Cincinnati Public Schools Mercantile Self Direct CUSTOM Applications – Part 1 of 4

Ohio | Public Utilities Commission

Application to Commit Energy Efficiency/Peak Demand Reduction Programs (Mercantile Customers Only)

Case No.: ____-____-EL-EEC

Mercantile Customer: **Cincinnati Public Schools**

Electric Utility: **Duke Energy**

Program Title or Description: **HVAC and Lighting (Custom)**

Rule 4901:1-39-05(F), Ohio Administrative Code (O.A.C.), permits a mercantile customer to file, either individually or jointly with an electric utility, an application to commit the customer's existing demand reduction, demand response, and energy efficiency programs for integration with the electric utility's programs. The following application form is to be used by mercantile customers, either individually or jointly with their electric utility, to apply for commitment of such programs in accordance with the Commission's pilot program established in Case No. 10-834-EL-POR

Completed applications requesting the cash rebate reasonable arrangement option (Option 1) in lieu of an exemption from the electric utility's energy efficiency and demand reduction (EEDR) rider will be automatically approved on the sixty-first calendar day after filing, unless the Commission, or an attorney examiner, suspends or denies the application prior to that time. Completed applications requesting the exemption from the EEDR rider (Option 2) will also qualify for the 60-day automatic approval so long as the exemption period does not exceed 24 months. Rider exemptions for periods of more than 24 months will be reviewed by the Commission Staff and are only approved up the issuance of a Commission order.

Complete a separate application for each customer program. Projects undertaken by a customer as a single program at a single location or at various locations within the same service territory should be submitted together as a single program filing, when possible. Check all boxes that are applicable to your program. For each box checked, be sure to complete all subparts of the question, and provide all requested additional information. Submittal of incomplete applications may result in a suspension of the automatic approval process or denial of the application.

Any confidential or trade secret information may be submitted to Staff on disc or via email at ee-pdr@puc.state.oh.us.

Section 1: Mercantile Customer Information

Name: **Cincinnati Public Schools**

Principal address: **2651 Burnet Avenue Cincinnati, Ohio 45219**

Address of facility for which this energy efficiency program applies:

Bond Hill Academy 1510 California Ave Cinti, Oh 45237	(HVAC)
Carson School 4323 Glenway Ave Cinti, Oh 45205	(HVAC)
Fairview-Clifton 3689 Clifton Ave Cinti, Oh 45220	(HVAC)
Kilgour School 1339 Herschel Cinti, Oh 45208	(Lighting)
Mt Airy School 5730 Colerain Cinti, Oh 45211	(HVAC and Lighting)
Pleasant Ridge Montessori School Cinti, Oh 45213	(HVAC and Lighting)
Roselawn Condon School Cinti, Oh 45237	(Lighting)
South Avondale Schools 636 Prospect Pl Cinti, Oh	(HVAC and Lighting)

Name and telephone number for responses to questions:

Grady Reid Jr 513-287-1038

Electricity use by the customer (check the box(es) that apply):

- ✓ **The customer uses more than seven hundred thousand kilowatt hours per year at the above facility.** (**See - Appendix A**)
- □ The customer is part of a national account involving multiple facilities in one or more states. (Please attach documentation.)

Section 2: Application Information

A) The customer is filing this application (choose which applies):

- □ Individually, without electric utility participation.
- ✓ **Jointly with the electric utility.**

B) The electric utility is: **Duke Energy**

C) The customer is offering to commit (check any that apply):

- □ Energy savings from the customer's energy efficiency program. (Complete Sections 3, 5, 6, and 7.)
- □ Capacity savings from the customer's demand response/demand reduction program. (Complete Sections 4, 5, 6, and 7.)
- ✓ **Both the energy savings and the capacity savings from the customer's energy efficiency program. (Complete all sections of the Application.)**

Section 3: Energy Efficiency Programs

A) The customer's energy efficiency program involves (check those that apply):

□ Early replacement of fully functioning equipment with new equipment. (Provide the date on which the customer replaced fully functioning equipment, and the date on which the customer would have replaced such equipment if it had not been replaced early. Please include a brief explanation for how the customer determined this future replacement date (or, if not known, please explain why this is not known)).

□ Installation of new equipment to replace equipment that needed to be replaced The customer installed new equipment on the following date(s): _____.

✓ **Installation of new equipment for new construction or facility expansion. The customer installed new equipment on the following date(s):**

Bond Hill Academy	**HVAC**	**March 2008**
Carson School	**HVAC**	**April 2008**
Fairview Clifton School	**HVAC**	**August 2008**
Kilgour School	**Lighting**	**August 2008**
Mt Airy School	**HVAC/Lighting**	**March 2008**
Pleasant Ridge School	**HVAC/Lighting**	**August 2008**
Roselawn School	**Lighting**	**August 2008**
South Avondale School	**HVAC/Lighting**	**November 2008**

□ Behavioral or operational improvement.

B) Energy savings achieved/to be achieved by the energy efficiency program:

1) If you checked the box indicating that the project involves the early replacement of fully functioning equipment replaced with new equipment, then calculate the annual savings [(kWh used by the original equipment) – (kWh used by new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: _____kWh

2) If you checked the box indicating that the customer installed new equipment to replace equipment that needed to be replaced, then calculate the annual savings [(kWh used by less efficient new equipment) – (kWh

used by the higher efficiency new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: _____kWh

Please describe any less efficient new equipment that was rejected in favor of the more efficient new equipment.

3) If you checked the box indicating that the project involves equipment for new construction or facility expansion, then calculate the annual savings [(kWh used by less efficient new equipment) – (kWh used by higher efficiency new equipment) = (kWh per year saved)]. Please attach your calculations and record the results below:

Annual savings: **491,888 kWh savings**
(**Refer to Appendix B for calculations and supporting documents).**

Please describe the less efficient new equipment that was rejected in favor of the more efficient new equipment.

4) If you checked the box indicating that the project involves behavioral or operational improvements, provide a description of how the annual savings were determined.

_____

Section 4: Demand Reduction/Demand Response Programs

A) The customer's program involves (check the one that applies):

✓ **Coincident peak-demand savings from the customer's energy efficiency program.**

□ Actual peak-demand reduction. (Attach a description and documentation of the peak-demand reduction.)

□ Potential peak-demand reduction (check the one that applies):

□ The customer's peak-demand reduction program meets the requirements to be counted as a capacity resource under a tariff of a regional transmission organization (RTO) approved by the Federal Energy Regulatory Commission.

□ The customer's peak-demand reduction program meets the requirements to be counted as a capacity resource under a program that is equivalent to an RTO program, which has been approved by the Public Utilities Commission of Ohio.

B) On what date did the customer initiate its demand reduction program?

March 2008
August 2008

C) What is the peak demand reduction achieved or capable of being achieved (show calculations through which this was determined):

243 KW
Refer to Appendix B for calculations and supporting documentation

Section 5: Request for Cash Rebate Reasonable Arrangement (Option 1) or Exemption from Rider (Option 2)

Under this section, check the box that applies and fill in all blanks relating to that choice.

Note: If Option 2 is selected, the application will not qualify for the 60-day automatic approval. All applications, however, will be considered on a timely basis by the Commission.

A) The customer is applying for:

✓ **Option 1: A cash rebate reasonable arrangement.**

OR

□ Option 2: An exemption from the energy efficiency cost recovery mechanism implemented by the electric utility.

OR

□ Commitment payment

B) The value of the option that the customer is seeking is:

Option 1: A cash rebate reasonable arrangement, which is the lesser of (show both amounts):

✓ A cash rebate of **$28,000.00. Refer to Appendix C**. (Rebate shall not exceed 50% project cost. Attach documentation showing the methodology used to determine the cash rebate value and calculations showing how this payment amount was determined.)

Option 2: An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider.

□ An exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for ____ months (not to exceed 24 months). (Attach calculations showing how this time period was determined.)

OR

□ A commitment payment valued at no more than $_____. (Attach documentation and

calculations showing how this payment amount was determined.)

OR

□ Ongoing exemption from payment of the electric utility's energy efficiency/peak demand reduction rider for an initial period of 24 months because this program is part of the customer's ongoing efficiency program. (Attach documentation that establishes the ongoing nature of the program.) In order to continue the exemption beyond the initial 24 month period, the customer will need to provide a future application establishing additional energy savings and the continuance of the organization's energy efficiency program.)

Section 6: Cost Effectiveness

The program is cost effective because it has a benefit/cost ratio greater than 1 using the (choose which applies):

□ Total Resource Cost (TRC) Test. The calculated TRC value is: _____ (Continue to Subsection 1, then skip Subsection 2)

✓ Utility Cost Test (UCT). The calculated UCT value is **12.04 (Skip to Subsection 2.) Refer to Appendix D for calculations and supporting documents.**

Subsection 1: TRC Test Used (please fill in all blanks).

The TRC value of the program is calculated by dividing the value of our avoided supply costs (generation capacity, energy, and any transmission or distribution) by the sum of our program overhead and installation costs and any incremental measure costs paid by either the customer or the electric utility.

The electric utility's avoided supply costs were _____.

Our program costs were _____.

The incremental measure costs were _____.

Subsection 2: UCT Used (please fill in all blanks).

We calculated the UCT value of our program by dividing the value of our avoided supply costs (capacity and energy) by the costs to our electric utility (including administrative costs and incentives paid or rider exemption costs) to obtain our commitment.

Our avoided supply costs were **$523,815**

The utility's program costs were **$15,491**

The utility's incentive costs/rebate costs were **$28,000.00**

Refer to Appendix D for calculations

Section 7: Additional Information

Please attach the following supporting documentation to this application:

Narrative description of the program including, but not limited to, make, model, and year of any installed and replaced equipment.

A copy of the formal declaration or agreement that commits the program or measure to the electric utility, including:

1) any confidentiality requirements associated with the agreement;
2) a description of any consequences of noncompliance with the terms of the commitment;
3) a description of coordination requirements between the customer and the electric utility with regard to peak demand reduction;
4) permission by the customer to the electric utility and Commission staff and consultants to measure and verify energy savings and/or peak-demand reductions resulting from your program; and,
5) a commitment by the customer to provide an annual report on your energy savings and electric utility peak-demand reductions achieved.

Refer to Rebate Offer Letter following this application

A description of all methodologies, protocols, and practices used or proposed to be used in measuring and verifying program results. Additionally, identify and explain all deviations from any program measurement and verification guidelines that may be published by the Commission.

DUKE ENERGY CORPORATION
Mercantile Self Direct Program
139 East Fourth Street
Cincinnati, OH 45202
513 629 5572 fax

March 21, 2012

Don Elbe
Cincinnati Public Schools
2651 Burnet Avenue
Cincinnati, Ohio 45219

Subject: Your Application for a Duke Energy Mercantile **CUSTOM** Self-Direct Rebate

Dear Mr. Don Elbe:

Thank you for your Duke Energy Mercantile Self Direct rebate application. As noted in the Energy Conservation Measure (ECM) chart on page three, a total rebate of $28,000.00 has been proposed for your HVAC and Lighting projects completed in the 2008 calendar year. **All Self Direct Rebates are contingent upon approval by the Public Utilities Commission of Ohio (PUCO).**

At your earliest convenience, please indicate if you accept this rebate by

- providing your signature on page two
- completing the PUCO-required affidavit on page four.

Please return the documents to my attention via fax at 513-629-5572 or e-mail to SelfDirect@Duke-Energy.com. Upon receipt, Duke Energy will submit the necessary documentation to PUCO. Following PUCO's approval, Duke Energy will remit payment.

At Duke Energy, we value your business and look forward to working with you on this and future energy efficiency projects. We hope you will consider our Smart $aver® incentives, when applicable. Please contact me if you have any questions.

Sincerely,

Grady Reid, Jr
Product Manager
Mercantile Self Direct Rebates

cc: Mike Heath, Duke Energy
Rob Jung, WECC
Lucas Dixon, PlugSmart

Please indicate your response to this rebate offer within 30 days of receipt.

☑ Rebate is accepted. ☐ Rebate is declined.

By accepting this rebate, Cincinnati Public Schools affirms its intention to commit and integrate the energy efficiency projects listed on the following pages into Duke Energy's peak demand reduction, demand response and/or energy efficiency programs.

Additionally, Cincinnati Public Schools also agrees to serve as joint applicant in any future filings necessary to secure approval of this arrangement as required by PUCO and to comply with any information and reporting requirements imposed by rule or as part of that approval.

Finally, Cincinnati Public Schools affirms that all application information submitted to Duke Energy pursuant to this rebate offer is true and accurate. Information in question would include, but not be limited to, project scope, equipment specifications, equipment operational details, project costs, project completion dates, and the quantity of energy conservation measures installed.

If rebate is accepted, will you use the monies to fund future energy efficiency and/or demand reduction projects?

☐ YES ☑ NO

If rebate is declined, please indicate reason (optional):

Donald M. Elbe Donald M. Elbe 3-23-12

Customer Signature Printed Name Date

Proposed Rebate Amounts

Measure ID	Energy Conservation Measure (ECM) (CUSTOM)	Proposed Rebate Amount
ECM-1	Bond Hill School – Energy Recovery Ventilator(s) (Total Rebate)	$2,000.00
ECM-2	Carson School - Energy Recovery Ventilator(s) (Total Rebate)	$4,000.00
ECM-3	Fairview School - Energy Recovery Ventilator(s) (Total Rebate)	$4,150.00
ECM-4	Kilgour School – New Construction Lighting	$1,050.00
ECM-5	Mt Airy School- Energy Recovery Ventilator(s) (Total Rebate)	$4,000.00
ECM-6	Mt Airy School – New Construction Lighting	$1,050.00
ECM-7	Pleasant Ridge School- Energy Recovery Ventilator(s) (Total Rebate)	$3,250.00
ECM-8	Pleasant Ridge School – New Construction Lighting	$2,200.00
ECM-9	Roselawn School – New Construction Lighting	$3,250.00
ECM-10	South Avondale School- Energy Recovery Ventilator(s) (Total Rebate)	$2,150.00
ECM-11	South Avondale School – New Construction Lighting	$900.00
Total		$28,000.00

Ohio | Public Utilities Commission

Application to Commit Energy Efficiency/Peak Demand Reduction Programs (Mercantile Customers Only)

Case No.: ____-____-EL-EEC

State of Ohio :

Donald M. Elbe, Affiant, being duly sworn according to law, deposes and says that:

1. I am the duly authorized representative of:

   Cincinnati Public Schools

   [insert customer or EDU company name and any applicable name(s) doing business as]

2. I have personally examined all the information contained in the foregoing application, including any exhibits and attachments. Based upon my examination and inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete.

3. I am aware of fines and penalties which may be imposed under Ohio Revised Code Sections 2921.11, 2921.31, 4903.02, 4903.03, and 4903.99 for submitting false information.

Donald M. Elbe
Signature of Affiant & Title

Sworn and subscribed before me this 23rd day of March, 2012 Month/Year

Pamula Thomas
Signature of official administering oath

Pamula Thomas - Notary
Print Name and Title

My commission expires on June 19, 2012

NOTARY PUBLIC STATE OF OHIO

PAMULA R. THOMAS
Notary Public, State of Ohio
My Commission Expires
June 19, 2012

Appendix A

91103676 01		
CINCINNATI PUBLIC SCHOOLS		
5945 MONTGOMERY RD		
CINCINNATI, OH 45213		
Date	Days	Actual KWH
12/29/2011	30	89,624
11/29/2011	33	99,166
10/27/2011	29	102,362
9/28/2011	30	119,392
8/29/2011	31	166,765
7/29/2011	30	162,193
6/29/2011	29	132,830
5/31/2011	32	118,148
4/29/2011	30	105,178
3/30/2011	29	115,864
3/1/2011	29	118,427
1/31/2011	32	128,341
Total		**1,458,290**

Please note additional supportive documentation is available upon for request. Some documentation does not covert from Excel to PDF such that it fits into a manageable format within this application while other documents create file size issues or is larger in size than most other documents contained. Available documents are:

- **Lighting schedules**
- **Lighting counts**
- **Lighting plans**
- **Representative interior lighting and power compliance results (Com Check print outs)**
- **Vendor-submitted energy recovery unit calculations**

Additionally, pertinent data from the lighting count spreadsheet is summarized in the documents presented immediately following the Appendix B, page 1, summarization of project savings.

Appendix B - Energy Savings Achieved

		Baseline Used				Post Project Actual					Savings	
ECM #	Facility	Description	Annual kWh	Operating kW	Summer Coincident kW[3]	Description	Annual kWh	Operating kW	Summer Coincident kW[3]	Hours of Operation[1]	Annual kWh	Summer Coincident kW
1	Bond Hill	38,000 CFM AHU without heat recovery	41,102	33.6	33.6	Heat recovery unit added	8,700	7.1	7.1	1,225	32,402	26.5
2	Carson	25,760 CFM AHU without heat recovery; 25,840 CFM AHU without heat recovery	67,097	54.8	54.8	Heat recovery units added	15,369	12.5	12.5	1,225	51,728	42.2
3	Fairview	14,096 CFM AHU without heat recovery; 23,253 CFM AHU without heat recovery; 23,849 CFM AHU without heat recovery	75,905	62.0	62.0	Heat recovery units added	22,605	18.5	18.5	1,225	53,300	43.5
4	Kilgour	Code Lighting Power Density (67,232 SF)[2]	214,408	78.5	78.5	As Installed[2]	189,235	69 3	69.3	2,730	25,172	9.2
5	Mt Airy	Code Lighting Power Density (84,144 SF)[2]	210,023	101.0	50.5	As Installed[2]	184,263	88 6	44.3	2,080	25,761	6.2
6	Mt Airy	37,000 CFM AHU without heat recovery; 24,000 CFM AHU without heat recovery	63,621	51.9	51.9	Heat recovery units added	12,328	10.1	10.1	1,225	51,293	41.9
7	Pleasant Ridge	Code Lighting Power Density (75,310 SF)[2]	162,670	90.4	0.0	As Installed[2]	112,317	62.4	0.0	1,800	50,353	0.0
8	Pleasant Ridge	33,700 CFM AHU without heat recovery; 16,925 CFM AHU without heat recovery	51,943	42.4	42.4	Heat recovery units added	10,342	8.4	8.4	1,225	41,601	34.0
9	Roselawn	Code Lighting Power Density (113,529 SF)[2]	260,549	136.2	0.0	As Installed[2]	180,444	94 3	0.0	1,913	80,105	0.0
10	South Avondale	Code Lighting Power Density (85,470 SF)[2]	213,333	102.6	0.0	As Installed[2]	191,925	92 3	0.0	2,080	21,408	0.0
11	South Avondale	33,700 CFM AHU without heat recovery; 16,925 CFM AHU without heat recovery	39,031	31.9	31.9	Heat recovery units added	11,484	9.4	9.4	1,225	27,548	22.5
		Totals	1,399,683	785	406		939,012	473	180		460,671	226

After consideration of line losses, total energy savings are **491,888 kWh** and **243 summer coincident kW**. These values may also reflect minor DSMore modeling software rounding error.

Notes:

1 Hours of operation do not apply simply to heat recovery unit measures. kWh and kW values presented are the results of bin analysis presented in the attached pages.

2 Building Code baseline lighting power density allowances as well as the as installed fixture wattages & quantities are detailed on the attached pages.

3 In some cases, facility operating hours end during the summer coincident hour. As such, one half the operating kW is shown as summer coincident demand savings.

DETAILED CALCULATIONS - ECM1

JAN 2012 V2

Salesforce Opportunity Name	*Cincinnati Public Schools - Bond Hill - HVAC Lighting*	Application #	12-007	Rev.	0
Project Name	*Cincinnati Public Schools - Bond Hill - HVAC Lighting*			State	OH

Note: all data from "Duke.CinciPub_BondHill.HRW.Calcs.xlsx" received 3-5-2012, except as otherwise noted

USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin
HEAT RECOVERY WHEEL SAVINGS AHU-1

Minimum Fraction Outdoor Air:	37.1%	
Heat Recover Effectiveness:	80.0%	
Set Point Temperature:	77	F
Set Point Enthalpy:	28.27	Btu/lba
Supply Air Temperature:	52.6	F
Supply Air Enthalpy:	22.51	Btu/lba
Supply Air Volume:	38,000	cfm
Supply Air Density:	0.075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107.0	0	0	37%	88.1	17.78	0.00	0.00	0.00
100	104	102.0	0	0	37%	86.3	17.78	0.00	0.00	0.00
95	99	96.1	42.6	12	37%	84.1	33.59	8.73	10.91	2.18
90	94	92.2	39.6	41	37%	82.6	32.48	23.57	29.47	5.89
85	89	87.6	37.7	142	37%	80.9	31.77	67.95	84.94	16.99
80	84	82.4	35.0	250	37%	79.0	30.77	85.37	106.71	21.34
75	79	77.2	33.4	287	37%	77.1	30.18	74.69	93.36	18.67
70	74	72.5	31.9	241	100%	72.5	31.90	119.58	149.47	29.89
65	69	68.0	29.1	252	100%	68.0	29.10	28.51	35.64	7.13
60	64	62.6	24.8	322	100%	62.6	24.80	0.00	0.00	0.00
55	59	57.1	21.9	222	100%	57.1	21.90	0.00	0.00	0.00
50	54	52.0	19.2	226	98%	52.6	19.42	0.00	0.00	0.00
45	49	47.5	17.3	151	83%	52.6	19.20	0.00	0.00	0.00
40	44	43.1	15.2	211	72%	52.6	18.86	0.00	0.00	0.00
35	39	37.6	12.9	206	62%	52.6	18.75	0.00	0.00	0.00
30	34	32.4	10.8	135	55%	52.6	18.71	0.00	0.00	0.00
25	29	27.7	9.0	99	49%	52.6	18.73	0.00	0.00	0.00
20	24	23.3	7.5	66	45%	52.6	18.83	0.00	0.00	0.00
15	19	18.3	5.9	36	42%	52.6	18.97	0.00	0.00	0.00
10	14	12.5	4.1	16	38%	52.6	19.13	0.00	0.00	0.00
5	9	7.5	2.7	5	37%	51.2	18.78	0.00	0.00	0.00
0	4	3.0	1.4	0	37%	49.5	18.30	0.00	0.00	0.00
							Annual Total mmBTU:	**408.39**	**510.49**	**102.10**
							Annual Ton-hours:	34,033	42,541	8,508
							75% Load EER:	12.42	12.42	12.42
							75% Load kW/Ton:	0.966	0.966	0.966
							Cooling kWh:	**32,882**	**41,102**	**8,220**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**26.84**	**33.55**	**6.71**

Energy recovery wheel motor	
Motor Size hp:	0.5
Load Factor:	0.85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.391**
Motor kWh:	**479**

Allocation of annual savings by month (Added During Tech Review)
Trade ally only provided annual savings numbers. Use % of cooling degree days by month to distribute annual savings appropriately.
Cooling Degree Day Source: http://www.climate-zone.com/climate/united-states/ohio/greater-cincinnati-airport/

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
CDD by Month	0.0	0.0	0.0	0.0	86.0	191.0	313.0	266.0	120.0	20.0	0.0	0.0	996.0
Degree Days % of Annual	0.0%	0.0%	0.0%	0.0%	8.6%	19.2%	31.4%	26.7%	12.0%	2.0%	0.0%	0.0%	100%
Degree Days % of Maximum	0.0%	0.0%	0.0%	0.0%	27.5%	61.0%	100.0%	85.0%	38.3%	6.4%	0.0%	0.0%	
Baseline kWh	0	0	0	0	3,549	7,882	12,917	10,977	4,952	825	0	0	41,102
Proposed kWh	0	0	0	0	751	1,668	2,734	2,323	1,048	175	0	0	8,700
kWh Savings	0	0	0	0	2,798	6,214	10,183	8,654	3,904	651	0	0	32,403
Baseline kW	0.00	0.00	0.00	0.00	9.22	20.47	33.55	28.51	12.86	2.14	0.00	0.00	33.55
Proposed kW	0.00	0.00	0.00	0.00	1.95	4.33	7.10	6.04	2.72	0.45	0.00	0.00	7.10
kW Savings	0.00	0.00	0.00	0.00	7.27	16.14	26.45	22.48	10.14	1.69	0.00	0.00	26.45

Cell: A8
Comment: zacho:
This text is from TA calculations. Don't have a copy, but file name (TMY3) indicates they used typical 30 year average temperature data.

Cell: D11
Comment: zacho:
Per "Duke.CPS_BondHill.HRW.Specs.5.pdf", total supply airflow for AHU is 38,000 cfm and ERV Supply is 14,100.

Therefore, Fraction Outside Air = 14,100 ÷ 38,000 = 37.1%

Cell: D17
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (14,100). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (38,000), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CPS_BondHill.HRW.Specs.5.pdf", total supply airflow for AHU is 38,000 cfm

Therefore, Fraction Outside Air = 14,100 ÷ 38,000 = 37.1%

Cell: J19
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A20
Comment: zacho:
Start temperature for bin

Cell: B20
Comment: zacho:
End temperature for bin

Cell: C20
Comment: zacho:
Temp. of outside air in deg. F

Cell: D20
Comment: zacho:
Enthalpy of outside air

Cell: F20
Comment: zacho:
Fraction outside air

Cell: G20
Comment: zacho:
Temperature of mixed air

Cell: H20
Comment: zacho:
Enthalpy of mixed air

Cell: I20
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J20
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K20
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H44
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B45
Comment: zacho:
Per "Duke.CPS_BondHill.HRW.Specs.5.pdf"

Cell: H45
Comment: zacho:
per "Duke.CPS_BondHill.Chiller.Specs.1.pdf"

Cell: B46
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H46
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B47
Comment: zacho:
Motor efficiency for 1.0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for 0.5 hp motor.

Cell: H47
Comment: zacho:
=annual ton hours x 75% load kW/ton

Cell: B49
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B50
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: A59
Comment: zacho:
Degree Days % of Annual x (Sum baseline kW for all energy recovery units)

Cell: A60
Comment: zacho:
Degree Days % of Annual x [(sum of proposed kWh for all energy recovery units) + sum of energy recovery wheel motor kWh used for all energy recovery units)]

Cell: A62
Comment: zacho:
Degree Days % of Maximum x (Sum baseline kW for all energy recovery units)

Cell: A63
Comment: zacho:
Degree Days % of Maximum x [(sum of proposed kW for all energy recovery units) + sum of energy recovery wheel motor kW used for all energy recovery units)]

DETAILED CALCULATIONS - ECM2

JAN 2012 V2

Salesforce Opportunity Name	*Cincinnati Public Schools - Carson - HVAC Lighting*	Application #	12-008	Rev.	0
Project Name	*Cincinnati Public Schools - Carson - HVAC Lighting*			State	OH

Note: all data from "HeatRecov.Calc.Cinci xlsx" received 3-5-2012, except as otherwise noted

USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin

HEAT RECOVERY WHEEL SAVINGS **HRU-1 (Serves AHU-3)**

Minimum Fraction Outdoor Air:	38.9%	
Heat Recover Effectiveness:	79.4%	
Set Point Temperature:	75	F
Set Point Enthalpy:	28.43	Btu/lba
Supply Air Temperature:	52	F
Supply Air Enthalpy:	20.82	Btu/lba
Supply Air Volume:	25,760	cfm
Supply Air Density:	0.075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107.0	0	0	39%	87.4	17 38	0.00	0.00	0 00
100	104	102.0	0	0	39%	85.5	17 38	0.00	0.00	0 00
95	99	96.1	42.6	12	39%	83.2	33 94	6.08	7.66	1 58
90	94	92.2	39.6	41	39%	81.7	32.77	16.38	20.62	4 25
85	89	87.6	37.7	142	39%	79.9	32 03	47.06	59.28	12 21
80	84	82.4	35.0	250	39%	77.9	30 98	58.72	73.95	15 23
75	79	77.2	33.4	287	39%	75.9	30 36	50.99	64.21	13 23
70	74	72.5	31.9	241	100%	72.5	31 90	76.90	96.86	19 95
65	69	68.0	29.1	252	100%	68.0	29.10	15.47	19.48	4 01
60	64	62.6	24.8	322	100%	62.6	24 80	0.00	0.00	0 00
55	59	57.1	21.9	222	100%	57.1	21 90	0.00	0.00	0 00
50	54	52.0	19.2	226	100%	52.0	19 20	0.00	0.00	0 00
45	49	47.5	17.3	151	84%	52.0	19.12	0.00	0.00	0 00
40	44	43.1	15.2	211	72%	52.0	18 89	0.00	0.00	0 00
35	39	37.6	12.9	206	61%	52.0	18 88	0.00	0.00	0 00
30	34	32.4	10.8	135	54%	52.0	18 91	0.00	0.00	0 00
25	29	27.7	9.0	99	49%	52.0	18 98	0.00	0.00	0 00
20	24	23.3	7.5	66	44%	52.0	19.12	0.00	0.00	0 00
15	19	18.3	5.9	36	41%	52.0	19 29	0.00	0.00	0 00
10	14	12.5	4.1	16	39%	50.7	18 98	0.00	0.00	0 00
5	9	7.5	2.7	5	39%	48.8	18.43	0.00	0.00	0 00
0	4	3.0	1.4	0	39%	47.0	17 93	0.00	0.00	0 00
							Annual Total mmBTU	**271.60**	**342.06**	**70.47**
							Annual Ton-hours:	22,633	28,505	5,872
Energy recovery wheel motor							75% Load EER:	10.50	10.50	10 50
Motor Size hp:	0.375						75% Load kW/Ton:	1.143	1.143	1.143
Load Factor:	0.85						**Cooling kWh:**	**25,867**	**32,577**	**6,711**
Motor Efficiency:	81.0%						Heat Recovery Hours of Operation:	1,225	1,225	1,225
hp to kW conversion:	0.7456						**Cooling kW:**	**21.12**	**26.59**	**5.48**
Motor kW:	**0.293**									
Motor kWh:	**359**									

DETAILED CALCULATIONS - ECM2

JAN 2012 V2

Salesforce Opportunity Name	*Cincinnati Public Schools - Carson - HVAC Lighting*	Application #	12-008	Rev.	0
Project Name	*Cincinnati Public Schools - Carson - HVAC Lighting*			State	OH

Note: all data from "HeatRecov.Calc.Cinci xlsx" received 3-5-2012, except as otherwise noted

USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin

HEAT RECOVERY WHEEL SAVINGS **HRU-2 (Serves AHU-4)**

Minimum Fraction Outdoor Air:	43.0%	
Heat Recover Effectiveness:	77.0%	
Set Point Temperature:	75	F
Set Point Enthalpy:	28.43	Btu/lba
Supply Air Temperature:	52	F
Supply Air Enthalpy:	20.82	Btu/lba
Supply Air Volume:	25,480	cfm
Supply Air Density:	0.075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107	0	0	43%	88.8	16 20	0.00	0.00	0 00
100	104	102	0	0	43%	86.6	16 20	0.00	0.00	0 00
95	99	96.1	42.6	12	43%	84.1	34 52	6.46	8.38	1 93
90	94	92.2	39.6	41	43%	82.4	33 23	17.39	22.58	5.19
85	89	87.6	37.7	142	43%	80.4	32.42	49.98	64.91	14 93
80	84	82.4	35	250	43%	78.2	31 26	62.36	80.99	18.63
75	79	77.2	33.4	287	43%	75.9	30 57	54.16	70.34	16.18
70	74	72.5	31.9	241	100%	72.5	31 90	73.83	95.89	22 05
65	69	68	29.1	252	100%	68.0	29.10	14.91	19.36	4.45
60	64	62.6	24.8	322	100%	62.6	24 80	0.00	0.00	0 00
55	59	57.1	21.9	222	100%	57.1	21 90	0.00	0.00	0 00
50	54	52	19.2	226	100%	52.0	19 20	0.00	0.00	0 00
45	49	47.5	17.3	151	84%	52.0	19.12	0.00	0.00	0 00
40	44	43.1	15.2	211	72%	52.0	18 89	0.00	0.00	0 00
35	39	37.6	12.9	206	61%	52.0	18 88	0.00	0.00	0 00
30	34	32.4	10.8	135	54%	52.0	18 91	0.00	0.00	0 00
25	29	27.7	9	99	49%	52.0	18 98	0.00	0.00	0 00
20	24	23.3	7.5	66	44%	52.0	19.12	0.00	0.00	0 00
15	19	18.3	5.9	36	43%	50.6	18.74	0.00	0.00	0 00
10	14	12.5	4.1	16	43%	48.1	17 97	0.00	0.00	0 00
5	9	7.5	2.7	5	43%	46.0	17 36	0.00	0.00	0 00
0	4	3	1.4	0	43%	44.0	16 81	0.00	0.00	0 00
							Annual Total mmBTU	**279.09**	**362.45**	**83.36**
							Annual Ton-hours:	23,257	30,204	6,947
							75% Load EER:	10.5	10 5	10.5
							75% Load kW/Ton:	1.143	1.143	1.143
							Cooling kWh:	**26,580**	**34,519**	**7,939**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**21.70**	**28.18**	**6.48**

Energy recovery wheel motor	
Motor Size hp:	0.375
Load Factor:	0.85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.293**
Motor kWh:	**359**

Allocation of annual savings by month (Added During Tech Review)

Trade ally only provided annual savings numbers. Use % of cooling degree days by month to distribute annual savings appropriately.

