136 psia at 70°F 0.00016mmHg@68°F	HCFC-22 HCFC-141b Polyol Blend	136 psia at 70°F 10 psia at 68°F NE*
Vapor Density (AIR = 1)	HCFC-22	2.98 at 1 ATM	HCFC-22 HCFC-141b	2.98 at 1 ATM 4.0 at 1 ATM
Specific Gravity (H ₂ O = 1)	HCFC-22 MDI	1.17 at 86°F 1.2	HCFC-22 HCFC-141b Polyol Blend	1.17 at 86°F 1.25 at 50°F 1.1
Flash Point	HCFC-22 MDI	None > 400°F closed cup	HCFC-22 Polyol Blend	None NE*
Solubility in Water	Insoluble		Soluble	
Appearance and Odor	Dark brown color with earthy, musty odor		Clear, off yellow viscous liquid with slight odor	

*Not established

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Extinguishing Media

Z2 units in boxes: Water fog, foam, CO₂, or dry chemical

Cured foam: Water fog, foam, CO₂, or dry chemical

Fire Fighting Procedures

Z2 units in boxes: Keep containers cool. Wear self-contained breathing apparatus and turnout gear. Hazardous decomposition products include CO, CO₂, oxides of nitrogen, and traces of HCN, HF, HCl, Tin Oxide, Cl, PO & Silicon Dioxide.

Cured foam: Wear self-contained breathing apparatus. Hazardous decomposition products include CO, CO₂, oxides of nitrogen, and traces of HCN, HF, HCl, Tin Oxide, Cl, and PO.

Unusual Hazards

Units in boxes: High temperatures will increase the pressure in the tanks, which may lead to rupturing.

Cured foam: This product is combustible. Do not expose to high heat, sparks, or open flame.

SECTION V - REACTIVITY DATA

Stability

Z2 units in boxes are considered stable under normal storage and handling conditions. Do not store above 120°F. The mixing of the "A" Component and "B" Component during use produces heat and expansion. Cured foam will slowly deteriorate when exposed to UV light.

Incompatibility

A Component:	Water, alcohols, strong bases, finely powdered metal such as aluminum, Magnesium or zinc, and strong oxidizers.
B Component:	Strong alkali or alkaline earth metals, finely powdered metals such as Aluminum, magnesium, or zinc, strong oxidizers, and strong acids.

Conditions/Hazards to Avoid:

Avoid high heat; i.e., flames, extremely hot metal surfaces, heating elements, combustion engines, etc. Contaminated A component with water may form CO₂. Do not dispense only one tank at a time. Both A & B components must be used together.

SECTION VI – TOXICOLOGICAL INFORMATION

Concentration of ingredients (section II) must be considered to determine effects of the "A" component mixture and "B" component mixture. Although these mixtures have not been tested, it is assumed that the mixture presents the same health hazards as do the ingredients present at 1% or higher level. Proper personnel protection and adequate ventilation should be provided to avoid exceeding the exposure limits listed in section II.

Inhalation MDI vapors from A component or spray mist may cause irritation of the mucous membranes of the nose, throat or trachea, which may cause chest discomfort, coughing, and allergic asthma-like sensitivity. Air-borne overexposure well above the PEL may result additionally in eye irritation, headache, *chemical bronchitis, asthma-like findings or pulmonary edema.*

Inhaling concentrated fluorocarbons from A component and/or B component can cause unconsciousness, drowsiness, respiratory depression, rapid heartbeat and other symptoms. Persons with preexisting heart disease may be at increased risk from exposure.

Skin Contact: with both A component and B component may result in localized irritation, reddening or swelling. Prolonged or repeated exposure may lead to sensitization and/or dermatitis. Uncured foam forms a quick bond with skin and hard to remove after it is cured.

Eyes Contact: with MDI of A component may result in eye irritation and mild corneal opacity due to adhesive character. B component may have irritating effect to eyes.

Ingestion: A component may cause irritation of mucous membranes in the mouth and digestive tract. B component may have slight effect of such.

Emergency and First Aid Procedures

A component or B component material

Skin - If frostbitten, warm skin slowly with water; otherwise, wash affected areas with soap and water at least 15 minutes. Remove contaminated clothing and launder before reuse. Get immediate medical attention.

Eyes - Immediately flush with large quantities of water for a minimum of 15 minutes. Use fingers to assure that eyelids are separated and that eye is being irrigated. Get immediate medical attention.

Ingestion - If swallowed, dilute with water. DO NOT INDUCE VOMITING. Never give fluids or induce vomiting if the victim is unconscious or having convulsions. Get immediate medical attention.

Inhalation - Remove to fresh air. Get immediate medical attention.

Foam

Skin - Remove wet foam immediately from skin with soft cloth, then clean with acetone or nail polish remover. If irritation persists get medical attention. Dried foam is hard to remove from skin. If foam dries on skin, apply generous amounts of petroleum jelly or lanolin, leave on for one hour, wash thoroughly, and repeat process until foam is removed. Do not attempt to remove dried foam with solvents.

Eye - In case of eye contact, flush with water for 15 minutes. Get immediate medical attention.

Ingestion - In case of ingestion, get immediate medical attention.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

"A" Side

Spills/Leaks - Evacuate and ventilate spill area, dike spill to prevent entry into water system, wear full protective equipment including respiratory equipment during clean up.

If transportation spill involved, call CHEMTREC @ 1-800-424-9300. If temporary control of isocyanate vapor is required, a blanket of protein foam (available at most fire departments) may be placed over the spill. Transfer as much liquid as possible via pump or vacuum device into closed but not sealed containers for disposal. Absorb the isocyanate with saw dust or other absorbent and shovel into open top containers. Do not make pressure tight. Transport to a well-ventilated area (outside) and treat with neutralizing solution consisting of a mixture of 90% water, 3-8% ammonia and 2-7% detergent. Add about 10 parts of neutralizer per part of isocyanate with mixing. Allow to stand for 48 hours letting evolved carbon dioxide

escape. Decontaminate spill area using neutralizing solution and letting stand over affected areas for at least 10 minutes.

Waste Disposal - Dispose according to federal, state, and local regulations. - Do not discharge into waterways or sewer systems.

Container Disposal - Dispose according to federal, state, and local regulations.

"B" Side

Spills/Leaks - Evacuate and ventilate spill area, dike spill to prevent entry into water system, wear full protective equipment including respiratory equipment during clean up. If transportation spill involved, call CHEMTREC @ 1-800-424-9300. Transfer as much liquid as possible via pump or vacuum device into closed but not sealed containers for disposal. Absorb the material with saw dust or other absorbent and shovel into containers and transport to a well-ventilated area.

Waste Disposal - Do not discharge into waterways or sewer systems. Dispose according to federal, state, and local regulations.

Container Disposal - Dispose according to federal, state, and local regulations

Storage: Store in a cool, dry place. Ideal storage temperature is 60°F - 80°F. Storage above 90°F will shorten the shelf life. Since the containers are pressurized, do not store above 120°F (49°C) in order to avoid excessive pressure build up and possible container rupture. Protect containers from physical abuse.

SECTION VIII - PERSONAL PROTECTION

Respiratory Protection Use only in well-ventilated areas. Wear NIOSH / MSHA approved, positive pressure, supplied air respirator when vapor level is exceed the guideline listed in section II in this MSDS.

Clothing Wear rubber butyl or nitrile rubber gloves, coveralls, long sleeve shirts, and head covering to avoid skin contact. Contaminated equipment / clothing should be cleaned after each use or disposed.

Eye Protection Wear face shield and goggles, or safety glasses.

Ventilation If ventilation is not enough to maintain P.E.L. exhaust area.

SECTION IX - OTHER REGULATORY INFORMATION

SARA - This product contains a toxic chemical that may be subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (40CFR 372).

NAME	CAS NO.	AMOUNT
Diphenylmethane Diisocyanate	101-68-8	25-35% of "A" Side

DOT Proper Shipping Name

Z2-200 & Z2-600 Compressed gas, NOS (Chlorodifluoromethane, Nitrogen)

Diphenylmethane Diisocyanate (cas# 101-68-8) is cited on certain state lists as follow:

NJ2=New Jersey environmental hazardous substance (present at greater than or equal to 1.0%)

NJ3=New Jersey workplace hazardous substance (present at greater than or equal to 1.0%)

PA1=Pennsylvania hazardous substance (present at greater than or equal to 1.0%)

PA3=New Jersey environmental hazardous substance (present at greater than or equal to 1.0%)

The above information is accurate to the best of our knowledge. However, since safety standards, data, and government regulations are subject to change and the conditions of handling and use or misuse are beyond our control, Zerodraft makes no warranty, either express or implied, with respect to the completeness or continuing accuracy of the information contained herein and disclaims all liability for reliance thereon. User should satisfy himself that he has all current data relevant to his particular use.

Apollo™ LIGHT PIPE

by Orion Energy Systems, Inc.



Project Name: _____ Date: _____
Project Location: _____ Schedule Type: _____

Model No: Apollo-16 Light Pipe

Standard light pipe length is 16" below top of flashing unit.

Consult factory to specify other standard light pipe lengths if required based on roof section thickness and desired location of the lower diffuser.

SPECIFICATION DATA

1. Apollo™ Light Pipe units are shipped fully assembled, no field assembly required.
2. Dome material, finish, shape and size shall maximize light gathering and direction into light pipe in low light conditions.
3. Dome material specification Acrylite FF complies with (ANSI) Z97.1-1975, Safety Glazing for Buildings.
4. Colorless dome visible light transmission rating of no less than 92%.
5. Acrylite FF colorless acrylic is an optical grade material with crystal clear forming capabilities to maximize capture and transmission of visible light rays.
6. Dome shall be securely attached to flashing in a manner fully supporting dome with no stress concentrations in dome or fastening system.
7. Dome seal allows for breathing to the outside but remains water-resistant.
8. Seal gasket materials are polyester fiber ultrasonically welded to polypropylene backing with 3M VHB adhesive.
9. Seamless one piece .080 spun aluminum roof flashing allows for a waterproof installation to your roofing system of choice.
10. Light pipe seal keeps warm moist building air from entering into the tubular unit and condensing on the upper dome.
11. Light pipe reflector tube material must be Alanod Miro-Silver with total reflectivity of no less than 98% and mechanically fastened to form the cylindrical light pipe.
12. All aluminum commercial grade construction components standard. No galvanic corrosion from dissimilar metals, no rust streaks possible. Steel and plastic components are not allowed.
13. Lower light diffuser dome material 100% virgin acrylic, pattern-12 geometry inverted for maximum light delivery to the work area, minimizing wasted high angle light in upper portions of the space.
14. Light pipe internal diameter of 22.25" for maximized light delivery.

PRODUCT FEATURES

1. Apollo™ LIGHT PIPE was designed to maximize light output in low light conditions to provide all of the benefits of natural light and energy savings for as long as possible in a given day.
2. Historical problems with condensation, bug and dust collection in the light pipe are eliminated by the internally sealed, yet externally breathable unit design. In addition, heat transfer either (in or out) is also reduced in comparison with other units.
3. Unique design allows for roof side only installation dramatically reducing installation labor time and avoids interference with internal building operations in retrofit applications.
4. Light tube material features 98% total reflectivity delivers high efficiency with little transmission loss. It also stays completely white eliminating color shift even after multiple reflections so pure white light reaches your work environment.

PERFORMANCE

Heavy Commercial Rating

Product designation: SP-HC 40 Dia. 591 (23)

Meets or exceeds performance levels specified in AAMA/WDMA/CSA 101/I.S.2/A440-05 for:

Air Infiltration:	Actual <.01 cfm/ft2
Water Penetration:	None
Uniform Load Deflection:	@+40/psf, (.003 in.)
Structural Load:	@+80/psf, (.01 in.).
Forced Entry Grade 10:	Passed.

PRODUCT OPTIONS

1. Counter Flashing.
2. Anti-bird Measures.
3. Security fasteners for dome retention.
4. Daylight harvesting sensor integration into HIF lighting systems.

Consult factory for details

Orion Energy Systems, Inc. 1204 Pilgrim Road, Plymouth, WI 53703 1.800.660.9340

U.S. Patents in force and pending. Copyright 2007-2008, All rights reserved including product design modifications. Control Doc. Date: 021908

Announcing the modular green roof system from



2'x2'x4.4"

3/8" predrilled drainage holes

17-20 *lbs s.f.* saturated dead load

Recycled utility high molecular weight polyethylene



Designed to seamlessly integrate with
standard roof paver

Can be pre-planted or planted in place

Flexible maximum stormwater capacity
for your climate



Specifications

Model	SLCO-30	SLCO-32	SLCO-40
Gross Area (sq. ft.)	24.51	31.78	38.87
Net Aperture Area (sq. ft.)	23.46	30.53	37.44
Ratio Net/Gross Area	0.95	0.95	0.95
Length (in.)	74.4"	96.48"	117.96"
Width (in.)	47.4"	47.4"	47.4"
Thickness (in.)	3.96"	3.96"	3.96"
Weight (lbs.)	77.8	105.8	132.2
Fluid Capacity (gal.)	0.6	0.8	1.05
Recommended Flow Rate	0.7	0.7	0.7
Test Pressure (psi)	300	300	300
Operating Pressure (psi)	145	145	145

Efficiencies

Ratings	SLCO-30	SLCO-32	SLCO-40
Low Temp (95° F)	28,700	37,300	45,700
Intermediate Temp (122° F)	23,800	30,900	37,900
High Temp (212° F)	10,300	13,400	16,400
Btu per Square Foot	970	974	976
Efficiency Equation	78.2-81 (Ti-Ta)/I	78.5-81 (Ti-Ta)/I	78.7-81 (Ti-Ta)/I

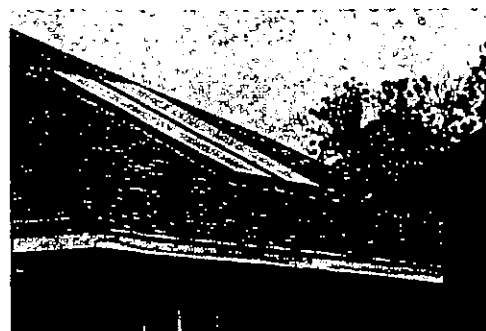
Ti = Water temperature (T out - T in)/2 F
 Ta = Ambient temperature F
 I = Solar radiation Btu/hr/ft²

Efficiency ratings as measured by the
 Florida Solar Energy Center (FSEC).