Cooling Degree Day Source: http://www.climate-zone.com/climate/united-states/ohio/greater-cincinnati-airport/

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
CDD by Month	0.0	0.0	0.0	0.0	86.0	191.0	313.0	266.0	120.0	20.0	0.0	0 0	996 0
Degree Days % of Annual	0.0%	0.0%	0.0%	0.0%	8.6%	19.2%	31.4%	26.7%	12.0%	2.0%	0.0%	0 0%	100%
Degree Days % of Maximum	0.0%	0.0%	0.0%	0.0%	27.5%	61.0%	100 0%	85.0%	38.3%	6.4%	0.0%	0 0%	
Baseline kWh	0	0	0	0	5,794	12,867	21,086	17,919	8,084	1,347	0	0	67,097
Proposed kWh	0	0	0	0	1,327	2,947	4,830	4,105	1,852	309	0	0	15,369
kWh Savings	0	0	0	0	4,466	9,920	16,256	13,815	6,232	1,039	0	0	51,728
Baseline kW	0.00	0 00	0 00	0.00	15.05	33.42	54.77	46.55	21 00	3.50	0.00	0.00	54.77
Proposed kW	0.00	0 00	0 00	0.00	3.45	7.66	12.55	10.66	4 81	0.80	0.00	0.00	12.55
kW Savings	0.00	0 00	0 00	0.00	11.60	25.77	42.23	35.89	16.19	2.70	0.00	0.00	42.23

Cell: A8
Comment: zacho:
This text is from TA calculations. Don't have a copy, but file name (TMY3) indicates they used typical 30 year average temperature data.

Cell: D11
Comment: zacho:
Per "CPS.Carson.hvac.schedule.pdf", total supply airflow for AHU is 25,760 cfm. Per "Duke.CinciPub_Carson.HRU.specs.1 JPG", ERV Supply is 10,010.

Therefore, Fraction Outside Air = 10,010 ÷ 25,760 = 38.9%

Cell: D17
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (10,010). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (25,760), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "CPS.Carson.hvac.schedule.pdf", total supply airflow for AHU is 25,760 cfm

Per "Duke.CinciPub_Carson.HRU.specs.1.JPG", total outside airflow for AHU is 10,010 cfm

Therefore, Fraction Outside Air = 10,010 ÷ 25,760 = 38.9%

Cell: J19
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A20
Comment: zacho:
Start temperature for bin

Cell: B20
Comment: zacho:
End temperature for bin

Cell: C20
Comment: zacho:
Temp. of outside air in deg. F

Cell: D20
Comment: zacho:
Enthalpy of outside air

Cell: F20
Comment: zacho:
Fraction outside air

Cell: G20
Comment: zacho:
Temperature of mixed air

Cell: H20
Comment: zacho:
Enthalpy of mixed air

Cell: I20
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J20
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K20
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H44
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B45
Comment: zacho:
Motor hp not listed in submittal data provided by TA, nor is it listed on Mfg. website. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0 5 hp for 14,100 cfm ERV

This ERV is 10,010 cfm, so 0.5 x 10,010 ÷ 14,100 = 0 35, so rounded to nearest motor size: 3/8 hp (0.375)

Cell: H45
Comment: zacho:
per "CPS.Carson.hvac.Chiller.specs.2.pdf" for model RTUA125 chiller (which is listed on "CPS.Carson.hvac.schedule.pdf")

Cell: B46
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H46
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B47
Comment: zacho:
Motor efficiency for 1 0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H47
Comment: zacho:
=annual ton hours x 75% load kW/ton

Cell: B49
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B50
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: D56
Comment: zacho:
Per "CPS.Carson.hvac.schedule.pdf", total supply airflow for AHU is 25,480 cfm. Per "Duke.CinciPub_Carson.HRU.specs.2 JPG", ERV Supply is 10,958.

Therefore, Fraction Outside Air = 10,958 ÷ 25,480 = 43.0%

Cell: D62
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (10,958). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (25,480), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "CPS.Carson.hvac.schedule.pdf", total supply airflow for AHU is 25,480 cfm

Per "Duke.CinciPub_Carson.HRU.specs.2.JPG", total outside airflow for AHU is 10,958 cfm

Therefore, Fraction Outside Air = 10,958 ÷ 25,480 = 43.0%

Cell: J64
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A65
Comment: zacho:
Start temperature for bin

Cell: B65
Comment: zacho:
End temperature for bin

Cell: C65
Comment: zacho:
Temp. of outside air in deg. F

Cell: D65
Comment: zacho:
Enthalpy of outside air

Cell: F65
Comment: zacho:
Fraction outside air

Cell: G65

Comment: zacho:
Temperature of mixed air

Cell: H65
Comment: zacho:
Enthalpy of mixed air

Cell: I65
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J65
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K65
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H89
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B90
Comment: zacho:
Motor hp not listed in submittal data provided by TA, nor is it listed on Mfg. website. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0 5 hp for 14,100 cfm ERV

This ERV is 10,958 cfm, so 0.5 x 10,958 ÷ 14,100 = 0 386, so rounded to nearest motor size: 3/8 hp (0.375)

Cell: H90
Comment: zacho:
per "Duke.CPS_BondHill.Chiller.Specs.1.pdf"

Cell: B91
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H91
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B92
Comment: zacho:
Motor efficiency for 1 0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H92
Comment: zacho:
=annual ton hours x 75% load kW/ton

Cell: B94
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B95
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: A104
Comment: zacho:
Degree Days % of Annual x (Sum baseline kW for all energy recovery units)

Cell: A105
Comment: zacho:
Degree Days % of Annual x [(sum of proposed kWh for all energy recovery units) + sum of energy recovery wheel motor kWh used for all energy recovery units)]

Cell: A107
Comment: zacho:
Degree Days % of Maximum x (Sum baseline kW for all energy recovery units)

Cell: A108
Comment: zacho:
Degree Days % of Maximum x [(sum of proposed kW for all energy recovery units) + sum of energy recovery wheel motor kW used for all energy recovery units)]

DETAILED CALCULATIONS - ECM3

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Fairview - HVAC Lighting*	Application #	12-009 MSD	Rev.	0
Project Name	*Cincinnati Public Schools - Fairview - HVAC Lighting*			State	OH
ECM	*2*				

Note: all data from "Duke.CinciPub_Fairview.HRW.Calcs.xlsx" received 3-9-2012, except as otherwise noted

USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin

HEAT RECOVERY WHEEL SAVINGS **HRU-1 (Serves AHU-1)**

Minimum Fraction Outdoor Air:	88.7%	
Heat Recover Effectiveness:	72.7%	
Set Point Temperature:	75	F
Set Point Enthalpy:	28.80	Btu/lba
Supply Air Temperature:	52.25	F
Supply Air Enthalpy:	21.42	Btu/lba
Supply Air Volume:	14,096	cfm
Supply Air Density:	0.075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107.0	0	0	89%	103.4	3.26	0.00	0.00	0.00
100	104	102.0	0	0	89%	98.9	3.26	0.00	0.00	0.00
95	99	96.1	42.6	12	89%	93.7	41.04	6.77	9.32	2.55
90	94	92.2	39.6	41	89%	90.3	38.38	18.10	24.91	6.81
85	89	87.6	37.7	142	89%	86.2	36.69	51.65	71.10	19.44
80	84	82.4	35.0	250	89%	81.6	34.30	63.35	87.20	23.85
75	79	77.2	33.4	287	89%	77.0	32.88	53.96	74.28	20.31
70	74	72.5	31.9	241	100%	72.5	31.90	34.44	47.41	12.97
65	69	68.0	29.1	252	100%	68.0	29.10	3.50	4.81	1.32
60	64	62.6	24.8	322	100%	62.6	24.80	0.00	0.00	0.00
55	59	57.1	21.9	222	100%	57.1	21.90	0.00	0.00	0.00
50	54	52.0	19.2	226	99%	52.3	19.30	0.00	0.00	0.00
45	49	47.5	17.3	151	89%	50.6	18.60	0.00	0.00	0.00
40	44	43.1	15.2	211	89%	46.7	16.74	0.00	0.00	0.00
35	39	37.6	12.9	206	89%	41.8	14.70	0.00	0.00	0.00
30	34	32.4	10.8	135	89%	37.2	12.84	0.00	0.00	0.00
25	29	27.7	9.0	99	89%	33.1	11.24	0.00	0.00	0.00
20	24	23.3	7.5	66	89%	29.2	9.91	0.00	0.00	0.00
15	19	18.3	5.9	36	89%	24.7	8.49	0.00	0.00	0.00
10	14	12.5	4.1	16	89%	19.6	6.90	0.00	0.00	0.00
5	9	7.5	2.7	5	89%	15.1	5.66	0.00	0.00	0.00
0	4	3.0	1.4	0	89%	11.2	4.50	0.00	0.00	0.00
							Annual Total mmBTU:	**231.77**	**319.02**	**87.25**
							Annual Ton-hours:	19,314	26,585	7,271
							Chiller IPLV EER:	13.90	13.90	13.90
							Chiller IPLV kW/Ton:	0.863	0.863	0.863
							Cooling kWh:	**16,674**	**22,951**	**6,277**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**13.61**	**18.74**	**5.12**

Energy recovery wheel motor	
Motor Size hp:	0.5
Load Factor:	0.85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.391**
Motor kWh:	**479**

DETAILED CALCULATIONS - ECM3

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Fairview - HVAC Lighting*	Application #	12-009 MSD	Rev.	0
Project Name	*Cincinnati Public Schools - Fairview - HVAC Lighting*			State	OH
ECM	*2*				

Note: all data from "Duke.CinciPub_Fairview.HRW.Calcs.xlsx" received 3-9-2012, except as otherwise noted

USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin

HEAT RECOVERY WHEEL SAVINGS **HRU-2 (Serves AHU-2)**

Minimum Fraction Outdoor Air:	57.8%	
Heat Recover Effectiveness:	72.6%	
Set Point Temperature:	75	F
Set Point Enthalpy:	28.80	Btu/lba
Supply Air Temperature:	50.85	F
Supply Air Enthalpy:	20.68	Btu/lba
Supply Air Volume:	23,253	cfm
Supply Air Density:	0.075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107	0	0	58%	93.5	12.14	0.00	0.00	0.00
100	104	102	0	0	58%	90.6	12.14	0.00	0.00	0.00
95	99	96.1	42.6	12	58%	87.2	36.78	7.28	10.02	2.74
90	94	92.2	39.6	41	58%	84.9	35.05	19.47	26.80	7.34
85	89	87.6	37.7	142	58%	82.3	33.95	55.56	76.49	20.94
80	84	82.4	35	250	58%	79.3	32.39	68.14	93.82	25.68
75	79	77.2	33.4	287	58%	76.3	31.46	58.04	79.92	21.87
70	74	72.5	31.9	241	100%	72.5	31.90	56.80	78.20	21.40
65	69	68	29.1	252	100%	68.0	29.10	5.76	7.94	2.17
60	64	62.6	24.8	322	100%	62.6	24.80	0.00	0.00	0.00
55	59	57.1	21.9	222	100%	57.1	21.90	0.00	0.00	0.00
50	54	52	19.2	226	100%	52.0	19.20	0.00	0.00	0.00
45	49	47.5	17.3	151	88%	50.9	18.70	0.00	0.00	0.00
40	44	43.1	15.2	211	76%	50.9	18.50	0.00	0.00	0.00
35	39	37.6	12.9	206	65%	50.9	18.53	0.00	0.00	0.00
30	34	32.4	10.8	135	58%	50.4	18.39	0.00	0.00	0.00
25	29	27.7	9	99	58%	47.6	17.35	0.00	0.00	0.00
20	24	23.3	7.5	66	58%	45.1	16.48	0.00	0.00	0.00
15	19	18.3	5.9	36	58%	42.2	15.55	0.00	0.00	0.00
10	14	12.5	4.1	16	58%	38.9	14.51	0.00	0.00	0.00
5	9	7.5	2.7	5	58%	36.0	13.70	0.00	0.00	0.00
0	4	3	1.4	0	58%	33.4	12.95	0.00	0.00	0.00
							Annual Total mmBTU:	**271.05**	**373.19**	**102.14**
							Annual Ton-hours:	22,588	31,100	8,512
							Chiller IPLV EER:	13.90	13.90	13.90
							Chiller IPLV kW/Ton:	0.863	0.863	0.863
							Cooling kWh:	**19,500**	**26,849**	**7,348**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**15.92**	**21.92**	**6.00**

Energy recovery wheel motor	
Motor Size hp:	0.5
Load Factor:	0.85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.391**
Motor kWh:	**479**

DETAILED CALCULATIONS - ECM3

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Fairview - HVAC Lighting*	Application #	12-009 MSD	Rev.	0
Project Name	*Cincinnati Public Schools - Fairview - HVAC Lighting*			State	OH
ECM	*2*				

Note: all data from "Duke.CinciPub_Fairview.HRW.Calcs.xlsx" received 3-9-2012, except as otherwise noted

USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin

HEAT RECOVERY WHEEL SAVINGS **HRU-3 (Serves AHU-3)**

Minimum Fraction Outdoor Air:	53.9%	
Heat Recover Effectiveness:	71.1%	
Set Point Temperature:	75	F
Set Point Enthalpy:	28.80	Btu/lba
Supply Air Temperature:	52.3	F
Supply Air Enthalpy:	21.51	Btu/lba
Supply Air Volume:	23,849	cfm
Supply Air Density:	0.075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107	0	0	54%	92.3	13.27	0.00	0.00	0.00
100	104	102	0	0	54%	89.6	13.27	0.00	0.00	0.00
95	99	96.1	42.6	12	54%	86.4	36.24	6.82	9.59	2.77
90	94	92.2	39.6	41	54%	84.3	34.62	18.23	25.63	7.40
85	89	87.6	37.7	142	54%	81.8	33.60	52.02	73.16	21.13
80	84	82.4	35	250	54%	79.0	32.14	63.80	89.73	25.92
75	79	77.2	33.4	287	54%	76.2	31.28	54.35	76.43	22.08
70	74	72.5	31.9	241	100%	72.5	31.90	57.03	80.21	23.17
65	69	68	29.1	252	100%	68.0	29.10	5.79	8.14	2.35
60	64	62.6	24.8	322	100%	62.6	24.80	0.00	0.00	0.00
55	59	57.1	21.9	222	100%	57.1	21.90	0.00	0.00	0.00
50	54	52	19.2	226	99%	52.3	19.33	0.00	0.00	0.00
45	49	47.5	17.3	151	83%	52.3	19.31	0.00	0.00	0.00
40	44	43.1	15.2	211	71%	52.3	19.12	0.00	0.00	0.00
35	39	37.6	12.9	206	61%	52.3	19.15	0.00	0.00	0.00
30	34	32.4	10.8	135	54%	52.0	19.09	0.00	0.00	0.00
25	29	27.7	9	99	54%	49.5	18.12	0.00	0.00	0.00
20	24	23.3	7.5	66	54%	47.1	17.31	0.00	0.00	0.00
15	19	18.3	5.9	36	54%	44.4	16.45	0.00	0.00	0.00
10	14	12.5	4.1	16	54%	41.3	15.48	0.00	0.00	0.00
5	9	7.5	2.7	5	54%	38.6	14.72	0.00	0.00	0.00
0	4	3	1.4	0	54%	36.2	14.02	0.00	0.00	0.00
							Annual Total mmBTU:	**258.04**	**362.87**	**104.83**
							Annual Ton-hours:	21,503	30,239	8,736
							Chiller IPLV EER:	13.90	13.90	13.90
							Chiller IPLV kW/Ton:	0.863	0.863	0.863
							Cooling kWh:	**18,564**	**26,106**	**7,542**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**15.15**	**21.31**	**6.16**

Energy recovery wheel motor	
Motor Size hp:	0.5
Load Factor:	0.85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.391**
Motor kWh:	**479**

Allocation of annual savings by month (Note: this table prepared by WECC)

Trade ally only provided annual savings numbers. Use % of cooling degree days by month to distribute annual savings appropriately.

Cooling Degree Day Source: http://www.climate-zone.com/climate/united-states/ohio/greater-cincinnati-airport/

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
CDD by Month	0.0	0.0	0.0	0.0	86.0	191.0	313.0	266.0	120.0	20.0	0.0	0.0	996.0
Degree Days % of Annual	0.0%	0.0%	0.0%	0.0%	8.6%	19.2%	31.4%	26.7%	12.0%	2.0%	0.0%	0.0%	100%
Degree Days % of Maximum	0.0%	0.0%	0.0%	0.0%	27.5%	61.0%	100.0%	85.0%	38.3%	6.4%	0.0%	0.0%	
Baseline kWh	0	0	0	0	6,554	14,556	23,854	20,272	9,145	1,524	0	0	75,905
Proposed kWh	0	0	0	0	1,952	4,335	7,104	6,037	2,724	454	0	0	22,605
kWh Savings	0	0	0	0	4,602	10,221	16,750	14,235	6,422	1,070	0	0	53,300
Baseline kW	0.00	0.00	0.00	0.00	17.03	37.81	61.96	52.66	23.76	3.96	0.00	0.00	61.96
Proposed kW	0.00	0.00	0.00	0.00	5.07	11.26	18.45	15.68	7.07	1.18	0.00	0.00	18.45
kW Savings	0.00	0.00	0.00	0.00	11.95	26.55	43.51	36.98	16.68	2.78	0.00	0.00	43.51

Cell: A9
Comment: zacho:
This text is from TA calculations. Don't have a copy, but file name (TMY3) indicates they used typical 30 year average temperature data.

Cell: D12
Comment: zacho:
Per "Duke.CinciPub_Fairview.HRW.specs.5.JPG", total supply airflow for AHU is 14,096 cfm. Per "Duke.CinciPub_Fairview.HRW.specs.2.JPG", ERV Supply is 12,500.

Therefore, Fraction Outside Air = 12,500 ÷ 14,096 = 88.7%

Cell: D18
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (12,500). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (14,096), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CinciPub_Fairview.HRW.specs.5.JPG", total supply airflow for AHU is 14,096 cfm

Per "Duke.CinciPub_Fairview.HRW.specs.2.JPG", total outside airflow for AHU is 12,500 cfm

Therefore, Fraction Outside Air = 12,500 ÷ 14,096 = 88.7%

Cell: J20
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A21
Comment: zacho:
Start temperature for bin

Cell: B21
Comment: zacho:
End temperature for bin

Cell: C21
Comment: zacho:
Temp. of outside air in deg. F

Cell: D21
Comment: zacho:
Enthalpy of outside air

Cell: F21
Comment: zacho:
Fraction outside air

Cell: G21
Comment: zacho:
Temperature of mixed air

Cell: H21
Comment: zacho:
Enthalpy of mixed air

Cell: I21
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J21
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K21
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H45
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B46
Comment: zacho:
Motor hp not listed in submittal data provided by TA. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0.5 hp for 14,100 cfm ERV

This ERV is 12,500 cfm, so 0.5 x 12,500 ÷ 14,100 = 0.44, so rounded to nearest motor size: 1/2 hp (0.5)

Cell: H46
Comment: zacho:

per "Duke.CinciPub_Fairview.Chiller.Specs.2.pdf" for model RTUA225 chiller (which is listed on "Duke.CinciPub_Fairview.Chiller.Specs.1.JPG")

Cell: B47
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H47
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B48
Comment: zacho:
Motor efficiency for 1.0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for this motor.

Cell: H48
Comment: zacho:
=annual ton hours x Chiller IPLV kW/ton

Cell: B50
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B51
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: D57
Comment: zacho:
Per "Duke.CinciPub_Fairview.HRW.specs.4.JPG", total supply airflow for AHU is 23,253 cfm. Per "Duke.CinciPub_Fairview.HRW.specs.4.JPG", ERV Supply is 13,449.

Therefore, Fraction Outside Air = 13,449 ÷ 23,253 = 57.8%

Cell: D63
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (13,449). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (23,253), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CinciPub_Fairview.HRW.specs.4.JPG", total supply airflow for AHU is 23,253 cfm

Per "Duke.CinciPub_Fairview.HRW.specs.4.JPG", total outside airflow for AHU is 13,449 cfm

Therefore, Fraction Outside Air = 13,449 ÷ 23,253 = 57.8%

Cell: J65
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A66
Comment: zacho:
Start temperature for bin

Cell: B66
Comment: zacho:
End temperature for bin

Cell: C66
Comment: zacho:
Temp. of outside air in deg. F

Cell: D66
Comment: zacho:
Enthalpy of outside air

Cell: F66
Comment: zacho:
Fraction outside air

Cell: G66
Comment: zacho:
Temperature of mixed air

Cell: H66
Comment: zacho:
Enthalpy of mixed air

Cell: I66
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J66

Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K66
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H90
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B91
Comment: zacho:
Motor hp not listed in submittal data provided by TA, nor is it listed on Mfg. website. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0.5 hp for 14,100 cfm ERV

This ERV is 13,449 cfm, so 0.5 x 13,449 ÷ 14,100 = 0.478, so rounded to nearest motor size: 1/2 hp (0.5)

Cell: H91
Comment: zacho:
per "Duke.CinciPub_Fairview.Chiller.Specs.2.pdf" for model RTUA225 chiller (which is listed on "Duke.CinciPub_Fairview.Chiller.Specs.1.JPG")

Cell: B92
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H92
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B93
Comment: zacho:
Motor efficiency for 1.0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H93
Comment: zacho:
=annual ton hours x 75% load kW/ton

Cell: B95
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B96
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: D102
Comment: zacho:
Per "Duke.CinciPub_Fairview.HRW.specs.4.JPG", total supply airflow for AHU is 23,849 cfm. Per "Duke.CinciPub_Fairview.HRW.specs.4.JPG", ERV Supply is 12,862.

Therefore, Fraction Outside Air = 12,862 ÷ 23,849 = 53.9%

Cell: D108
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (12,862). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (23,849), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CinciPub_Fairview.HRW.specs.4.JPG", total supply airflow for AHU is 23,849 cfm

Per "Duke.CinciPub_Fairview.HRW.specs.4.JPG", total outside airflow for AHU is 12,862 cfm

Therefore, Fraction Outside Air = 12,862 ÷ 23,849 = 53.9%

Cell: J110
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A111
Comment: zacho:
Start temperature for bin

Cell: B111
Comment: zacho:
End temperature for bin

Cell: C111
Comment: zacho:

Temp. of outside air in deg. F

Cell: D111
Comment: zacho:
Enthalpy of outside air

Cell: F111
Comment: zacho:
Fraction outside air

Cell: G111
Comment: zacho:
Temperature of mixed air

Cell: H111
Comment: zacho:
Enthalpy of mixed air

Cell: I111
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J111
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K111
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H135
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B136
Comment: zacho:
Motor hp not listed in submittal data provided by TA, nor is it listed on Mfg. website. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0.5 hp for 14,100 cfm ERV

This ERV is 12,862 cfm, so 0.5 x 12,862 ÷ 14,100 = 0.456, so rounded to nearest motor size: 1/2 hp (0.5)

Cell: H136
Comment: zacho:
per "Duke.CinciPub_Fairview.Chiller.Specs.2.pdf" for model RTUA225 chiller (which is listed on "Duke.CinciPub_Fairview.Chiller.Specs.1.JPG")

Cell: B137
Comment: zacho:
Estimate...typically between 80-90%, so chose 85% load factor.

Cell: H137
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B138
Comment: zacho:
Motor efficiency for 1.0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H138
Comment: zacho:
=annual ton hours x 75% load kW/ton

Cell: B140
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B141
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: A150
Comment: zacho:
Degree Days % of Annual x (Sum baseline kW for all energy recovery units)

Cell: A151
Comment: zacho:
Degree Days % of Annual x [(sum of proposed kWh for all energy recovery units) + sum of energy recovery wheel motor kWh used for all energy recovery units)]

Cell: A153

Comment: zacho:
Degree Days % of Maximum x (Sum baseline kW for all energy recovery units)

Cell: A154
Comment: zacho:
Degree Days % of Maximum x [(sum of proposed kW for all energy recovery units) + sum of energy recovery wheel motor kW used for all energy recovery units)]

DETAILED CALCULATIONS - ECM4

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Kilgour - Lighting*	Application #	12-010	Rev.	0
Project Name	*Cincinnati Public Schools - Kilgour - Lighting*			State	OH
ECM	*1*				

Note: all data from "Duke.CinciPub_Kilgour.Lighting.Count.xlsx" received 3/9/12, except as otherwise noted

2,730	hr/yr operation - before implementation
2,730	hr/yr operation - after implementation

Only show total savings

Line items not 1 for 1 match between Baseline and Proposed Sections

	Baseline (Code)						Proposed						Savings			
Site ID	Space Type	Square Feet	Watts per Sq Ft	kw per fixture	total kw	kw-hr/yr	Fixture	Qty	Watts per fixture	kw per fixture	total kw	kw-hr/yr	kw	kw-hr/yr	Other Annual Savings	Total Implementation Costs
1	Classroom	23,665	1.40		33.1	90,448	CH1	32	58	0.058	1.9	5,067				$ 3,008
	Conference Room	739	1.30		1.0	2,623	CL3	12	91	0.091	1.1	2,981				$ 1,308
	Dining	2,810	0.90		2.5	6,904	CL4	1	91	0.091	0.1	248				$ 95
	Food Prep	871	1.20		1.0	2,853	R1	147	91	0.091	13.4	36,519				$ 13,965
	Gym	5,957	2.30		13.7	37,404	R2	7	91	0.091	0.6	1,739				$ 735
	Hall	16,437	0.50		8.2	22,437	R3	96	91	0.091	8.7	23,849				$ 10,080
	Laboratory	1,654	1.40		2.3	6,322	R3A	23	91	0.091	2.1	5,714				$ 2,415
	Laundry	48	0.60		0.0	79	R4	66	91	0.091	6.0	16,396				$ 6,270
	Lobby	1,170	1.30		1.5	4,152	R4A	19	91	0.091	1.7	4,720				$ 1,805
	Locker	699	0.60		0.4	1,145	R5	14	75	0.075	1.1	2,867				$ 1,666
	Lounge	511	1.20		0.6	1,674	R7	14	35	0.035	0.5	1,338				$ 2,982
	Mail Sorting	486	1.20		0.6	1,592	R8	29	88	0.088	2.6	6,967				$ 7,714
	Mech/Elec	3,011	1.50		4.5	12,330	R9	3	32	0.032	0.1	262				$ 225
	Nurse	226	1.00		0.2	617	S1	25	458	0.458	11.5	31,259				$ 5,250
	Office	1,012	1.10		1.1	3,039	S2	151	90	0.090	13.6	37,101				$ 46,206
	Reading	1,200	1.20		1.4	3,931	S3	18	64	0.064	1.2	3,145				$ 11,502
	Restroom	2,443	0.90		2.2	6,002	S4	7	148	0.148	1.0	2,828				$ 1,071
	Stacks	100	1.70		0.2	464	S5	2	90	0.090	0.2	491				$ 1,278
	Stairs	1,782	0.60		1.1	2,919	S6	4	64	0.064	0.3	699				$ 2,556
	Storage	1,676	0.80		1.3	3,660	T1	0	250	0.250	0.0	0				$ -
	Workshop	735	1.90		1.4	3,812	W1	1	129	0.129	0.1	352				$ 189
							W2	6	14	0.014	0.1	229				$ 306
							W3	0	150	0.150	0.0	0				$ -
							W4	17	57	0.057	1.0	2,645				$ 1,326
							W5	16	36	0.036	0.6	1,572				$ 960
							W6	0	186	0.186	0.0	0				$ -
							W7	1	90	0.090	0.1	246				$ 163
Totals		**67,232**			**78.5**	**214,408**		**711**			**69.3**	**189,235**	**9.2**	**25,172**	**$ -**	**$ 123,075**
												% of total cost that is incremental cost over code-efficient lighting system:				10.0%
												Total Incremental Project Cost:				$ 12,308

Cell: H12
Comment: zacho:
Proposed fixture type, quantity, and watts per fixture from "Duke.CinciPub_Kilgour.Lighting.Count.xlsx"

Cell: Q12
Comment: zacho:
Install Costs are per "Duke.CinciPub.Kilgour.PoP Signed.pdf"

Cell: J14
Comment: zacho:
Fixture input watts per "Duke.CinciPub_kilgour.Lighting.Specs6.pdf" and "Duke.CinciPub_kilgour.Lighting.Specs7.pdf"

Cell: J15
Comment: zacho:
Per "2012-03-09 email fm D Dumond re tech info response to 12-010.pdf", no IES files were available for CL3 fixture. Therefore, calculated input watts based on: 3 lamps x 32 watts per lamp x 0.95 estimated ballast factor = 91W

Cell: H16
Comment: zacho:
Per "2012-03-09 email fm D Dumond re tech info response to 12-010.pdf", CL4 replaced 1 R4 fixture per Bulletin 18.It is the same as Fixture CL3

Cell: Q16
Comment: zacho:
Per comment cell H15, CL4 fixture replaced one R4 fixture, so assumed same per-fixture cost as CL4.

Cell: H20
Comment: zacho:
Per "2012-03-09 email fm D Dumond re tech info response to 12-010.pdf", R3A replaced R3 per Bulletin 18. It is the same as fixture R3.

Cell: H22
Comment: zacho:
Per "2012-03-09 email fm D Dumond re tech info response to 12-010.pdf", R4A replaced R4 per Bulletin 18. It is the same as fixture R4.

Cell: J23
Comment: zacho:
Per "Duke.CinciPub_kilgour.Lighting.Specs9.pdf" and "Duke.CinciPub_kilgour.Lighting.Specs10.pdf"

Cell: J24
Comment: zacho:
per "Duke.CinciPub_kilgour.Lighting.Specs4.pdf", specific IES files for this fixture don't exist. Calculated based on 1.1 ballast factor:

32W lamp x 1 lamp x 1.1 Ballast Factor = 35 input watts

Cell: J25
Comment: zacho:
Per "Duke.CinciPub_kilgour.Lighting.Specs11.pdf" and "Duke.CinciPub_kilgour.Lighting.Specs12.pdf"

Cell: J27
Comment: zacho:
Per "Duke.CinciPub_kilgour.Lighting.Specs13.pdf" and "Duke.CinciPub_kilgour.Lighting.Specs14.pdf"

Cell: H30
Comment: zacho:
per "Duke.CinciPub_kilgour.Lighting.Specs4.pdf", no IES files exist for exact fixture. Therefore, used input watts for similar fixture with (1) 32W CFL lamp (37W) and multiplied by number of lamps in fixture S4 (4):
37W x 4 = 148W

Cell: J30
Comment: zacho:
(4) at 37W input each, for total of 148W

Cell: I33
Comment: zacho:
Per "2012-03-09 email fm D Dumond re tech info response to 12-010.pdf", this fixture is excluded per exception M under ASHRAE 90.1 9.2.2.3 (stage lighting) as long as it's controlled independently from general lighitng.

Cell: J34
Comment: zacho:
Per "Duke.CinciPub_kilgour.Lighting.Specs15.pdf"

Cell: I36
Comment: zacho:
Per "2012-03-09 email fm D Dumond re tech info response to 12-010.pdf", was excluded since couldn't locate on the plans.

Cell: J38
Comment: zacho:
Updated from 30W to 36W to match product data in "Duke.CinciPub_kilgour.Lighting.Specs1.pdf"

Cell: I39
Comment: zacho:
Per "2012-03-09 email fm D Dumond re tech info response to 12-010.pdf", excluded since only used on exterior of building.

Cell: J39
Comment: zacho:
Estimated per Xcel Energy's Input Wattage Guide: 70W MH = 93 watts, this fixture has two 70W MH

Cell: J40
Comment: zacho:
Fixture input watts per "Duke.CinciPub_kilgour.Lighting.Specs8.pdf"

Cell: Q42
Comment: zacho:
Estimate based on professional judgement

DETAILED CALCULATIONS - ECM5

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Mt Airy - HVAC Lighting*	Application #	12-011 MSD	Rev.	0
Project Name	*Cincinnati Public Schools - Mt Airy - HVAC Lighting*			State	OH
ECM	*1*				

Note: all data from "Duke.CinciPub_MTAiry.Lighting.Form.xls", except as otherwise noted

2,080	hr/yr operation - before implementation
2,080	hr/yr operation - after implementation

Only show total savings

Line items not 1 for 1 match between Baseline and Proposed Sections

	Baseline (Code)						Proposed						Savings			
Site ID	Building Area Type	Square Feet	Watts per Sq Ft	kw per fixture	total kw	kw-hr/yr	Fixture	Qty	Watts per fixture	kw per fixture	total kw	kw-hr/yr	kw	kw-hr/yr	Other Annual Savings	Total Implementation Costs
1	School	84,144	1.20		101.0	210,023	B10	24	240	0.240	5.8	11,981				$ 2,760
							B2	50	61	0.061	3.1	6,344				$ 4,500
							B3	724	91	0.091	65.9	137,039				$ 68,780
							B5	8	87.6	0.088	0.7	1,458				$ 1,496
							B7	16	91	0.091	1.5	3,028				$ 2,928
							B8	4	67	0.067	0.3	557				$ 748
							C1	19	61	0.061	1.2	2,411				$ 1,786
							F1	19	50	0.050	1.0	1,976				$ 1,786
							F4	16	200	0.200	3.2	6,656				$ 832
							H1	35	176	0.176	6.2	12,813				$ 2,730
Totals		**84,144**			**101.0**	**210,023**		**915**			**88.6**	**184,263**	**12.4**	**25,761**	**$ -**	**$ 88,346**
								% of total cost that is incremental cost over code-efficient lighting system:								10.0%
													Total Incremental Project Cost:			$ 8,835

Cell: B9
Comment: zacho:
Per updated "Duke.CinciPub_MTAiry.Lighting.Form.xls" received 3/9/12.