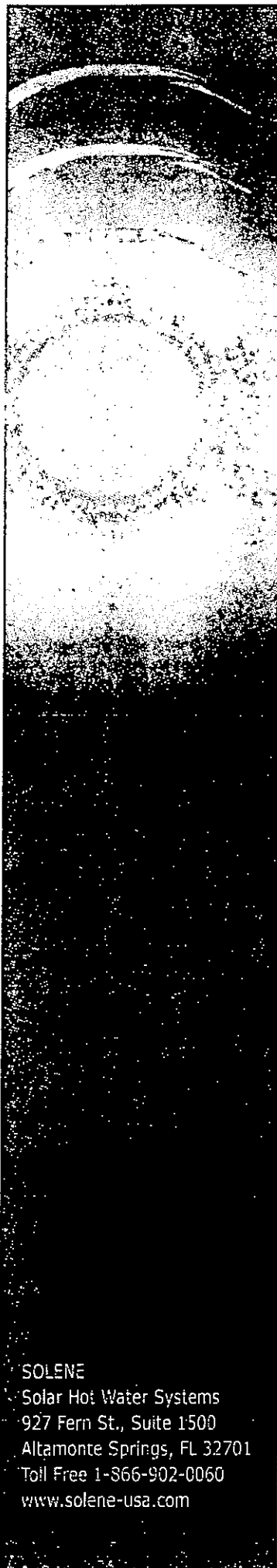
08-100 Collector Approved
 08-300 System Approved

Solene
 SOLAR HOT WATER SYSTEMS



Authorized Solene Dealer

SOLENE
 Solar Hot Water Systems
 Fern St., Suite 1500
 Altamonte Springs, FL 32701
 Toll Free 1-866-902-0060
 www.solene-usa.com

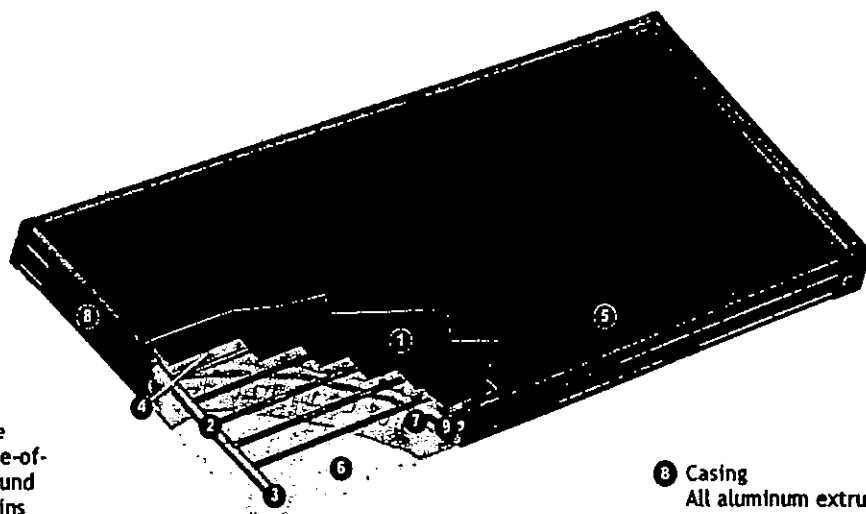


Corona™ Solar Collectors by Solene™

TECHNOLOGICALLY ADVANCED ENGINEERING FOR MAXIMUM PERFORMANCE

CORONA Solar Collectors are the most technologically advanced collectors on the market today. CORONA features the highest quality materials & state-of-the-art engineering to provide maximum efficiency & durability you can depend on for years to come.

CORONA collectors are environmentally responsible, non-polluting and reliable in any environment. CORONA panels are an important element of any hot water system, producing dependable results under any weather conditions.



- 1 Absorber Plate**
Utilizing a state-of-the-art ultrasound weld, copper fins and risers provide superior thermal connectivity between the fins and risers. Revolutionary coating is black chrome on nickel, producing a premium selective surface with maximum efficiency for solar energy use.
Absorbability = 0.95

- 2 Tubing Grid**
3/4" copper risers are brazed to 1" copper manifolds for optimal flow distribution.

- 3 Piping Connection**
Four 1" Type M copper tubes.

- 4 Aluminum Foil**
Attached to the insulation, acts as a barrier against out-gassing.

- 5 Solar Glass Glazing**
A single pane of 1/4" thick solar glass is patterned to reduce reflection and tempered to maximize strength and durability.
*Iron oxide content: 0.03%

- 6 Back Plate**
Made of fiberglass for maximum benefit

- 7 Insulation**
1-3/4" polyurethane foam cast under and around the side of the absorber plate, retains the heat of the water in the collector. DFC-free P.U. meets U.S. and European standards.

- 8 Casing**
All aluminum extrusion casings create a sleek framewall. Unique extruded profile allows easy anchoring to the roof (shingle, tile, tar) or collector stands.

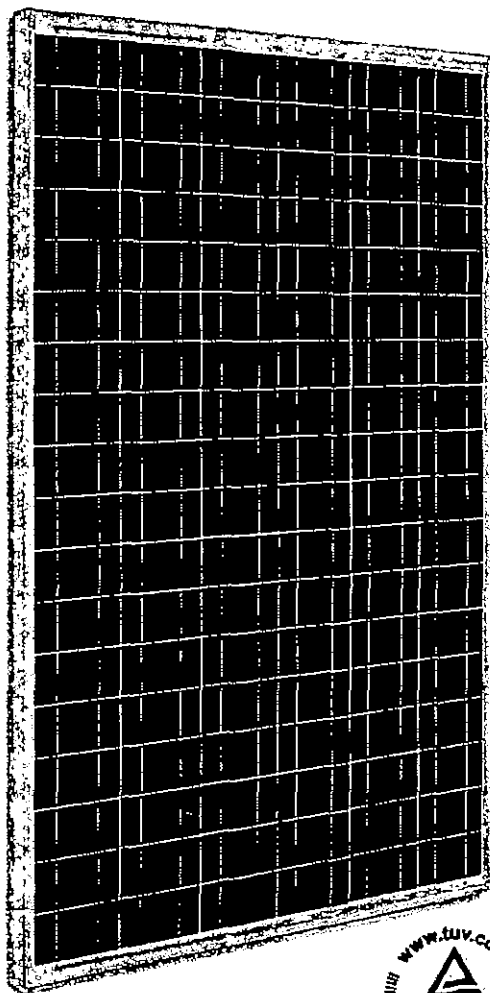
- 9 Gaskets**
All-around EPDM gasket. Highly resistant to temperature differences and UV radiation. Absorbs the differential expansion of frame and glazing.

SOLENE
Solar Hot Water Systems
927 Fern St., Suite 1500
Altamonte Springs, FL 32701
Toll Free 1-866-902-0060
www.solene-usa.com

Solene
SOLAR HOT WATER SYSTEMS

The best investment under the sun!

ES-SERIES photovoltaic modules



A range of high quality poly-crystalline solar panels for on-grid markets offering exceptional performance, extraordinary versatility and industry-leading environmental credentials based on our cutting-edge String Ribbon™ wafer technology.

- Best-in-class performance ratings proven by field installations
- 98% of rated power guaranteed for 180, 190W product; 100% guaranteed for 195W product
- 5 year workmanship and 25 year power warranty for ultimate peace of mind*
- More installation versatility with our extensive range of mounting options
- Higher strength with wind and snow loads guaranteed up to 80 lbs/ft²
- Tested to all major industry certifications and regulatory standards
- Smallest carbon foot-print leading the fight against global warming
- Quickest energy payback time for the maximum energy conservation
- Cardboard-free packaging for minimal on-site waste and disposal cost



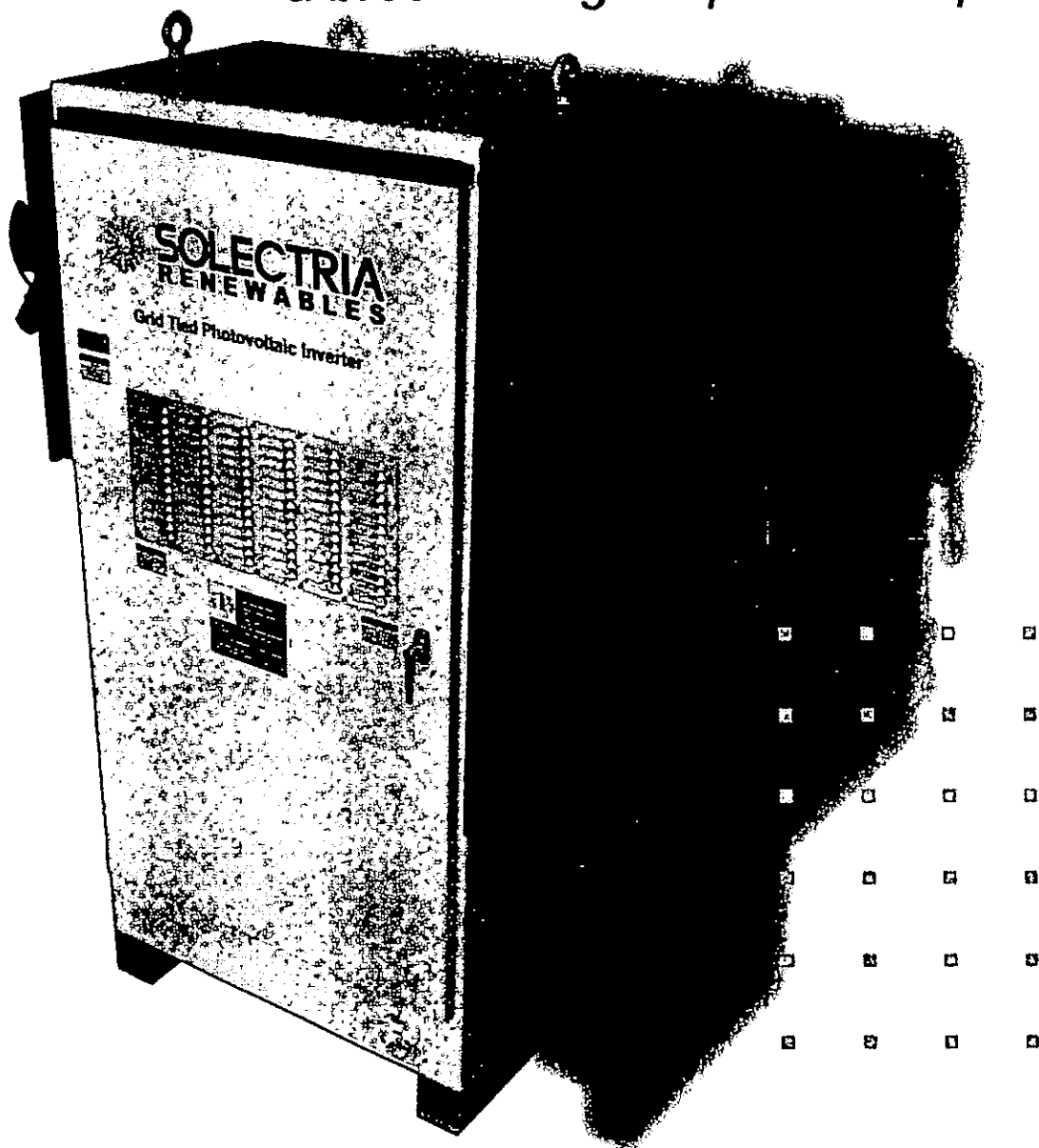


**SOLECTRIA
RENEWABLES**

Grid-Tied PV Inverters

PVI 60KW PVI 82KW PVI 95KW

a breakthrough in price and quality



Solectria introduces the PVI 60KW, PVI 82KW and PVI 95KW Inverter:
exceptional quality and efficiency at an extraordinary price.