Cell: H12
Comment: zacho:
Proposed fixture type, quantity, and watts per fixture from "Duke.CinciPub_MTAiry.Lighting.Count.xlsx"

Cell: Q12
Comment: zacho:
Install Costs are per "Duke.CinciPub.Mt Airy.PoP Signed.pdf"

Cell: J14
Comment: zacho:
Revised from 200 to 240W to match IES data file from manufacturer's website ("FSK444T5HPS.IES" and "FSK-44-B-4-T5HO-S-120-G-PS-WH.pdf")

Cell: J15
Comment: zacho:
Revised from 56 to 61W to match product data ("Duke.CinciPub_MTAiry.Lighting.Specs1.pdf" and "Duke.CinciPub_MTAiry.Lighting.Specs2.pdf")

Cell: J16
Comment: zacho:
Revised from 85 to 91W to match product data ("Duke.CinciPub_MTAiry.Lighting.Specs1.pdf" and "Duke.CinciPub_MTAiry.Lighting.Specs2.pdf")

Cell: J17
Comment: zacho:
Per "Duke.CinciPub_MtAiry.Lighting.Specs4.pdf"

Cell: J18
Comment: zacho:
Revised from 85 to 91W to match product data ("Duke.CinciPub_MTAiry.Lighting.Specs1.pdf" and "Duke.CinciPub_MTAiry.Lighting.Specs2.pdf")

Cell: J19
Comment: zacho:
Revised from 57 to 67W to match product data ("Duke.CinciPub_MTAiry.Lighting.Specs1.pdf" and "Duke.CinciPub_MTAiry.Lighting.Specs2.pdf")

Cell: J20
Comment: zacho:
Revised from 56 to 61W to match product data ("Duke.CinciPub_MTAiry.Lighting.Specs1.pdf" and "Duke.CinciPub_MTAiry.Lighting.Specs2.pdf")

Cell: H23
Comment: zacho:
Labeled as fixture "H" in application, but product data refers to as "H1"

Cell: Q25
Comment: zacho:

Estimate based on professional judgment

DETAILED CALCULATIONS - ECM6

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Mt Airy - HVAC Lighting*	Application #	12-011 MSD	Rev.	0
Project Name	*Cincinnati Public Schools - Mt Airy - HVAC Lighting*			State	OH
ECM	*2*				

Note: all data from "Duke.CinciPub_Mt. Airy.HRW.Calcs.xlsx" received 3-9-2012, except as otherwise noted

USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin
HEAT RECOVERY WHEEL SAVINGS **AHU-1**

Minimum Fraction Outdoor Air:	38.8%
Heat Recover Effectiveness:	80.0%
Set Point Temperature:	75 F
Set Point Enthalpy:	28.14 Btu/lba
Supply Air Temperature:	53 F
Supply Air Enthalpy:	21.63 Btu/lba
Supply Air Volume:	37,000 cfm
Supply Air Density:	0.075 lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107.0	0	0	39%	87.4	17.23	0.00	0.00	0.00
100	104	102.0	0	0	39%	85.5	17.23	0.00	0.00	0.00
95	99	96.1	42.6	12	39%	83.2	33.75	8.96	11.20	2.24
90	94	92.2	39.6	41	39%	81.7	32.59	24.27	30.34	6.07
85	89	87.6	37.7	142	39%	79.9	31.85	70.11	87.64	17.53
80	84	82.4	35.0	250	39%	77.9	30.80	88.57	110.71	22.14
75	79	77.2	33.4	287	39%	75.9	30.18	77.96	97.45	19.49
70	74	72.5	31.9	241	100%	72.5	31.90	120.64	150.80	30.16
65	69	68.0	29.1	252	100%	68.0	29.10	32.16	40.20	8.04
60	64	62.6	24.8	322	100%	62.6	24.80	0.00	0.00	0.00
55	59	57.1	21.9	222	100%	57.1	21.90	0.00	0.00	0.00
50	54	52.0	19.2	226	96%	53.0	19.59	0.00	0.00	0.00
45	49	47.5	17.3	151	80%	53.0	19.47	0.00	0.00	0.00
40	44	43.1	15.2	211	69%	53.0	19.22	0.00	0.00	0.00
35	39	37.6	12.9	206	59%	53.0	19.18	0.00	0.00	0.00
30	34	32.4	10.8	135	52%	53.0	19.19	0.00	0.00	0.00
25	29	27.7	9.0	99	47%	53.0	19.24	0.00	0.00	0.00
20	24	23.3	7.5	66	43%	53.0	19.36	0.00	0.00	0.00
15	19	18.3	5.9	36	39%	53.0	19.51	0.00	0.00	0.00
10	14	12.5	4.1	16	39%	50.8	18.82	0.00	0.00	0.00
5	9	7.5	2.7	5	39%	48.8	18.27	0.00	0.00	0.00
0	4	3.0	1.4	0	39%	47.1	17.77	0.00	0.00	0.00
							Annual Total mmBTU	**422.67**	**528.33**	**105.67**
							Annual Ton-hours	35,222	44,028	8,806
							Chiller IPLV EER:	13.30	13.30	13.30
							Chiller IPLV kW/Ton:	0.902	0.902	0.902
							Cooling kWh:	**31,780**	**39,724**	**7,945**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**25.94**	**32.43**	**6.49**

Energy recovery wheel motor	
Motor Size hp:	0.5
Load Factor:	0.85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.391**
Motor kWh:	**479**

DETAILED CALCULATIONS - ECM6

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Mt Airy - HVAC Lighting*	Application #	12-011 MSD	Rev.	0
Project Name	*Cincinnati Public Schools - Mt Airy - HVAC Lighting*			State	OH
ECM	*2*				

Note: all data from "Duke.CinciPub_Mt. Airy.HRW.Calcs.xlsx" received 3-9-2012, except as otherwise noted
USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin
HEAT RECOVERY WHEEL SAVINGS **AHU-2**

Minimum Fraction Outdoor Air:	34.4%	
Heat Recover Effectiveness:	85.0%	
Set Point Temperature:	75	F
Set Point Enthalpy:	28.14	Btu/lba
Supply Air Temperature:	53	F
Supply Air Enthalpy:	21.74	Btu/lba
Supply Air Volume:	24,000	cfm
Supply Air Density:	0.075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107	0	0	34%	86.0	18.47	0.00	0.00	0.00
100	104	102	0	0	34%	84.3	18.47	0.00	0.00	0.00
95	99	96.1	42.6	12	34%	82.3	33.11	5.47	6.44	0.97
90	94	92.2	39.6	41	34%	80.9	32.08	14.82	17.44	2.62
85	89	87.6	37.7	142	34%	79.3	31.43	42.83	50.39	7.56
80	84	82.4	35	250	34%	77.5	30.50	54.10	63.65	9.55
75	79	77.2	33.4	287	34%	75.8	29.95	47.62	56.02	8.40
70	74	72.5	31.9	241	100%	72.5	31.90	83.14	97.81	14.67
65	69	68	29.1	252	100%	68.0	29.10	22.16	26.07	3.91
60	64	62.6	24.8	322	100%	62.6	24.80	0.00	0.00	0.00
55	59	57.1	21.9	222	100%	57.1	21.90	0.00	0.00	0.00
50	54	52	19.2	226	96%	53.0	19.59	0.00	0.00	0.00
45	49	47.5	17.3	151	80%	53.0	19.47	0.00	0.00	0.00
40	44	43.1	15.2	211	69%	53.0	19.22	0.00	0.00	0.00
35	39	37.6	12.9	206	59%	53.0	19.18	0.00	0.00	0.00
30	34	32.4	10.8	135	52%	53.0	19.19	0.00	0.00	0.00
25	29	27.7	9	99	47%	53.0	19.24	0.00	0.00	0.00
20	24	23.3	7.5	66	43%	53.0	19.36	0.00	0.00	0.00
15	19	18.3	5.9	36	39%	53.0	19.51	0.00	0.00	0.00
10	14	12.5	4.1	16	35%	53.0	19.68	0.00	0.00	0.00
5	9	7.5	2.7	5	34%	51.8	19.40	0.00	0.00	0.00
0	4	3	1.4	0	34%	50.3	18.95	0.00	0.00	0.00
							Annual Total mmBTU	**270.15**	**317.83**	**47.67**
							Annual Ton-hours	22,513	26,486	3,973
							Chiller IPLV EER:	13.30	13.30	13.30
							Chiller IPLV kW/Ton:	0.902	0.902	0.902
							Cooling kWh:	**20,312**	**23,897**	**3,585**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**16.58**	**19.51**	**2.93**

Energy recovery wheel motor	
Motor Size hp:	0.333
Load Factor:	0.85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.261**
Motor kWh:	**319**

Allocation of annual savings by month (Note: this table prepared by WECC)
Trade ally only provided annual savings numbers. Use % of cooling degree days by month to distribute annual savings appropriately.
Cooling Degree Day Source: http://www.climate-zone.com/climate/united-states/ohio/greater-cincinnati-airport/

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
CDD by Month	0.0	0.0	0.0	0.0	86.0	191.0	313.0	266.0	120.0	20.0	0.0	0.0	996.0
Degree Days % of Annual	0.0%	0.0%	0.0%	0.0%	8.6%	19.2%	31.4%	26.7%	12.0%	2.0%	0.0%	0.0%	100%
Degree Days % of Maximum	0.0%	0.0%	0.0%	0.0%	27.5%	61.0%	100.0%	85.0%	38.3%	6.4%	0.0%	0.0%	
Baseline kWh	0	0	0	0	5,493	12,200	19,993	16,991	7,665	1,278	0	0	63,621
Proposed kWh	0	0	0	0	1,064	2,364	3,874	3,292	1,485	248	0	0	12,328
kWh Savings	0	0	0	0	4,429	9,836	16,119	13,699	6,180	1,030	0	0	51,293
Baseline kW	0.00	0.00	0.00	0.00	14.27	31.69	51.94	44.14	19.91	3.32	0.00	0.00	51.94
Proposed kW	0.00	0.00	0.00	0.00	2.77	6.14	10.06	8.55	3.86	0.64	0.00	0.00	10.06
kW Savings	0.00	0.00	0.00	0.00	11.50	25.55	41.87	35.58	16.05	2.68	0.00	0.00	41.87

Cell: A9
Comment: zacho:
This text is from TA calculations. Don't have a copy, but file name (TMY3) indicates they used typical 30 year average temperature data.

Cell: D12
Comment: zacho:
Per "Duke.CPS.HRW.Specs.TIF", total supply airflow for AHU is 37,000 cfm and ERV Supply is 14,350.

Therefore, Fraction Outside Air = 14,350 ÷ 37,000 = 38.8%

Cell: D18
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (14,350). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (37,000), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CPS.HRW.Specs.TIF", total supply airflow for AHU is 37,000 cfm

Per "Duke.CPS.HRW.Specs.TIF", total outside airflow for AHU is 14,350 cfm

Therefore, Fraction Outside Air = 14,350 ÷ 37,000 = 38.8%

Cell: J20
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A21
Comment: zacho:
Start temperature for bin

Cell: B21
Comment: zacho:
End temperature for bin

Cell: C21
Comment: zacho:
Temp. of outside air in deg. F

Cell: D21
Comment: zacho:
Enthalpy of outside air

Cell: F21
Comment: zacho:
Fraction outside air

Cell: G21
Comment: zacho:
Temperature of mixed air

Cell: H21
Comment: zacho:
Enthalpy of mixed air

Cell: I21
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J21
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K21
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H45
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B46
Comment: zacho:
Motor hp not listed in submittal data provided by TA, nor is it listed on Mfg. website. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0.5 hp for 14,100 cfm ERV

This ERV is 14,350 cfm, so assume same motor hp as Bond Hill project.

Cell: H46
Comment: zacho:

per "Duke.CPS_MTAiry.Chiller.Specs.1.pdf" for model RTAC200 chiller (which is listed on "Duke.CPS_MTAiry.Chiller.Specs.2.JPG")

Cell: B47
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H47
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B48
Comment: zacho:
Motor efficiency for 1.0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H48
Comment: zacho:
=annual ton hours x Chiller IPLV kW/ton

Cell: B50
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B51
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: D57
Comment: zacho:
Per "Duke.CPS.HRW.Specs.TIF", total supply airflow for AHU is 24,000 cfm and ERV Supply is 8,250.

Therefore, Fraction Outside Air = 8,250 ÷ 24,000 = 34.4%

Cell: D63
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (8,250). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (24,000), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CPS.HRW.Specs.TIF", total supply airflow for AHU is 24,000 cfm

Per "Duke.CPS.HRW.Specs.TIF", total outside airflow for AHU is 8,250 cfm

Therefore, Fraction Outside Air = 8,250 ÷ 24,000 = 34.4%

Cell: J65
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A66
Comment: zacho:
Start temperature for bin

Cell: B66
Comment: zacho:
End temperature for bin

Cell: C66
Comment: zacho:
Temp. of outside air in deg. F

Cell: D66
Comment: zacho:
Enthalpy of outside air

Cell: F66
Comment: zacho:
Fraction outside air

Cell: G66
Comment: zacho:
Temperature of mixed air

Cell: H66
Comment: zacho:
Enthalpy of mixed air

Cell: I66
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J66

Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K66
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H90
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B91
Comment: zacho:
Motor hp not listed in submittal data provided by TA, nor is it listed on Mfg. website. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0.5 hp for 14,100 cfm ERV

This ERV is 8,250 cfm, so 0.5 x 8,250 ÷ 14,100 = 0.29, so rounded to nearest motor size: 1/3 hp (0.333)

Cell: H91
Comment: zacho:
per "Duke.CPS_MTAiry.Chiller.Specs.1.pdf" for model RTAC200 chiller (which is listed on "Duke.CPS_MTAiry.Chiller.Specs.2.JPG")

Cell: B92
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H92
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B93
Comment: zacho:
Motor efficiency for 1.0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H93
Comment: zacho:
=annual ton hours x Chiller IPLV kW/ton

Cell: B95
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B96
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

DETAILED CALCULATIONS - ECM7

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Pleasant Ridge - HVAC Lighting*	Application #	12-012	Rev.	0
Project Name	*Cincinnati Public Schools - Pleasant Ridge - HVAC Lighting*			State	OH
ECM	*1*				

Note: all data from "Duke.CinciPub_PleasantRidge.custom.lighting.form.xls", except as otherwise noted

Lighting Product data supplied by TA for this project is general spec sheets from manufacturer's website (vs. actual lighting submittal for the project that was submitted for other CPS MDS projects.

1,800	hr/yr operation - before implementation
1,800	hr/yr operation - after implementation

Only show total savings

Line items not 1 for 1 match between Baseline and Proposed Sections

	Baseline (Code)						Proposed						Savings			
Site ID	Building Area Type	Square Feet	Watts per Sq Ft	kw per fixture	total kw	kw-hr/yr	Fixture	Qty	Watts per fixture	kw per fixture	total kw	kw-hr/yr	kw	kw-hr/yr	Other Annual Savings	Total Implementation Costs
1	School	75,310	1.20		90.4	162,670	B4	18	112	0.112	2.0	3,629				$ 2,142
							B4G	5	112	0.112	0.6	1,008				$ 595
							C1	36	58	0.058	2.1	3,758				$ 6,408
							C1G	2	58	0.058	0.1	209				$ 356
							D1	3	265	0.265	0.8	1,429				$ 1,917
							D2	2	441	0.441	0.9	1,588				$ 1,278
							D4	9	176	0.176	1.6	2,858				$ 5,751
							F1	63	56	0.056	3.5	6,350				$ 10,332
							F2	3	55	0.055	0.2	295				$ 105
							F4	3	56	0.056	0.2	302				$ 492
							H1	30	202	0.202	6.0	10,886				$ 4,620
							H1G	10	202	0.202	2.0	3,629				$ 1,540
							K3	0	58	0.058	0.0	0				$ -
							R1	707	58	0.058	41.0	73,811				$ 125,846
							R2	27	39	0.039	1.1	1,895				$ 3,726
							R3	12	31	0.031	0.4	670				$ 3,516
Totals		**75,310**			**90.4**	**162,670**		**930**			**62.4**	**112,317**	**28.0**	**50,353**	**$ -**	**$ 168,624**
								% of total cost that is incremental cost over code-efficient lighting system:								10.0%
													Total Incremental Project Cost:			$ 16,862

Cell: B11
Comment: zacho:
Per "Duke.CinciPub_PleasantRidge.custom.lighting.form.xls" received 3/9/12, which listed 1800 annual hours (this is equivalent to 8 hrs/day x 5 days/wk x 45 wks).

Daily schedule in "Duke.CinciPub_PleasantRidge.custom.lighting.form.xls" listed 8.5 hours/day x 5 days/wk x 45 wks (for annual total of 1,912.5), but went with 1,800 hours to be conservative.

Cell: H14
Comment: zacho:
Proposed fixture type, quantity, and watts per fixture from "Duke.CinciPub_PleasantRidge.Lighting.Count.xlsx"

Cell: Q14
Comment: zacho:
Install Costs are per "Duke.CinciPub_PleasantRidge.PoP Signed.pdff"

Cell: J16
Comment: zacho:
Per "Duke.CinciPub_PleasantRidge.Lighting.Specs.13.pdf"

Cell: J17
Comment: zacho:
Per "Duke.CinciPub_PleasantRidge.Lighting.Specs.13.pdf"

Cell: J18
Comment: zacho:
Per "Duke.CinciPub_PleasantRidge.Lighting.Specs.11.pdf"

Cell: J19
Comment: zacho:
Per "Duke.CinciPub_PleasantRidge.Lighting.Specs.11.pdf"

Cell: H20
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J20
Comment: zacho:
Per "e601.pdf" this as 9 lamp 28W T8 fixture, which has 3 lamps in cross section for 12 ft (3 bulb) long suspended direct/indirect fixture. Lamps are 28W T5.

Cell: H21
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J21
Comment: zacho:
Per "e601.pdf" this as 15 lamp 28W T8 fixture, which has 3 lamps in cross section for 20 ft (5 bulb) long suspended direct/indirect fixture. Lamps are 28W T5.

Cell: H22
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J22
Comment: zacho:
Per "e601.pdf" this as 6 lamp 28W T8 fixture, which has 3 lamps in cross section for 8 ft (2 bulb) long suspended direct/indirect fixture. Lamps are 28W T5.

Cell: J23
Comment: zacho:
Input watts per "Duke.CinciPub_PleasantRidge.Lighting.Specs.9.pdf"

Cell: H24
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J24
Comment: zacho:
(2) 26W CFL fixture

Cell: J25
Comment: zacho:
Input watts per "Duke.CinciPub_PleasantRidge.Lighting.Specs.9.pdf"

Cell: H26
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J26
Comment: zacho:
6 lamp 32W T8 high bay

Cell: H27
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J27
Comment: zacho:
6 lamp 32W T8 high bay

Cell: J30
Comment: zacho:
Changed watts per fixture from 25 to 39 to match product data ("Duke.CinciPub_PleasantRidge.Lighting.Specs.2.pdf")

Cell: Q33
Comment: zacho:
Estimate based on professional judgment

DETAILED CALCULATIONS - ECM8

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Pleasant Ridge - HVAC Lightir*	Application #	12-012	Rev.	0
Project Name	*Cincinnati Public Schools - Pleasant Ridge - HVAC Lighting*			State	OH
ECM	*2*				

Note: all data from "Duke.CinciPub_PleasantRidge.HRW.Calcs.xlsx" received 3-9-2012, except as otherwise noted

Savings are based off of Air Handling Unit and Energy Recovery Unit information on mechanical equipment schedule drawing. Per TA email "2012-03-09 email fm D Dumond re tech info response to 12-012.pdf": "No further data was available on in the form of submittals for the air handlers or heat wheels at this time. If the data provided is insufficient then the project will have to be stricken."

For other CPS Projects (12-007 to 12-009, 12-011, 12-014), energy recovery unit submittals have closely matched mechanical equipment schedules. Therefore (and since all other technical information requested was provided), WECC left this ECM in the project.

USA_OH_Cincinnati.Muni AP-Lunken.Field.724297_TMY3.bin
HEAT RECOVERY WHEEL SAVINGS **AHU-1**

Minimum Fraction Outdoor Air:	40.2%	
Heat Recover Effectiveness:	79.6%	
Set Point Temperature:	75	F
Set Point Enthalpy:	28.14	Btu/lba
Supply Air Temperature:	52 8	F
Supply Air Enthalpy:	21.45	Btu/lba
Supply Air Volume:	33,700	cfm
Supply Air Density:	0.075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107.0	0	0	40%	87.9	16.83	0.00	0 00	0.00
100	104	102.0	0	0	40%	85.9	16.83	0.00	0 00	0.00
95	99	96.1	42.6	12	40%	83.5	33.96	8.42	10 58	2.16
90	94	92.2	39.6	41	40%	81.9	32.75	22.80	28.64	5.84
85	89	87.6	37.7	142	40%	80.1	31.99	65.87	82.76	16.88
80	84	82.4	35 0	250	40%	78.0	30.90	83.22	104 54	21.33
75	79	77.2	33.4	287	40%	75.9	30.26	73.24	92 01	18.77
70	74	72.5	31 9	241	100%	72.5	31.90	109.33	137 35	28.02
65	69	68.0	29.1	252	100%	68.0	29.10	29.14	36.61	7.47
60	64	62.6	24 8	322	100%	62.6	24.80	0.00	0 00	0.00
55	59	57.1	21 9	222	100%	57.1	21.90	0.00	0 00	0.00
50	54	52.0	19 2	226	97%	52.8	19.51	0.00	0 00	0.00
45	49	47.5	17 3	151	81%	52.8	19.39	0.00	0 00	0.00
40	44	43.1	15 2	211	70%	52.8	19.14	0.00	0 00	0.00
35	39	37.6	12 9	206	59%	52.8	19.09	0.00	0 00	0.00
30	34	32.4	10 8	135	52%	52.8	19.10	0.00	0 00	0.00
25	29	27.7	9 0	99	47%	52.8	19.16	0.00	0 00	0.00
20	24	23.3	7 5	66	43%	52.8	19.28	0.00	0 00	0.00
15	19	18.3	5 9	36	40%	52.2	19.20	0.00	0 00	0.00
10	14	12.5	4.1	16	40%	49.9	18.48	0.00	0 00	0.00
5	9	7.5	2.7	5	40%	47.9	17.91	0.00	0 00	0.00
0	4	3.0	1.4	0	40%	46.1	17.39	0.00	0 00	0.00
							Annual Total mmBTU:	**392.02**	**492.49**	**100.47**
							Annual Ton-hours:	32,669	41,041	8,372
							75% Load EER:	13.2	13.2	13 2
							75% Load kW/Ton:	0 909	0.909	0.909
							Cooling kWh:	**29,699**	**37,310**	**7,611**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**24.24**	**30.46**	**6.21**

Energy recovery wheel motor	
Motor Size hp:	0.5
Load Factor:	0 85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.391**
Motor kWh:	**479**

DETAILED CALCULATIONS - ECM8

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Pleasant Ridge - HVAC Lightir*	Application #	12-012	Rev.	0
Project Name	*Cincinnati Public Schools - Pleasant Ridge - HVAC Lighting*			State	OH
ECM	*2*				

Note: all data from "Duke.CinciPub_PleasantRidge.HRW.Calcs.xlsx" received 3-9-2012, except as otherwise noted
USA_OH_Cincinnati.Muni AP-Lunken.Field.724297_TMY3.bin
HEAT RECOVERY WHEEL SAVINGS **AHU-2**

Minimum Fraction Outdoor Air:	26.6%	
Heat Recover Effectiveness:	86.8%	
Set Point Temperature:	75	F
Set Point Enthalpy:	28.14	Btu/lba
Supply Air Temperature:	53	F
Supply Air Enthalpy:	21.45	Btu/lba
Supply Air Volume:	16,925	cfm
Supply Air Density:	0.075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	**EndTemp (F)**	**Toa (F)**	**hoa (Btu/lba)**	**hrs**	**foa**	**Tma (F)**	**hma (Btu/lba)**	**Q (mmBTU)**	**Q (mmBTU)**	**Q (mmBTU)**
105	109	107	0	0	27%	83.5	20.66	0.00	0 00	0.00
100	104	102	0	0	27%	82.2	20.66	0.00	0 00	0.00
95	99	96.1	42.6	12	27%	80.6	31.99	3.05	3 51	0.46
90	94	92.2	39.6	41	27%	79.6	31.19	8.26	9 51	1.26
85	89	87.6	37.7	142	27%	78.4	30.68	23.86	27.48	3.63
80	84	82.4	35	250	27%	77.0	29.97	30.14	34.72	4.58
75	79	77.2	33.4	287	27%	75.6	29.54	26.52	30 56	4.03
70	74	72.5	31 9	241	100%	72.5	31.90	59.87	68 98	9.11
65	69	68	29.1	252	100%	68.0	29.10	15.96	18 39	2.43
60	64	62.6	24 8	322	100%	62.6	24.80	0.00	0 00	0.00
55	59	57.1	21 9	222	100%	57.1	21.90	0.00	0 00	0.00
50	54	52	19 2	226	96%	53.0	19.59	0.00	0 00	0.00
45	49	47.5	17 3	151	80%	53.0	19.47	0.00	0 00	0.00
40	44	43.1	15 2	211	69%	53.0	19.22	0.00	0 00	0.00
35	39	37.6	12 9	206	59%	53.0	19.18	0.00	0 00	0.00
30	34	32.4	10 8	135	52%	53.0	19.19	0.00	0 00	0.00
25	29	27.7	9	99	47%	53.0	19.24	0.00	0 00	0.00
20	24	23.3	7 5	66	43%	53.0	19.36	0.00	0 00	0.00
15	19	18.3	5 9	36	39%	53.0	19.51	0.00	0 00	0.00
10	14	12.5	4.1	16	35%	53.0	19.68	0.00	0 00	0.00
5	9	7.5	2.7	5	33%	53.0	19.85	0.00	0 00	0.00
0	4	3	1.4	0	31%	53.0	19.97	0.00	0 00	0.00
							Annual Total mmBTU:	**167.66**	**193.15**	**25.50**
							Annual Ton-hours:	13,971	16,096	2,125
							75% Load EER:	13.2	13.2	13 2
							75% Load kW/Ton:	0 909	0.909	0.909
							Cooling kWh:	**12,701**	**14,633**	**1,932**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**10.37**	**11.95**	**1.58**

Energy recovery wheel motor	
Motor Size hp:	0.333
Load Factor:	0 85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.261**
Motor kWh:	**319**

Allocation of annual savings by month (Added During Tech Review)
Trade ally only provided annual savings numbers. Use % of cooling degree days by month to distribute annual savings appropriately.
Cooling Degree Day Source: http://www.climate-zone.com/climate/united-states/ohio/greater-cincinnati-airport/

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
CDD by Month	0.0	0 0	0.0	0.0	86.0	191 0	313.0	266.0	120 0	20.0	0.0	0.0	996 0
Degree Days % of Annual	0.0%	0.0%	0 0%	0.0%	8.6%	19 2%	31.4%	26.7%	12.0%	2 0%	0.0%	0.0%	100%
Degree Days % of Maximum	0.0%	0.0%	0 0%	0.0%	27.5%	61 0%	100.0%	85.0%	38.3%	6.4%	0.0%	0.0%	
Baseline kWh	0	0	0	0	4,485	9,961	16,323	13,872	6,258	1,043	0	0	51,943
Proposed kWh	0	0	0	0	893	1,983	3,250	2,762	1,246	208	0	0	10,342
kWh Savings	0	0	0	0	3,592	7,978	13,074	11,110	5,012	835	0	0	41,601
Baseline kW	0 00	0.00	0.00	0 00	11.65	25.87	42.40	36 04	16.26	2.71	0 00	0 00	42.40
Proposed kW	0 00	0.00	0.00	0 00	2.32	5.15	8.44	7.17	3.24	0.54	0 00	0 00	8.44
kW Savings	0 00	0.00	0.00	0 00	9.33	20.72	33.96	28 86	13.02	2.17	0 00	0 00	33.96

Cell: A11
Comment: zacho:
This text is from TA calculations. Don't have a copy, but file name (TMY3) indicates they used typical 30 year average temperature data.

Cell: D14
Comment: zacho:
Per "Duke.CinciPub_PleasantRidge.HRW.specs.1.JPG", total supply airflow for AHU is 33,700 cfm and ERV Supply is 13,550 cfm.

Therefore, Fraction Outside Air = 13,550 ÷ 33,700 = 40.2%

Cell: D20
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (13,550). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (33,700), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CinciPub_PleasantRidge.HRW.specs.1.JPG", total supply airflow for AHU is 33,700 cfm

Per "Duke.CinciPub_PleasantRidge.HRW.specs.1.JPG", total outside airflow for AHU is 13,550 cfm

Therefore, Fraction Outside Air = 13,550 ÷ 33,700 = 40.2%

Cell: J22
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A23
Comment: zacho:
Start temperature for bin

Cell: B23
Comment: zacho:
End temperature for bin

Cell: C23
Comment: zacho:
Temp. of outside air in deg. F

Cell: D23
Comment: zacho:
Enthalpy of outside air

Cell: F23
Comment: zacho:
Fraction outside air

Cell: G23
Comment: zacho:
Temperature of mixed air

Cell: H23
Comment: zacho:
Enthalpy of mixed air

Cell: I23
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J23
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K23
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H47
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B48
Comment: zacho:
Motor hp not listed in submittal data provided by TA, nor is it listed on Mfg. website. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0 5 hp for 14,100 cfm ERV

This ERV is 13,700 cfm, so assume same motor hp as Bond Hill project.

Cell: H48
Comment: zacho:
per "CPS.Carson.hvac.Chiller specs.2.pdf" for model RTUA125 chiller (which is listed on "CPS.Carson.hvac.schedule.pdf")

Cell: B49
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H49
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B50
Comment: zacho:
Motor efficiency for 1 0 hp TEFC EPACT efficient motor is 82 5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H50
Comment: zacho:
=annual ton hours x 75% load kW/ton

Cell: B52
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B53
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: D59
Comment: zacho:
Per "Duke.CinciPub_PleasantRidge.HRW.specs.1.JPG", total supply airflow for AHU is 16,925 cfm and ERV Supply is 4,500.

Therefore, Fraction Outside Air = 4,500 ÷ 16,925 = 26.6%

Cell: D65
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (4,500). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (16,925), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CinciPub_PleasantRidge.HRW.specs.1.JPG", total supply airflow for AHU is 16,925 cfm

Per "Duke.CinciPub_PleasantRidge.HRW.specs.1.JPG", total outside airflow for AHU is 4,500 cfm

Therefore, Fraction Outside Air = 4,500 ÷ 16,9250 = 26.6%

Cell: J67
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A68
Comment: zacho:
Start temperature for bin

Cell: B68
Comment: zacho:
End temperature for bin

Cell: C68
Comment: zacho:
Temp. of outside air in deg. F

Cell: D68
Comment: zacho:
Enthalpy of outside air

Cell: F68
Comment: zacho:
Fraction outside air

Cell: G68
Comment: zacho:
Temperature of mixed air

Cell: H68
Comment: zacho:
Enthalpy of mixed air

Cell: I68
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J68
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K68
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H92
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B93
Comment: zacho:
Motor hp not listed in submittal data provided by TA, nor is it listed on Mfg. website. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0 5 hp for 14,100 cfm ERV

This ERV is 4,500 cfm, so 0.5 x 4,500 ÷ 14,100 = 0.319, so rounded to nearest motor size: 1/3 hp (0.333)

Cell: H93
Comment: zacho:
per "Duke.CPS_BondHill.Chiller.Specs.1.pdf"

Cell: B94
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H94
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B95
Comment: zacho:
Motor efficiency for 1 0 hp TEFC EPACT efficient motor is 82 5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H95
Comment: zacho:
=annual ton hours x 75% load kW/ton

Cell: B97
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B98
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: A107
Comment: zacho:
Degree Days % of Annual x (Sum baseline kW for all energy recovery units)

Cell: A108
Comment: zacho:
Degree Days % of Annual x [(sum of proposed kWh for all energy recovery units) + sum of energy recovery wheel motor kWh used for all energy recovery units)]

Cell: A110
Comment: zacho:
Degree Days % of Maximum x (Sum baseline kW for all energy recovery units)

Cell: A111
Comment: zacho:
Degree Days % of Maximum x [(sum of proposed kW for all energy recovery units) + sum of energy recovery wheel motor kW used for all energy recovery units)]

DETAILED CALCULATIONS - ECM9

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - Roselawn - Lighting*	Application #	12-013	Rev.	0
Project Name	*Cincinnati Public Schools - Roselawn - Lighting*			State	OH

Note: all data from "Duke.CinciPub_Roselawn.custom.lighting.form.xls", except as otherwise noted

1,912.5 hr/yr operation - before implementation

1,912.5 hr/yr operation - after implementation

Only show total savings

Line items not 1 for 1 match between Baseline and Proposed Sections

	Baseline (Code)						Proposed						Savings			
Site ID	Building Area Type	Square Feet	Watts per Sq Ft	kw per fixture	total kw	kw-hr/yr	Fixture	Qty	Watts per fixture	kw per fixture	total kw	kw-hr/yr	kw	kw-hr/yr	Other Annual Savings	Total Implementation Costs
1	School	113,529	1.20		136.2	260,549	A1	9	58	0.058	0.5	998				$ 1,170
							A2	32	58	0.058	1.9	3,550				$ 4,160
							A31	52	84	0.084	4.4	8,354				$ 7,020
							A32	132	168	0.168	22.2	42,412				$ 17,820
							B28	126	118	0.118	14.8	28,339				$ 54,306
							C3	2	84	0.084	0.2	321				$ 230
							C31	7	84	0.084	0.6	1,125				$ 805
							C32	7	168	0.168	1.2	2,249				$ 805
							D1	14	59	0.059	0.8	1,574				$ 2,548
							D2	14	54	0.054	0.8	1,446				$ 4,060
							D4	16	105	0.105	1.7	3,213				$ 2,432
							D6	5	59	0.059	0.3	564				$ 910
							D6F	7	118	0.118	0.8	1,580				$ 1,274
							G1	25	59	0.059	1.5	2,811				$ 10,775
							G21	188	118	0.118	22.1	42,283				$ 81,028
							G4	1	114	0.114	0.1	218				$ 242
							J3	2	82	0.082	0.2	314				$ 462
							L14	5	30	0.030	0.2	287				$ 290
							L24	5	62	0.062	0.3	593				$ 290
							L28	30	112	0.112	3.4	6,426				$ 2,370
							S1	47	35	0.035	1.6	3,146				$ 2,350
							S2	48	35	0.035	1.7	3,213				$ 2,400
							S5	6	40	0.040	0.2	459				$ 192
							V1	12	250	0.250	3.0	5,738				$ 516
							V2	16	100	0.100	1.6	3,060				$ 432
							X8P	28	302	0.302	8.5	16,172				$ 23,100
Totals		**113,529**			**136.2**	**260,549**		**836**			**94.3**	**180,444**	**41.9**	**80,105**	**$ -**	**$ 221,987**
							% of total cost that is incremental cost over code-efficient lighting system:									10.0%
												Total Incremental Project Cost:				$ 22,199

Per "2012-03-09 email #1 fm D Dumond re tech info response to 12-013.pdf":

Fixture A3 was counted as A32 or A31

Fixture B28W was counted as B28

Fixture G21S was counted as G21

No S3 or S4 fixtures were installed

Any fixtures with GTD suffix were counted as the same fixture w/o "GTD"

Cell: B8
Comment: zacho:
Per "Duke.CinciPub_Roselawn.custom.lighting.form.xls" received 3/9/12, which listed 1,912.5 annual hours (this is equivalent to 8.5 hrs/day x 5 days/wk x 45 wks).

Daily schedule in "Duke.CinciPub_Roselawn.custom.lighting.form.xls" lists 10.5 hours/day x 5 days/wk x 45 wks (for annual total of 2,362.5), but went with 1,912.5 hours to be conservative.

Cell: H11
Comment: zacho:
Proposed fixture type, quantity, and watts per fixture from "Duke.CinciPub_Roselawn.Lighting.Count.xlsx" received 3/9/12.

Cell: Q11
Comment: zacho:
Install Costs are per "Duke.CinciPub_Roselawn.PoP Signed.pdf"

Cell: J13
Comment: zacho:
Changed from 63 to 58W to match product data. Fixture A1 is same mfg/model as A2, but is 1x4 instead of 2x4.

Cell: J14
Comment: zacho:
Changed from 63 to 58W to match product data ("Duke.CinciPub_Roselawn.Lighting.specs1.pdf", page 14)

Cell: J16
Comment: zacho:
This fixture is a pair of A31 fixtures wired for master/satellite ballasts

Cell: H17
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J17
Comment: zacho:
Product data ("Duke.CinciPub_Roselawn.Lighting.specs1.pdf", page 26) only lists input watts with T5HO. Actually has (4) 28W T5.

Cell: J20
Comment: zacho:
This fixture is a pair of C31 fixtures wired for master/satellite ballasts

Cell: H21
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J21
Comment: zacho:
Product data ("Duke.CinciPub_Roselawn.Lighting.specs1.pdf", page 36) only lists input watts with T8. Actually has (2) 28W T5.

Cell: J22
Comment: zacho:
Per "Duke.CinciPub_Roselawn.Lighting.specs5.pdf"

Cell: J24

Comment: zacho:
Product data ("Duke.CinciPub_Roselawn.Lighting.specs1.pdf", page 42) lists 56 and 59 input watts for 2 lamp T8 like this. Used 59W to be conservative in savings estimate.

Cell: H26
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J26
Comment: zacho:
Product data ("Duke.CinciPub_Roselawn.Lighting.specs2.pdf", page 6) only lists input watts with T5HO. Actually has (2) 28W T5.

Cell: H27
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J27
Comment: zacho:
This fixture is a pair of G1 fixtures for an 8 ft section. Total 8 ft section has (4) 28W T5

Cell: J28
Comment: zacho:
"Duke.CinciPub_Roselawn.Lighting.specs6.pdf" lists input watts for 2 lamp version of fixture as 57W. This fixture is 4 lamp, so 57W x 2 = 114W.

Cell: J32
Comment: zacho:
Input watts per "Duke.CinciPub_Roselawn.Lighting.specs8.pdf", which is 2 lamp fixture. L28 is (2) 2 lamp fixtures end-to-end, so L28 watts = 2 x 56W = 112W

Cell: J38
Comment: zacho:
Input watts per "Duke.CinciPub_Roselawn.Lighting.specs7.pdf"

Cell: Q40
Comment: zacho:
Estimate based on professional judgment

DETAILED CALCULATIONS

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - South Avondale - HVAC Lightin*	Application #	12-014	Rev.	0
Project Name	*Cincinnati Public Schools - South Avondale - HVAC Lighting*			State	OH
ECM	*1*				

Note: all data from "Duke.CinciPub.SAvondale.CustomLighting.xls", except as otherwise noted

2,080	hr/yr operation - before implementation
2,080	hr/yr operation - after implementation

Only show total savings

Line items not 1 for 1 match between Baseline and Proposed Sections

	Baseline (Code)						Proposed						Savings			
Site ID	Building Area Type	Square Feet	Watts per Sq Ft	kw per fixture	total kw	kw-hr/yr	Fixture	Qty	Watts per fixture	kw per fixture	total kw	kw-hr/yr	kw	kw-hr/yr	Other Annual Savings	Total Implementation Costs
1	School	85,470	1.20		102.6	213,333	A2	22	59	0.059	1.3	2,700				$ 1,386
							A3	99	85	0.085	8.4	17,503				$ 7,524
							A31	117	84	0.084	9.8	20,442				$ 8,892
							A32	484	84	0.084	40.7	84,564				$ 36,784
							B3	16	77	0.077	1.2	2,563				$ 1,232
							D3	13	82	0.082	1.1	2,217				$ 1,625
							F32	14	84	0.084	1.2	2,446				$ 1,904
							H4	33	116	0.116	3.8	7,962				$ 4,950
							K4	40	61	0.061	2.4	5,075				$ 3,200
							K41	1	61	0.061	0.1	127				$ 80
							M4	6	86	0.086	0.5	1,073				$ 330
							N2	130	18	0.018	2.3	4,827				$ 5,200
							N3	5	26	0.026	0.1	273				$ 200
							N4	2	29	0.029	0.1	121				$ 80
							P	8	60	0.060	0.5	998				$ 1,136
							P2	60	56	0.056	3.4	6,989				$ 7,800
							PS1	8	258	0.258	2.1	4,293				$ 2,160
							PS2	4	242	0.242	1.0	2,013				$ 2,400
							PS4	19	86	0.086	1.6	3,399				$ 5,130
							PS5	4	63	0.063	0.3	524				$ 540
							S1	22	36	0.036	0.8	1,647				$ 770
							S4	2	28	0.028	0.1	116				$ 104
							T	8	94	0.094	0.8	1,564				$ 584
							W	12	295	0.295	3.5	7,363				$ 660
							W2	12	295	0.295	3.5	7,363				$ 660
							W4	4	452	0.452	1.8	3,761				$ 220
Totals		**85,470**			**102.6**	**213,333**		**1,145**			**92.3**	**191,925**	**10.3**	**21,408**	**$ -**	**$ 95,551**
															% of total cost that is incremental cost over code-efficient lighting system:	10.0%
															Total Incremental Project Cost:	$ 9,555

Per "2012-03-09 email #1 fm D Dumond re tech info response to 12-014.pdf":

Any fixtures with "E" suffix were counted as the same fixture w/o "E"

Cell: H12
Comment: zacho:
Proposed fixture type, quantity, and watts per fixture from "Duke.CinciPub_SAvondale.Lighting.count.xlsx"

Cell: Q12
Comment: zacho:
Install Costs are per "Duke.CinciPub_SA.PoP Signed.pdf"

Cell: J14
Comment: zacho:
Changed from 56 to 59W to match product data ("Duke.CinciPub_SouthAvondale.Lighting.Specs1.PDF", page 4)

Cell: J16
Comment: zacho:
Changed from 85 to 84W to match product data ("Duke.CinciPub_SouthAvondale.Lighting.Specs1.PDF", page 25)

Cell: J17
Comment: zacho:
Changed from 85 to 84W to match product data ("Duke.CinciPub_SouthAvondale.Lighting.Specs1.PDF", page 29)

Cell: J21
Comment: zacho:
Per "Duke.CinciPub_SouthAvondale.Lighting.Specs5.pdf"

Cell: H25
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J25
Comment: zacho:
Product data ("Duke.CinciPub_SouthAvondale.Lighting.Specs3.PDF", page 9) only lists input watts with (1) 4 ft 32W T8. Actually has (1) 2 ft 17W T8.

Cell: H26
Comment: zacho:
TA reported that product data does not list input watts so they used 1.05 ballast factor x lamp quantity x lamp watts.

Cell: J26
Comment: zacho:
Product data ("Duke.CinciPub_SouthAvondale.Lighting.Specs3.PDF", page 12) only lists input watts with (1) 4 ft 32W T8. Actually has (1) 3 ft 25W T8.

Cell: J27
Comment: zacho:
Per "Duke.CinciPub_SouthAvondale.Lighting.Specs8.pdf"

Cell: J28
Comment: zacho:
Per "Duke.CinciPub_SouthAvondale.Lighting.Specs7.pdf"

Cell: J29
Comment: zacho:
Per "Fixture P2 - Daybright MS.pdf" obtained by WECC from mfg. website

Cell: J30
Comment: zacho:
Per "Duke.CinciPub_SouthAvondale.Lighting.Specs6.pdf" is 86W per 4 ft section. This fixture is 12 ft.

Cell: J31
Comment: zacho:
Per "SAvondale_Elec_AsBuilts_E201.pdf". Is (8) lamp T8 4x4 recessed fixture.

Cell: J32
Comment: zacho:
Per "Duke.CinciPub_SouthAvondale.Lighting.Specs6.pdf" is 86W per 4 ft section. This fixture is 4 ft.

Cell: J33
Comment: zacho:
Per "SAvondale_Elec_AsBuilts_E201.pdf". Is 2 lamp T8 wall mount similar to PS1/PS2/PS4 (which is 3 lamp in cross section).

Cell: J34
Comment: zacho:
Changed from 35 to 36W to match product data ("Duke.CinciPub_SouthAvondale.Lighting.Specs3.PDF", page 31)

Cell: J36
Comment: zacho:
Per "Duke.CinciPub_SouthAvondale.Lighting.Specs9.pdf"

Cell: J37
Comment: zacho:
Updated from 279 to 295W per "Duke.CinciPub_SouthAvondale.Lighting.Specs3.PDF" page 37

Cell: J38
Comment: zacho:
Updated from 279 to 295W per "Duke.CinciPub_SouthAvondale.Lighting.Specs3.PDF" page 41

Cell: J39
Comment: zacho:
Updated from 432 to 452W per "Duke.CinciPub_SouthAvondale.Lighting.Specs3.PDF" page 41, which is input watts table for fixture W2. Fixture W4 is same mfg and similar model, just larger housing…with lamp and ballast as listed on page 41.

Cell: Q41
Comment: zacho:
Estimate based on professional judgment

DETAILED CALCULATIONS

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - South Avondale - HVAC Lightin*	Application #	12-014	Rev.	0
Project Name	*Cincinnati Public Schools - South Avondale - HVAC Lighting*			State	OH
ECM	*2*				

Note: all data from "Duke.CinciPub_SAvondale.HRW.Calcs.xlsx" received 3-9-2012, except as otherwise noted

USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin

HEAT RECOVERY WHEEL SAVINGS **AHU-1**

Minimum Fraction Outdoor Air:	35 0%	
Heat Recover Effectiveness:	73.1%	
Set Point Temperature:	75	F
Set Point Enthalpy:	29.17	Btu/lba
Supply Air Temperature:	54	F
Supply Air Enthalpy:	22.29	Btu/lba
Supply Air Volume:	26,720	cfm
Supply Air Density:	0 075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	**EndTemp (F)**	**Toa (F)**	**hoa (Btu/lba)**	**hrs**	**foa**	**Tma (F)**	**hma (Btu/lba)**	**Q (mmBTU)**	**Q (mmBTU)**	**Q (mmBTU)**
105	109	107 0	0	0	35%	86 2	18.96	0 00	0.00	0.00
100	104	102 0	0	0	35%	84.4	18.96	0 00	0.00	0.00
95	99	96.1	42.6	12	35%	82.4	33.87	4 96	6.78	1.82
90	94	92 2	39.6	41	35%	81 0	32.82	13.16	17.99	4.83
85	89	87.6	37.7	142	35%	79.4	32.16	37 27	50.96	13.69
80	84	82.4	35.0	250	35%	77.6	31.21	44 84	61.31	16.47
75	79	77 2	33.4	287	35%	75 8	30.65	37 35	51.07	13.72
70	74	72 5	31.9	241	100%	72 5	31.90	57 84	79.08	21.24
65	69	68 0	29.1	252	100%	68 0	29.10	0 00	0.00	0.00
60	64	62.6	24.8	322	100%	62.6	24.80	0 00	0.00	0.00
55	59	57.1	21.9	222	100%	57.1	21.90	0 00	0.00	0.00
50	54	52 0	19.2	226	91%	54 0	20.07	0 00	0.00	0.00
45	49	47 5	17.3	151	76%	54 0	20.11	0 00	0.00	0.00
40	44	43.1	15.2	211	66%	54 0	19.97	0 00	0.00	0.00
35	39	37.6	12.9	206	56%	54 0	20.03	0 00	0.00	0.00
30	34	32.4	10.8	135	49%	54 0	20.11	0 00	0.00	0.00
25	29	27.7	9.0	99	44%	54 0	20.22	0 00	0.00	0.00
20	24	23 3	7.5	66	41%	54 0	20.37	0 00	0.00	0.00
15	19	18 3	5.9	36	37%	54 0	20.55	0 00	0.00	0.00
10	14	12 5	4.1	16	35%	53.1	20.40	0 00	0.00	0.00
5	9	7 5	2.7	5	35%	51.4	19.91	0 00	0.00	0.00
0	4	3 0	1.4	0	35%	49 8	19.45	0 00	0.00	0.00
							Annual Total mmBTU:	**195.42**	**267.19**	**71.77**
							Annual Ton-hours:	16,285	22,266	5,981
							Chiller IPLV EER:	14 00	14.00	14.00
							Chiller IPLV kW/Ton:	0.857	0.857	0 857
							Cooling kWh:	**13,959**	**19,085**	**5,126**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**11.39**	**15.58**	**4.18**

Energy recovery wheel motor	
Motor Size hp:	0.375
Load Factor:	0.85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.293**
Motor kWh:	**359**

DETAILED CALCULATIONS

JAN 2012 V2.0

Salesforce Opportunity Name	*Cincinnati Public Schools - South Avondale - HVAC Lightin*	Application #	12-014	Rev.	0
Project Name	*Cincinnati Public Schools - South Avondale - HVAC Lighting*			State	OH
ECM	*2*				

Note: all data from "Duke.CinciPub_SAvondale.HRW.Calcs.xlsx" received 3-9-2012, except as otherwise noted
USA_OH_Cincinnati.Muni.AP-Lunken.Field.724297_TMY3.bin
HEAT RECOVERY WHEEL SAVINGS **AHU-4**

Minimum Fraction Outdoor Air:	40 0%	
Heat Recover Effectiveness:	71.7%	
Set Point Temperature:	75	F
Set Point Enthalpy:	29.17	Btu/lba
Supply Air Temperature:	54	F
Supply Air Enthalpy:	22.29	Btu/lba
Supply Air Volume:	25,370	cfm
Supply Air Density:	0 075	lb/ft^3

								Savings	Baseline	Proposed
StrTemp (F)	EndTemp (F)	Toa (F)	hoa (Btu/lba)	hrs	foa	Tma (F)	hma (Btu/lba)	Q (mmBTU)	Q (mmBTU)	Q (mmBTU)
105	109	107	0	0	40%	87 8	17.50	0 00	0.00	0.00
100	104	102	0	0	40%	85 8	17.50	0 00	0.00	0.00
95	99	96.1	42.6	12	40%	83.4	34.54	5 28	7.36	2.08
90	94	92 2	39.6	41	40%	81 9	33.34	14 01	19.53	5.52
85	89	87.6	37.7	142	40%	80 0	32.58	39.67	55.31	15.64
80	84	82.4	35	250	40%	78 0	31.50	47.73	66.55	18.81
75	79	77 2	33.4	287	40%	75 9	30.86	39.76	55.43	15.67
70	74	72 5	31.9	241	100%	72 5	31.90	53 86	75.09	21.23
65	69	68	29.1	252	100%	68 0	29.10	0 00	0.00	0.00
60	64	62.6	24.8	322	100%	62.6	24.80	0 00	0.00	0.00
55	59	57.1	21.9	222	100%	57.1	21.90	0 00	0.00	0.00
50	54	52	19.2	226	91%	54 0	20.07	0 00	0.00	0.00
45	49	47 5	17.3	151	76%	54 0	20.11	0 00	0.00	0.00
40	44	43.1	15.2	211	66%	54 0	19.97	0 00	0.00	0.00
35	39	37.6	12.9	206	56%	54 0	20.03	0 00	0.00	0.00
30	34	32.4	10.8	135	49%	54 0	20.11	0 00	0.00	0.00
25	29	27.7	9	99	44%	54 0	20.22	0 00	0.00	0.00
20	24	23 3	7.5	66	41%	54 0	20.37	0 00	0.00	0.00
15	19	18 3	5.9	36	40%	52 3	19.86	0 00	0.00	0.00
10	14	12 5	4.1	16	40%	50 0	19.14	0 00	0.00	0.00
5	9	7 5	2.7	5	40%	48 0	18.58	0 00	0.00	0.00
0	4	3	1.4	0	40%	46 2	18.06	0 00	0.00	0.00
							Annual Total mmBTU:	**200.31**	**279.25**	**78.94**
							Annual Ton-hours:	16,692	23,271	6,579
							Chiller IPLV EER:	14 00	14.00	14.00
							Chiller IPLV kW/Ton:	0.857	0.857	0 857
							Cooling kWh:	**14,308**	**19,946**	**5,639**
							Heat Recovery Hours of Operation:	1,225	1,225	1,225
							Cooling kW:	**11.68**	**16.28**	**4.60**

Energy recovery wheel motor	
Motor Size hp:	0.375
Load Factor:	0.85
Motor Efficiency:	81.0%
hp to kW conversion:	0.7456
Motor kW:	**0.293**
Motor kWh:	**359**

Allocation of annual savings by month (Added During Tech Review)
Trade ally only provided annual savings numbers. Use % of cooling degree days by month to distribute annual savings appropriately.
Cooling Degree Day Source: http://www.climate-zone.com/climate/united-states/ohio/greater-cincinnati-airport/

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
CDD by Month	0 0	0.0	0.0	0.0	86 0	191.0	313.0	266 0	120.0	20.0	0.0	0 0	996.0
Degree Days % of Annual	0.0%	0 0%	0.0%	0.0%	8.6%	19 2%	31.4%	26.7%	12 0%	2 0%	0.0%	0.0%	100%
Degree Days % of Maximum	0.0%	0 0%	0.0%	0.0%	27.5%	61 0%	100.0%	85.0%	38 3%	6.4%	0.0%	0.0%	
Baseline kWh	0	0	0	0	3,370	7,485	12,266	10,424	4,703	784	0	0	39,031
Proposed kWh	0	0	0	0	992	2,202	3,609	3,067	1,384	231	0	0	11,484
kWh Savings	0	0	0	0	2,379	5,283	8,657	7,357	3,319	553	0	0	27,548
Baseline kW	0.00	0.00	0 00	0 00	8.75	19.44	31 86	27.08	12.22	2.04	0 00	0.00	31.86
Proposed kW	0.00	0.00	0 00	0 00	2.58	5.72	9 37	7.97	3.59	0.60	0 00	0.00	9.37
kW Savings	0.00	0.00	0 00	0 00	6.18	13.72	22.49	19.11	8.62	1.44	0 00	0.00	22.49

Cell: A9
Comment: zacho:
This text is from TA calculations. Don't have a copy, but file name (TMY3) indicates they used typical 30 year average temperature data.

Cell: D12
Comment: zacho:
Per "Duke.CinciPub_SA.HRW Specs.5.JPG", total supply airflow for AHU is 26,720 cfm. Per Duke.CinciPub_SA.HRW.Specs.6.JPG", ERV Supply is 9,350 cfm.

Therefore, Fraction Outside Air = 9,350 ÷ 26,720 = 35 0%

Cell: D18
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (9,350). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (26,720), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CinciPub_SA.HRW Specs.5.JPGf", total supply airflow for AHU is 26,720 cfm

Per "Duke.CinciPub_SA.HRW Specs.6.JPG", total outside airflow for AHU is 9,350 cfm

Therefore, Fraction Outside Air = 9,350 ÷ 26,720 = 35 0%

Cell: J20
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A21
Comment: zacho:
Start temperature for bin

Cell: B21
Comment: zacho:
End temperature for bin

Cell: C21
Comment: zacho:
Temp. of outside air in deg. F

Cell: D21
Comment: zacho:
Enthalpy of outside air

Cell: F21
Comment: zacho:
Fraction outside air

Cell: G21
Comment: zacho:
Temperature of mixed air

Cell: H21
Comment: zacho:
Enthalpy of mixed air

Cell: I21
Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J21
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K21
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H45
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B46
Comment: zacho:
Motor hp not listed in submittal data provided by TA. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0.5 hp for 14,100 cfm ERV

This ERV is 9,350 cfm, so 0.5 x 9,350 ÷ 14,100 = 0.331. Too close to 1/3 hp (no safety factor/oversize) so rounded up to nearest motor size: 3/8 hp (0 375)

Cell: H46
Comment: zacho:
per "Duke.CPS_MTAiry.Chiller Specs.1.pdf" for model RTAC200 chiller (which is listed on "Duke.CPS_MTAiry.Chiller Specs 2 JPG")

Cell: B47
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H47
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B48
Comment: zacho:
Motor efficiency for 1.0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H48
Comment: zacho:
=annual ton hours x Chiller IPLV kW/ton

Cell: B50
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B51
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: D57
Comment: zacho:
Per "Duke.CinciPub_SA.HRW Specs.5.JPG", total supply airflow for AHU is 25,370 cfm. Per "Duke.CinciPub_SA.HRW Specs.6.JPG", ERV Supply is 10,148.

Therefore, Fraction Outside Air = 10,148 ÷ 25,370 = 40.0%

Cell: D63
Comment: zacho:
TA set up calculations to use "supply" through just the energy recovery unit and applied the fraction outside air to that value. However, the "supply" going through the energy recovery unit is really the full outside air CFM (10,148). Therefore, revised Supply Air Volume input for calculations to be total AHU cfm (25,370), so that when Supply Air Volume is multiplied by Minimum Fraction Outside Air, the result is the outside air CFM through the energy recovery unit.

Per "Duke.CinciPub_SA.HRW Specs.5.JPG", total supply airflow for AHU is 25,370 cfm

Per "Duke.CinciPub_SA.HRW Specs.6.JPG", total outside airflow for AHU is 10,148 cfm

Therefore, Fraction Outside Air = 10,148 ÷ 25,370 = 40.0%

Cell: J65
Comment: zacho:
Baseline energy is energy to cool outside air with mechanical cooling. Uses same formula as savings…but removes the heat recover effectiveness input.

Cell: A66
Comment: zacho:
Start temperature for bin

Cell: B66
Comment: zacho:
End temperature for bin

Cell: C66
Comment: zacho:
Temp. of outside air in deg. F

Cell: D66
Comment: zacho:
Enthalpy of outside air

Cell: F66
Comment: zacho:
Fraction outside air

Cell: G66
Comment: zacho:
Temperature of mixed air

Cell: H66
Comment: zacho:
Enthalpy of mixed air

Cell: I66

Comment: zacho:
Heat Recover Effectiveness x Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: J66
Comment: zacho:
NOTE: This column developed by WECC

Supply Air Volume x foa x Supply Air Density x hrs x (hoa - Set Point Enthalpy) x 60 minutes per hour

Cell: K66
Comment: bchiesa:
NOTE: This column developed by WECC

Cell: H90
Comment: zacho:
= Q in mmBTU x 1,000,000 btu per mmBTU ÷ 12,000 BTU per ton

Cell: B91
Comment: zacho:
Motor hp not listed in submittal data provided by TA. Therefore, estimated motor hp using App. 12-007 (Bond Hill) as a basis:

Bond Hill = 0.5 hp for 14,100 cfm ERV

This ERV is 10,148 cfm, so 0.5 x 10,148 ÷ 14,100 = 0.360. Therefore, rounded up to nearest motor size: 3/8 hp (0.375)

Cell: H91
Comment: zacho:
per "Duke.CPS_MTAiry.Chiller Specs.1.pdf" for model RTAC200 chiller (which is listed on "Duke.CPS_MTAiry.Chiller Specs 2 JPG")

Cell: B92
Comment: zacho:
Estimate…typically between 80-90%, so chose 85% load factor.

Cell: H92
Comment: zacho:
kW/ton = 12 ÷ EER

Cell: B93
Comment: zacho:
Motor efficiency for 1.0 hp TEFC EPACT efficient motor is 82.5%...so used slightly less efficient than that for 3/8 hp motor.

Cell: H93
Comment: zacho:
=annual ton hours x Chiller IPLV kW/ton

Cell: B95
Comment: zacho:
Motor size hp x Load Factor x hp to kW conversion ÷ Motor Efficiency

Cell: B96
Comment: zacho:
Motor kW x Heat Recovery Hours of Operation

Cell: A105
Comment: zacho:
Degree Days % of Annual x (Sum baseline kW for all energy recovery units)

Cell: A106
Comment: zacho:
Degree Days % of Annual x [(sum of proposed kWh for all energy recovery units) + sum of energy recovery wheel motor kWh used for all energy recovery units)]

Cell: A108
Comment: zacho:
Degree Days % of Maximum x (Sum baseline kW for all energy recovery units)

Cell: A109
Comment: zacho:
Degree Days % of Maximum x [(sum of proposed kW for all energy recovery units) + sum of energy recovery wheel motor kW used for all energy recovery units)]

Appendix C – Cincinnati Public Schools (8 Schools) Cash Rebate Calculation

HVAC and Lighting

Measure	Quantity	Commitment Payment/Rebate Rate	Cash Rebate
Bond Hill School – Energy Recovery Ventilator(s) (Total Rebate)	1	50% of incentive that would be offered by the Smart $aver Custom program	$2000.00
Carson School - Energy Recovery Ventilator(s) (Total Rebate)	1	50% of incentive that would be offered by the Smart $aver Custom program	$4000.00
Fairview School - Energy Recovery Ventilator(s) (Total Rebate)	1	50% of incentive that would be offered by the Smart $aver Custom program	$4150.00
Kilgour School – New Construction Lighting	1	50% of incentive that would be offered by the Smart $aver Custom program	$1050.00
Mt Airy School- Energy Recovery Ventilator(s) (Total Rebate)	1	50% of incentive that would be offered by the Smart $aver Custom program	$4000.00
Mt Airy School – New Construction Lighting	1	50% of incentive that would be offered by the Smart $aver Custom program	$1050.00
Pleasant Ridge School- Energy Recovery Ventilator(s) (Total Rebate)	1	50% of incentive that would be offered by the Smart $aver Custom program	$3250.00
Pleasant Ridge School – New Construction Lighting	1	50% of incentive that would be offered by the Smart $aver Custom program	$2000.00
Roselawn School – New Construction Lighting	1	50% of incentive that would be offered by the Smart $aver Custom program	$3250.00
South Avondale School- Energy Recovery Ventilator(s) (Total Rebate)	1	50% of incentive that would be offered by the Smart $aver Custom program	$2150.00
South Avondale School – New Construction Lighting	1	50% of incentive that would be offered by the Smart $aver Custom program	$900.00
		Total Incentive	$28,000.00

Appendix D -UCT Value Cincinnati Public Schools

HVAC and Lighting

Measure	Total Avoided Cost	Program Cost	Incentive	Quantity	Measure UCT
Bond Hill School – Energy Recovery Ventilator(s)	$49,898	$1,102	$2,000	1	**16.09**
Carson School - Energy Recovery Ventilator(s)	$79,657	$2,099	$4,000	1	**13.06**
Fairview School - Energy Recovery Ventilator(s)	$82,079	$2,175	$4,150	1	**12.98**
Kilgour School – New Construction Lighting	$20,172	$645	$1,050	1	**11.90**
Mt Airy School- Energy Recovery Ventilator(s)	$78,988	$2,095	$4,000	1	**12.96**
Mt Airy School – New Construction Lighting	$17,910	$650	$1,050	1	**10.54**
Pleasant Ridge School- Energy Recovery Ventilator(s)	$64,063	$1,702	$3,250	1	**12.94**
Pleasant Ridge School – New Construction Lighting	$30,504	$1,332	$2,200	1	**8.64**
Roselawn School – New Construction Lighting	$45,674	$2,014	$3,250	1	**8.68**
South Avondale School- Energy Recovery Ventilator(s)	$42,421	$1,126	$2,150	1	**12.95**
South Avondale School – New Construction Lighting	$12,449	$551	$900	1	**8.58**
Totals			**$28,000**	**11**	

Total Avoided Supply Costs	$523,815	***Aggregate Application UCT***	***12.04***
Total Program Costs	$15,491.00		
Total Incentive	$28,000		

Bond Hill School

Supporting Documentation

Ohio Mercantile Self Direct Program

Application Guide & Cover Sheet

Questions? Call 1-866-380-9580 or visit www.duke-energy.com.

Email this form along with completed Mercantile Self Direct Prescriptive or Custom applications, proof of payment, energy savings calculations and spec sheets to SelfDirect@Duke-Energy.com. You may also fax to 1-513-419-5572.

Mercantile customers, defined as using at least 700,000 kWh annually are eligible for the Mercantile Self Direct program. Please indicate mercantile qualification:

- ☐ a single Duke Energy Ohio account
- ☒ multiple accounts in Ohio (energy usage with other utilities may be counted toward the total)

Please list Duke Energy account numbers below (attach listing of multiple accounts an/or billing history for other utilities as required):

Account Number	Annual Usage	Account Number	Annual Usage
0140-3636-01			

Self Direct rebates are available for completed Custom projects that have not previously received a Duke Energy Smart $aver® Custom Incentive. Self Direct incentives are applicable to Prescriptive measures that were installed more than 90 days prior to submission to Duke Energy and have not previously received a Duke Energy Prescriptive rebate.

Self Direct Program requirements dictate that certain projects that may be Prescriptive in nature under the Smart $aver program must be evaluated using the Custom process. Use the table on page two as a guide to determine which Self Direct program fits your project(s). Apply for Self Direct projects using the appropriate application forms in conjunction with this cover sheet. Where Mercantile Self Direct Prescriptive applications are listed, please refer to the measure list on that application. If your measure is not listed, you may be eligible for a Self Direct Custom rebate. Self Direct Custom applications, like Smart $aver Custom applications, should include detailed analysis of pre-project and post-project energy usage and project costs. Please indicate which type of rebate applications are included in the table provided on page two.