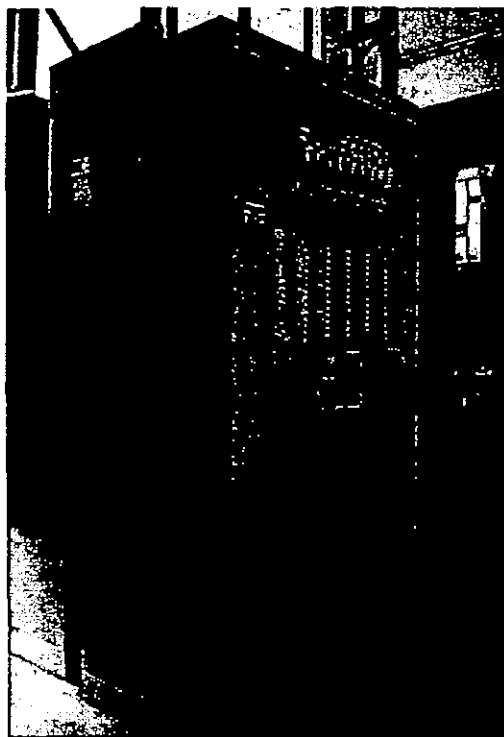


Product Information

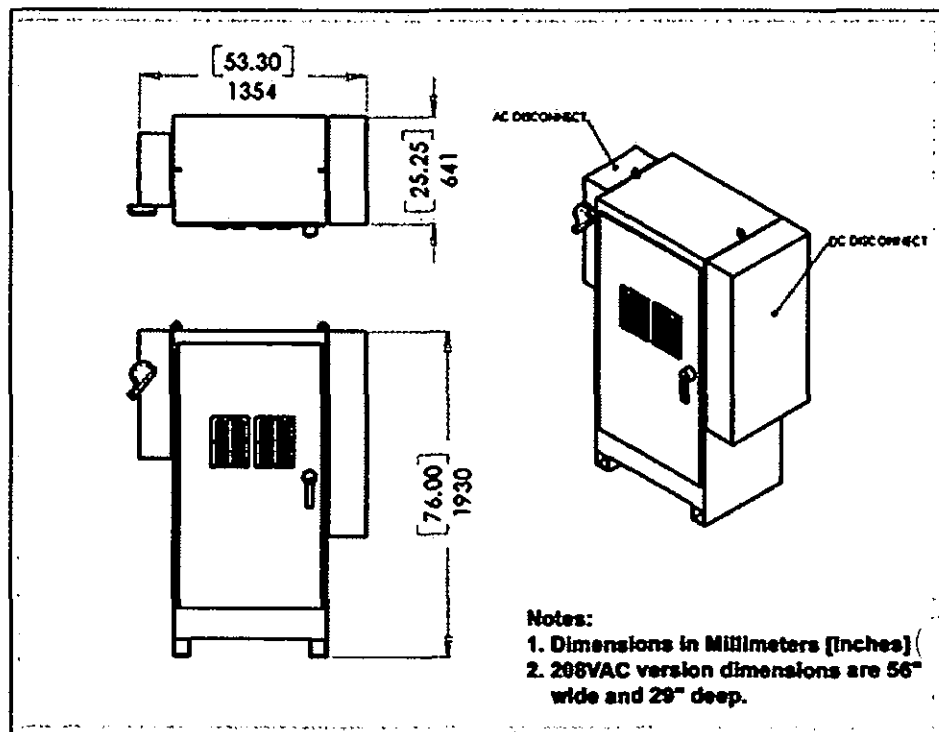
PVI 60KW PVI 82KW PVI 95KW

Grid-Tied PV Inverters

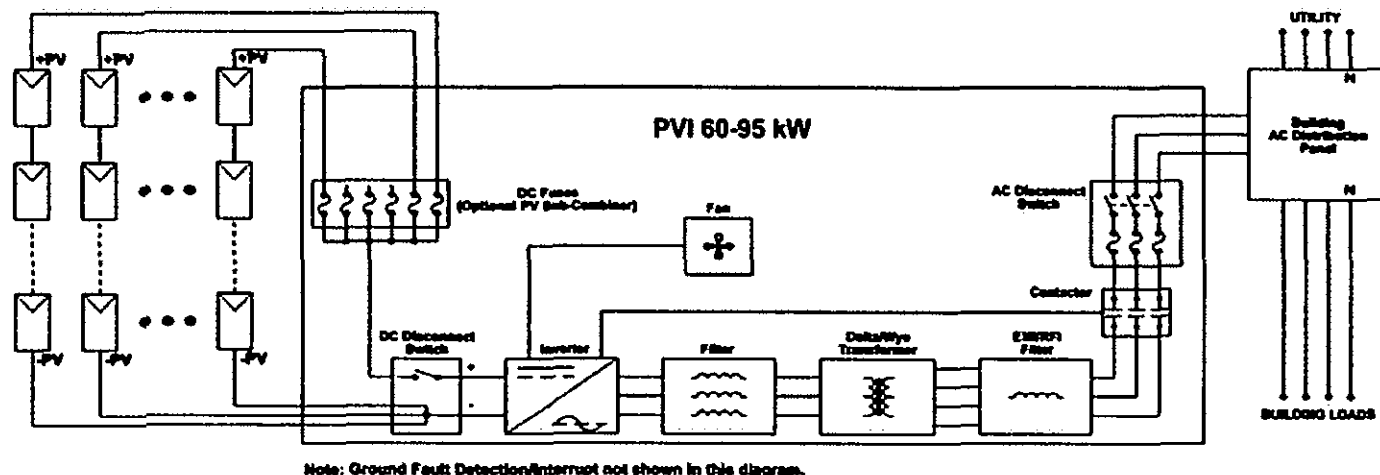
INTEGRATED INVERTER



DIMENSIONS



PVI 60-95KW 3-PHASE COMMERCIAL / INDUSTRIAL INVERTER BLOCK DIAGRAM



OVERVIEW: INTEGRATED PV INVERTER

The Solectria Renewables PVI 60KW, PVI 82KW and PVI 95KW are rugged, DSP-controlled, premium efficient PV inverters for grid-connected commercial, industrial and utility 3-phase PV systems. The core of the inverter, a 600VDC version of Solectria's proven DMGI 660 distributed generation inverter, uses state-of-the-art control techniques and devices including space vector PWM, a precision MPT algorithm, and low-loss IGBTs. With peak inverter power electronics efficiency over 98% (over 96% including the transformer and filters) and fully integrated packaging, these inverters set a new industry standard for efficiency, ease of installation and use, reliability and installed cost.

APPLICATIONS

- 40-95kWAC, 60Hz, 480VAC or 208VAC, 3-phase, grid-tied commercial PV systems (50-115kWDC STC array).
- Multiple inverters can be used together in any combination for 150, 200, 500kW or larger PV systems.
- Designed for mounting as desired, in full sun, driving rain and drifting snow: rooftop/ground or indoors.
- Can be used for other renewable and distributed generation applications such as wind power, hydro, geothermal and biomass.

FEATURES & OPTIONS

- Fully integrated design includes transformer, filters, and heavy duty, visible blade AC & DC disconnects (with optional DC sub-combiner fuses).
- No nighttime standby losses.
- Industry-leading overall efficiency.
- Simple set-up and connections (connect DC from PV combiners and 3-phase AC connections).
- Precision DSP-controlled Maximum Power Tracking Algorithm.
- High-reliability design, based on 17 years of power electronics development, includes sealed power and signal electronics unit and high-efficiency magnetics.
- Optional fused DC sub-combiner (4-8 fuses, 40-100A).
- Optional positive grounded version.

CONNECTIVITY

- RS232 and PC software for diagnostics and data capture.
- RS485 option for communication with multiple inverters in larger systems, or with long communication lines.
- Fat Spaniel Inverter-Direct Internet or cellular data monitoring option

SAFETY FEATURES

- Electronic temperature protection.
- DC Ground-fault detection and interrupt.
- Current limit protections.
- Standards-compliance: All inverters Listed to UL 1741 and IEEE Std 1547 and certified to IEEE 62.41 (NY SIR Surge Test Requirements). Units are also listed on CEC's eligible equipment list.



SPECIFICATIONS

PVI 60KW				PVI 82KW		PVI 95KW					
Output											
Continuous AC Power (CEC)				60 kW		83 kW		95 kW			
Power Factor				> 0.98							
Voltage (L-L), ±10%								208 / 480 VAC, 3-Ph			
Rated Current				208VAC		166A		229A		281A	
(&CEC rated current)				480VAC		73A		100A		115A	
Current Distortion				< 5% THD, Nom Power							
Frequency, ±1 %								60 Hz			
Inverter Electronics Peak Efficiency				> 98% (50%-100% load)							
Overall Peak Efficiency ¹								> 96% (50%-100% load)			
Input											
Array Configuration:				Monopole, negative grounded (Positive ground option)							
Max V _{oc} ²								600 VDC			
Maximum DC Current				180A		248A		287A			
CEC Eligible DC Current				177A		241A		279A			
MPT Voltage Range				330-600 VDC							
CEC Full Power Voltage Range								346-480 VDC			
Protection³											
AC Grid-connection (Standards Compliance: See "Safety Features")				Over/Under Voltage, Over Current Over/Under Freq., DC Ground Fault (GFDI)							
AC Disconnect (Integral)								NEMA 3R, Integral			
DC Sub-Combiner w/Fuses (Optional ⁴)				40A-100A fuses available, 3-8 pots, NEMA 3R, TVSS							
DC Disconnect (Integral)								Break load rated, NEMA 3R			
Environmental											
Ambient Temperature				-25 to 50 deg C (full power)							
Cooling								Automatic Forced Convection			
Enclosure				Rain Proof (UL 1741)							
Electronics Enclosure								Sealed (IP62)			
General											
Weight lb (kg)				1526 (694)		1591 (713)		1610 (732)			
Dimensions: Inch (mm)				208VAC		76(1930) H x 56(1422) W x 29.3(744) D		78(1930) H x 54(1372) W x 25.3(643) D			
(Height w/o lifting eyes)				480VAC							
Communications, Optional Data Acquisition				RS232, RS485, PVIDAQ PC software, Fat Spaniel Inverter-Direct Option							
Warranty								5 years standard (optional 10 & 15 year warranties)			

¹ Fully Integrated Package: Includes premium efficient transformer, filters, brushless blower, AC & DC disconnects. (>95.5% peak efficiency for 208VAC versions)

² Max Open circuit voltage (V_{oc}) of PV array = 1.25 x V_m rated (per NEC 690-7).

³ Complies with grid connection and safety standards ("Safety Features")

⁴ Incorporated into inverter package if selected.

¹ Fully Integrated Package: Includes premium efficient transformer, filters, brushless blower, AC & DC disconnects. (>95.5% peak efficiency for 208VAC versions)

² Max Open circuit voltage (V_{oc}) of PV array = $1.25 \times V_{oc}$ rated (per NEC 690-7).

³ Complies with grid connection and safety standards ("Safety Features")

⁴ Integrated into inverter package if selected.

proven history, sustainable future

Solectria Renewables designs and manufactures power electronics for renewable power generation systems. Feature-packed and highly integrated, the products lead the industry in installation ease and total value. At the heart of Solectria's products are its reliable and efficient core inverters, which have been proven over the past 17 years in the extremely harsh environment of truck, bus and military transportation applications. Solectria Renewables is run by the renowned MIT engineers who founded the Solectria brand in 1989. With a customer-focused team, high quality suppliers and a best practices manufacturing process, Solectria is committed to your success.



SOLECTRIA
RENEWABLES

Lawrence, Massachusetts
USA

Tel: 978.683.9700

Fax: 978.683.9702

E-mail: inverters@solren.com

www.solren.com

Background and right: 118kW Spire Corporation installation at North Coast Seafoods includes a PVI 95KW inverter.
Left: Dual inverters for 140-230 kW DC systems. Center: WorldWater and Power installation at a California carwash.