Please check each box to indicate completion of the following program requirements:

☐ All sections of appropriate application(s) are completed	☐ Proof of payment.*	☐ Manufacturer's Spec sheets	☐ Energy model/calculations and detailed inputs for Custom applications

* If a single payment record is intended to demonstrate the costs of both Prescriptive & Custom projects, please include an additional document with an estimated breakout of costs for each Prescriptive and Custom energy conservation measure.

Application Type	Replaced equipment at end of lifetime or because equipment failed**	Replaced fully operational equipment to improve efficiency***	New Construction
Lighting	MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐	MSD Prescriptive Lighting ☐	MSD Prescriptive Lighting ☐
		MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐	MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐
Heating & Cooling	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Heating & Cooling ☐
			MSD Custom Part 1 ☒ MSD Custom General Worksheet ☒
Window Films, Programmable Thermostats, & Guest Room Energy Management Systems	MSD Custom Part 1 ☐ MSD Custom General and/or EMS Worksheet(s) ☐	MSD Prescriptive Heating & Cooling ☐	MSD Custom Part 1 ☐ MSD Custom General and/or EMS Worksheet(s) ☐
Chillers & Thermal Storage	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Chillers & Thermal Storage ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
Motors & Pumps	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Motors, Pumps & Drives ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
VFDs	Not Applicable	MSD Prescriptive Motors, Pumps & Drives ☐	MSD Custom Part 1 ☐ MSD Custom VFD Worksheet ☐
		MSD Custom Part 1 ☐ MSD Custom VFD Worksheet ☐	
Food Service	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Food Service ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
Process	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Process ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
		MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	
Energy Management Systems	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐
Behavioral* & No/Low Cost**	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐		

** Under the Self Direct program, failed equipment and equipment at the end of its useful life are evaluated differently than early replacement of fully functioning equipment. **All equipment replacements due to failure or old age will be evaluated via the Custom program.**

*** Please ensure that you include the age of the replaced equipment for measures classified as "Early Replacement" in your application as well as the estimated date that you would have otherwise replaced the existing equipment if you had not chosen a more energy efficient option.

**** Behavioral energy efficiency and demand reduction projects must be both measurable and verifiable. Provide justification with your application.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Proposed energy efficiency measures may be eligible for Self-Direct Custom rebates if they clearly reduce electrical consumption and/or demand as compared to the appropriate baseline.

Before you complete this application, please note the following important criteria:

- Submitting this application does not guarantee a rebate will be approved.
- Rebates are based on electricity conservation only.
- Electric demand and/or energy reductions must be well documented with auditable calculations.
- Incomplete applications cannot be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, beginning on page 6.

Notes on the Application Process

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact your Duke Energy Ohio, Inc account manager or the Duke Energy Smart $aver® team at 1-866-380-9580.

Every application must include calculations of the baseline electrical usage and the electrical usage of the proposed high-efficiency equipment/system. Monthly calculations are best. You, the Duke Energy Ohio customer, or your equipment vendor / engineer should perform these calculations and submit them to Duke Energy for review. *We strongly encourage the use of modeling software (such as eQuest or comparable) for complex projects.*

Upon receipt of your application, an acknowledgement email will be sent to you with an estimated response time based on an initial assessment of your application. The application review may include some communication to resolve any questions about the project or to request additional information. Applications that are received complete without missing information have a faster review time.

There are two ways to submit your completed application.

Email your scanned form to: SelfDirect@duke-energy.com

Or, fax your form to 513-419-5572

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

1. Contact Information (Required)

Duke Energy Customer Contact Information									
Company Name	Cincinnati Public Schools								
Address	2651 Burnet Ave								
Project Contact	Don Elbe								
City	Cincinnati	State	OH	Zip Code	45219				
Title	Utility Management Coordinator								
Office Phone	614-580-3352	Mobile Phone		Fax					
E-mail Address	elbedon@cpsboe.k12.oh.us								

Equipment Vendor / Contractor / Architect / Engineer Contact Information									
Company Name	Plug Smart								
Address	1275 Kinnear Road Suite 229								
City	Columbus	State	OH	Zip Code	43212				
Project Contact	Lucas Dixon								
Title	Operations Manager								
Office Phone	614-580-3352	Mobile Phone		Fax	1-800-518-5576				
E-mail Address	lucas.dixon@plugsmart.com								
Describe Role	Ensures rebate is correctly applied for								

Payment Information					
Payee Legal Company Name (as shown on Federal income tax return):	Cincinnati Public Schools				
Mailing Address	2651 Burnet Ave				
City	Cincinatti	State	OH	Zip Code	45219
Type of organization (check one) ☐ Individual/Sole Proprietor ☐ Corporation ☐ Partnership ☐ Unit of Government ☐ Non-Profit (non-corporation)					
Payee Federal Tax ID # of Legal Company Name Above:	31-6000758				
Who should receive incentive payment? (select one) ☒ Customer ☐ Vendor (Customer must sign below)					
If the vendor is to receive payment, please sign below: I hereby authorize payment of incentive directly to vendor: Customer Signature _____ Date____/___/_____ (mm/dd/yyyy)					

2. Project Information (Required)

A. Please indicate project type:
- ☒ New Construction
- ☐ Expansion at an existing facility
- ☐ Replacing equipment due to equipment failure
- ☐ Replacing equipment that is estimated to have remaining useful life of 2 years or less
- ☐ Replacing equipment that is estimated to have remaining useful life of more than 2 years
- ☐ Behavioral, operational and/or procedural programs/projects

B. Please describe your project, or attach a detailed project description that describes the project.
New public pre kindergarten - 8th grade school.

C. When did you start and complete implementation?
Start date / (mm/yyyy) End date 03/ 2008 (mm/yyyy)

D. Are you also applying for Self-Direct Prescriptive incentives and, if so, which one(s)[1]?
Lighting Controls

E. Please indicate which worksheet(s) you are submitting for this application (check all that apply):
- ☐ Lighting
- ☐ Variable Frequency Drive (VFD)
- ☐ Compressed Air
- ☐ Energy Management System (EMS)
- ☒ General (for projects not easily submitted using one of the above worksheets)

F. Please tell us if there is anything about your electrical energy projections (either for the baseline or the proposed project) that you are either unsure about or for which you have made significant assumptions. Attach additional sheets as needed.

Required: Attach a supplier or contractor invoice or other equivalent information documenting the Implementation Cost for each project listed in your application. (Note: self-install costs cannot be included in the Implementation Cost)

[1] If your project involves some equipment that is eligible for prescriptive incentives and some equipment that is likely eligible for custom incentives, and if it is feasible to separate the equipment for the energy analysis, then the equipment will be evaluated separately. If it is not feasible to separate the equipment for analysis, then the equipment will be evaluated together in the custom application.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

3. Signature (Required – must be signed by Duke Energy customer)

Customer Consent to Release of Personal Information

I, (insert name) Don Elbe, do hereby consent to Duke Energy disclosing my Duke Energy Ohio, Inc Account Number and Federal Tax ID Number to its subcontractors solely for the purpose of administering Duke Energy Ohio's Mercantile Self-Direct Program. I understand that such subcontractors are contractually bound to otherwise maintain my Duke Energy Ohio, Inc Account Number and Federal Tax ID Number in the strictest of confidence.

I realize that under the rules and regulations of the public utilities commission, I may refuse to allow Duke Energy Ohio, Inc to release the information set forth above. By my signature, I freely give Duke Energy Ohio, Inc permission to release the information designated above.

Application Signature

I certify that I meet the eligibility requirements of the Duke Energy Ohio, Inc Mercantile Self Direct Custom Incentives Program and that all information provided within this application is correct to the best of my knowledge. I agree to the terms and conditions set forth for this program. I certify that the numbers, energy savings, and responses shown on this form are correct. Further, I certify that the taxpayer identification number is current and correct. I am not subject to backup withholding because: (a) I am exempt from backup withholding; or (b) I have not been notified by the IRS that I am subject to backup withholding as a result of a failure to report all interest or dividends; or (c) the IRS has notified me that I am no longer subject to backup withholding. I am a U.S. citizen (includes a U.S. resident alien).

Don Elbe

Duke Energy Ohio, Inc Customer Signature

Print Name Don Elbe

Date 12/30/2011

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Checklist for completing the Application

INCOMPLETE APPLICATIONS WILL RESULT IN DELAYS IN DUKE ENERGY PROCESSING YOUR APPLICATION AND NOTIFYING YOU CONCERNING AY REBATES. Before submitting the application and the required supplementary information, use the following checklist to ensure that your application is complete and the information in the application is accurate. (Note: this checklist is for your use only – do not submit this checklist with your application)

Section No. & Title	Have You:
1. Contact Information	☐ Completed the contact information for the Duke Energy customer? ☐ Completed the contact information for the equipment vendor / project engineer that can answer questions about the technical aspects of the project, if that is a different person than above?
2. Project Information	☐ Answered the questions A-E, including providing a description of your project. ☐ Completed and attached the lighting, compressed air, VFD, EMS and/or General worksheet(s)?
3. Signature	☐ Signed your name? ☐ Printed your name? ☐ Entered the date?
Supplementary information (Required)	☐ Attached a supplier or contractor's invoice or other equivalent information documenting the Implementation Cost for projects listed in your application? (Note: self-install costs cannot be included in the Implementation Cost) ☐ (If submitting the General Worksheet) attached calculations documenting the energy usage and energy savings for **each** project listed in your application?

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact:

- your Duke Energy account manager
  or,
- the Duke Energy Smart $aver® team at 1-866-380-9580.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Instructions/Terms/Conditions

Note: Please keep for your records- do not submit with the application

1. Energy service companies or contractors may assist in preparing the application, but an authorized representative of the customer must sign this application to be eligible to participate in the Mercantile Self Direct Program. Completion of this application does not guarantee the approval of a Self Direct Custom Rebate.

2. Once all documentation requested in this application is received by *Duke Energy Ohio, Inc,* and any follow-up information requested by *Duke Energy* is received, the rebate amount for each Energy Conservation Measure (ECM) will be communicated to the customer. The rebate amount will be based on ECM energy savings and ECM incremental installation cost.

3. All rebates require approval by the Public Utilities Commission of Ohio. *Duke Energy Ohio, Inc* will submit an application for rebate on the customer's behalf upon customer attestation to program terms, conditions and requirements as outlined in the rebate offer letter and upon customer completion of attestation documents required by the Public Utilities Commission of Ohio.

4. *Duke Energy Ohio, Inc* will issue a Self Direct Custom Rebate check, based on the approved rebate amount for each ECM, upon receiving approval from the Public Utilities Commission of Ohio. *Duke Energy* Ohio, Inc does not guarantee PUCO approval.

5. With the application, the customer must provide a list of all sites where the ECMs were installed. *Duke Energy Ohio, Inc* requests that sites of similar size, hours of operation and energy consuming characteristics be grouped together in one application for the determination of the rebate amount. The application should identify the site where each unique ECM was installed.

6. Based on the information submitted with the application and the information gathered both before and after the initial installation of the ECM, *Duke Energy Ohio, Inc* will calculate the rebate amount for each ECM.

7. *Duke Energy Ohio, Inc* may conduct random site inspections of a sample of the locations where the ECMs are installed to verify installation and operability of the ECMs and to obtain information needed to calculate the Approved Incentive Amount.

8. Customers are encouraged to retain copies of all forms, invoices and supporting documentation for their records.

9. Approved rebates are valid for 6 months from the date communicated to the customer by *Duke Energy Ohio, Inc,* subject to the expiration of measure eligibility based on project completion dates and application submission deadlines as defined by PUCO. Customers are encouraged to execute their rebate offer contracts and PUCO-required affidavits promptly to ensure eligibility is not forfeited.

10. *Duke Energy Ohio, Inc* reserves the right to recover all unrecoverable costs associated with the project approval if the customer decides not to execute the rebate contract, after the project is approved by *Duke Energy Ohio, Inc.*

11. Projects financially supported by other funding sources will be evaluated on a case-by-case basis for potential partial funding from *Duke Energy Ohio, Inc*.

12. Participants must be *Duke Energy Ohio, Inc* nonresidential, mercantile customers with the project sites in the *Duke Energy Ohio, Inc* service territory.

13. Customers or trade allies may not use any *Duke Energy* logo without prior written permission.

14. Only trade allies registered with *Duke Energy* are eligible to participate.

15. All equipment must be new. Used or rebuilt equipment is not eligible for incentives. All old existing equipment must be removed on retrofit projects.

16. Disclaimers: *Duke Energy Ohio, Inc*
    a. does not endorse any particular manufacturer, product or system design within the program;
    b. will not be responsible for any tax liability imposed on the customer as a result of the payment of incentives;
    c. does not expressly or implicitly warrant the performance of installed equipment. (Contact your contractor for details regarding equipment warranties.);
    d. is not responsible for the proper disposal/recycling of any waste generated or obsolete or old equipment as a result of this project;
    e. is not liable for any damage caused by the installation of the equipment nor for any damage caused by the malfunction of the installed equipment; and
    f. reserves the right to change or discontinue this program at any time. The acceptance of program applications is determined solely by *Duke Energy Ohio, Inc.*

The General Worksheet is part 2 of the application. Do not submit this file without submitting a completed Part1 Custom Application document file, which can be found at www.duke-energy com. This worksheet is for all projects that are not easily submitted through one of the other worksheets

Before you complete this application, please note the following important criteria:

- Submitting this application does not guarantee an incentive will be approved.
- Incentive already decided to proceed.
- Electric demand and/or energy reductions must be well documented with auditable calculations.
- Incomplete applications will not be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, found in the Mercantile Self Direct Custom Application Part 1 document.

Please enter your information and data into the cells that are shaded.
Cells in white are locked and cannot be written over.

Duke Energy Customer Contact Information (Match the information in Application Part 1):

Name	Don Elbe
Company	Cinicinnati Public Schools

Equipment Vendor / Project Engineer Contact Information

Name	Lucas Dixon
Company	Plug Smart

Before proceeding with the custom application, please verify that your project is not on the Self-Direct Prescriptive application.
The prescriptive incentive applications can be found at:
http //www.duke-energy.com/ohio-large-business/smart-saver/mercantile-self-direct.asp
Prescriptive rebate amounts are pre-approved.

List of Sites (Required)

App No.	
Rev.	

Provide a list of sites addressed by this custom incentive application

Site ID (see note 1)	Duke Energy Electric Account Number(s) (see note 2)	Facility Address	List of Proposed Projects at each site	Annual Hours of Operation	Gross Square Footage	Conditioned Square Footage	Facility Age (years)
225	*12345678 01*	*Example: 123 Main Street, Anywhere USA 12345*	*Project Name(s)*	*5,840*	*42,000*	*38,000*	*12*
	0140-3636-01	*1510 California Ave Cincinnati Ohio 45237*	*Heat Recovery Wheel*	*700*	*66,100*	*66,100*	*3*

1 **Site ID**
Can be a store number, building name or other way to identify the location. If there is only one site involved in this application, then a Site ID is not necessary.

2 **Account Numbers**
Must match the facility of the proposed project(s). If there are multiple meters at a site, only include the meters that pertain to the project(s).

For each project, answer the following questions (use one worksheet per project)

App No.	0
Rev.	0

Project Name: Heat Recovery Wheel

How would you classify this project? (Place an x in all boxes that apply.)

Lighting		**Heating/Cooling**	X	**Air Compressor**		**Energy Management System**	
VFD		**Motors/Pumps**		**Process Equipment**		**Other, describe below:**	

Brief Project Description

Describe the Baseline (see note 3) Equipment/System	Describe the Proposed High Efficiency Project
Air handler without heat recovery	Aid handler with heat recovery

If Existing Equipment is the Baseline, how many years of useful life remain or how many years until scheduled replacement?

Detailed Project Description Attached? Yes (Required)

Operating Hours (see note 4)

	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
24 x 7	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour		
No	*7:00 AM*	*3:00 PM*					*14*	*700*

Energy Savings

	Baseline (see Note 3)	Proposed	Savings	Describe how energy numbers were calculated
Annual Electric Energy	18,759 kWh	0 kWh	18,759 kWh	
Electric Demand	0 kW	0 kW	0 kW	
Calculations attached	Yes	Yes	(Required)	ne is listed as the savings with proposed at 0 kWh. See attached DUKE.CincPublic_Evan

Simple Payback

Average electric rate ($/kWh) on the applicable accounts (see note 6)			$0.10
Estimated annual electric savings			$1,876
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels			
Incremental cost to implement the project (equipment & installation) (see note 7)			
Copy of vendor proposal is attached (see note 8)			Yes
Simple Electric Payback in years (see note 9)	0	**Total Payback in years**	0

3 Baseline
Retrofit projects: the existing equipment is the baseline.
New construction projects: the baseline is the standard option in today's market, taking into account any applicable organizational, local, state or federal codes or standards currently in effect.

4 Operating Hours
Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

5 Weeks of Use in Year
If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why: Used year round but savings are only claimed during summer heating season

6 Average electric rate ($/kWh)
If you do not know your average electric rate, use $0.10/kWh.

7 Incremental cost to implement the project
Costs exclude self installation costs. Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

8 Copy of vendor invoice is attached
Vendor invoices detailing costs of the project are always required.
New construction projects or where the existing equipment must be replaced anyway, vendor proposal of baseline must also be attached.

9 Simple Electric Payback
If the simple electric payback is less than 1 year, the rebate structure is affected. Double check average electric rate for correct payback.

March 2, 2012

To whom it may concern:

This letter is to confirm that for the renovation to **Bond Hill Academy (1510 California Ave)**, for the **custom** rebate application, an energy conservation wheel was installed with a minimum unit cost listed below.

DESCRIPTION	QUANTITY	PRICE/FIXTURE	AMOUNT
NovelAire ECW 844 Energy Conservation Wheel	1	$8,000.00	$8,000.00

This is also to confirm that for the renovation to **Bond Hill Academy (1510 California Ave)**, for the **prescriptive** rebate application, an energy conservation wheel was installed with a minimum unit cost listed below.

DESCRIPTION	QUANTITY	PRICE/FIXTURE	AMOUNT
Sensor Switch OccSensors - WSD PDT 2P, CM PDT 10, & WV PDT 16	172	$117.89	$20,277.08

Thank you for your attention to this matter,

Don Elbe

Don Elbe
Utility Management Coordinator

APPLICATION AND CERTIFICATE FOR PAYMENT

TO OWNER: CINCINNATI PUBLIC SCHOOLS **PROJECT:** BOND HILL ACADEMY **APPLICATION No:** PAY APP 16
PERIOD TO: COMPLETION
PROJECT NOS:
CONTRACT DATE:

FROM CONTRACTOR: ATKINS & STANG **VIA ARCHITECT:** STEED HAMOND PAUL

CONTRACT FOR: ELECTRICAL/TELECOMMUNICATIONS

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment as shown below, in connection with the Contract
Continuation sheet is attached.

1.	ORIGINAL CONTRACT SUM.....$		1,700,000.00
2.	Net Change by Change Orders.....$		79,122.00
3.	CONTRACT SUM TO DATE.....$		1,779,122.00
4.	TOTAL COMPLETED & STORED TO DATE.....$		1,779,122.00
5.	RETAINAGE		
	a. 5-50% of Completed Labor.....$	Retainer Inv	0.00
	b. 8% of Stored Material.....$		0.00
	Total Retainage.....$		0.00
6.	TOTAL EARNED LESS RETAINAGE.....$		1,779,122.00
7.	LESS PREVIOUS CERTIFICATES FOR PAYMENT.....$		1,754,546.68
8.	CURRENT PAYMENT DUE.....$		24,575.32
9.	BALANCE TO FINISH, INCLUDING RETAINAGE.....$		0.00

Change Order/Contract	ADDITIONS	DEDUCTIONS
Total Changes approved In Previous months by Owner	38384.00	0.00
Total approved this month	40738.00	0.00
TOTALS	79122.00	0.00
NET CHANGES by Change Order	79122.00	0.00

The Contractor certified that the work covered by this pay request has been completed in accordance with the Contract Documents and that all progress payments previously paid by the State have been applied by the Contractor to discharge in full all of Contractor's obligations incurred in connection with the work covered by all prior pay requests.

Contractor: Atkins & Stang, Inc. Date: 1-24-09

Based upon on-site observations, the firm affirms that the work has progressed to the percentage of completeness indicated on the pay request.

State of: OHIO County of: HAMILTON
Subscribed and sworn to before me thi 24th day of January 2009
Notary Public: Linda Ann McCormick
My Commission expires:

LINDA ANN McCORMICK
Notary Public, State of Ohio
My Commission Expires Mar. 38, 2013

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising the application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED.....$ 24,575.32
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and ont he Continuation Sheet that are changed to conform with the amount certified.)

Architect Date: 2-4-09

Construction Manager Date: 2/4/09

Approved:

School District Date

925S9

CONTINUATION SHEET

AIA DOCUMENT G703

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: C3352-16
APPLICATION DATE: 1/24/09
PERIOD TO: COMPLETION
ARCHITECT'S PROJECT NO:

A ITEM NO.	B DESCRIPTION OF WORK		C SCHEDULED VALUE	D WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	E WORK COMPLETED THIS PERIOD	F MATERIALS PRESENTLY STORED (NOT IN D OR E)	G TOTAL COMPLETED AND STORED TO DATE (D+E+F)	G % (G ÷ C)	H BALANCE TO FINISH (C - G)	I RETAINAGE (IF VARIABLE RATE)
	BOND	X	$17,000.00	$17,000.00			$17,000.00	100.00%		$0.00
	MOBILIZATION	X	$5,000.00	$5,000.00			$5,000.00	100.00%		$0.00
	GENERAL ALLOWANCE	X	$15,000.00	$15,000.00			$15,000.00	100.00%		$0.00
	DSL LINES ALLOWANCE	X	$9,000.00	$9,000.00			$9,000.00	100.00%		$0.00
	SUPERVISION	L	$20,000.00	$20,000.00			$20,000.00	100.00%		$0.00
	PRIMARY ELECTRIC LABOR	L	$6,000.00	$6,000.00			$6,000.00	100.00%		$0.00
	PRIMARY ELECTRIC MAT	M	$16,000.00	$16,000.00			$16,000.00	100.00%		$0.00
	SITE ELECTRIC LABOR	L	$15,000.00	$15,000.00			$15,000.00	100.00%		$0.00
	SITE ELECTRIC MATERIAL	M	$5,000.00	$5,000.00			$5,000.00	100.00%		$0.00
	BRANCH CONDUIT LABOR	L	$125,000.00	$125,000.00			$125,000.00	100.00%		$0.00
	BRANCH CONDUIT MAT.	M	$37,500.00	$37,500.00			$37,500.00	100.00%		$0.00
	FEEDER CONDUIT LABOR	L	$15,000.00	$15,000.00			$15,000.00	100.00%		$0.00
	FEEDER CONDUIT MAT.	M	$12,000.00	$12,000.00			$12,000.00	100.00%		$0.00
	BRANCH WIRING LABOR	L	$22,300.00	$22,300.00			$22,300.00	100.00%		$0.00
	BRANCH WIRING MATERIAL	M	$45,000.00	$45,000.00			$45,000.00	100.00%		$0.00
	FEEDER WIRING LABOR	L	$18,000.00	$18,000.00			$18,000.00	100.00%		$0.00
	FEEDER WIRING MATERIAL	M	$133,700.00	$133,700.00			$133,700.00	100.00%		$0.00
	SWITCHGEAR, PANELS, TRANSFORMERS LABOR	L	$30,000.00	$30,000.00			$30,000.00	100.00%		$0.00
	SWITCHGEAR, PANELS, TRANSFORMERS MATERIAL	M	$90,000.00	$90,000.00			$90,000.00	100.00%		$0.00
	FIRE ALARM LABOR	L	$14,000.00	$14,000.00			$14,000.00	100.00%		$0.00
	FIRE ALARM MATERIAL	M	$23,000.00	$23,000.00			$23,000.00	100.00%		$0.00
	EMERGENCY GEN. LABOR	L	$3,000.00	$3,000.00			$3,000.00	100.00%		$0.00
	EMERGENCY GEN. MAT.	M	$25,000.00	$25,000.00			$25,000.00	100.00%		$0.00
	CABLE TRAY LABOR	L	$12,000.00	$12,000.00			$12,000.00	100.00%		$0.00
	CABLE TRAY MATERIAL	M	$20,000.00	$20,000.00			$20,000.00	100.00%		$0.00

CONTINUATION SHEET

AIA DOCUMENT G703

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.

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APPLICATION NO: C3352-16
APPLICATION DATE: 01/24/09
PERIOD TO: COMPLETION
ARCHITECT'S PROJECT NO:

A	B		C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK		SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
	LIGHTING CONTROL LABOR	L	$15,000.00	$15,000.00			$15,000.00	100.00%		$0.00
	LIGHTING CONTROL MATERIAL	M	$35,000.00	$35,000.00			$35,000.00	100.00%		$0.00
	STAGE LIGHTING LABOR	L	$3,000.00	$3,000.00			$3,000.00	100.00%		$0.00
	STAGE LIGHTING MATERIAL	M	$20,000.00	$20,000.00			$20,000.00	100.00%		$0.00
	SCOREBOARD LABOR	L	$700.00	$700.00			$700.00	100.00%		$0.00
	SCOREBOARD MATERIAL	M	$4,300.00	$4,300.00			$4,300.00	100.00%		$0.00
	EQUIPMENT & HVAC, KITCHEN, ETC. LABOR	L	$18,000.00	$18,000.00			$18,000.00	100.00%		$0.00
	EQUIPMENT & HVAC, KITCHEN, ETC MATERIAL	M	$5,000.00	$5,000.00			$5,000.00	100.00%		$0.00
	LIGHT FIXTURES LABOR	L	$30,000.00	$30,000.00			$30,000.00	100.00%		$0.00
	LIGHT FIXTURES MATERIAL	M	$140,000.00	$140,000.00			$140,000.00	100.00%		$0.00
	DEVICES LABOR	L	$9,000.00	$9,000.00			$9,000.00	100.00%		$0.00
	DEVICES MATERIAL	M	$8,000.00	$8,000.00			$8,000.00	100.00%		$0.00
	TEMPORARY ELECTRIC LABOR	L	$7,000.00	$7,000.00			$7,000.00	100.00%		$0.00
	TEMPORARY ELECTRIC MATERIAL	M	$4,500.00	$4,500.00			$4,500.00	100.00%		$0.00
	TELECOMMUNICATIONS CABLING LABOR	L	$60,337.00	$60,337.00			$60,337.00	100.00%		$0.00
	TELECOMMUNICATIONS CABLING MATERIAL	M	$140,788.00	$140,788.00			$140,788.00	100.00%		$0.00
	NETWORK ELECTRONICS LABOR	L	$20,100.00	$20,100.00			$20,100.00	100.00%		$0.00
	NETWORK ELECTRONICS MAT	M	$46,900.00	$46,900.00			$46,900.00	100.00%		$0.00
	MUSIC ROOM SOUND LABOR	L	$3,870.00	$3,870.00			$3,870.00	100.00%		$0.00
	MUSIC ROOM SOUND MAT.	M	$9,030.00	$9,030.00			$9,030.00	100.00%		$0.00
	CAFETORIUM SOUND LABOR	L	$8,280.00	$8,280.00			$8,280.00	100.00%		$0.00
	CAFETORIUM SOUND MAT.	M	$19,320.00	$19,320.00			$19,320.00	100.00%		$0.00
	PAGE SUBTOTALS		$608,125.00	$608,125.00	$0.00	$0.00	$608,125.00	100.00%	$0.00	$0.00
	SUB TOTALS		$1,341,625.00	$1,341,625.00	$0.00	$0.00	$1,341,625.00		$0.00	$0.00

Users may obtain validation of this document by requesting of the li

CONTINUATION SHEET

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APPLICATION DATE: 01/24/09
PERIOD TO: COMPLETION
ARCHITECT'S PROJECT NO:

A ITEM NO.	B DESCRIPTION OF WORK		C SCHEDULED VALUE	D WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	E WORK COMPLETED THIS PERIOD	F MATERIALS PRESENTLY STORED (NOT IN D OR E)	G TOTAL COMPLETED AND STORED TO DATE (D+E+F)	G % (G ÷ C)	H BALANCE TO FINISH (C - G)	I RETAINAGE (IF VARIABLE
	VIDEO DISTRIBUTION LABOR	L	$37,140.00	$37,140.00			$37,140.00	100.00%		$0.00
	VIDEO DISTRIBUTION MAT.	M	$86,660.00	$86,660.00			$86,660.00	100.00%		$0.00
	GYM SOUND LABOR	L	$8,272.00	$8,272.00			$8,272.00	100.00%		$0.00
	GYM SOUND MATERIAL	M	$19,303.00	$19,303.00			$19,303.00	100.00%		$0.00
	CLASSROOM SOUND LABOR	L	$14,700.00	$14,700.00			$14,700.00	100.00%		$0.00
	CLASSROOM SOUND MATERIAL	M	$34,300.00	$34,300.00			$34,300.00	100.00%		$0.00
	ALARM & ACCESS CONTROL LABOR	L	$12,780.00	$12,780.00			$12,780.00	100.00%		$0.00
	ALARM & ACCESS CONTROL MATERIAL	M	$29,820.00	$29,820.00			$29,820.00	100.00%		$0.00
	CCTV LABOR	L	$15,570.00	$15,570.00			$15,570.00	100.00%		$0.00
	CCTV MATERIAL	M	$36,330.00	$36,330.00			$36,330.00	100.00%		$0.00
	CENTRAL SOUND LABOR	L	$13,950.00	$13,950.00			$13,950.00	100.00%		$0.00
	CENTRAL SOUND MATERIAL	M	$31,550.00	$31,550.00			$31,550.00	100.00%		$0.00
	PUNCHLIST CLOSEOUT		$3,000.00	$3,000.00			$3,000.00	100.00%		$0.00
	CLOSEOUT DOCUMENTATION	L	$15,000.00	$15,000.00			$15,000.00	100.00%		$0.00
	CO 1		$8,819.00	$8,819.00			$8,819.00	100.00%		$0.00
	CO 2		$8,037.00	$8,037.00			$8,037.00	100.00%		$0.00
	CO 3		$8,055.00	$8,055.00			$8,055.00	100.00%		$0.00
	CO 4		$8,908.00	$8,908.00			$8,908.00	100.00%		$0.00
	CO 5		$2,926.00	$2,926.00			$2,926.00	100.00%		$0.00
	CO 6		$1,639.00	$1,639.00			$1,639.00	100.00%		$0.00
	CO 7		$7,244.00	$7,244.00			$7,244.00	100.00%		$0.00
	CO 8		($3,392.00)	($3,392.00)			($3,392.00)	100.00%		$0.00
	CO 9		$6,455.00	$6,455.00			$6,455.00	100.00%		$0.00
	CO 10		$9,404.00	$9,404.00			$9,404.00	100.00%		$0.00
	PAGE SUBTOTALS		$416,470.00	$416,470.00	$0.00	$0.00	$416,470.00	100.00%	$0.00	$0.00
	SUB TOTALS		$1,758,095.00	$1,758,095.00	$0.00	$0.00	$1,758,095.00	100.00%	$0.00	$0.00
	TOTAL LABOR for RETAINER		$0.00							$0.00
	TOTAL MATERIAL for RETAINER		$0.00							$0.00
										$0.00

CONTINUATION SHEET

AIA DOCUMENT G703

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APPLICATION NO: C3352-16
APPLICATION DATE: 01/24/09
PERIOD TO: COMPLETION
ARCHITECT'S PROJECT NO:

A ITEM NO.	B DESCRIPTION OF WORK		C SCHEDULED VALUE	D WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	E WORK COMPLETED THIS PERIOD	F MATERIALS PRESENTLY STORED (NOT IN D OR E)	G TOTAL COMPLETED AND STORED TO DATE (D+E+F)	G % (G ÷ C)	H BALANCE TO FINISH (C - G)	I RETAINAGE (IF VARIABLE
	CO 11		$1,730.00	$1,730.00			$1,730.00	100.00%		$0.00
	CO 12		$1,028.00	$1,028.00			$1,028.00	100.00%		$0.00
	CO 13		$3,838.00	$3,838.00			$3,838.00	100.00%		$0.00
	CO 14		$6,724.00	$6,724.00			$6,724.00	100.00%		$0.00
	CO 15		$2,864.00	$2,864.00			$2,864.00	100.00%		$0.00
	CO 16		$4,359.00	$4,359.00			$4,359.00	100.00%		$0.00
	CO 17		$484.00	$484.00			$484.00	100.00%		$0.00
	PAGE SUBTOTALS		$21,027.00	$21,027.00	$0.00	$0.00	$21,027.00	100.00%	$0.00	$0.00
	GRAND TOTALS		$1,779,122.00	$1,779,122.00	$0.00	$0.00	$1,779,122.00		$0.00	
	TOTAL LABOR for RETAINER									$0.00
	TOTAL MATERIAL for RETAINER		$0.00							$0.00

Users may obtain validation of this document by requesting of the license a completed AIA Document D401 - Certification of Document's Authenticity

Cincinnati Public Schools
2315 Iowa Avenue
Cincinnati, OH 45208

Contractor's Name: ATKINS & STANG, INC.
Address:1031 META DR.CINCINNATI,OH 45237

PO #508759

Contractor Pay Application Summary

Project Name: Bond Hill Elementary

1	Original Contract Amount	$	1,700,000.00
2	Net Changes to Date	$	79,122.00
3	Current Contract Amount	$	1,779,122.00
4	Labor Completed to Date	$	0.00
5	Material Completed to Date	$	1,139,096.00
6	Total Work Completed to Date	$	1,779,122.00
7	Stored Material to Date	$	0.00
8	Less Retained to Date	$	0.00
9	Total Amount Due	$	1,779,122.00
10	Less Previous Payments	$	1,576,646.18
11	Less Amount Retained to Cover Lien	$	0.00
12	Less Amount Retained for Liquidated Damages	$	0.00
13	Less Other Amounts Withheld	$	0.00
14	Current Due	$	24,575.32
15	Balance to Complete	$	0.00

***Owner approval required for the following contract adjustments:**

1. Assessment of liquidated damages
2. Other amounts withheld

_____ _____
Date

Comments:

Turner DAG TYS
Rebuilding Cincinnati Public Schools

February 20, 2009

Angie Tolle
Cincinnati Public Schools
2315 Iowa Avenue
Cincinnati, OH 45206

Dear Angie:

Attached are **Pay Applications** for the **Bond Hill Academy, please process for payment.**

Contractor	Application #	Monthly Billing	Total Billing To Date	Contract Amount to Date
BP#7 Atkins & Stang	**#Final**	**$ 24,575.32**	**$1,779,122.00**	**$1,779,122.00**

Please call if you have any questions.