PERFORMANCE DATA

SOLAR TRANSMITTANCE	14%
SOLAR REFLECTANCE	54%
SOLAR ABSORPTANCE	32%
VISIBLE LIGHT TRANSMITTANCE	18%
VISIBLE LIGHT REFLECTANCE	62%
GLARE REDUCTION	80%
EMISSION	.71
WINTER MEDIAN U VALUE	.94
LUMINOUS EFFICACY	.75
ULTRAVIOLET REJECTED	99%
SOLAR ENERGY REJECTED	79%
SHADING COEFFICIENT	.24

BENEFITS

- Substantially reduces excessive heat gain for improved comfort
- Cuts glare to reduce eyestrain
- Rejects 99% of Ultraviolet radiation reducing fading of valuables, fabrics and furnishings
- Durable scratch-resistant coating for easy cleaning
- Reduction of hot spots increases HVAC efficiency and lowers energy costs



EXTERIOR



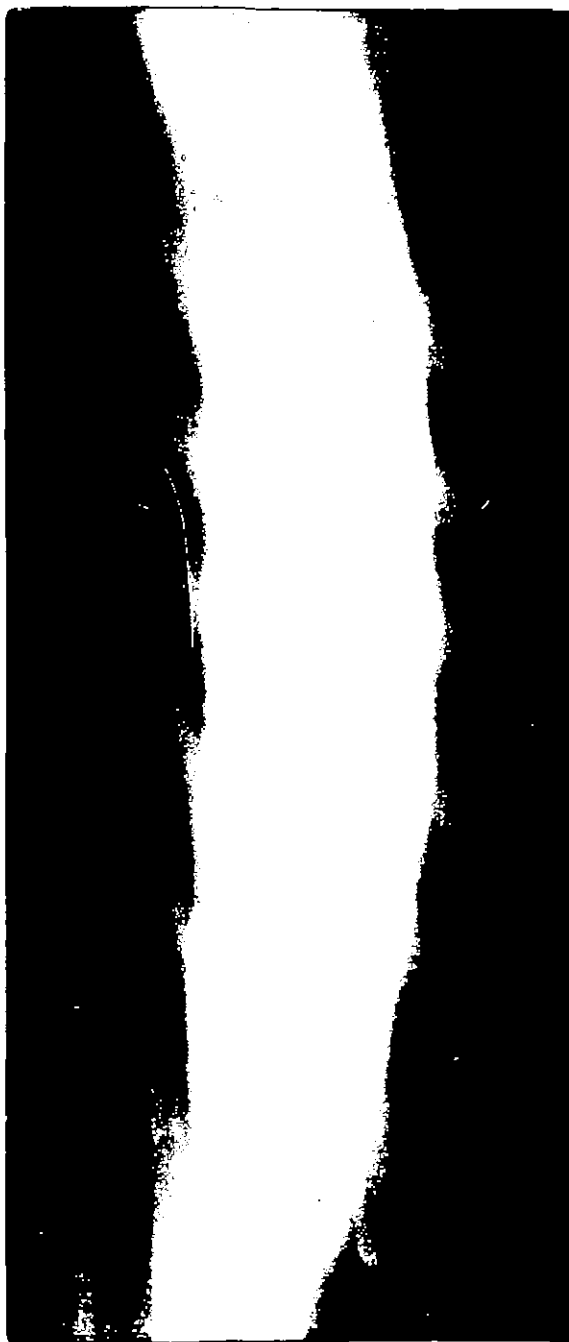
INDUSTRY
PARTNER

PERFORMANCE DATA

SOLAR TRANSMITTANCE	13%
SOLAR REFLECTANCE	65%
SOLAR ABSORPTANCE	22%
VISIBLE LIGHT TRANSMITTANCE	18%
VISIBLE LIGHT REFLECTANCE	63%
GLARE REDUCTION	80%
EMISSIVITY	.71
WINTER MEDIAN U VALUE	.99
LUMINOUS EFFICACY	.82
ULTRAVIOLET REJECTED	99%
SOLAR ENERGY REJECTED	81%
SHADING COEFFICIENT	.22

BENEFITS

- Reduces excessive heat gain for improved comfort
- Cuts glare to reduce eyestrain
- Rejects 99% of Ultraviolet radiation reducing fading of valuables, fabrics and furnishings
- Reduction of hot spots increases HVAC efficiency and lowers energy costs
- Exterior installation provides protection for hard to reach locations



Ambiance

Description:

A low emissivity (Low E) film with excellent heat rejection.

Suggested Applications:

For residential and commercial applications where energy conservation is important.

Special Features:

- Retains interior heat in cooler months making your home more comfortable.
- Insulates your windows.
- Rejects 69% of total solar energy, reducing heat build-up and energy costs.
- Scratch-resistant coating insures long lasting beauty and years of easy maintenance.
- Professionally installed, VISTA® utilizes an exclusive adhesive system that will not lose effectiveness or loosen over time.
- Carries manufacturer's warranty for labor and materials.

Clear
Quality &
Protection



Exterior

CPFilms Inc.
P.O. Box 5063
Martinsville, Virginia 24115
1-800-345-6088
www.vista-films.com

VISTA
WINDOW FILM

Ambiance (VE-35 SR CDF)

Bring Beauty and Protection to Light

Total Solar Transmittance: The ratio of the amount of total solar energy in the full solar wavelength range (300-2,100 nanometers) that is allowed to pass through a glazing system to the amount total solar energy falling on that glazing system. Value is expressed as a percentage.

Total Solar Reflectance: The ratio of the amount of total solar energy which is reflected outward by a glazing system to the amount of total solar energy falling on the glazing system. On filmed windows, this reflectance is a function of the side of film facing the window surface. Value is expressed as a percentage.

Total Solar Absorptance: The ratio of the amount of total solar energy absorbed by a glazing system to the amount of total solar energy falling on the glazing system. Solar absorptance is that portion of total solar energy that is neither transmitted nor reflected.

Visible Light Transmittance: The ratio of the amount of total visible solar energy (380-780 nanometers) that is allowed to pass through a glazing system to the amount of total visible energy falling on the glazing system. Value is expressed as a percentage. Glare is influenced by visible light transmittance through a glazing system.

Visible Light Reflectance: The ratio of the amount of total visible solar energy (380-780 nanometers) that is reflected by a glazing system. Value is expressed as a percentage. Glare is influenced by visible light transmittance through a glazing system.

Winter Median U-Value: The overall heat transfer coefficient of the glazing system, U-Value is a measure of the heat transfer that occurs through the glazing system and its outer and inner surfaces. This value is a function of temperature and is expressed in BTU's per square

foot per hour per degree Fahrenheit (BTU/sq.ft./hr./°F). The lower the U-Value, the better the insulation qualities of the glazing system. The value is measured at 45°F outdoors, 68°F indoors, at 15 mph winds.

Ultraviolet Rejection: The ratio of the amount of total ultraviolet solar energy (300-380 nanometers) that is not allowed to pass through a glazing system to the amount of total ultraviolet solar energy falling on the glazing system. Ultraviolet is one portion of the total energy spectrum which greatly contributes to fading and deterioration of fabric and furnishings.

Shading Coefficient: The ratio of the amount of the total solar heat gain through a given glazing system to the solar heat gain under the same conditions for clear, unshaded, double-strength window glass (DSA). Shading coefficient defines the sun control capability of the glazing system.

Solar Heat Rejection: The percentage by which incoming solar heat energy is reduced by the addition of a filtering material.

Glare Reduction: The percentage by which visible light is reduced by the addition of a filtering material.

Luminous Efficacy: The visible light transmission (in decimal form) divided by the shading coefficient. This indicates how effective a glazing product is at reducing unwanted solar heat gain without significantly altering visible light transmission.

Total Solar Energy Rejected: The percentage of incidental solar energy rejected by a glazing system. The higher this value, the less solar heat energy is transmitted by the glazing system.

Performance Data

% Total Solar Transmittance	% Total Solar Reflectance	% Total Solar Absorptance	% Visible Light Transmittance	% Visible Light Reflectance: Exterior	% Visible Light Reflectance: Interior	Winter Median U-Value	% Ultraviolet Rejection	Shading Coefficient	Energy	% Solar Heat Reduction	% Glare Reduction	Luminous Efficacy	% Total Solar Energy Rejected
92.0	36.0	42.0	39.0	35.0	35.0	0.68	99.9	0.35	0.33	65.0	64.0	0.91	69.0

Interior

The nature of certain delicate fabrics and dyes will require premium shading regardless of the application of any window film.

VISTA® is a registered trademark of 3M Co. Inc.
Product in USA © 1975 3M Co.

Options include VTC (see page 14) and VTC-2 (see page 15).

*Some windows may require additional treatment for optimal performance with this film product.

VISTA®
WINDOW FILM

BOILER REPLACEMENT PROJECT

HOWARD COUNTY DETENTION CENTER
JESSUP, MARYLAND

DRAWING INDEX

CS-B COVER SHEET
M-B1 BOILER REPLACEMENT DEMOLITION
M-B2 BOILER REPLACEMENT NEW WORK
M-B3 BOILER REPLACEMENT SCHEDULE

PREPARED FOR ESG BY:

GLOBAL FACILITY SOLUTIONS, LLC
(410) 259-3679
FAX (410) 635-6165

SYMBOLS & ABBREVIATIONS

AMP	AMPERE
CH-x	CHILLER
CT-x	COOLING TOWER
CHS	CHILLED WATER SUPPLY
CHR	CHILLED WATER RETURN
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
EWI	ENTERING WATER TEMPERATURE
EX.	EXISTING
°F	DEGREES FAHRENHEIT
GPM	GALLONS PER MINUTE
HZ	HERTZ
LWT	LEAVING WATER TEMPERATURE
MCA	MINIMUM CIRCUIT AMPS
N.C.	NORMALLY CLOSED
P-x	PUMP
PD	PRESSURE DROP
PH	PHASE
PSI	POUNDS PER SQUARE INCH
V	VOLTAGE
—	NEW WORK

—	EXISTING WORK
—	DEMOLITION WORK
—	BUTTERFLY VALVE
—	MOTOR OPERATED VALVE
—	BALANCING VALVE
—	CONNECT TO EXISTING
—	REMOVE TO EXTENT
—	RISE
—	DROP
—	FLOW DIRECTION
—	REDUCER
—	CHECK VALVE
—	STRAINER