Sincerely,
TURNER/DAG/TYS

James T. DeLage/bcs

James T. DeLage
Project Executive

/bcs

Attachments

cc: Matt Meibers - SHP
Manasseh Robinson – Turner/DAG/TYS
File 0025 –10960PB

T:PROJECTS/BOND HILL/00250 Pay Application/2009-02-20 combined Pay App. Ltr. Doc

APPLICATION AND CERTIFICATE FOR PAYMENT

TO OWNER:	Cincinnati Public Schools 2315 Iowa Street Cincinnati, Ohio 45206	**PROJECT:**	Bond Hill Academy K-8 1510 California Avenue Cincinnati, Ohio 45237	**APPLICATION No:** **PERIOD TO:** **PROJECT NOS:** **CONTRACT DATE:** **INVOICE NO:**	21-RET 08/04/08 06/22/06 1214-20
FROM CONTRACTOR:	Feldkamp Enteprises, Inc. 3642 Muddy Creek Road Cincinnati, Ohio 45238	**VIA ARCHITECT:**	Steed Hammond & Paul		
CONTRACT FOR:	HVAC & PIPING				

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment as shown below, in connection with the Contract Continuation sheet is attached.

1. ORIGINAL CONTRACT SUM	$	1,258,000.00
2. Net Change by Change Orders	$	9,619.00
3. CONTRACT SUM TO DATE	$	1,267,619.00
4. TOTAL COMPLETED & STORED TO DATE	$	1,267,619.00
5. RETAINAGE		
a. 8-50% of Completed Labor	$	-
b. 8% of Stored Material	$	-
Total Retainage	$	-
6. TOTAL EARNED LESS RETAINAGE	$	1,267,619.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT	$	1,224,369.48
8. CURRENT PAYMENT DUE	$	43,249.52
9. BALANCE TO FINISH, INCLUDING RETAINAGE	$	-

Change Order/Contract	ADDITIONS	DEDUCTIONS
Total Changes approved in Previous months by Owner		
Total approved this month		
TOTALS		
NET CHANGES by Change Order		

The Contractor certified that the work covered by this pay request has been completed in accordance with the Contract Documents and that all progress payments previously paid by Felicity-Franklin have been applied by the Contract to discharge in full all of Contractor's obligations incurred in connection with the work covered by all prior pay requests.

Contractor — Date: 8/4/08

PATRICIA A. HUCKE
Notary Public, State of Ohio
My Commission Expires 01-26-2013

Based upon on-site observations, the firm affirms that the work has progressed to the point indicated on the pay request.

Architect — Date: 8-13-08

Construction Manager — Date: 8/6/08

Approved:

School District — Date

ITEM NUMBER	DESCRIPTION OF WORK		SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED	TOTAL COMPLETED & STORED TO DATE	%	BALANCE TO FINISH	RETAINAGE
				PREVIOUS APPS.	THIS PERIOD					
NEW HIGH SCHOOL										
	HVAC									
1	COORDINATION DRAWINGS	LABOR	30,000.00	30,000.00	0.00	0.00	30,000.00	100.00%	0.00	0.00
2	COORDINATION DRAWINGS	MATERIAL	1,000.00	1,000.00	0.00	0.00	1,000.00	100.00%	0.00	0.00
3	MOBILIZATION	LABOR	2,000.00	2,000.00	0.00	0.00	2,000.00	100.00%	0.00	0.00
4	MOBILIZATION	MATERIAL	2,000.00	2,000.00	0.00	0.00	2,000.00	100.00%	0.00	0.00
5	DUCT WIORK	LABOR	127,000.00	127,000.00	0.00	0.00	127,000.00	100.00%	0.00	0.00
6	DUCT WIORK	MATERIAL	127,000.00	127,000.00	0.00	0.00	127,000.00	100.00%	0.00	0.00
7	BOILER FLUE	LABOR	2,000.00	2,000.00	0.00	0.00	2,000.00	100.00%	0.00	0.00
8	BOILER FLUE	MATERIAL	4,000.00	4,000.00	0.00	0.00	4,000.00	100.00%	0.00	0.00
9	FANS	LABOR	6,000.00	6,000.00	0.00	0.00	6,000.00	100.00%	0.00	0.00
10	FANS	MATERIAL	15,000.00	15,000.00	0.00	0.00	15,000.00	100.00%	0.00	0.00
11	VAV BOXES	LABOR	15,000.00	15,000.00	0.00	0.00	15,000.00	100.00%	0.00	0.00
12	VAV BOXES	MATERIAL	0.00	0.00	0.00	0.00	0.00		0.00	0.00
13	AIR DEVICES	LABOR	8,000.00	8,000.00	0.00	0.00	8,000.00	100.00%	0.00	0.00
14	AIR DEVICES	MATERIAL	8,000.00	8,000.00	0.00	0.00	8,000.00	100.00%	0.00	0.00
	PIPING									
100	BOND	LABOR	13,000.00	13,000.00	0.00	0.00	13,000.00	100.00%	0.00	0.00
101	SUBMITTALS	LABOR	5,000.00	5,000.00	0.00	0.00	5,000.00	100.00%	0.00	0.00
102	MOBILIZATION	LABOR	5,000.00	5,000.00	0.00	0.00	5,000.00	100.00%	0.00	0.00
103	CLEAN-UP	LABOR	3,500.00	3,500.00	0.00	0.00	3,500.00	100.00%	0.00	0.00
104	PUNCH LIST	LABOR	3,000.00	3,000.00	0.00	0.00	3,000.00	100.00%	0.00	0.00
105	HVAC ALLOWANCE	LABOR	10,000.00	10,000.00	0.00	0.00	10,000.00	100.00%	0.00	0.00
106	HVAC EQUIPMENT	MATERIAL	330,582.00	330,582.00		0.00	330,582.00	100.00%	0.00	0.00
107	HVAC EQUIPMENT	LABOR	20,000.00	20,000.00	0.00	0.00	20,000.00	100.00%	0.00	0.00
108	HYDRONIC EQUIPMENT	MATERIAL	20,000.00	20,000.00	0.00	0.00	20,000.00	100.00%	0.00	0.00
109	HYDRONIC EQUIPMENT	LABOR	5,000.00	5,000.00	0.00	0.00	5,000.00	100.00%	0.00	0.00
110	BOILERS	MATERIAL	30,000.00	30,000.00	0.00	0.00	30,000.00	100.00%	0.00	0.00
111	BOILERS	LABOR	5,500.00	5,500.00	0.00	0.00	5,500.00	100.00%	0.00	0.00
112	HW/CW PIPING	MATERIAL	111,418.00	111,418.00	0.00	0.00	111,418.00	100.00%	0.00	0.00
113	HW/CW PIPING	LABOR	140,000.00	140,000.00	0.00	0.00	140,000.00	100.00%	0.00	0.00
	SUBCONTRACTORS									
115	INSULATION	MATERIAL	28,000.00	28,000.00	0.00	0.00	28,000.00	100.00%	0.00	0.00
116	INSULATION	LABOR	30,000.00	30,000.00	0.00	0.00	30,000.00	100.00%	0.00	0.00
117	TEMP CONTROLS	MATERIAL	50,000.00	50,000.00	0.00	0.00	50,000.00	100.00%	0.00	0.00
118	TEMP CONTROLS	LABOR	68,000.00	68,000.00	0.00	0.00	68,000.00	100.00%	0.00	0.00
119	ENGINEERING	LABOR	20,000.00	20,000.00	0.00	0.00	20,000.00	100.00%	0.00	0.00
120	AIR/WATER BALANCE	LABOR	13,000.00	13,000.00	0.00	0.00	13,000.00	100.00%	0.00	0.00
121	CO #1/Bulletin #43	LABOR	11,722.00	11,722.00	0.00	0.00	11,722.00	100.00%	0.00	0.00
122	CO #2/PCO #158	LABOR	(2,103.00)	(2,103.00)	0.00	0.00	(2,103.00)	100.00%	0.00	0.00
	TOTALS		1,267,619.00	1,267,619.00	0.00	0.00	1,267,619.00	100.00%	0.00	0

Steed | Hammond | Paul
Architecture Inspired by the Community

LETTER OF TRANSMITTAL

Steed Hammond Paul Inc.
82 Williams Ave
Hamilton, OH 45015

Phone: 513-863-5441
Fax: 513-863-5441
eMail: mmeibers@shpinc.com

PTC-NEIGH DEV.
2008 AUG 15 P 2:03

TO:	Manasseh Robinson	FROM:	Matthew E. Meibers
COMPANY:	Turner/DAG/TYS 2315 Iowa Street Cincinnati, OH 45206	RE:	Bond Hill Academy K-8
DATE:	8/14/2008	COMM NO.:	2005002.00

We are Sending You the Following Items ◉ Attached ○ Under a Separate Cover VIA _____

☐ Copy of Letter ☐ Prints ☐ Specifications
☐ Shop Drawings ☐ Change Order ☒ Pay Application
☐ Plans ☐ Samples ☐ Other..

COPIES	DIV. NO.	DESCRIPTION
4		HVAC pay application

THESE ARE TRANSMITTED as checked below

☐ For Approval ☐ Reviewed as Submitted ☐ Resubmit ____ copies for approval
☒ For Your Use ☐ Reviewed as Noted ☐ Submit ____ copies for approval
☐ For Review & Comments ☐ Returned for Corrections ☐ Return ____ corrected prints

REMARKS

IF ENCLOSURES ARE NOT AS NOTED, PLEASE NOTIFY SIGNEE

COPIED TO

SIGNED _____
Matthew E. Meibers
Field Representative

Turner DAG TYS
Rebuilding Cincinnati Public Schools

August 22, 2008

Angie Tolle
Cincinnati Public Schools
2315 Iowa Avenue
Cincinnati, OH 45206

Dear Angie:

Attached are **Pay Applications** for the **Bond Hill Academy, please process for payment.**

Contractor	Application #	Monthly Billing	Total Billing To Date	Contract Amount to Date
BP#6 Feldkamp	**#21-Retainage**	**$ 43,249.52**	**$1,267,619.00**	**$1,267,619.00**

Please call if you have any questions.

Sincerely,
TURNER/DAG/TYS

James T. DeLage
Project Executive

/bcs

Attachments

cc: Matt Meibers - SHP
Dave Daniel – Turner/DAG/TYS
File 0025 –10960PO

T:PROJECTS/BOND HILL/00250 Pay Application/2008-08-22 combined Pay App. Ltr. Doc

AIR HANDLING UNITS

- BASIS OF DESIGN: TRANE. REFER TO SPECIFICATIONS FOR LIST OF APPROVED MANUFACTURERS
- WATER TYPE HEATING COIL CAPACITY BASED ON 190°F E.W.T./160°F L.W.T.
- WATER TYPE COOLING COIL CAPACITY BASED ON 44°F E.W.T./58°F L.W.T.
- MOTORS SHALL BE 480/3/60 UNLESS NOTED OTHERWISE.

UNIT NUMBER		AHU-1	AHU-2	AHU-3		
AREA SERVED		ACADEMIC	ADMIN/ MEDIA	GYM/CAFE		
MAXIMUM SYSTEM AIRFLOW (CFM)		38,000	9,000	20,000	(TYPICAL)	
MINIMUM OA (CFM)		14,100	2,600	3,000/ 12,050		
SUPPLY FAN	CFM	38,000	9,000	20,000		
	S.P. - IN W.G. EXT./TOTAL	2.0/6.0	1.5/5.0	1.5 / 4.06		
	WHEEL DIA. IN./RPM	44.5 / 1202	20 / 1794	39.39 / 1400		
	WHEEL TYPE/ CLASS	AF PLENUM / II	DWDI AF/ II	PLENUM AF / II		
	MOTOR BHP / HP	51.1 / 60	10.53 / 15	20.93 / 25		
	-					
RETURN/EXHAUST FAN	CFM	32,300	7,800	17,000		
	S.P. - IN W.G. EXT./TOTAL	0.75 / 2.0	0.5 / 0.75	0.75 / 1.22		
	WHEEL DIA. IN./RPM	49 / 615	20 / 495	39.39 / 724		
	WHEEL TYPE/ CLASS	AF PLENUM / I	DWDI AF / I	AF PLENUM / I		
	MOTOR BHP / HP	14.9 / 20	2.79 / 3	4.83 / 7.5		
	VFD / STARTER/DISC. VOLTS/PHASE	Danfoss/Graham 460V/3Ø	Danfoss/Graham 460V/3Ø	Danfoss/Graham 460V/3Ø		
PRE-HEATING COIL	FACE AREA	80.0	14.67	37.75		
	CAPACITY MBH	820.8	195.21	867.6		
	ENT. AIR TEMP.	45	55	25		
	LVG. AIR TEMP.	85	75	65		
	CFM	38,000	9,000	20,000		
	MAX. AIR P.D. - IN. W.C.	0.5	0.5	0.5		
	GPM	85	13	57.75		
	MAX WATER P.D.	5	5	5		
			1	1		

	VFD / STARTER/DISC. VOLTS/PHASE	Danfoos/Graham 460V/3Ø	Danfoos/Graham 460V/3Ø	Danfoos/Graham 460V/3Ø	
PRE-HEATING COIL	FACE AREA	80.0	14.67	37.75	
	CAPACITY MBH	820.8	195.21	867.6	
	ENT. AIR TEMP.	45	55	25	
	LVG. AIR TEMP.	65	75	65	
	CFM	38,000	9,000	20,000	
	MAX. AIR P.D. - IN. W.C.	0.5	0.5	0.5	
	GPM	55	13	57.73	
	MAX WATER P.D. FT.	5	5	5	
	MINIMUM ROWS	2	1	1	
COOLING COIL	FACE AREA S.F.	80.0	16.8	39.33	
	SENSIBLE CL'G MBH	1098	253	575.4	
	TOTAL CL'G MBH	1380	295	818.9	
	ENT. AIR TEMP. DB/WB	79.3 / 64.6	80.6 / 65.1	80.0 / 67.0	
	LVG. AIR TEMP. DB/WB	53.0 / 52.0	55.0 / 54.17	53.9 / 53.5	
	CFM	38,000	9,000	20,000	
	MAX. AIR P.D. - IN W.C.	1.0	0.8	1.0	
	GPM	203	42	116.6	
	MAX. WATER P.D. FT.	10	10	10	
	MINIMUM ROWS	6	8	6	
FILTER	TYPE - PRE	30	30	30	
	TYPE - FINAL	65	65	65	
	FACE AREA S.F.	80	40	40	
	P.D. IN W.C. PRE-FLTRS. CLN/DIRTY	0.3/0.7	0.3/0.7	0.3/0.7	
	P.D. IN W.C. FNL-FLTRS. CLN/DIRTY	0.5/1.0	0.5/1.0	0.5/1.0	
	-				
	OUTSIDE AIR - CFM	14,100			
	EXHAUST AIR - CFM	9,500			
SUMMER	O.A. E.A.T. - DB/WB °F	93 / 74			
	O.A. L.A.T. DB/WB °F	83.4 / 67.8			
	E.A. E.A.T. - DB/WB °F	77.0 / 62.8			
		5 / 2			

	FT.	10	10	10		
	MINIMUM ROWS	6	6	6		
FILTER	TYPE - PRE	30	30	30		
	TYPE - FINAL	65	65	65		
	FACE AREA S.F.	80	40	40		
	P.D. IN W.C. PRE-FLTRS. CLN/DARTY	0.3/0.7	0.3/0.7	0.3/0.7		
	P.D. IN W.C. FNL-FLTRS. CLN/DARTY	0.5/1.0	0.5/1.0	0.5/1.0		
	-					
HEAT RECOVERY	OUTSIDE AIR - CFM	14,100				
	EXHAUST AIR - CFM	9,500				
	SUMMER O.A. E.A.T. - DB/WB °F	93 / 74				
	SUMMER O.A. L.A.T. DB/WB °F	83.4 / 67.8				
	SUMMER E.A. E.A.T. - DB/WB °F	71.0 / 62.8				
	WINTER O.A. E.A.T. - DB/WB °F	5 / 2				
	WINTER O.A. L.A.T. - DB/WB °F	42.2 / 35.7				
	WINTER E.A. E.A.T. - DB/WB °F	70 / 54				
	MAX. FACE VEL. - FPM	600				
	MAX. AIR P.D. W.C. O/A	.75				
	MAX. AIR P.D. W.C. EXH	.75				
	TOTAL RECOVERY EFFECTIVENESS	80				
	UNIT WEIGHT (LBS)	35,000 LBS	6,000 LBS	15,000 LBS		

REQ'D ACCESS.

1. EMS CONTRACTOR SHALL DISABLE WHEEL OPERATION WHEN UNIT ENTERS ECONOMIZER MODE.
2. PACKAGED HEAT RECOVERY UNIT WITH SINGLE POINT POWER CONNECTION PACKAGE AND STOP/JOG ECONOMIZER WHEEL CONTROLS. UNIT SHALL BE 460-3-60. PROVIDE INTEGRAL MOTOR STARTERS.
3. FACTORY PROVIDED HEAT WHEEL 1 HP, VVFD, 460V, V8 FOR AHU-1.

Project Name: Carson Elementary School 10/2/2006

Thybar Corporation AIRX ERC DESIGN POINT ANALYSIS

DESIGN CONDITIONS	Dry Bulb, F	Wet Bulb, F	Enthalpy, Btu/lb
SUMMER, Outdoor	92.00	74.00	38.15
SUMMER, Indoor	75.00	63.00	28.94
WINTER, Outdoor	.00	-2.00	.31
WINTER, Indoor	70.00	53.00	22.25

Project Unit: ERV-1	**Model Number:** TV-7490	
SUPPLY AIR FLOW RATE, cfm	10010	10010
EXHAUST AIR FLOW RATE, cfm	8010	8010
Latent Effectiveness	75.96%	76.75%
Sensible Effectiveness	81.67%	82.58%
Measured Effectiveness (S/W)	79.4%	81.7%

SUPPLY AIR CONDITIONS	**Summer**	**Winter**
Dry Bulb Temperature, F	80.59	44.70
Wet Bulb Temperature, F	67.17	37.04
Enthalpy, Btu/lb	32.19	14.07
Relative Humidity, %	50.6	48.0

DESIGN LOADS, Btu/h	**Summer**	**Winter**
Outside Air, Sensible	172,229	765,017
Outside Air, Latent	216,811	233,833
Outside Air, Total	389,040	998,850

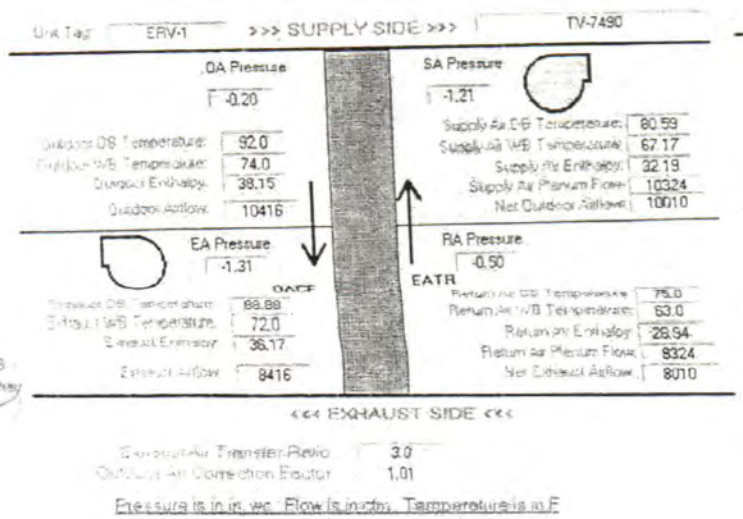
RECOVERED LOADS, Btu/h	**Summer**	**Winter**
Sensible Recovered	113,884	445,029
Latent Recovered	133,862	169,997
Total Recovered	247,746	615,026
Net OA Load	141,294	383,824

INSTALLED HVAC REDUCTION

COOLING, Tons	20.65
HEATING, Btu/h	615,026

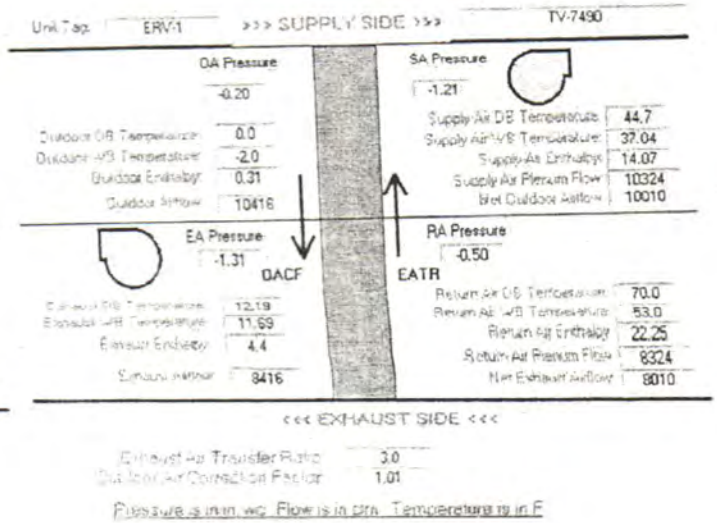
RF

Summer Process Diagram



Pressure is in in. wc. Flow is in cfm. Temperature is in F

Winter Process Diagram



Pressure is in in. wc. Flow is in cfm. Temperature is in F

Project Name: Carson Elementary School 10/2/2006

Thybar Corporation AIRX ERC DESIGN POINT ANALYSIS

DESIGN CONDITIONS	Dry Bulb, F	Wet Bulb, F	Enthalpy, Btu/lb
SUMMER, Outdoor	92.00	74.00	38.15
SUMMER, Indoor	75.00	63.00	28.94
WINTER, Outdoor	.00	-2.00	.31
WINTER, Indoor	70.00	53.00	22.25

Project Unit: ERV-2	**Model Number:** TV-7490	
SUPPLY AIR FLOW RATE, cfm	10958	10958
EXHAUST AIR FLOW RATE, cfm	8958	8958
Latent Effectiveness	73.38%	74.14%
Sensible Effectiveness	79.45%	80.34%
Measured Effectiveness (S/W)	77.0%	79.4%

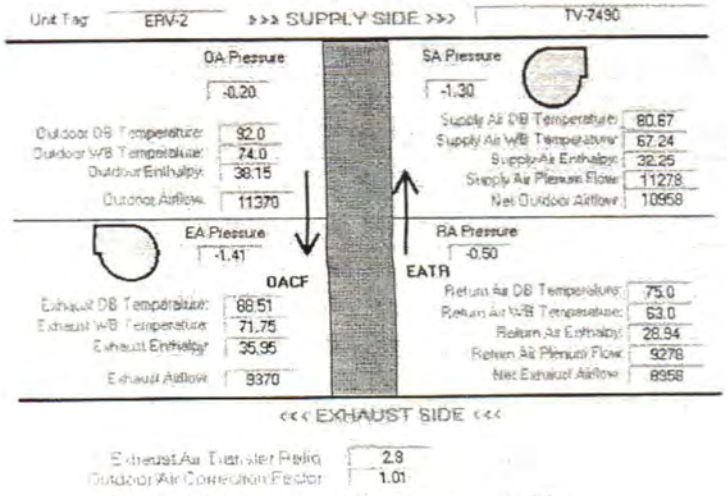
SUPPLY AIR CONDITIONS	**Summer**	**Winter**
Dry Bulb Temperature, F	80.67	44.36
Wet Bulb Temperature, F	67.24	36.76
Enthalpy, Btu/lb	32.25	13.94
Relative Humidity, %	50.7	48.0

DESIGN LOADS, Btu/h	**Summer**	**Winter**
Outside Air, Sensible	188,512	837,978
Outside Air, Latent	237,310	256,134
Outside Air, Total	425,822	1,094,113

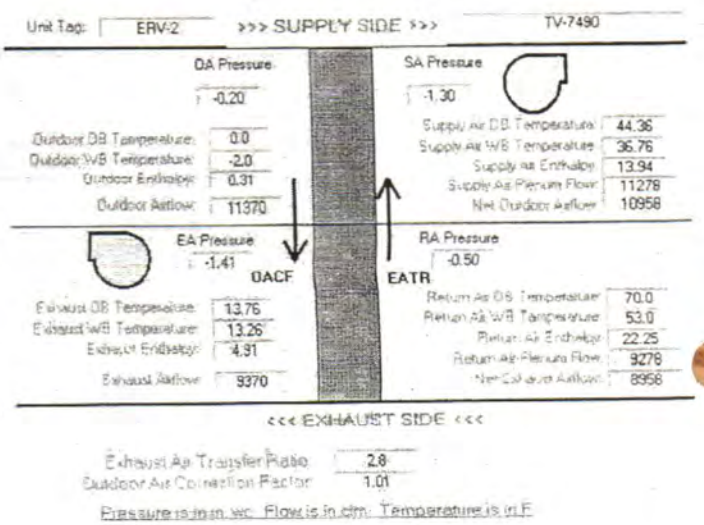
RECOVERED LOADS, Btu/h	**Summer**	**Winter**
Sensible Recovered	123,898	483,833
Latent Recovered	144,652	184,275
Total Recovered	268,550	668,108
Net OA Load	157,271	426,005

INSTALLED HVAC REDUCTION		
COOLING, Tons	22.38	
HEATING, Btu/h		668,108

Summer Process Diagram



Winter Process Diagram



TRANE

Air-Cooled Series R™ Helical-Rotary Liquid Chiller

Model RTAC 120 to 200 (400 to 760kw - 50 Hz) Built for the Industrial and Commercial Markets

RLC-PRC005-E4

Performance Data

SI Units

Table P-49 — ARI Part-Load Values RTAC Standard (along with ARI 550/590-98)

Unit	% Load	kW cooling	P.I. kW	COP (kW/kW)	IPLV (kW/kW)
140	100	505.9	159.0	2.90	4.09
	75	372.0	85.8	3.67	
	50	247.9	47.3	4.47	
	25	124.1	21.0	4.25	
155	100	554.3	175.6	2.87	3.98
	75	407.6	94.7	3.63	
	50	271.9	52.2	4.36	
	25	135.7	24.8	3.89	
170	100	603.4	192.4	2.85	3.98
	75	443.8	103.7	3.60	
	50	295.8	58.4	4.32	
	25	148.1	26.0	4.11	
185	100	669.7	212.5	2.86	3.98
	75	491.7	114.6	3.62	
	50	328.1	62.6	4.40	
	25	164.2	31.1	3.81	
200	100	737.6	232.9	2.88	4.00
	75	542.3	125.8	3.64	
	50	361.5	71.3	4.34	
	25	180.8	32.7	4.05	

Table P-50 — ARI Part-Load Values RTAC High-Efficiency (along with ARI 550/590-98)

Unit	% Load	kW cooling	P.I. kW	COP (kW/kW)	IPLV (kW/kW)
120	100	434.8	126.3	3.06	4.17
	75	320.0	70.5	3.71	
	50	213.1	38.3	4.58	
	25	106.6	16.3	4.34	
130	100	480.3	138.9	3.07	4.14
	75	353.5	76.9	3.74	
	50	235.3	41.2	4.59	
	25	117.8	19.6	3.97	
140	100	526.6	151.6	3.08	4.18
	75	387.2	83.4	3.76	
	50	258.1	46.2	4.59	
	25	129.1	20.6	4.21	
155	100	574.0	167.5	3.04	4.08
	75	423.4	92.1	3.73	
	50	281.4	50.7	4.49	
	25	140.7	24.2	3.89	
170	100	622.0	183.6	3.01	4.08
	75	456.9	100.1	3.70	
	50	304.9	56.5	4.45	
	25	152.3	25.4	4.07	
185	100	693.1	203.9	3.03	4.08
	75	510.3	111.9	3.72	
	50	339.7	61.7	4.50	
	25	169.9	30.6	3.82	
200	100	765.9	224.4	3.05	4.10
	75	561.7	122.8	3.75	
	50	375.6	70.6	4.45	
	25	187.8	32.2	4.08	

English Units

Table P-51 — ARI Part-Load Values RTAC Standard (along with ARI 550/590-98)

Unit	% Load	tons	P.I. kW	EER	IPLV
140	100	143.9	159.0	9.88	13.95
	75	105.8	85.8	12.51	
	50	70.5	47.3	15.24	
	25	35.3	21.0	14.51	
155	100	157.6	175.6	9.79	13.59
	75	115.9	94.7	12.39	
	50	77.3	52.2	14.89	
	25	38.6	24.8	13.29	
170	100	171.6	192.4	9.72	13.58
	75	126.2	103.7	12.29	
	50	84.1	58.4	14.74	
	25	42.1	26.0	14.02	
185	100	190.4	212.5	9.77	13.60
	75	139.8	114.6	12.34	
	50	93.3	62.6	15.02	
	25	46.7	31.1	13.00	
200	100	209.7	232.9	9.83	13.64
	75	154.2	125.8	12.42	
	50	102.8	71.3	14.81	
	25	51.4	32.7	13.81	

Table P-52 — ARI Part-Load Values RTAC High-Efficiency (along with ARI 550/590-98)

Unit	% Load	tons	P.I. kW	EER	IPLV
120	100	434.8	126.3	10.45	14.23
	75	320.0	70.5	12.66	
	50	213.1	38.3	15.63	
	25	106.6	16.3	14.82	
130	100	480.3	138.9	10.47	14.14
	75	353.5	76.9	12.76	
	50	235.3	41.2	15.66	
	25	117.8	19.6	13.55	
140	100	526.6	151.6	10.50	14.27
	75	387.2	83.4	12.84	
	50	258.1	46.2	15.65	
	25	129.1	20.6	14.37	
155	100	574.0	167.5	10.37	13.93
	75	423.4	92.1	12.73	
	50	281.4	50.7	15.31	
	25	140.7	24.2	13.26	
170	100	622.0	183.6	10.26	13.92
	75	456.9	100.1	12.64	
	50	304.9	56.5	15.20	
	25	152.3	25.4	13.90	
185	100	693.1	203.9	10.33	13.91
	75	510.3	111.9	12.71	
	50	339.7	61.7	15.35	
	25	169.9	30.6	13.04	
200	100	765.9	224.4	10.40	13.98
	75	561.7	122.8	12.80	
	50	375.6	70.6	15.17	
	25	187.8	32.2	13.93	

CHILLERS

TAG	DESCRIPTION	E.W.T.	L.W.T.	GPM	FOULING FACTOR	MAX EVAP P.D. (FT. HD.)	TONS	MIN. CAPACITY	EER	ELECTRICAL DATA VOLTS	PHASE	MCA	MOCP	MFR. **	MODEL	REQ'D ACCESS.
CH-1	AIR COOLED SCREW	56	44	330	0.0001	10	197.9	10%	9.6	460	3	419	500	TRANE	RTAC200	ALL
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

REQ'D ACCESS:
1. FACTORY MOUNTED & WIRED DISCONNECT
2. VIBRATION PADS
3. SINGLE POINT POWER CONNECTION
4. WATER FLOW SWITCH
5. HEAT TRACE FOR ALL EXTERIOR PIPING
6. HFC-134A REFRIGERANT
7. UNIT SHALL MEET ASHRAE 90.1-1999 FOR FULL LOAD CAPACITY AT AIR CONDITIONS.
8. WEIGHT OF UNIT IS 14,2000 LBS, WITH REFRIGERANT.
9. UNIT DIMENSIONS; 232'-0"L x 89"W x 95"H
10. Gas CHARGE 1 & 2 = 215 LB EACH
11. UNIT POWER 247.8 KW, COMPRESSOR POWER 229.60 KW, FAN MOTOR POWER 17.5 KW, 12 CONDENSER FANS, WYE-DELTA CLOSED COMPRESSOR STARTER TYPE.
12. FLA- CONDENSER FANS EACH 3.00A; FLA - COMPRESSOR A 168.00 A & FLA COMPRESSOR B 168.00 A

** - REFER TO SPECIFICATIONS FOR LIST OF APPROVED MANUFACTURERS (CARRIER MODEL 30GXR-024 ACCEPTABLE MODEL#)

GAS FIRED BOILERS

TAG	DESCRIPTION	E.W.T.	L.W.T.	GPM	MAX. P.D. FT.	MBH INPUT	MBH OUTPUT	BURNER H.P.	BURNER VOLTS	BURNER PHASE	OPER. GAS PRESS. IN. WC.	MFR. **	MODEL	REQ'D ACCESS.
B-1	FLEXIBLE TUBE FORCED DRAFT	160	180	110	10	2,000	1,670	5	460	3	14"	BRYAN	AB200	ALL
B-2	FLEXIBLE TUBE FORCED DRAFT	160	180	110	10	2,000	1,670	5	460	3	14"	BRYAN	AB200	ALL
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Dynamix Engineering Ltd.
Facility Engineering Consultants

1108 City Park Avenue, 3rd Floor
Phone (614) 443-1178 Fax (614) 443-1594
Columbus, Ohio 43206
www.dynamix-ltd.com

Shop Drawing Submittal Comments

Project: 050003 Bond Hill Academy
In regard to: 15855 – Custom AHU #1

REVIEW IS FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS. NO RESPONSIBILITY IS ASSUMED FOR CORRECTNESS OF DIMENSIONS OR DETAILS.
NO EXCEPTIONS TAKEN ☐
MAKE CORRECTIONS NOTED ☒
AMEND & RESUBMIT ☐
REJECTED-SEE REMARKS ☐
DYNAMIX ENGINEERING LTD.
DATE RECEIVED BY DYNAMIX: 8/11/06
DATE RETURNED: 9/29/06
BY: MEO

REMARKS

1) The Hot Water Coils, Chilled Water Coils, and The Energy Recovery Wheel in the original submittal were not correct. The manufacturer has submitted Supplemental Information regarding these items. See Attached Sheets.
2) Energy Recovery Wheel submitted in Supplemental Information is acceptable.