GLOBAL FACILITY SOLUTIONS, LLC
Energy & Engineering Services

(410) 259-3679
Fax (410) 635-6165

REVISION

DATE

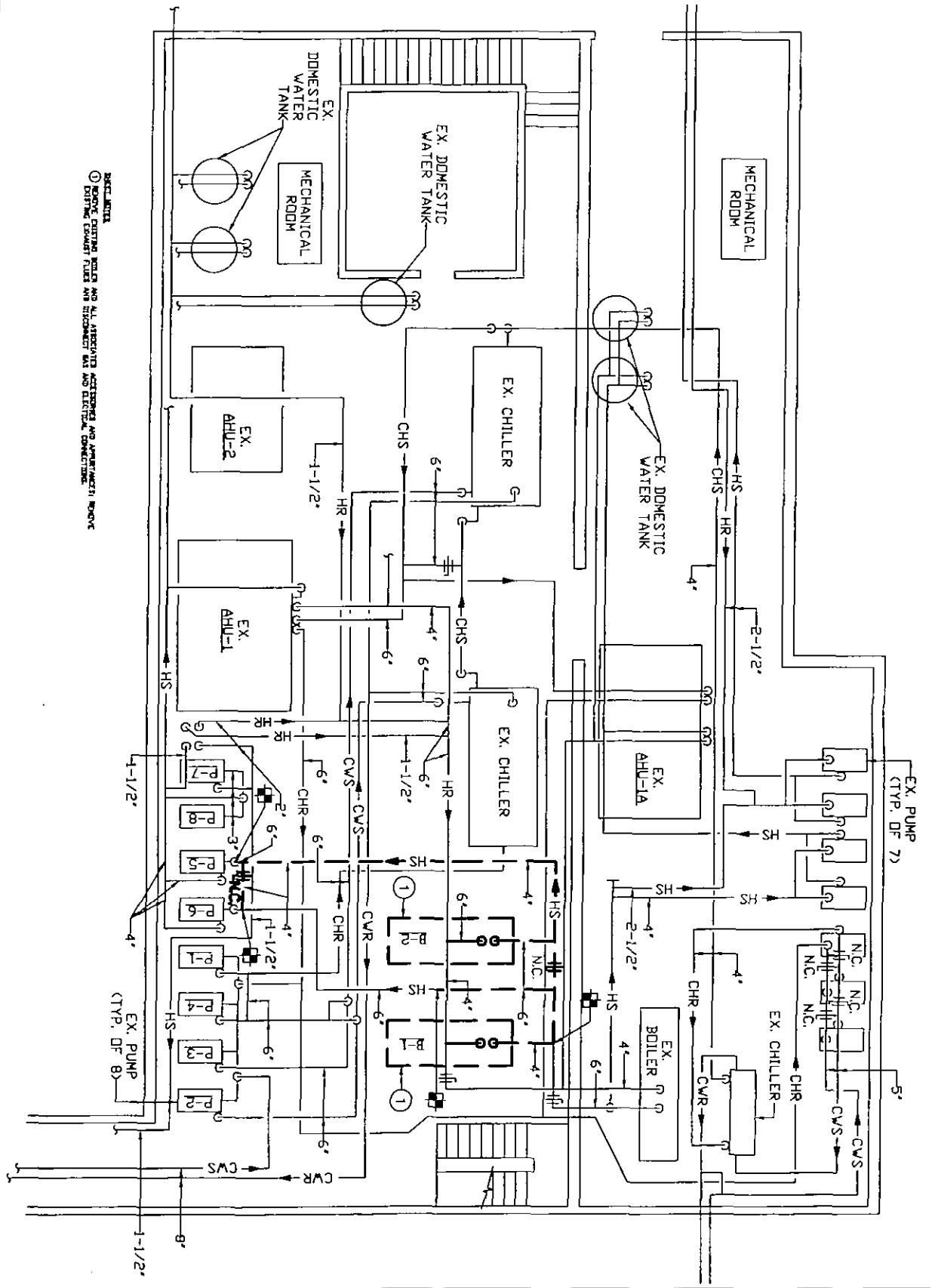
TITLE:
COVER SHEET

PROJ #:
DATE: 8/5/08
SCALE: NO SCALE

ENERGY SYSTEMS
GROUP
HOWARD COUNTY
DETENTION CENTER
PROJECT
Jessup, Maryland

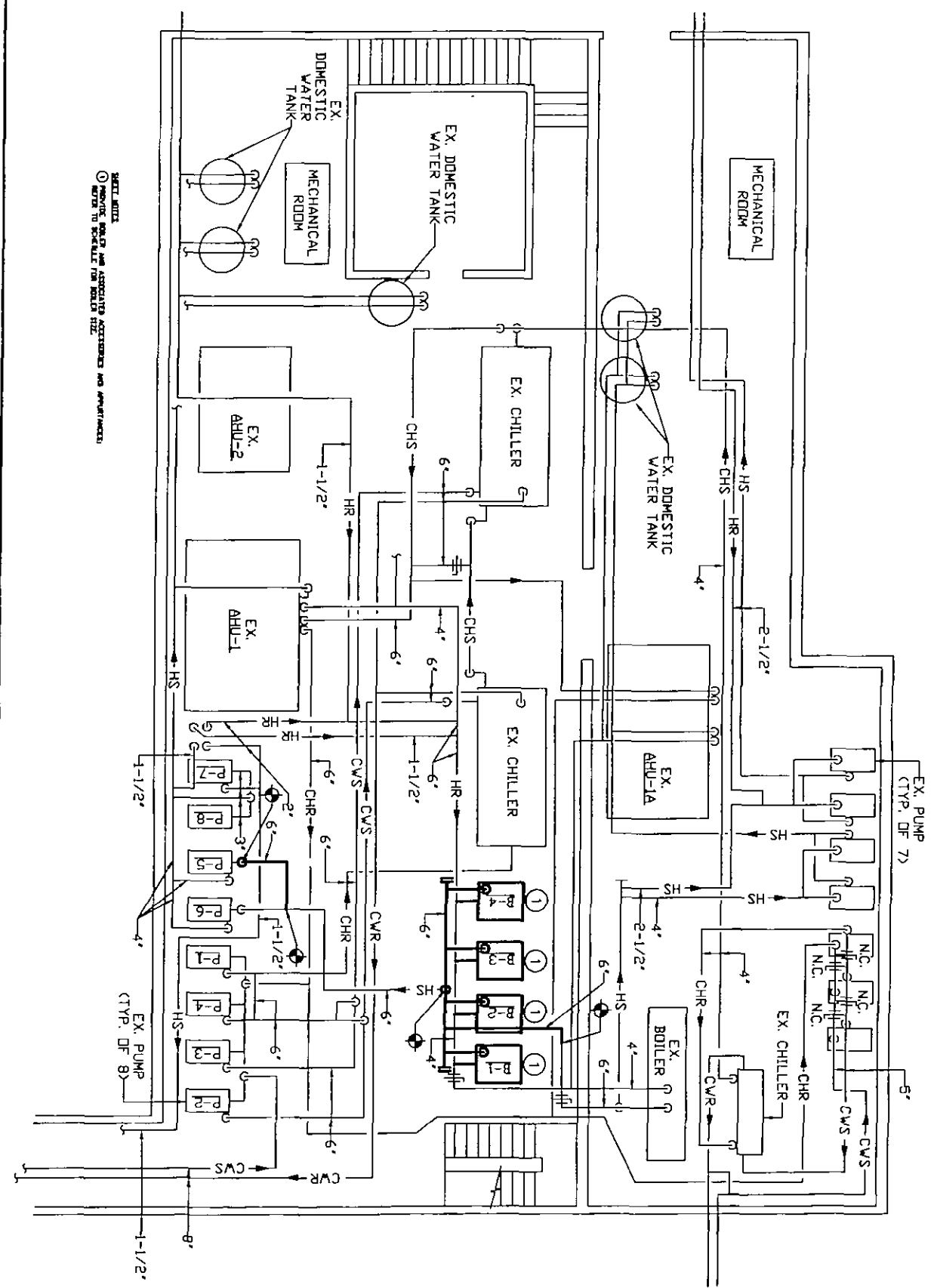
SHEET:

CS-B



REMARKS:
 ① REMOVE ALL EXISTING MECHANICAL ROOMS AND ALL ASSOCIATED SYSTEMS AND APPURTENANCES REMOVE EXISTING EXHAUST FUELS AND DISCONNECT GAS AND ELECTRICAL CONNECTIONS.

SHEET: <div style="font-size: 2em; font-weight: bold;">M-B1</div>	ENERGY SYSTEMS GROUP HOWARD COUNTY DETENTION CENTER PROJECT Jessup, Maryland	PROJ #: 8/5/08 DATE: 1/8-1-08 SCALE: 1/8"=1'-0"	TITLE:	DATE	REVISION	<div style="font-weight: bold; font-size: 1.2em;">GLOBAL FACILITY SOLUTIONS, LLC</div> <div style="font-size: 0.8em;">Energy and Engineering Services</div> Energy & Engineering Services (410) 259-3879 Fax (410) 635-6165
			BOILER REPLACEMENT MECH RM FLOOR PLAN DEMOLITION			



SEE ELEVATIONS
 1. MECHANICAL ROOM AND ASSOCIATED ACCESSORIES AND APPOINTMENTS
 2. REFER TO SPECIFICATIONS FOR MECHANICAL ROOM

SHEET: M-B2	ENERGY SYSTEMS GROUP HOWARD COUNTY DETENTION CENTER PROJECT Jessup, Maryland	PROJ #: 8/5/08 DATE: 1/8"-1'-0" SCALE:	TITLE: BOILER REPLACEMENT MECH RM FLOOR PLAN NEW WORK	DATE	REVISION	GLOBAL FACILITY SOLUTIONS, LLC <small>Energy & Engineering Services</small> Energy & Engineering Services (410) 259-3679 Fax (410) 635-6165

BOILER SCHEDULE

ID NO.	LOCATION	TYPE	BOILER HP	1-B-B-R GROSS OUTPUT RATING (MBH)	FIRING RATE (MBH)	FUEL	BURNER HP	INDUCED FAN HP	GAS PRESS. (PSIG)	BASES OF DESIGN
B-1	MECHANICAL ROOM	NON-CONDENSING; MODULATION	50	1,523	1,750	NAT. GAS	50	-	2	RBI MODEL MB 1750
B-2	MECHANICAL ROOM	NON-CONDENSING; MODULATION	50	1,523	1,750	NAT. GAS	50	-	2	RBI MODEL MB 1750
B-3	MECHANICAL ROOM	NON-CONDENSING; MODULATION	50	1,523	1,750	NAT. GAS	50	-	2	RBI MODEL MB 1750
B-4	MECHANICAL ROOM	NON-CONDENSING; MODULATION	50	1,523	1,750	NAT. GAS	50	-	2	RBI MODEL MB 1750



Energy & Engineering Services
 (410) 259-3679
 Fax (410) 635-6165

TITLE: BOILER REPLACEMENT SCHEDULES
 DATE: 8/5/08
 SCALE: NO SCALE

REVISION	DATE

ENERGY SYSTEMS GROUP
 HOWARD COUNTY
 DETENTION CENTER
 PROJECT
 Jessup, Maryland

SHEET:

M-B3

CHILLER REPLACEMENT PROJECT

HOWARD COUNTY DETENTION CENTER
JESSUP, MARYLAND

DRAWING INDEX

CS-C COVER SHEET
M-C1 CHILLER REPLACEMENT DEMOLITION
M-C2 CHILLER REPLACEMENT NEW WORK
M-C3 CHILLER REPLACEMENT SCHEDULE

PREPARED FOR ESG BY:

GLOBAL FACILITY SOLUTIONS, LLC
(410) 259-3679
FAX (410) 635-6165

SYMBOLS & ABBREVIATIONS

AMP AMPERE
CH-x CHILLER
CT-x COOLING TOWER
CHS CHILLED WATER SUPPLY
CHR CHILLED WATER RETURN
CWR CONDENSER WATER RETURN
CWS CONDENSER WATER SUPPLY
EWT ENTERING WATER TEMPERATURE
EX. EXISTING
°F DEGREES FAHRENHEIT
GPM GALLONS PER MINUTE
HZ HERTZ
LWT LEAVING WATER TEMPERATURE
MCA MINIMUM CIRCUIT AMPS
N.C. NORMALLY CLOSED
P-x PUMP
PD PRESSURE DROP
PH PHASE
PSI POUNDS PER SQUARE INCH
V VOLTAGE
— NEW WORK

— EXISTING WORK
— DEMOLITION WORK
— BUTTERFLY VALVE
— MOTOR OPERATED VALVE
— BALANCING VALVE
— CONNECT TO EXISTING
— REMOVE TO EXTENT
— RISE
— DROP
— FLOW DIRECTION
— REDUCER
— CHECK VALVE
— STRAINER

GLOBAL FACILITY SOLUTIONS, LLC
Energy & Engineering Services

(410) 259-3679
Fax (410) 635-6165

REVISION
DATE

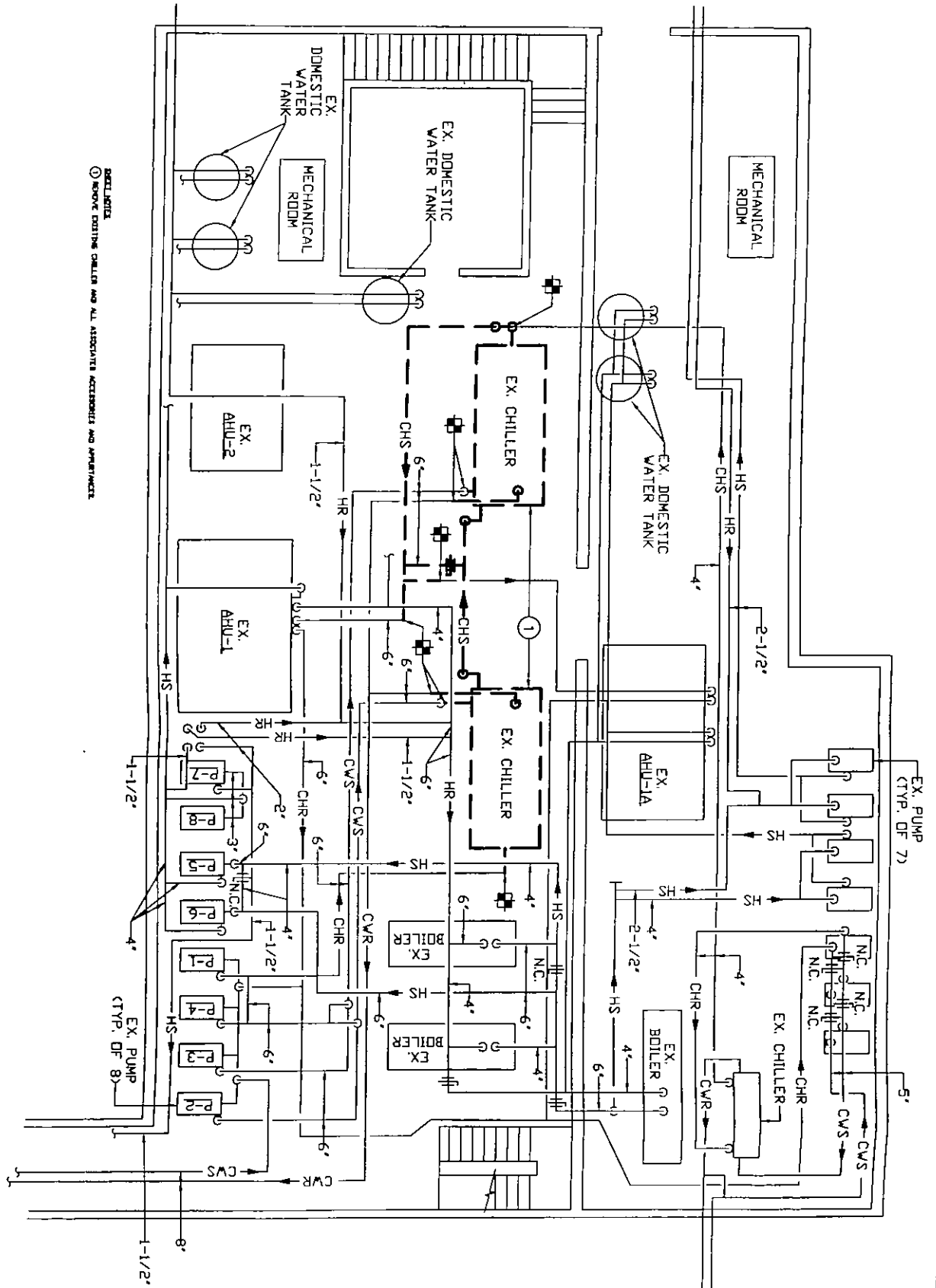
TITLE:
COVER SHEET

PROJ #:
DATE: 8/5/08
SCALE: NO SCALE

ENERGY SYSTEMS
GROUP
HOWARD COUNTY
DETENTION CENTER
PROJECT
Jessup, Maryland

SHEET:

CS-C



EX. MECHANICAL ROOM
EX. DOMESTIC WATER TANK

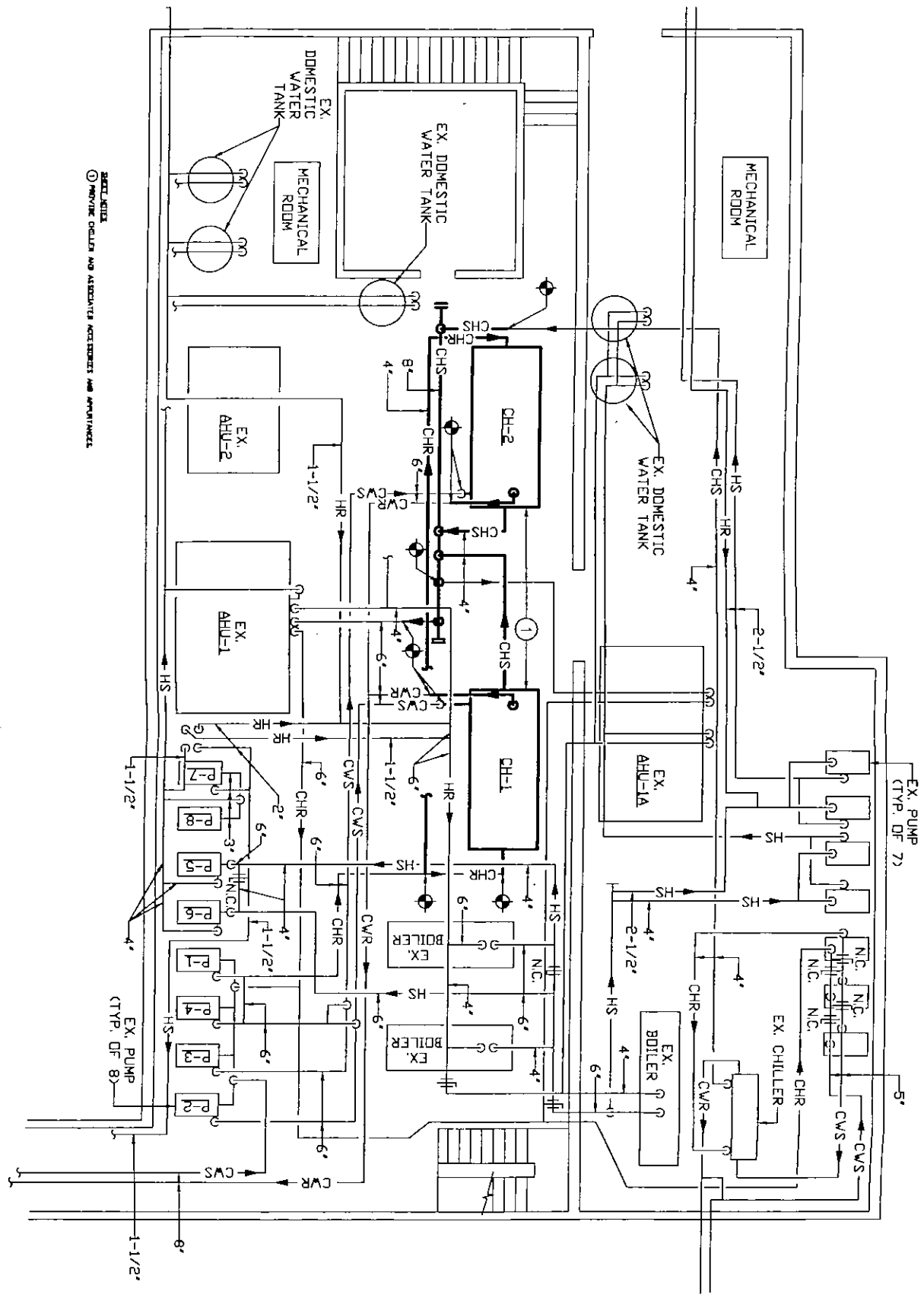
SHEET:
M-C1

ENERGY SYSTEMS GROUP
HOWARD COUNTY DETENTION CENTER PROJECT
Jessup, Maryland

TITLE:
CHILLER REPLACEMENT
MECH RM FLOOR PLAN
DEMOLITION
PROJ #:
DATE: 8/5/08
SCALE: 1/8"=1'-0"


DATE	REVISION

GLOBAL FACILITY SOLUTIONS, LLC
Energy & Engineering Services
(410) 259-3679
Fax (410) 635-6165



REVISIONS
 ① REPAIR PIPING AND ASSOCIATED ACCESSORIES AND APPURTENANCES

SHEET: M-C2	ENERGY SYSTEMS GROUP HOWARD COUNTY DETENTION CENTER PROJECT Jessup, Maryland	PROJ #: _____ DATE: 8/5/08 SCALE: 1/8"=1'-0"	TITLE: CHILLER REPLACEMENT MECH RM FLOOR PLAN NEW WORK		DATE	REVISION


GLOBAL FACILITY SOLUTIONS, LLC
Design and Engineering Services
Energy & Engineering Services
 (410) 259-3679
 Fax (410) 635-6165

CHILLER SCHEDULE															
DESIGNATION NUMBER	MANUFACTURER	MODEL NUMBER	CAPACITY (TONS)	WATER								ELECTRICAL			
				HOT SIDE				COLD SIDE							
				FLOW RATE (GPM)	EWT (°F)	LWT (°F)	PD (FT.)	FLOW RATE (GPM)	EWT (°F)	LWT (°F)	PD (FT.)	V	PH	HZ	MCA
CH-1	TRANE	RTHD	150	300	56	44	11.1	450	85	95	19.0	280	3	60	408
CH-2	TRANE	RTHD	150	300	56	44	11.1	450	85	95	19.0	280	3	60	480

GLOBAL FACILITY SOLUTIONS, LLC
Energy and Engineering Services

Energy & Engineering Services
(410) 259-3679
Fax (410) 636-6165

REVISION	
DATE	

TITLE:
CHILLER REPLACEMENT
SCHEDULES

PROJ #:
DATE: 8/5/08
SCALE: NO SCALE

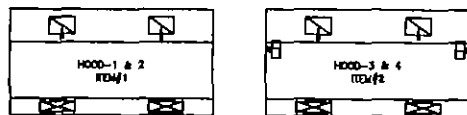
ENERGY SYSTEMS
GROUP
HOWARD COUNTY
DETENTION CENTER
PROJECT
Jessup, Maryland

SHEET:
M-C3

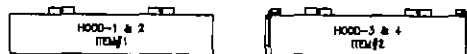
Mechanical Scope of Work

OVERVIEW OF HOOD LAYOUT AND SENSOR LOCATIONS

TOP VIEW (HOOD-1, 2, 3 & 4)



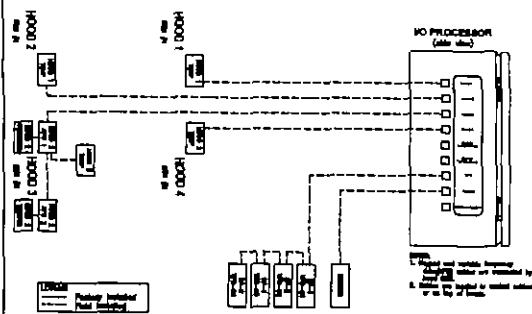
FRONT SECTION VIEW (HOOD-1, 2, 3 & 4)



SIDE SECTION VIEW (HOOD-1, 2, 3 & 4)



DETAIL 2: INSTALL HOOD SENSOR CABLES



MECHANICAL SCOPE OF WORK

1. MELINK SHALL INSTALL INTELLI-HOOD SENSORS ON EACH HOOD. SENSORS TO BE INSTALLED ACCORDING TO THE MELINK INTELLI-HOOD CONTROLS INSTALLATION MANUAL. SEE OVERVIEW OF HOOD LAYOUT AND SENSOR LOCATIONS.
2. MELINK SHALL INSTALL PLUG-IN-PLAY HOOD SENSOR CABLES FROM MELINK V/O PROCESSOR TO EACH HOOD AND FROM SENSOR TO SENSOR ON TOP OF EACH HOOD. SEE DETAIL 2.
3. MELINK SHALL INSTALL PLUG-IN-PLAY CABLE FROM MELINK V/O PROCESSOR TO KERNAL. SEE DETAIL 2.
5. MELINK SHALL START-UP THE SYSTEM BY PRESSING THE LIGHT AND FAN SWITCH ON KEYPAD TO VERIFY THE HOOD LIGHTS TURN ON AND THE FANS GO TO MINIMUM SPEED. CORRECT FAN ROTATION IF NECESSARY. SEE SEQUENCE OF OPERATION.
6. MELINK SHALL PRESS THE 100% RESET SWITCH TO RUN THE DRIVES AT FULL SPEED FOR 10 MINUTES. VERIFY THAT THE DRIVES DO NOT TRIP OUT ON OVER CURRENT. CORRECT DRIVE FULL LOAD AMPS IF NECESSARY. SEE DRIVE USER MANUAL.

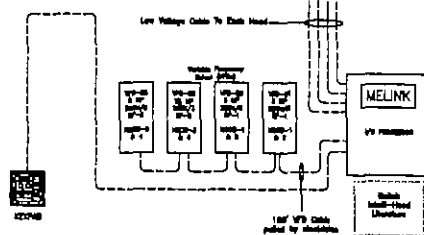
NOTES:

1. REFER TO INTELLI-HOOD CONTROLS E-SHEET FOR ELECTRICAL SCOPE OF WORK.
2. THE RUNNING OF ANY WIRE, CABLE, OR CONDUIT DOES NOT FALL WITHIN MELINK SCOPE OF WORK.

APPROVALS:

THE MELINK INTELLI-HOOD OPERATOR IS UL AND CSA LISTED, AND CONFORMS WITH ALL APPLICABLE CODES AND STANDARDS INCLUDING NFPA 96, IMC, BOCA, BOULDER, IBC, IRC, HIF, AND CE.

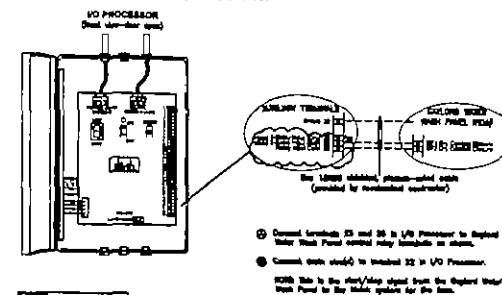
INTELLI-HOOD CONTROLS



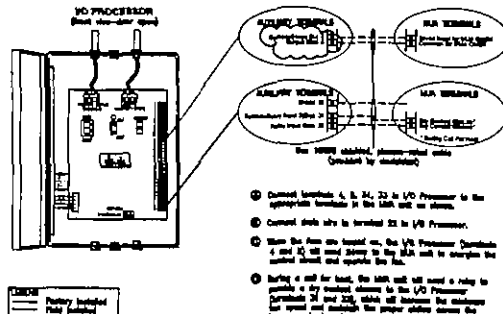
SEQUENCE OF OPERATION

- 1) PRESS THE START FAN BUTTON ON THE GPO-HOOD PANEL TO START THE FANS IN THE AUTO MODE. THIS WILL ACCOMPLISH THE FOLLOWING:
 - a) V/O PROCESSOR WILL SEND A RUN COMMAND AND SPEED REFERENCE SIGNAL TO THE VARIABLE FREQUENCY DRIVES (VFDs).
 - b) V/O PROCESSOR WILL SEND A 24VDC SIGNAL TO THE MUA UNIT TO ENERGIZE THE CONTROL CIRCUIT. IN THE EVENT THE MUA UNIT GOES INTO HEATING MODE, THE MUA UNIT WILL PROVIDE A DRY CLOSING SIGNAL TO THE V/O PROCESSOR TO INCREASE THE MINIMUM AIR FLOW ACROSS THE BURNER OR HEAT EXCHANGER.
 - c) THE INTELLI-HOOD SYSTEM WILL AUTOMATICALLY ADJUST EXHAUST AND SUPPLY AIR FLOWS BASED ON ACTUAL COOKING LOADS AS SENSED BY THE TEMPERATURE AND OPTIC SENSORS MOUNTED IN THE HOODS.
- 2) PRESS THE START WASH BUTTON ON THE GPO-HOOD PANEL TO TURN OFF THE FANS AND START THE WASH CYCLE.
- 3) PRESS THE 100% SWITCH IN CASE OF EMERGENCY TO BYPASS THE SENSORS AND OPERATE THE FANS AT FULL SPEED FOR 10 MINUTES.

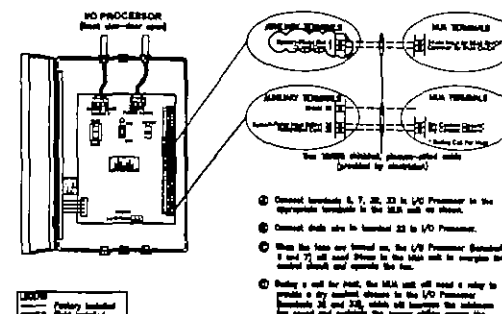
DETAIL 1: INSTALL WIRING FOR GAYLORD WATER WASH PANEL



DETAIL 3: INSTALL WIRING FOR MUA UNIT HOOD-1 & 2



DETAIL 4: INSTALL WIRING FOR MUA UNIT HOOD-3 & 4



5140 RIVER VALLEY ROAD
CHICAGO, IL 60631-2800
PHONE: (815) 985-7200
FAX: (815) 985-7253
www.melinkcorp.com
intelli-hood@melinkcorp.com

MELINK®

PROJECT: ME DIVISION OF CORRECTIONS SYSTEM LAYOUT
PRELIM

REVISIONS:
DATE: 11/11/11
BY: [Signature]
CHECKED BY: [Signature]
TITLE: INTELLI-HOOD CONTROLS DRAWING & DETAILS
SHEET NO. 1 OF 1

M1

**HOWARD COUNTY, MARYLAND
ENERGY PERFORMANCE CONTRACT
CONTRACT#**

THIS AGREEMENT ("Agreement"), is made this _____ day of _____ in the year 2009, by and between ENERGY SYSTEMS GROUP, LLC ("Contractor"), 4401 O'Donnell Street, Baltimore, MD 21224 ("the Contractor"), and HOWARD COUNTY, MARYLAND, ("the County" or "the Owner").