Ventrol

Ventrol Air Handling Systems Inc

Bond Hill Academy

STATIC PRESSURE SUMMARY

air pressure drops at **0** feet above sea level (inches w.g.)
septembre 15, 2006

	Supply	Return
Job Tag	AHU-1	AHU-1
Serial Number	11406-01	11329-01
Intake Section	0.10	0.01
2" Pre-Filters 25-30%	0.60	0.60
Heat Wheel	1.27	0.86
Return Fan System Effect	-	0.14
Exhaust damper	-	0.10
2" Pre-Filters 25-30%	0.60	
Cooling Coils	0.83	-
Heating Coils	0.06	-
12" Cartidge Filters 60-65%	1.00	-
Supply Fan System Effect	0.17	-
Discharge Section	0.01	-
Internal Static Pressure	4.64	1.71
Available External Static Pressure	2.00 ✓	0.75 ✓
Total Static Pressure	6.64	2.46

* Filters estimated at 50% Dirty.

Bond Hill Academy 11406-01 Revision : 2

Ventrol

Certified Performance Data Sheet

UNIT DETAILS

Unit TAG :	AHU-1
CFM :	38000
TSP :	6.55" WG
Unit Type :	Indoor
Unit Exterior :	Air dried enamel CES sandstone color coated exterior liner
Unit Roof Curb :	N/A
Unit Roof Curb Serial :	N/A
Unit Floor Type :	Standard flat floor
Auxiliary Floor Drains :	1¼" Dia. Galvanized Drain Connection
Unit Floor Insulation :	4", 3 lbs / cu.ft. density insulation
Unit Floor Liner :	12 Ga. Galvanized steel checkered plate
Unit Under Floor Liner :	22 Ga. Galvanized steel (Ventrol standard)
Unit Wall And Roof Insultation :	2", 3 lbs/cu.ft density
Unit Exterior Liner :	16 Ga G-90 galvanized steel (Ventrol standard)
Interior Liner :	SEE UNIT DRAWING
Fastners :	Zinc coated screws on interior and exterior liners (Ventrol Standard Interior Unit)
ETL :	YES

Dampers Louvers

Damper Louver Number :	1
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Return air
Damper Actuator Model :	None

Pre-Filter

Filter Duty :	E/A
Filter Number :	1
Filter Loading :	Front loading
Filter Type :	2" AAF Perfect Pleat 25-30% efficiency (MERV 7), UL Class II
Total Media Sets :	2 sets supplied by Ventrol, 1 set installed by Ventrol & 1 set extra
Filter Gage Type :	Dwyer 2002
Filter Frame Type Material :	AAF Universal Holding Frame (angular, front loading)
Filter Qty 24 X 24 :	20
Filter Qty 12 X 24 :	0
Blanking Material :	Galvanized

Dampers Louvers

Damper Louver Number :	2
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Return Bypass Damper
Damper Actuator Model :	None

Dampers Louvers

Damper Louver Number :	3
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Exhaust Bypass air
Damper Actuator Model :	None

Return Fan(s)

Return Fan Number :	1
Fan Model Number :	PF-49
Class Construction :	II
Rotation :	CW
Fan Discharge Arrangement :	axial
Fan Arrangement Type :	3
Motor manufacturer :	Weg
Motor Model # :	02018T3E256T
Enclosure/Hp/RPM/Frame/Eff. :	ODP - 20 - 1800 - 256T - PREMIUM ✓
Vac/Ph/Hz :	460/3/60 ✓
Belt Guard :	OSHA
Drive Sheaves :	Fixed pitch 1.2 safety factor
Safety Lock On Fan Door :	OSHA approved tool operated latch
Fan Bearings :	200 000 hrs L-50 with heavy duty nylon tubing & grease fittings to common internal location
Septum Wall:	2" Double Wall
Fan Accessories 1 :	Inertia base (concrete by others in the field)
Fan Accessories 2 :	Inlet screen
Fan Accessories 3 :	Fan enclosure screen

Dampers Louvers

Damper Louver Number :	4
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Exhaust air
Damper Actuator Model :	None

Dampers Louvers

Damper Louver Number :	5
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Outside air
Damper Actuator Model :	None

Pre-Filter

Filter Duty :	O/A
Filter Number :	2
Filter Loading :	Front loading
Filter Type :	2" AAF Perfect Pleat 25-30% efficiency (MERV 7), UL Class II ✓
Total Media Sets :	2 sets supplied by Ventrol, 1 set installed by Ventrol & 1 set extra ✓
Filter Gage Type :	Dwyer 2002
Filter Frame Type Material :	Type 8 Galvanized steel
Filter Qty 24 X 24 :	20
Filter Qty 12 X 24 :	0

Blanking Material :	Galvanized

Dampers Louvers

Damper Louver Number :	6
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Outside Bypass air
Damper Actuator Model :	None

Combo-Filter

Filter Duty :	S/A
Filter Number :	1
Filter Loading :	Front loading
Filter Type :	2" AAF Perfect Pleat 25-30% efficiency (MERV 7), UL Class II
Total Media Sets :	2 sets supplied by Ventrol, 1 set installed by Ventrol & 1 set extra
Pre-Filter Gage Type :	Dwyer 2002
Final Filter Type :	12" AAF Varicel, Type SH, 60-65%, UL Class I
Final Filter Total Media Sets :	2 sets supplied by Ventrol, 1 set installed by Ventrol & 1 set extra
Final Filter Gage Type :	Dwyer 2002
Final Filter Frame Type Material:	Type 8 Galvanized steel
Filter Qty 24 X 24 :	20
Filter Qty 12 X 24 :	0
Blanking Material :	Galvanized

Heating Coil(s)

Coil Casing Material :	Galvanized Steel
Blanking Material :	Galvanized
Coil Rack :	304 Stainless Steel Coil Rack
Special Coating :	None
Piping :	No

Cooling Coil(s)

Coil Casing Material :	Galvanized Steel
Blanking Material :	Galvanized
Coil Rack :	304 Stainless Steel Coil Rack
Drain Pan :	IAQ 304 (18 Ga.) Stainless Steel Drain Pan With (18 Ga.) Intermediate Drain Pan
Drain Pan Connection :	1¼" Dia. Stainless Steel Drain Connection
Special Coating :	None
Piping :	No

Supply Fan(s)

Supply Fan Number :	1
Fan Model Number :	PF-49
Class Construction :	II
Rotation :	CW
Fan Discharge Arrangement :	Radial
Fan Arrangement Type :	3

Bond Hill Academy 11406-01 Revision : 2

Ventrol

Certified Performance Data Sheet

Motor manufacturer :	Weg
Motor Model # :	06018OT3E364T
Enclosure/Hp/RPM/Frame/Eff. :	ODP - 60 - 1800 - 364T - PREMIUM
Vac/Ph/Hz :	460/3/60
Belt Guard :	OSHA
Drive Sheaves :	Fixed pitch 1.2 safety factor
Safety Lock On Fan Door :	OSHA approved tool operated latch
Fan Bearings :	200 000 hrs L-50 with heavy duty nylon tubing & grease fittings to common internal location
Septum Wall:	2" Double Wall
Fan Accessories 1 :	Inertia base (concrete by others in the field)
Fan Accessories 2 :	Inlet screen
Fan Accessories 3 :	Fan enclosure screen

Others Components

Other Component - 1 :	Novel Aire Heat Wheel (ECW~~966~~ 844) c/w VFD & Frost Control (motor is 460V)
Note :	See Heatwheel selection for more info. Frost control is c/w one E/A temperature sensor (see electrical drawing for more info).

Production Notes

1- S/A floor opening c/w grating.

2- Galvanized auxilliary drains provided downstream of the heatwheel for both tunnels (see drawing)

3- Short radius bellmouths provided on S/A openings. See drawing for more details.

4- All doors are c/w ADH-50 handles and stainless steel butt hinges.

Electrical Notes

1- Each fan motor is wired to a junction box (460V).

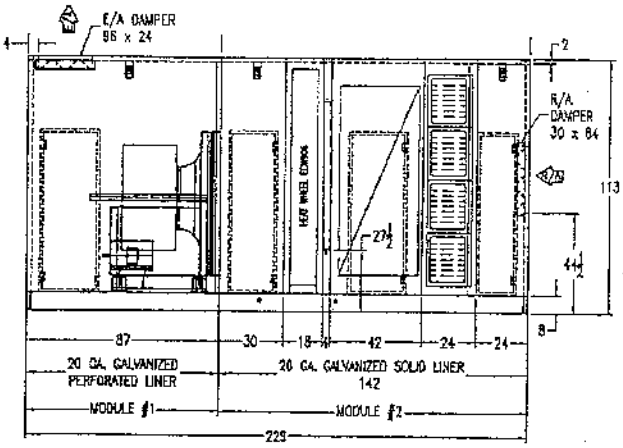
2- Heatwheel motor is wired to the VFD/Frost control enclosure.

3- Frost Control is c/w one temperature sensor installed in exhaust air tunnel.

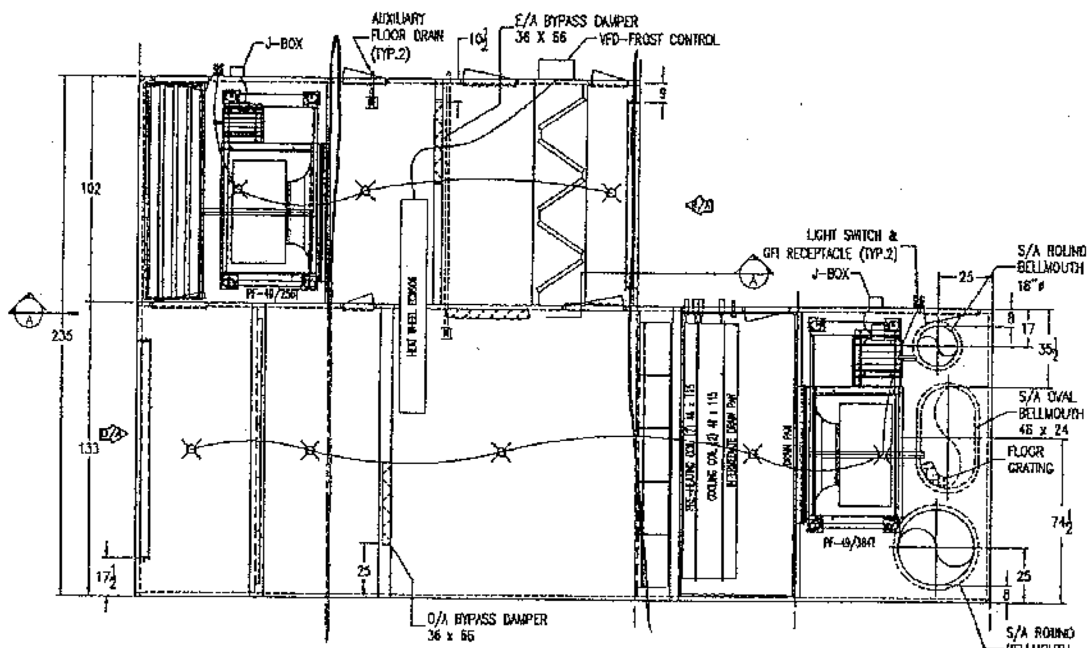
4- All compact fluorescent lights in S/A tunnel are wired to a light switch (c/w pilot light) and GFI at supply fan section.

5- All compact fluorescent lights in R/A tunnel are wired to a light switch (c/w pilot light) and GFI at return fan section.

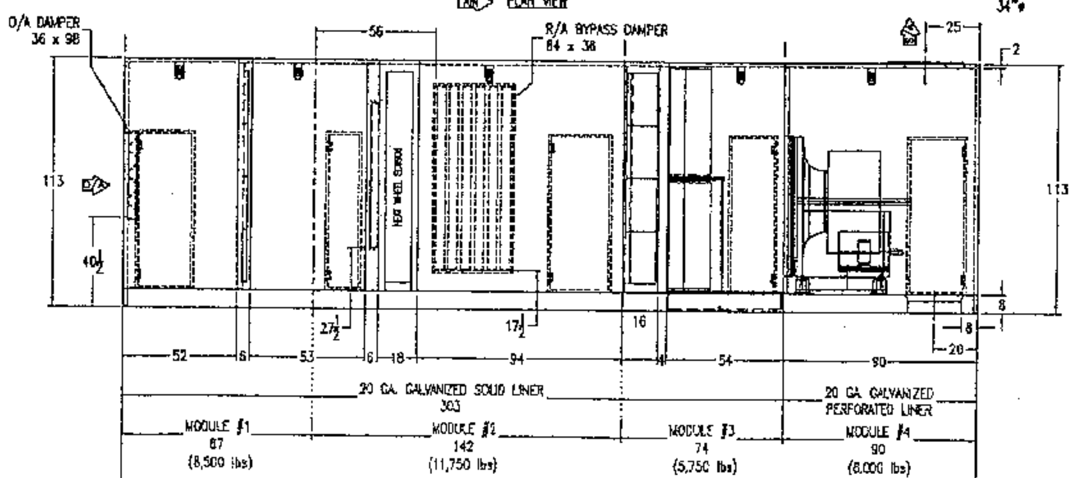
6- VFDs provided, installed and wired by others.



ELEVATION SECTION A-A



PLAN VIEW



ELEVATION VIEW

ALL INTERNAL COMPONENTS ARE GENERIC AND FOR ILLUSTRATION PURPOSES ONLY. REFER TO COMPONENT SELECTION FOR DETAILED INFORMATION.

DATE	DESCRIPTION	REV
09/08/08	CHANGE SUBMITTAL	02
07/31/08	SEE REVISION TABLE IN SUBMITTAL	01
07/14/08	–	–

REVISION TABLE

Ventrol

REP: Stoermer-Anderson

JOB NAME: Bond Hill Academy		TYPE OF DRAWING: –	DRAWING NUMBER: –
ENGINEER: –	SCALE: N.T.S	REFERENCE DRAWINGS	
PREPARER / APPLICATION ENGINEER: FST/ ver. MC	SERIAL NO.: 11406	SHOP ORDER NO.: 01	UNIT TAG: AHU-1 CFM 35,000

Ventrol

PF02-49 NYB 12 Blade Plenum

JOB INFORMATION:

Job Name:	Bond Hill Academy
Job Tag:	AHU-1 (Return Fan)
Rep Firm:	Stoermer-Anderson
Serial No:	11406-01
Date:	09-15-2006

OPERATING CONDITIONS:

Required Air Flow:	32,300 CFM
Static Pressure:	2.32 in. Wg.
Unducted Axial Disch.:	0.04 in. Wg.
Inlet Screen:	0.10 in. Wg.
Total Adjusted Static:	2.46 in. Wg.
Site Elevation:	Sea Level
TSP @ Sea Level:	2.46 in. Wg.

FAN PERFORMANCE:

RPM:	700
BHP / BHP with Belt Loss:	16.86 / 19.44
Static / Mech. Efficiency:	66.3% / 71.5%
Inlet / Outlet Velocity:	1976 / 1764 FPM
Plenum Outlet Velocity:	500 FPM

WHEEL SPECIFICATIONS:

Class / Max RPM:	Class II / 1,105
Diameter:	49.0 In.
Width:	100%
Tip Speed:	8,980 FPM
Shaft / Bearing Dia.:	2 7/16", 2 7/16"
Inertia:	143 WR²

MOTOR SELECTION:

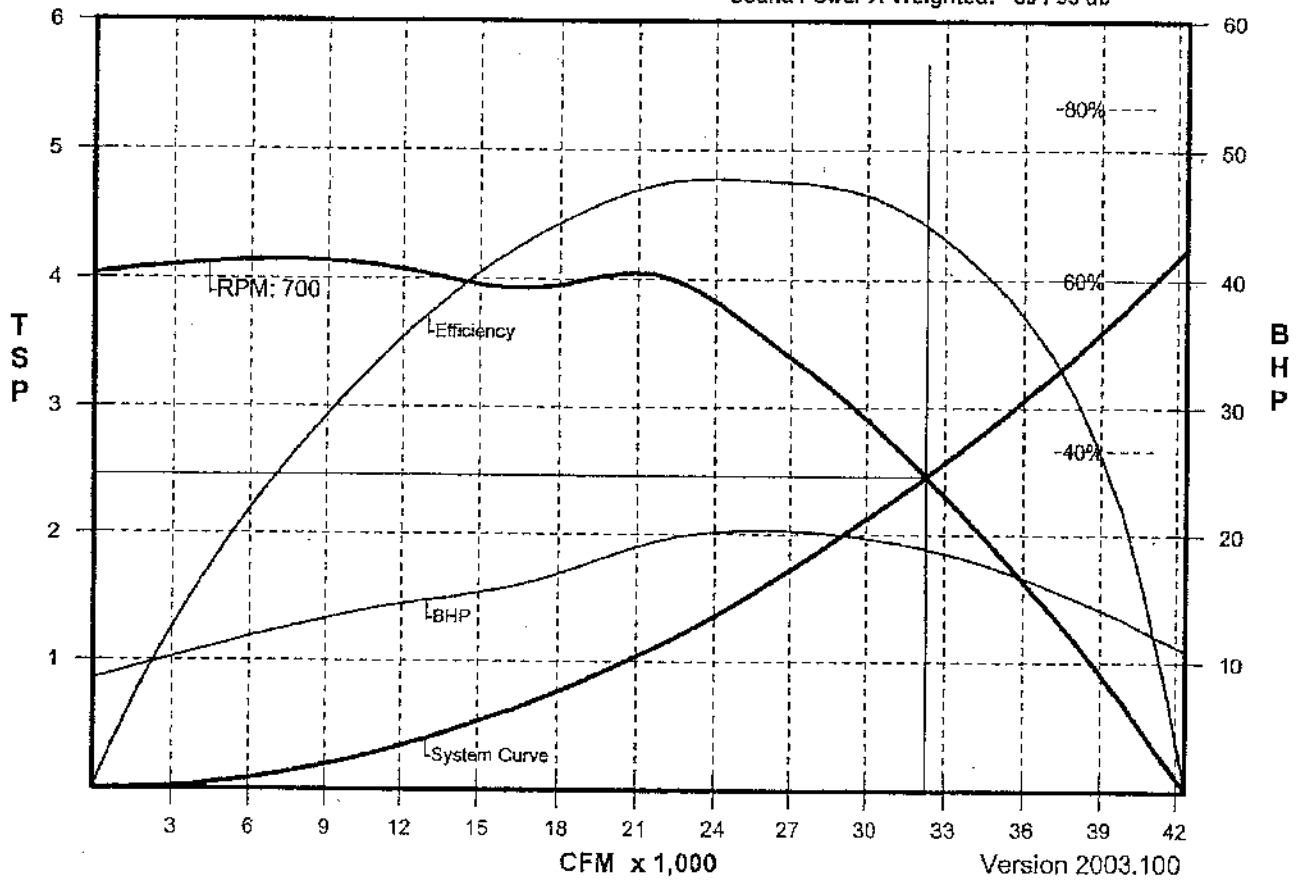
Rated HP:	20.0
Frame Size:	256T
Nominal RPM:	1750
VAC / PH / HZ:	460/3/60
Efficiency:	Premium
Enclosure Type:	ODP
Max Inertial Load:	236 WR²

SOUND POWER: (Inlet / Outlet)

Octave Band: (Re 10^-12 watts)

1	2	3	4	5	6	7	8
89	96	88	84	83	81	81	77
91	96	92	90	87	84	82	79

Sound Power A-Weighted: 89 / 93 db



Ventrol

PF02-49 NYB 12 Blade Plenum

JOB INFORMATION:

Job Name:	Bond Hill Academy
Job Tag:	AHU-1 (Supply Fan)
Rep Firm:	Stoermer-Anderson
Serial No:	11406-01
Date:	09-15-2006

OPERATING CONDITIONS:

Required Air Flow:	38,000 CFM
Static Pressure:	6.47 in. Wg.
Unducted Radial Disch.:	0.03 in. Wg.
Inlet Screen:	0.14 in. Wg.
Total Adjusted Static:	6.64 in. Wg.
Site Elevation:	Sea Level
TSP @ Sea Level:	6.64 in. Wg.

FAN PERFORMANCE:

RPM:	981
BHP / BHP with Belt Loss:	55.70 / 57.26
Static / Mech. Efficiency:	71.3% / 74.2%
Inlet / Outlet Velocity:	2324 / 2075 FPM
Plenum Outlet Velocity:	500 FPM

WHEEL SPECIFICATIONS:

Class / Max RPM:	Class II / 1,105
Diameter:	49.0 in.
Width:	100%
Tip Speed:	12,584 FPM
Shaft / Bearing Dia.:	2 7/16", 2 7/16"
Inertia:	280 WR²

MOTOR SELECTION:

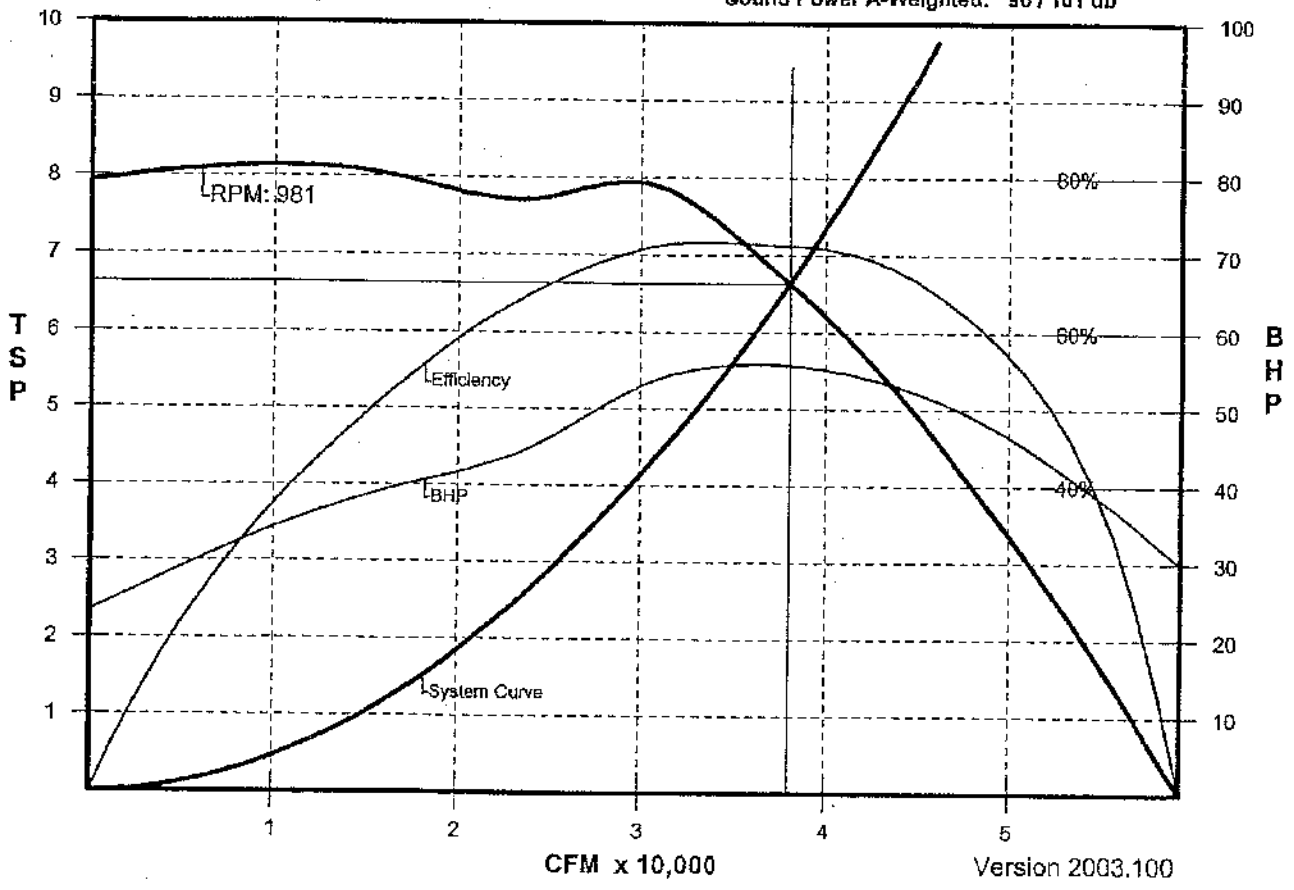
Rated HP:	60.0
Frame Size:	364T
Nominal RPM:	1750
VAC / PH / HZ:	460/3/60
Efficiency:	Premium
Enclosure Type:	ODP
Max Inertial Load:	637 WR²

SOUND POWER: (Inlet / Outlet)

Octave Band: (Re 10^-12 watts)

1	2	3	4	5	6	7	8
92	98	96	92	89	87	87	82
97	99	102	100	95	90	88	83

Sound Power A-Weighted: 96 / 101 db



Ventrol

Coil Selection / Rating 2006.100

Job Name: Bond Hill Academy
Tag: AHU-1 HC
Entered By: User Name
Date: 09/08/06
Serial #: 11406-01

Hot Water		5WC - 2 - 48 x 115 x 1 - 6 AL	
Individual Coil Construction		**Entering Conditions**	**Leaving Conditions**
(Qty) FH x FL :	(2) 48.00 x 115.00	ACFM : 38,000 ✓	Total Heat : 938,734 Btu/Hr ✓
Rows - FPI :	1 - 6	SCFM : 38,000 ✓	Sensible Heat : 938,734 Btu/Hr
Serpentine :	0.500	Altd : 0 ft	
Total Face Area :	76.67 sq.ft	EDB : 45.0°F	LDB : 67.8°F
Fin Thick / Mat. :	0.008" / AL		
Tube O.D. / Wall :	5/8" / 0.020"		
Tube Material :	CU	EWT : 180.0°F - 190	LWT : 141.1°F
Case Material :	16 GA GALV	Fluid : Water	Actual FV : 495.7 ft/min
Conn Location :	LH Same	GPM : 55.00 ✓	APD : 0.06 in.WG ✓
Sup.Conn - Qty / Size :	(1) 1-1/2"		Water Velocity : 1.91 ft/s
Ret.Conn - Qty / Size :	(1) 1-1/2"		Water PD : 2.53 ft ✓
ARI CERTIFIED 'Rated in Accordance with ARI Standard 410'			

1. Hot water velocity is below recommended minimum of 2.5 fps

Ventrol

Coil Selection / Rating 2006.100

Job Name: Bond Hill Academy
Tag: AHU-1 CC
Entered By: User Name
Date: 09/08/06
Serial #: 11406-01

Chilled Water		5WC - 4 - 48 x 115 x 6 - 11 AL	
Individual Coil Construction		**Entering Conditions**	**Leaving Conditions**
(Qty) FH x FL :	(2) 48.00 x 115.00	ACFM : 38,000	Total Heat : 1,367,474 Btu/Hr
Rows - FPI :	6 - 11	SCFM : 38,000	Sensible Heat : 1,103,715 Btu/Hr
Serpentine :	1.500	Altd : 0 ft	
Total Face Area :	76.67 sq.ft	EDB : 79.3°F	LDB : 52.8°F
Fin Thick / Mat. :	0.008" / AL	EWB : 64.8°F	LWB : 52.6°F
Tube O.D. / Wall :	5/8" / 0.020"		
Tube Material :	CU	EWT : 44.0°F	LWT : 57.4°F
Case Material :	16 GA GALV	Fluid : Water	Actual FV : 495.7 ft/min
Conn Location :	LH Same	GPM : 203.00	APD : 0.83 in.WG
Sup.Conn - Qty / Size :	(1) 2-1/2"		Water Velocity : 2.35 ft/s
Ret.Conn - Qty / Size :	(1) 2-1/2"		Water PD : 8.2 ft
ARI CERTIFIED 'Rated in Accordance with ARI Standard 410'			

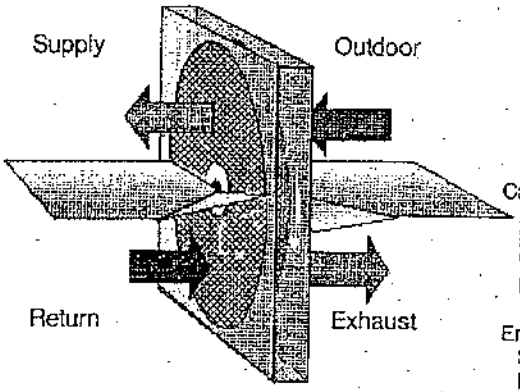
1. Chilled water velocity is below recommended minimum of 2.5 fps

NovelAire Technologies

Energy Conservation Wheel
Summer Operation

Title: AHU 1-Bond Academy
Date: 9/11/2006

Model Number: ECW 844



Wheel Parameters	
Wheel Diam., in.	84.0
Wheel Depth, in.	4.0
Purge Angle, °	2.0
Purge Vol., scfm	48
Wheel Speed, RPM	45
Hub Diam. in.	10.0

Cassette Parameters	
Drive Motor, HP	1.5
Height, in.	90.0
Width, in.	90.0
Depth, in.	9.0

Energy Conserved, BTU/h	
Sensible	135,448
Latent	178,677
Total	314,124

Face Velocity, sfpm	
Supply Side	721
Exhaust Side	489

Pressures, in. WC	
OA Static	0.40
RA Static	0.00
Supply Delta P	1.27
Exhaust Delta P	0.86

Effectiveness Balanced	
Sensible, %	77.2
Latent, %	73.9

Effectiveness Unbalanced	
Sensible, %	85.8
Latent, %	82.1
Total, %	83.8

	Volume scfm	Volume acfm	°FDB	°F WB	gr/lb	RH%	Enthalpy BTU / lb
Outdoor	13,607	14,518	93.0	74.0	95.7	41.2	37.39
Supply	13,497	14,100	83.7	68.0	77.3	44.8	32.22
Return	9,229	9,500	77.0	62.8	62.6	45.3	28.27
Exhaust	9,277	9,852	90.7	72.3	89.6	41.5	35.86

(Elevation: 0 ft. above Sea Level)

WHEEL

WHEEL:	Unitary rotor design with 12 galvanized spokes equally spaced, 10 in. diameter aluminum center hub, 2.19 in. diameter shaft, 12 ga. outer band
MEDIA:	Total energy transfer type (sensible and latent), corrugated synthetic fibrous matrix with molecular sieve desiccant

CASSETTE

FRAME:	Galvanized 10 ga. steel with two (2) removable side panels
BEARINGS:	Internal sealed roller bearing
AIR SEALS:	Non-contact inner and outer bulb seals
PURGE:	Adjustable Purge
DRIVE:	Perimeter driven belt drive

NovelAire Technologies, 10132 Mammoth Drive, Baton Rouge, LA 70814
Telephone: 800-762-1320 / 225-924-0427 Fax: 225-930-0340
www.novelaire.com

3642 Muddy Creek Road
Cincinnati, Ohio 45238
Phone:(513) 347-4500
Fax: (513) 347-4506
Website: www.feldkamphvac.com

SUBMITTAL DATA

Project:	Bond Hill Academy K-8
Project / P.O.#	1214
Specification Section	15855
Architect/Engineer:	Steed Hammond Paul
Submittal For:	Air Handling Unit #1
Manufacturer:	Ventrol
Supplier:	Stoermer-Anderson, Inc.
Contact Name & Phone #	George Mayer - (513) 527-2300

Comments:

Wesley B. Goodyear **8/8/2006**

RECEIVED BY
FELDKAMP ENTERPRISES, INC.