RECITALS

WHEREAS, this Agreement is being made for the Contractor to provide to project management, energy audit, engineering, construction, provision of certain equipment, and measurement & verification to the County in order to develop and implement comprehensive energy efficiency and guaranteed savings programs at County facilities; and.

WHEREAS, this Agreement will fulfill the provision that a formal contract should be executed by and between the Contractor and the County evidencing the terms of the award.

NOW THEREFORE, in consideration of the mutual promises and covenants of the parties and payments by the County to the Contractor as agreed to below, the parties agree as follows:

AGREEMENTS

1. The Contract is subject to all the conditions, covenants, stipulations, terms and provisions contained in the Contract Documents as described in Paragraph 6 of this Agreement.
2. The Contractor covenants and agrees with the County that it will well and faithfully furnish all of the materials and perform all of the work and provide the guarantees and savings, and do everything required by the Contract Documents, all of which are made a part hereof and are referred to herein as the "Contract" at and for a sum equal to the aggregate cost of the work, labor, equipment, materials, and supplies done and furnished at the prices and rates respectively named in the Attachment A. The Contractor further covenants and agrees that it will well and faithfully comply with and perform each and every obligation imposed upon him by the Contract Documents, or the terms of the award.
3. The Contractor covenants and agrees that its obligations pursuant to the Contract Documents include but are not limited to the furnishing of all material, labor, equipment, supplies, plant, tools, and all other services, facilities and expenses necessary for the full operational performance and completion of the requirements of the Contract Documents.
4. The County agrees that it will pay the Contractor, when due and payable under the terms of said Contract Documents and of said award, the sums set forth in Attachment A, and the Contractor agrees that it will well and faithfully comply with and perform each and every obligation imposed upon it by this Agreement.
5. The Contractor (if a corporation) hereby certifies that it is a Maryland corporation in good standing or a foreign corporation registered to do business in Maryland with the Maryland State Department of Assessments and Taxation.
6. The Contractor and County agree that the following enumerated documents, collectively referred to as Contract Documents, are all essential documents of this Agreement and are incorporated herein and made a part hereof as if fully set forth:

- a. This Agreement
- b. State of Maryland's Indefinite Delivery Contract No. DGS-06-EPC-IDC-5.0 dated August 21, 2006 and documents identified therein as part of the Contract Documents.
- c. All engineering drawings and design documents in supporting the final proposal from both ESG and ESG's subcontractors.
- d. Proposal entitled "Final Phase II Proposal for Energy Performance Contract (EPC) for Howard County" dated February 9, 2009.
- e. Performance Bond _____
- f. Payment Bond _____
- g. Guarantee Energy Savings Bond _____

In the event of a conflict between or among provisions of the Contract Documents, documents shall be controlling in the order in which they are listed in Section III – General Conditions of Indefinite Delivery Contract No. DGS-06-EPC-IDC-5.0, Paragraph 24, except that this Agreement shall be deemed to have the highest order of precedence.

The term "State" in Indefinite Delivery Contract No. GGS-06-EPC-IDC-5.0 shall be deemed to mean "County." The term "Contractor" or "ESCO" shall be deemed to mean the Contractor.

7. Time of Completion for Specified Tasks

- a. The tasks identified in Section III, "Final Phase II Proposal for Energy Performance Contract (EPC) for Howard County" for Phase I Construction, shall be commenced upon issuance of a Purchase Order and written Notice to Proceed and shall be completed within 12 months of the issuance of the Notice to Proceed.
- b. If notified by the County by issuance of a Purchase Order and written Notice to Proceed to initiate the tasks identified in Section III, "Final Phase II Proposal for Energy Performance Contract (EPC) for Howard County" for Phase II Construction, Contractor shall complete them within 12 months of the issuance of the Notice to Proceed (if issued by July 30, 2009). It is understood and agreed, that inclusion of Phase II tasks under this Agreement is subject to the authorization of the Howard County Council of the required funds in the FY2010 Capital budget.
- c. The Contractor shall provide other performances under this Agreement, for the period set forward in Section 8 d. 3).

8. Special Provisions

- a. Acknowledgment of Election of Owner Financing. By executing this Contract, Contractor acknowledges that the Owner has elected to finance the energy improvements through an Owner's Energy Performance Master Lease Purchase Agreement. Contractor further acknowledges that the Owner's election of tax exempt financing places limitations on the private business use of such funds and the property financed with such funds.
- b. Management Services. "Management Services" are all monitoring and verification of energy savings (as defined in Section IV, Measurement and Verification, of the Contractor's "Final Phase II Proposal for Energy Performance Contract (EPC) for Howard County" proposal); service, and training (as defined in Sections IV & V, of Contractor's "Final Phase II Proposal for Energy Performance Contract (EPC) for Howard County" Proposal), and the securing of a

Guarantee Energy Savings Bond, defined more particularly below. Payment for Management Services, consisting of an annual fee invoiced and payable monthly, shall be based upon the cash flow analysis on pages 1 & 2 of Section II, Financials, of the Contractor's "Final Phase II Proposal for Energy Performance Contract (EPC) for Howard County" and will include M&V, and Guarantee Energy Savings Bond. The County will self-perform maintenance services.

- c. Severability of Management Services and Guarantee. The parties agree that the Owner may terminate the Management Services (and resultant fee) at any time, without violating the terms of the Guarantee, by providing reasonable notice, in writing, to the Contractor.
- d. Agreement on Guarantee of Annual Savings.
 - 1) Contractor warrants and guarantees that Owner will realize guaranteed energy savings of \$8,212,800 (\$6,402,574 for Phase I construction & \$1,810,226 for Phase II construction) and overall savings of \$8,308,483 (\$6,498,257 for Phase I construction & \$1,810,226 for Phase II construction), as set forth in Contractor's Final Phase II Proposal, Table – Cash Flow Analysis on pages 1 & 2 of Section II Financials, and the other contract documents.
 - 2) The price for Contractor's guarantee that Owner will realize the savings set forth in the Guaranteed Savings Summary section of Contractor's Phase II Proposal is \$82,128.00 and is included in the price set forth in Attachment A (\$64,026.00 for Phase I Construction & \$18,102 for the Phase II construction). The surety for the Guarantee Energy Savings Bond will be provided from a financial institution approved by the State Treasurer's Office and the Owner. This amount is shown as apportioned annually within the Contractor's Final Phase II Proposal, Section II – Cash Flow Analysis and will be invoiced and payable monthly as part of the Management Services. The Guarantee Energy Savings Bond shall be provided within 10 days of execution of the contract and prior to issuance of the purchase order.
 - 3) Unless otherwise terminated sooner in accordance with the terms of the Contract Documents, this Contract shall remain in force and effect for the period described in the Contractor's "Final Phase II Proposal for Energy Performance Contract (EPC) for Howard County", provided that this Contract shall automatically terminate on the date which is fifteen (15) years from the first date on which Owner obtains tax-exempt financing to finance the capital portion (design and construction) of this Contract.
 - 4) Owner acknowledges that the Payment and Performance Bonds required hereunder shall expire upon final acceptance of all Energy Conservation Measures required under this Contract, including any applicable two year warranty period, and shall not secure any energy savings, measurement and verification obligations or maintenance/service obligations, which may be guaranteed by ESG under this Contract. This surety will be provided by an insurance company, which is licensed in the State of Maryland by the Maryland Insurance Commission. The bonds shall be provided prior to issuance of the purchase order.
 - 5) The following clarifications to Section V of the Indefinite Delivery Contract are incorporated herein:
 - a) Guaranteed Savings Reconciliation Report. Contractor will provide Owner

with a Guaranteed Savings Reconciliation Report after the one-year anniversary of the end of the Construction Period and after the end of each subsequent annual Guaranty Period within 120 days after the year's end. The County shall provide the with access to, relevant records relating to such Energy and Operations and Maintenance Costs. The County shall permit access to any energy billing information, maintenance records, drawings, or other data reasonably necessary to generate the said report. Data and calculations utilized by Contractor in the preparation of its Guaranteed Savings Reconciliation report will be made available to Owner, along with such explanations and clarifications as Owner may reasonably request.

- b) Upon receipt of the Reconciliation Report, Owner shall have forty-five (45) days to review the Guaranteed Savings Reconciliation Report and provide written notice to Contractor of rejection of the Guaranteed Savings Reconciliation Report for that Guaranty Year. Such written notice shall explain the with reasonable particularity the reasons why the Owner does not accept the report. If the Owner fails to provide written notice of rejection within forty-five (45) days of the receipt of the Guaranteed Savings Reconciliation Report, it shall be deemed accepted..
 - c) Whenever either party shall be prevented from or delayed in carrying out any obligation of such party hereunder (other than for the payment of money) by reason of any riot, strike, work stoppage, embargo, quarantine, accident, fire, flood or other similar or dissimilar cause beyond the reasonable control of such party, the performance of such obligation by such party shall be excused to the extent of such prevention or delay, provided that such party immediately begins to take in good faith whatever reasonable steps are available to ameliorate, cure, and mitigate the impact of the difficulties created by the cause beyond the party's control."
- 6) Upon receiving a written request (the "Written Request") from the Contractor, the County agrees that it will consider the allocation (the "Allocation") of the energy efficient tax deduction allowable under Section 179D of the Internal Revenue Code, as it may be amended, and any regulations or notices promulgated thereunder (the "Code") allowable to a Designer (as such term is defined in the Code). After receipt of the Written Request, the County may require the Contractor to provide any data, analysis, or other information that may assist the County in evaluation the Written Request. The provision of such data, analysis, or other information shall be at the Contractor's sole cost and expense.

The County's decision as to the execution of the Allocation shall be in its sole discretion and may be withheld for any reason whatsoever or may be conditioned as the County determines in its sole discretion. Nothing in this Agreement shall be construed or interpreted to create any obligation whatsoever upon the County to execute the Allocation pursuant to the Code and should the County decide not to execute the Allocation, the Contractor shall not have any rights, remedies, or recourse against the Contractor for such determination."

- e. Liquidated Damages. The amount of liquidated damages for this contract shall be \$1,000.00 per calendar day if the Time of Completion requirements, stipulated in Section 7. a. above, are not met.

9. Ownership of Goods.

All finished or unfinished work, reports, or goods that are the subject of this Agreement; including any licenses or consents acquired by the Contractor for performance hereunder, shall be and shall remain the property of the County.

10. Ethics.

10.1 The Contractor certifies that the officer of the corporation who is executing this Agreement has read and understands Attachment A, entitled Howard County Charter and Code References to Ethics, which contains the provisions of Section 901(a) of the Howard County Charter dealing with conflicts of interest and Section 22.204 of the Howard County Code dealing with conflicts of interest.

10.2 The Contractor certifies that he/she has (1) not been a party to an agreement to bid a fixed or uniform price; (2) not offered nor will offer any gratuity to any county official or employee; and (3) not violated any of the fair employment provisions of Code Sec. 4.119 Ethics and Fair Employment Practices detailed in Attachment A.

This Agreement is made and entered into in Maryland and is to be construed under the laws of Maryland. As to the Contractor, this Agreement is intended to be a contract under seal and a specialty.

11. Governing Law.

This Agreement shall be governed by and construed in accordance with the laws of the State of Maryland without regard to any choice of law principles that would dictate the laws of any other jurisdiction. The parties agree that the exclusive venue for any and all actions related hereto shall be the appropriate Federal or State court located within the State of Maryland.

12 Termination:

12.1 Termination for Convenience: The County may terminate this Agreement, in whole or in part, whenever the County determines that such termination is in the best interest of the County, without showing cause, upon giving at least 30 days written notice to the Contractor. The County shall pay all reasonable costs incurred by the Contractor up to the date of termination. However, in no event shall the Contractor be paid an amount which exceeds the price bid for the work performed. The Contractor shall not be reimbursed for any profits which may have been anticipated but which have not been earned up to the date of termination.

12.2 Termination for Default: When the Contractor has not performed or has unsatisfactorily performed one or more material terms of the Agreement, the County may terminate the Agreement for default. Upon termination for default, payment may be withheld at the discretion of the County. Failure on the part of a Contractor to fulfill the contractual obligations shall be considered just cause for termination of the Agreement. If the damages exceed the undisbursed sums available for compensation, the County shall not be obligated to make any further disbursements hereunder. The Contractor will be paid for work satisfactorily performed prior to termination less any excess costs incurred by the County in reprocurring and completing the work.

13 Notice: Any notice required to be delivered shall be deemed to have been received when the notice has been sent by certified mail, return receipt, overnight carrier, or hand delivered to the following address and individual or at such other address and/or such other individual a party may identify in writing to the other party:

FOR THE COUNTY:
Helen Ashley, CPPB, Buyer
Howard County, Maryland
Office of Purchasing
6751 Columbia Gateway Drive

Columbia, MD 21046
Telephone: (410) 313-6378
Fax: (410) 313-6388
Email: hashley@howardcountymd.gov

FOR THE CONTRACTOR:
Karen Galindo-White, Account Executive
ENERGY SYSTEMS GROUP, LLC
4401 O'Donnell Street
Baltimore, MD 21224
(410) 522-5656
(812) 492-8323

14 Indemnification.

14.1 The Contractor shall indemnify and hold harmless the County, its employees, agents and officials from any and all claims, suits, or demands including reasonable attorney fees which may be made against the County, its employees, agents or officials resulting from any act or omission committed in the performance of the duties imposed by and performed under the terms of this Agreement by the Contractor or anyone under agreement with the Contractor to perform duties under this Agreement. The Contractor shall not be responsible for acts of negligence or willful misconduct committed by the County, its employees, agents and officials.

14.2 Any property or work to be provided by the Contractor under this Agreement will remain at the Contractor's risk until written acceptance by the County; and the Contractor will replace, at the Contractor's expense, all property or work damaged or destroyed by any cause whatsoever.

15 Reports/Information/Inspections/and Audits:

15.1 At any time during normal business hours and as often as the County may deem necessary, the Contractor shall make available to and permit inspection by the County, its employees or agents, all records, information and documentation of the Contractor related to the subject matter of this Agreement, including, but not limited to, all contracts, invoices, payroll, and financial audits.

This Agreement is made and entered into in Maryland and is construed under the laws of Maryland. As to Contractor, this Agreement is intended to be a contract under seal and a specialty.

ATTEST:

Secretary

Print Name

ATTEST:

Lonnie R. Robbins
Chief Administrative Officer

RECOMMENDED FOR APPROVAL:

James M. Irvin, Director
Director of Public Works

APPROVED FOR LEGAL SUFFICIENCY:

Margaret Ann Nolan
County Solicitor

APPROVED AND AGREED TO:
ENERGY SERVICES GROUP

By: _____ (SEAL)
Title: _____

APPROVED:
HOWARD COUNTY, MARYLAND

By: _____
Ken Ulman
County Executive

APPROVED FOR SUFFICIENCY OF FUNDS

Sharon F. Greisz, Director
Department of Finance

ATTACHMENT A

CONTRACT PRICE

The Owner shall pay the Contract as follows, subject to and in accordance with the Contract Documents. For Phase II Construction, payment is specifically made subject to appropriation by the Howard County Council of the required design/construction funds (\$1,095,277.00) in the FY2010 Capital Budget:

<u>Amount</u>	<u>Description</u>	<u>Terms of Payment</u>
<u>PHASE I CONSTRUCTION</u>		
\$4,400,000.00	Design/Construction - Miscellaneous Work	Payable Monthly as progress is approved by the Owner
\$ 177,928.00	Total Management Service (Measurement & Verification, and Guarantee Energy Savings Bond)	Payable Monthly by Owner
\$4,577,928.00	Total Contract Amount (Construction and Management Services)	
<u>PHASE II CONSTRUCTION</u>		
\$1,095,277.00	Design/Construction - Miscellaneous work	Payable Monthly as progress is approved by the Owner
\$ 50,686.00	Total Management Services (Measurement & Verification, And Guarantee Energy Savings Bond)	Payable Monthly by Owner
\$1,145,963.00	Total Contract Amount (Construction and Management Services)	

ATTACHMENT B

AFFIDAVIT

Contractor _____

Address _____

Telephone _____

I, _____, the undersigned, _____ of the above named Contractor
(Print Signer's Name) Print Office Held)

does declare and affirm this _____ day of _____, _____, that I hold the aforementioned office
(Month) (Year)
in the above named bidder and I affirm the following:

AFFIDAVIT I

The Contractor, his Agent, servants and/or employees, have not in any way colluded with anyone for and on behalf of the Contractor or themselves, to obtain information that would give the Contractor an unfair advantage over others, nor have they colluded with anyone for and on behalf of the Contractor, or themselves, to gain any favoritism in the award of the contract herein.

AFFIDAVIT II

No officer or employee of Howard County, whether elected or appointed, has in any manner whatsoever, any interest in or has received prior hereto or will receive subsequent hereto any benefit, monetary or material, or consideration from the profits or emoluments of this contract, job, work or service for the County, and that no officer or employee has accepted or received or will receive in the future a service or thing of value, directly or indirectly, upon more favorable terms than those granted to the public generally, nor has any such officer or employee of the County received or will receive, directly or indirectly, any part of any fee, commission or other compensation paid or payable to the County in connection with this contract, job, work, or service for the County, excepting, however, the receipt of dividends on corporation stock.

AFFIDAVIT III

Neither I, nor the Contractor, nor any officer, director, or partners, or any of its employees who are directly involved in obtaining contracts with Howard County have been convicted of bribery, attempted bribery, or conspiracy to bribe under the laws of any state, or of the federal government for acts of omissions committed after July 1, 1977.

AFFIDAVIT IV

Neither I, nor the Contractor, nor any of our agents, partners, or employees who are directly involved in obtaining contracts with Howard County have been convicted within the past 12 months of discrimination against any employee or applicant for employment, nor have we engaged in unlawful employment practices as set forth in Section 12.200 of the Howard County Code, or of Section 16 of Article 49B of the Annotated Code of Maryland or, of Sections 703 and 704 of Title VII of the Civil Rights Act of 1964.

I do solemnly declare and affirm under the penalties of perjury that the contents of the foregoing affidavits are true and correct to the best of my knowledge, information and belief.

DATE

SIGNATURE

PRINTED NAME

TITLE

ATTACHMENT C
HOWARD COUNTY CHARTER AND CODE REFERENCES TO ETHICS

Charter Section 901. Conflict of Interest.

(a) **Prohibitions.** No officer or employee of the County, whether elected or appointed, shall in any manner whatsoever be interested in or receive any benefit from the profits or emoluments of any contract, job, work, or service for the County. No such officer or employee shall accept any service or thing of value, directly or indirectly, from any person, firm or corporation having dealings with the County, upon more favorable terms than those granted to the public generally, nor shall he receive, directly or indirectly, any part of any fee, commission or other compensation paid or payable by the County, or by any person in connection with any dealings with the County, or by any person in connection with any dealings with or proceedings before any branch, office, department, board, commission or other agency of the County. No such officer or employee shall directly or indirectly be the broker or agent who procures or receives any compensation in connection with the procurement of any type of bonds for County officers, employees or persons or firms doing business with the County. No such officer or employee shall solicit or accept any compensation or gratuity in the form of money or otherwise for any act or omission in the course of his public work; provided, however, that the head of any department or board of the County may permit an employee to receive a reward publicly offered and paid for, for the accomplishment of a particular task.

(b) **Rules of construction; exceptions by Council.** The provisions of this Section shall be broadly construed and strictly enforced for the purpose of preventing officers and employees from securing any pecuniary advantages, however indirect, from their public associations, other than their compensation provided by law.

In order, however, to guard against injustice, the Council may, by resolution, specifically authorize any County officer or employee to own stock in any corporation or to maintain a business in connection with any person, firm or corporation dealing with the County, if, on full public disclosure of all pertinent facts to the County Council by such officer or employee, the Council shall determine that such stock ownership or connection does not violate the public interest.

The County Council may, by ordinance, delegate to the Howard County Ethics Commission the power to make such determinations and to authorize the ownership or connection. Any ordinance which delegates this power shall provide for procedures including a public hearing, and shall establish criteria for determining when the ownership or connection does not violate the public interest.

(c) **Penalties.** Any officer or employee of the County who willfully violates any of the provisions of this Section shall forfeit his office. If any person shall offer, pay, refund or rebate any part of any fee, commission, or other form of compensation to any officer or employee of the County in connection with any County business or proceeding, he shall, on conviction, be punishable by imprisonment for not less than one or more than six months or a fine of not less than \$100.00 or more than \$1,000.00, or both. Any contract made in violation of this Section may be declared void by the Executive or by resolution of the Council. The penalties in this Section shall be in addition to all other penalties provided by law.

Code Section 4.119. Ethics and Fair Employment Practices.

(a) **Conflict of Interest.** Bidders, vendors, purchasers and county employees involved in the purchasing process shall be governed by the provisions of the Howard County Charter and Howard County law regarding conflict of interest. No vendor shall offer a gratuity to an official or employee of the county. No official or employee shall accept or solicit a gratuity.

(b) **Discouragement of Uniform Bidding.**

(1) It is the policy of the county to discourage uniform bidding by every possible means and to endeavor to obtain full and open competition on all purchases and sales.

(2) No bidder may be a party with other bidders to an agreement to bid a fixed or uniform price.

(3) No person may disclose to another bidder, nor may a bidder acquire, prior to the opening of bids, the terms and conditions of a bid submitted by a competitor.

(c) **Fair Employment Practices**

(1) Bidders, vendors and purchases may not engage in unlawful employment practices as set forth in Subtitle 2 "human Rights" of Title 12 of the Howard County Code Section 24 of Article 49B of the Annotated Code of Maryland or Sections 703 and 704 of Title VII of the Civil Rights Act of 1964 as amended. Should any bidders, vendors or purchasers engage in such unlawful employment practices, they shall be subject to being declared irresponsible or being debarred pursuant to the provisions of this subtitle.

(2) The Howard County Office of Human Rights shall notify the county purchasing agent when any bidder is found, by a court of competent jurisdiction, to have engaged in any high unlawful employment practices.

(3) If any bidder has been declared to be an irresponsible bidder for having engaged in an unlawful employment practice and has been debarred from bidding pursuant to this subtitle, the Howard County Office of Human Rights shall review the employment practices of such bidder after the period of debarment has expired to determine if violations have been corrected and shall, within 30 days, file a report with the county purchasing agent informing the agent of such corrections before such bidder can be declared to be a responsible bidder by the county purchasing agent.

(4) Payment of subcontractors. All contractors shall certify in writing that timely payments have been made to all subcontractors supplying labor and materials in accordance with the contractual arrangements made between the contractor and the subcontractors. No contractor will be paid a second or subsequent progress payment or final payment until such written certification is presented to the county purchasing agent.

Code Section 22.204. Prohibited Conduct and Interests.

(a) **Participation Prohibitions:** County official and employees subject to this subtitle shall not:

(1) Except in the exercise of an administrative or ministerial duty which does not affect the disposition or decision with respect to the matter, participate on behalf of the county in any matter which would, to their knowledge, have a direct financial impact as distinguished from the public generally, on them, their spouse, parent, child, sibling or upon any business interest with which they are affiliated;

(2) Except as exempted by the county council pursuant to Section 901(b) of the Howard County Charter, hold or acquire an interest in a business entity that has or is negotiating a contract with the county or is regulated by the official or employee;

(3) Except in the exercise of an administrative or ministerial duty which does not affect the disposition or decision with respect to the matter, participate in any matter involving a business entity with which they, their spouse, parent, child or sibling are negotiating or have an arrangement concerning prospective employment.

(b) **Employment Prohibitions:** Except as exempted by the county council pursuant to section 901(b) of the Howard County Charter or when the employment or interest does not create an actual or apparent conflict of interest, officials and employees shall not:

(1) Be employed by:

(i) Any entity subject to their official authority;

(ii) Any entity subject to the authority of the Howard County agency, board or commission with which they are affiliated;

(iii) Any entity which is negotiating or has entered into a contract with the Howard County agency, board or commission with which they are affiliated.

(2) Represent any party for a fee, commission or other compensation before any county body;

(3) Within one (1) year following termination of county service, act as a compensated representative of another in connection with any specific matter in which they participated substantially as a county official or employee.

The employment provisions listed above do not apply to:

(1) An official or employee who is appointed to a regulatory or licensing authority pursuant to a requirement that persons subject to its jurisdiction be represented in appointments to it;

(2) Subject to other provisions of law, a member of a board or commission who publicly disclosed a financial interest or employment to the appointing authority at the time of appointment;

(3) Employees or officials whose duties are ministerial, provided that the private employment or financial interest does not create a conflict of interest or the appearance of such a conflict.

(c) **Solicitation/Acceptance of Gifts or Compensation:** No employee or official shall solicit any gifts. No employee or official shall accept any gift or compensation, directly or indirectly from any person that he/she knows or has reason to know, has

financial interests, distinguishable from the interest of the public, that would be affected by the actions of the employee or official.

(d) **Use of Prestige of Office:** No county officials or employees subject to this subtitle shall intentionally use the prestige of their office for their own gain or that of another. The performance of usual and customary constituent services without additional compensation does not constitute the use of prestige of office for an official or employee's private gain or that of another.

(e) **Disclosure of Confidential Information:** Other than in the discharge of official duties, officials or employees may not disclose or use, for their own gain or that of another, confidential information acquired by reason of public position and which is not available to the public.

BY THE COUNCIL

This Bill, having been approved by the Executive and returned to the Council, stands enacted on
April 8, 2009.

Stephen M. LeGendre
Stephen M. LeGendre, Administrator to the County Council

BY THE COUNCIL

This Bill, having been passed by the yeas and nays of two-thirds of the members of the Council notwithstanding the objections of the Executive, stands enacted on _____, 2009.

Stephen M. LeGendre, Administrator to the County Council

BY THE COUNCIL

This Bill, having received neither the approval nor the disapproval of the Executive within ten days of its presentation, stands enacted on _____, 2009.

Stephen M. LeGendre, Administrator to the County Council

BY THE COUNCIL

This Bill, not having been considered on final reading within the time required by Charter, stands failed for want of consideration on _____, 2009.

Stephen M. LeGendre, Administrator to the County Council

BY THE COUNCIL

This Bill, having been disapproved by the Executive and having failed on passage upon consideration by the Council stands failed on _____, 2009.

Stephen M. LeGendre, Administrator to the County Council

BY THE COUNCIL

This Bill, the withdrawal of which received a vote of two-thirds (2/3) of the members of the Council, is withdrawn from further consideration on _____, 2009.

Stephen M. LeGendre, Administrator to the County Council