- [X] APPROVED
- [ ] APPROVED AS NOTED
- [ ] NOT APPROVED
- [ ] RESUBMIT
- [ ] REVISION NOTED

SPEC SECTION 15855

Stoermer-Anderson, Inc.
*Manufactures Representative * Heating / A.C. * Industrial / Power Equipment*
3818 Red Bank Road, Cincinnati, Ohio 45227
t:513-527-2300 www.stoermer-anderson.com f:531-527-2306

Submittal Data

EQUIPMENT SUBMITTAL

PROJECT:	Bond Hill Academy K-8 1510 California Avenue Cincinnati, Ohio 45237
ENGINEER:	Steed Hammond Paul 1014 Vine Street, Suite 2100 Cincinnati, Ohio 45202
CONTRACTOR:	Feldkamp Enterprises, Inc. 3642 Muddy Creek Rd. Cincinnati, OH 45238
BY:	Stoermer-Anderson, Inc. 3818 Red Bank Road Cincinnati, Ohio 45227
MANUFACTURER:	Ventrol
EQUIPMENT:	Air Handling Unit #1
DATE:	August 1, 2006

Below this line reserved for approval stamps

Ventrol

Ventrol Air Handling Systems Inc.

SUBMITTAL

SUBMITTAL
DRAWINGS & PERFORMANCE

PROJECT NAME: BOND HILL ACADEMY

VENTROL REP: STOERMER ANDERSON

SERIAL NUMBER:	11406-01
REVISION:	01
CUSTOMER:	-
ENGINEER FIRM:	-
PROJECT MANAGER:	Mauro Catavolo
DATE:	JULY 31st, 2006

☑ SUBMISSION FOR APPROVAL

☐ FOR RECORD PURPOSES ONLY
(NO DRAWINGS TO BE RETURNED)

9100 rue du Parcours, Anjou, Qc, H1J 2Z1

www.ventrol.com

Ventrol

Ventrol Air Handling Systems Inc

GENERAL:

- Factory fabricated (ITF) indoor air handling unit(s).
- Right and left is determined by facing in the direction of the airflow with the air hitting the back of your neck.
- All dimensions are in inches, unless otherwise indicated on drawings.
- All unit dimensions are nominal, they do not include lifting lugs, light switches, convenience outlets, variable frequency drives, coil connections or any other accessory or component.
- Multiple section units are shipped in modular sections. Units are shipped with sufficient gasket, mending plates, caulking and screws for field reassembly by OTHERS.
- Multiple piece units with factory furnished lights or electrical conduit will require reconnections at each demount. Field furnished electrical connections will be required after the unit is reassembled and set in place.
- **Units shall be ETL listed in accordance to UL Standard 1995 except for units with gas-fired heater, electric coils over 252 kW or shipped knocked down.**

UNIT BASE / FLOOR / FRAMEWORK:

The unit base frame is manufactured with rectangular structural tubing and fitted with C-Channel cross support members and "Double Bottom" base. The base rails are fitted with lifting lugs at each corner and midpoints as required.

LINERS:

- Liners are as per each Certified Performance Data Sheet (CPDS).
- Panels are secured with 1/4" hex head, zinc plated fasteners.
- If specified in the submittal, exterior panels are painted with industrial air-dried (alkyd) enamel (Standard CES Sandstone color). Salt Spray Resistance 5% salt fog at 95 °F passes 1000 hrs (ASTM B-117). Humidity Resistance 100% salt fog at 95 °F passes 1000 hrs (ASTM D-2247). If customer requires special color, please furnish factory with paint chip and/or paint color number **before or at time of release.**

INSULATION:

The fiberglass insulation has an effective thermal conductivity (C) of .24 (BTU in. / hr sq.ft. °F) and a noise reduction coefficient (NRC) of 0.70 per inch thick (based on a type "A" mounting). Coefficients meet or exceed a 3.0 lb/ft³ density material rating, unless otherwise indicated in CPDS. The insulation meets erosion requirements of UL 181 facing the air stream and fire hazard classification of 25/50 (per ASTM-84 and UL 723).

ACCESS DOORS:

Access doors are double wall construction with an extruded aluminum frame, stainless steel butt hinges and heavy duty ADH-50 handles on 2" walls and Allegis handles on 4" wall units. The doorframe features a built-in no-through-metal and a perimeter gasket.

CONDENSATE PAN:

Condensate pan is 16-ga TYPE 304 stainless steel. All pans have a dual slope and "Double Bottom" construction with welded corners. Drain connections are standard stainless steel 1 1/4" MPT.

FANS:

Specific fan information can be found in CPDS and fan selection print out. The fan shaft is turned, ground and polished solid steel rated at a maximum RPM below the critical speed. The fan wheel and sheaves are keyed to the shaft. Prior to shipment, the fan is balanced at the design RPM. Fans are rated in accordance with AMCA 210 for performance and/or AMCA 300 for sound (See fan selection print out for more details). All fans are provided with high-pressure plastic lube lines internally located on the drive side unless otherwise indicated in CPDS. Fans, motors and drives are internally spring isolated on a welded structural steel base complete with flex connections. Isolators are Amber Booth (or equal) seismically restrained type with 2" deflection for all fans, except for AF wheels 18" or smaller and FC wheels 27" or smaller which will have 1" isolators, unless otherwise indicated in CPDS.

MOTORS:

NEMA Design B T-FRAME motors are mounted on an adjustable base. The motors are tested to IEEE standard 112 test method B and NEMA MG 12.58.2 and 12.59 table 12-10. The motors meet energy policy act (EPAct) regulations unless otherwise indicated in CPDS. See performance data and accessories sheet for voltage, rpm, efficiencies, and motor type.

DRIVES:

VP "Variable Pitch" drive sheaves are furnished on motors up to 10 HP and fixed pitch on 15 HP and above. "Fixed pitch" sheaves are provided on all fans in excess of 2,000 RPM. See the air unit performance data and accessories sheet for the motor / fan sheave model numbers. V-Belt drives are selected at 120% to 150% of the motor nameplate horsepower.

COILS:

All coil assemblies are leak tested under water at 315 PSIG. PERFORMANCE is CERTIFIED under ARI Standard 410. Coils exceeding the range of ARI standard rating conditions will be as noted on the coil computer printout. Coils are constructed of seamless copper tubing mechanically expanded into fin collars. Fins are die formed plate type. Headers are seamless copper with die formed tube holes. Intermediate tube supports are supplied on coils over 44" fin length with an additional support every 42" multiple thereafter.

OTHERS:

- All electrical and automatic control devices not called out in this submittal are to be furnished and installed in the field by OTHERS.
- Dampers, louvers and/or other accessories are furnished and/or installed by Ventrol as indicated in each CPDS.

Ventrol

Ventrol Air Handling Systems Inc

AHU - 1

Ventrol

Ventrol Air Handling Systems Inc

STATIC PRESSURE SUMMARY

Ventrol

Ventrol Air Handling Systems Inc

Bond Hill Academy

STATIC PRESSURE SUMMARY

air pressure drops at 0 feet above sea level (inches w.g.)

juillet 13, 2006

	Supply	Return
Job Tag	AHU-1	AHU-1
Serial Number	11406-01	11329-01
Intake Section	0.10	0.01
2" Pre-Filters 25-30%	0.60	0.60
Heat Wheel	0.92	0.56
Return Fan System Effect	-	0.31
Exhaust damper	-	0.10
2" Pre-Filters 25-30%	0.60	
Cooling Coils	0.76	-
Heating Coils	0.06	-
12" Cartidge Filters 60-65%	1.00	-
Supply Fan System Effect	0.32	-
Discharge Section	0.01	-
Internal Static Pressure	4.37	1.58
Available External Static Pressure	2.00	0.75
Total Static Pressure	6.37	2.33

* Filters estimated at 50% Dirty.

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Ventrol Air Handling Systems Inc

CERTIFIED PERFORMANCE DATA

Bond Hill Academy 11406-01 Revision : 1

Ventrol

Certified Performance Data Sheet

UNIT DETAILS

Unit TAG :	AHU-1
CFM :	38000
TSP :	6.37" WG
Unit Type :	Indoor
Unit Exterior :	Air dried enamel CES sandstone color coated exterior liner
Unit Roof Curb :	N/A
Unit Roof Curb Serial :	N/A
Unit Floor Type :	Standard flat floor
Auxiliary Floor Drains :	1¼" Dia. Galvanized Drain Connection
Unit Floor Insulation :	4", 3 lbs / cu.ft. density insulation
Unit Floor Liner :	12 Ga. Galvanized steel checkered plate
Unit Under Floor Liner :	22 Ga. Galvanized steel (Ventrol standard)
Unit Wall And Roof Insultation :	2", 3 lbs/cu.ft density
Unit Exterior Liner :	16 Ga G-90 galvanized steel (Ventrol standard)
Interior Liner :	SEE UNIT DRAWING
Fastners :	Zinc coated screws on interior and exterior liners (Ventrol Standard Interior Unit)
ETL :	YES

Dampers Louvers

Damper Louver Number :	1
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Return air
Damper Actuator Model :	None

Pre-Filter

Filter Duty :	E/A
Filter Number :	1
Filter Loading :	Front loading
Filter Type :	2" AAF Perfect Pleat 25-30% efficiency (MERV 7), UL Class II
Total Media Sets :	2 sets supplied by Ventrol, 1 set installed by Ventrol & 1 set extra
Filter Gage Type :	Dwyer 2002
Filter Frame Type Material :	AAF Universal Holding Frame (angular, front loading)
Filter Qty 24 X 24 :	20
Filter Qty 12 X 24 :	0
Blanking Material :	Galvanized

Dampers Louvers

Damper Louver Number :	2
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Return Bypass Damper
Damper Actuator Model :	None

Dampers Louvers

Bond Hill Academy 11406-01 Revision : 1

Ventrol

Certified Performance Data Sheet

Damper Louver Number :	3
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Exhaust Bypass air
Damper Actuator Model :	None

Return Fan(s)

Return Fan Number :	1
Fan Model Number :	PF-49
Class Construction :	II
Rotation :	CW
Fan Discharge Arrangement :	axial
Fan Arrangement Type :	3
Motor manufacturer :	Weg
Motor Model # :	02018T3E256T
Enclosure/Hp/RPM/Frame/Eff. :	ODP - 20 - 1800 - 256T - PREMIUM
Vac/Ph/Hz :	460/3/60
Belt Guard :	OSHA
Drive Sheaves :	Fixed pitch 1.2 safety factor
Safety Lock On Fan Door :	OSHA approved tool operated latch
Fan Bearings :	200 000 hrs L-50 with heavy duty nylon tubing & grease fittings to common internal location
Septum Wall:	2" Double Wall
Fan Accessories 1 :	Inertia base (concrete by others in the field)
Fan Accessories 2 :	Inlet screen
Fan Accessories 3 :	Fan enclosure screen

Dampers Louvers

Damper Louver Number :	4
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Exhaust air
Damper Actuator Model :	None

Dampers Louvers

Damper Louver Number :	5
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Outside air
Damper Actuator Model :	None

Pre-Filter

Filter Duty :	O/A
Filter Number :	2
Filter Loading :	Front loading
Filter Type :	2" AAF Perfect Pleat 25-30% efficiency (MERV 7), UL Class II
Total Media Sets :	2 sets supplied by Ventrol, 1 set installed by Ventrol & 1 set extra
Filter Gage Type :	Dwyer 2002
Filter Frame Type Material :	Type 8 Galvanized steel
Filter Qty 24 X 24 :	20
Filter Qty 12 X 24 :	0

Bond Hill Academy 11406-01 Revision : 1

Ventrol

Certified Performance Data Sheet

Blanking Material :	Galvanized

Dampers Louvers

Damper Louver Number :	6
Damper Model :	Ventrol VCD-60
Damper Louver Duty :	Outside Bypass air
Damper Actuator Model :	None

Combo-Filter

Filter Duty :	S/A
Filter Number :	1
Filter Loading :	Front loading
Filter Type :	2" AAF Perfect Pleat 25-30% efficiency (MERV 7), UL Class II
Total Media Sets :	2 sets supplied by Ventrol, 1 set installed by Ventrol & 1 set extra
Pre-Filter Gage Type :	Dwyer 2002
Final Filter Type :	12" AAF Varicel, Type SH, 60-65%, UL Class I
Final Filter Total Media Sets :	2 sets supplied by Ventrol, 1 set installed by Ventrol & 1 set extra
Final Filter Gage Type :	Dwyer 2002
Final Filter Frame Type Material:	Type 8 Galvanized steel
Filter Qty 24 X 24 :	20
Filter Qty 12 X 24 :	0
Blanking Material :	Galvanized

Heating Coil(s)

Coil Casing Material :	Galvanized Steel
Blanking Material :	Galvanized
Coil Rack :	304 Stainless Steel Coil Rack
Special Coating :	None
Piping :	No

Cooling Coil(s)

Coil Casing Material :	Galvanized Steel
Blanking Material :	Galvanized
Coil Rack :	304 Stainless Steel Coil Rack
Drain Pan :	IAQ 304 (18 Ga.) Stainless Steel Drain Pan With (18 Ga.) Intermediate Drain Pan
Drain Pan Connection :	1¼" Dia. Stainless Steel Drain Connection
Special Coating :	None
Piping :	No

Supply Fan(s)

Supply Fan Number :	1
Fan Model Number :	PF-49
Class Construction :	II
Rotation :	CW
Fan Discharge Arrangement :	Radial
Fan Arrangement Type :	3

Bond Hill Academy 11406-01 Revision : 1

Ventrol

Certified Performance Data Sheet

Motor manufacturer :	Weg
Motor Model # :	06018OT3E364T
Enclosure/Hp/RPM/Frame/Eff. :	ODP - 60 - 1800 - 364T - PREMIUM
Vac/Ph/Hz :	460/3/60
Belt Guard :	OSHA
Drive Sheaves :	Fixed pitch 1.2 safety factor
Safety Lock On Fan Door :	OSHA approved tool operated latch
Fan Bearings :	200 000 hrs L-50 with heavy duty nylon tubing & grease fittings to common internal location
Septum Wall:	2" Double Wall
Fan Accessories 1 :	Inertia base (concrete by others in the field)
Fan Accessories 2 :	Inlet screen
Fan Accessories 3 :	Fan enclosure screen

Others Components

Other Component - 1 :	Innergy tech Heat Wheel (ERW3000-T-88) c/w VFD & Frost Control (motor is 460V)
Note ;	See Heatwheel selection for more info. Frost control is c/w one E/A temperature sensor (see electrical drawing for more info).

Production Notes

1- S/A floor opening c/w grating.

2- Galvanized auxilliary drains provided downstream of the heatwheel for both tunnels (see drawing)

3- Short radius bellmouths provided on S/A openings. See drawing for more details.

4- All doors are c/w ADH-50 handles and stainless steel butt hinges.

Electrical Notes

1- Each fan motor is wired to a junction box (460V).

2- Heatwheel motor is wired to the VFD/Frost control enclosure.

3- Frost Control is c/w one temperature sensor installed in exhaust air tunnel.

4- All compact fluorescent lights in S/A tunnel are wired to a light switch (c/w pilot light) and GFI at supply fan section.

5- All compact fluorescent lights in R/A tunnel are wired to a light switch (c/w pilot light) and GFI at return fan section.

6- VFDs provided, installed and wired by others.

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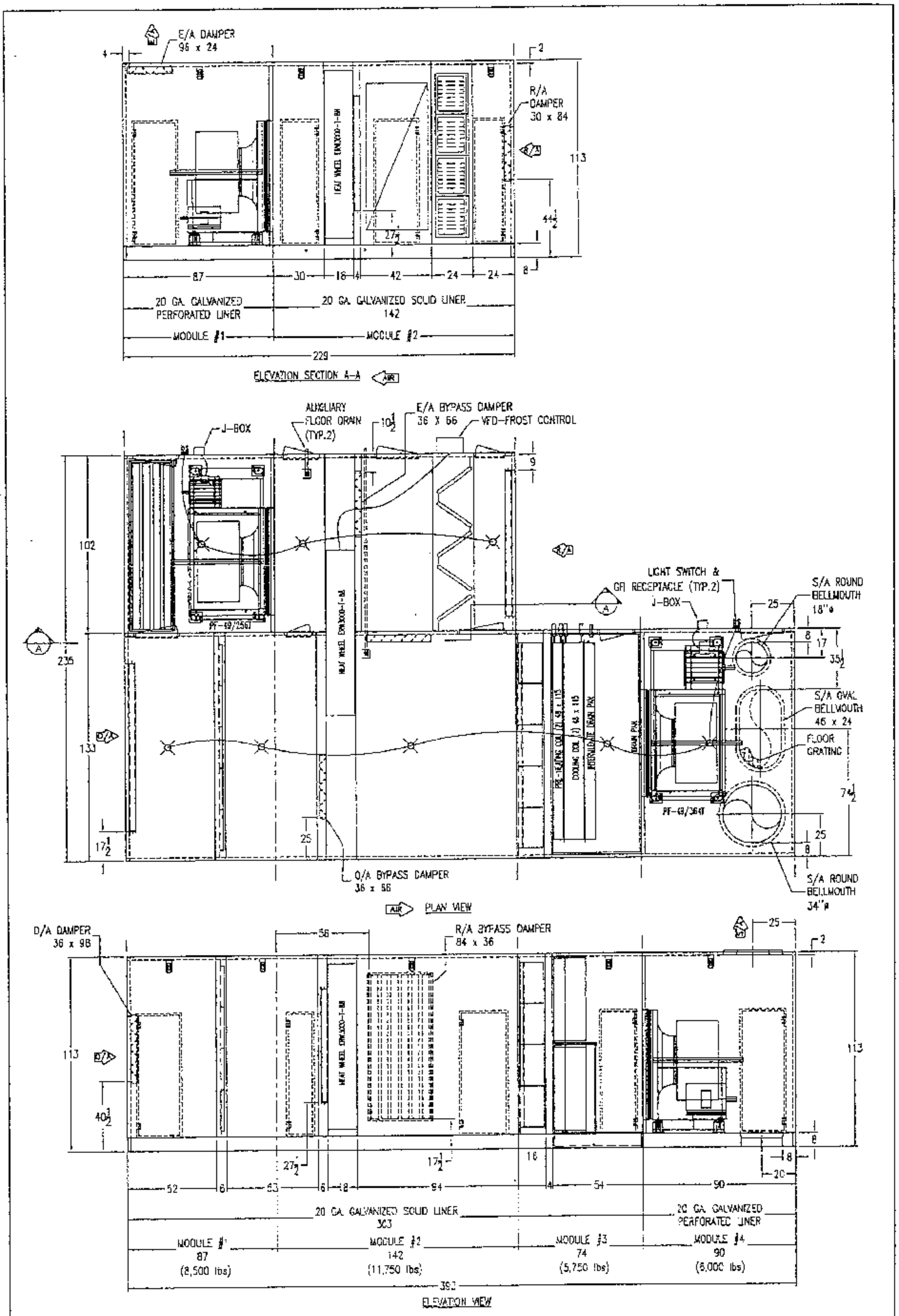
Ventrol Air Handling Systems Inc

DRAWINGS



ALL INTERNAL COMPONENTS ARE GENERIC AND FOR ILLUSTRATION PURPOSES ONLY. REFER TO COMPONENT SELECTION FOR DETAILED INFORMATION.

07/31/08	SEE REVISION TABLE IN SUBMITTAL	01
07/14/08	–	–
DATE	DESCRIPTION	REV.
REVISION TABLE		

Ventrol

REF: Stearns–Anderson

JOB NAME: Bond Hill Academy			TYPE OF DRAWING: REFERENCE DRAWINGS
ENGINEER: –		SCALE: N.T.S	DRAWING NUMBER: –
PREPARER / APPLICATION ENGINEER: FST/ ver: MC	SERIAL NO.: 11406	SHOP ORDER NO.: 01	UNIT TAG: AHU-1 CFM 38,000

... SPECIFICATIONS AND ENGINEERING DATA SUBMITTED HERE WITH OR WHICH MAY BE SUBMITTED REMAIN THE PROPERTY OF VENTROL AIR HANDLING SYSTEMS INC. AND SHALL NOT BE REPRODUCED OR ALTERED OR USED IN WHOLE OR IN PART AS THE BASIS ...

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FAN SELECTION

Ventrol

PF02-49 NYB 12 Blade Plenum

JOB INFORMATION:

Job Name:	Bond Hill Academy
Job Tag:	AHU-1 (Return Fan)
Rep Firm:	-
Serial No:	-
Date:	07-13-2006

OPERATING CONDITIONS:

Required Air Flow:	32,300 CFM
Static Pressure:	2.02 in. Wg.
Unducted Axial Disch.:	0.21 in. Wg.
Inlet Screen:	0.10 in. Wg.
Total Adjusted Static:	2.30 in. Wg.
Site Elevation:	Sea Level
TSP @ Sea Level:	2.30 in. Wg.

FAN PERFORMANCE:

RPM:	691
BHP / BHP with Belt Loss:	17.93 / 18.49
Static / Mech. Efficiency:	65.2% / 70.7%
Inlet / Outlet Velocity:	1976 / 1764 FPM
Plenum Outlet Velocity:	1200 FPM

WHEEL SPECIFICATIONS:

Class / Max RPM:	Class II / 1,105
Diameter:	49.0 in.
Width:	100%
Tip Speed:	8,864 FPM
Shaft / Bearing Dia.:	2 7/16", 2 7/16"
Inertia:	139 WR²

MOTOR SELECTION:

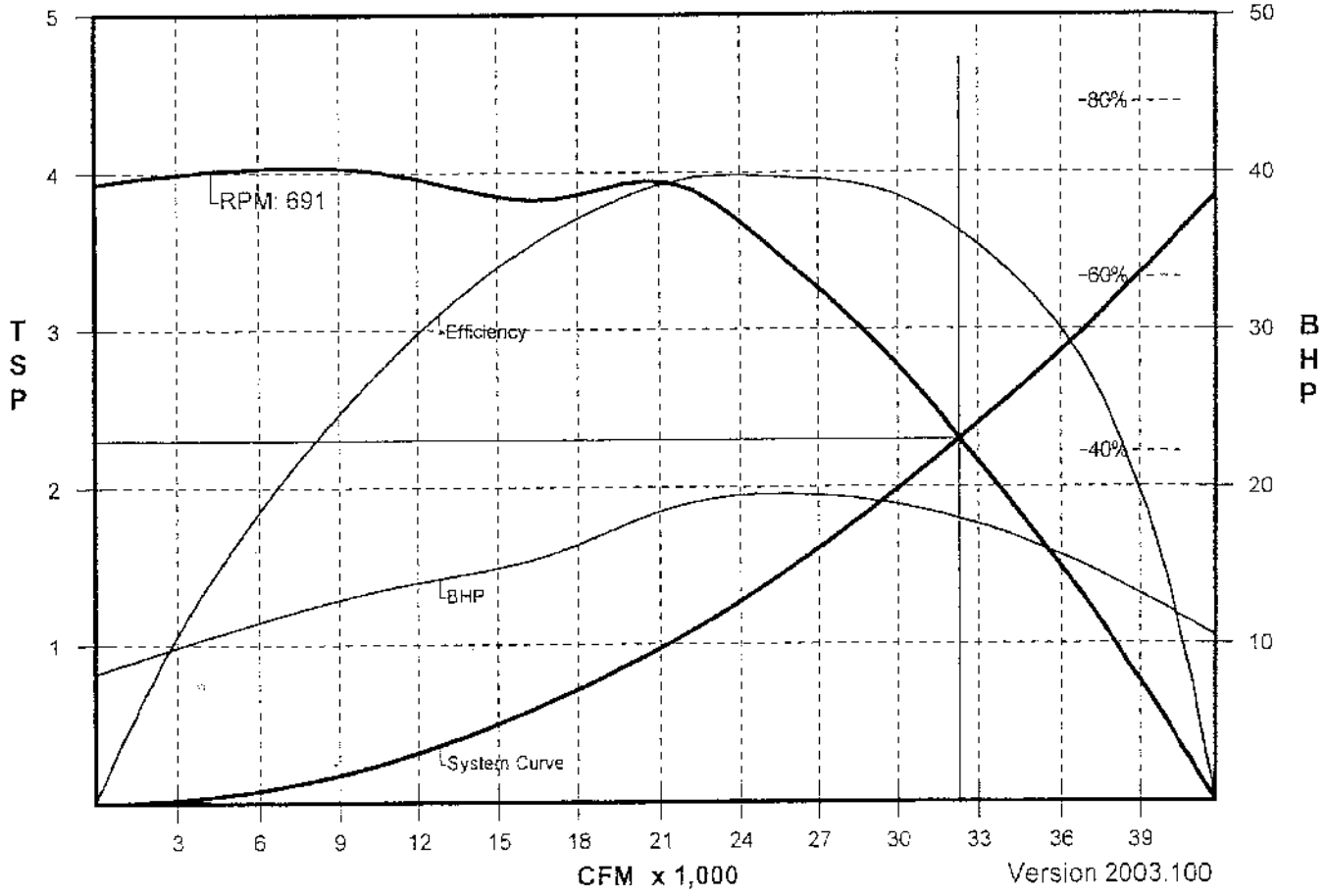
Rated HP:	20.0
Frame Size:	256T
Nominal RPM:	1750
VAC / PH / HZ:	460/3/60
Efficiency:	Premium
Enclosure Type:	ODP
Max Inertial Load:	236 WR²

SOUND POWER: (Inlet / Outlet)

Octave Band: (Re 10^-12 watts)

1	2	3	4	5	6	7	8
89	96	88	83	83	81	80	77
91	96	92	90	87	84	81	79

Sound Power A-Weighted: 89 / 93 db



Ventrol

PF02-49 NYB 12 Blade Plenum

JOB INFORMATION:

Job Name:	Bond Hill Academy
Job Tag:	AHU-1 (Supply Fan)
Rep Firm:	-
Serial No:	-
Date:	07-13-2006

WHEEL SPECIFICATIONS:

Class / Max RPM:	Class II / 1,105
Diameter:	49.0 in.
Width:	100%
Tip Speed:	12,418 FPM
Shaft / Bearing Dia.:	2 7/16", 2 7/16"
Inertia:	273 WR²

OPERATING CONDITIONS:

Required Air Flow:	38,000 CFM
Static Pressure:	6.05 in. Wg.
Unducted Radial Disch.:	0.18 in. Wg.
Inlet Screen:	0.14 in. Wg.
Total Adjusted Static:	6.37 in. Wg.
Site Elevation:	Sea Level
TSP @ Sea Level:	6.37 in. Wg.

MOTOR SELECTION:

Rated HP:	60.0
Frame Size:	364T
Nominal RPM:	1750
VAC / PH / HZ:	460/3/60
Efficiency:	Premium
Enclosure Type:	ODP
Max Inertial Load:	637 WR²

FAN PERFORMANCE:

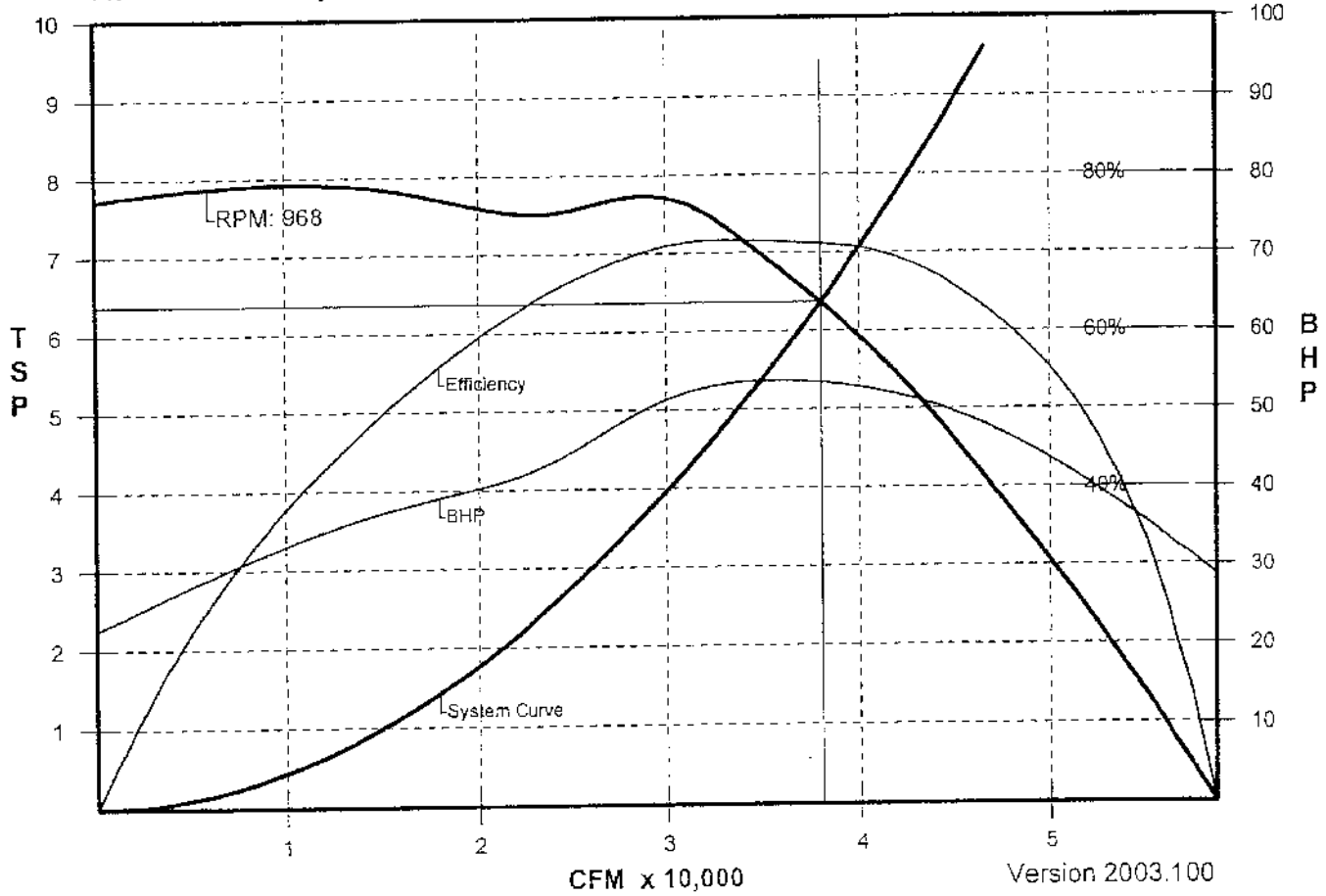
RPM:	968
BHP / BHP with Belt Loss:	53.42 / 54.91
Static / Mech. Efficiency:	71.3% / 74.3%
Inlet / Outlet Velocity:	2324 / 2075 FPM
Plenum Outlet Velocity:	1200 FPM

SOUND POWER: (Inlet / Outlet)

Octave Band: (Re 10^-12 watts)

1	2	3	4	5	6	7	8
92	97	95	92	89	86	86	81
96	99	101	100	95	90	87	82

Sound Power A-Weighted: 95 / 101 db



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COIL SELECTION

Ventrol

Coil Selection / Rating 2006.100

Job Name: Bond Hill Academy
Tag: CC-1
Entered By: User Name
Date: 07/13/06
Serial #: 0

Chilled Water				5WC - 6 - 48 x 115 x 6 - 10 AL	
Individual Coil Construction		**Entering Conditions**		**Leaving Conditions**	
(Qty) FH x FL :	(2) 48.00 x 115.00	ACFM :	38,000	Total Heat :	1,402,762 Btu/Hr
Rows - FPI :	6 - 10	SCFM :	38,000	Sensible Heat :	1,113,445 Btu/Hr
Serpentine :	1.000	Altd :	0 ft		
Total Face Area :	76.67 sq.ft	EDB :	79.3°F	LDB :	52.6°F
Fin Thick / Mat. :	0.008" / AL	EWB :	64.8°F	LWB :	52.2°F
Tube O.D. / Wall :	5/8" / 0.020"				
Tube Material :	CU	EWT :	44.0°F	LWT :	57.8°F
Case Material :	16 GA GALV	Fluid :	Water	Actual FV :	495.7 ft/min
Conn Location :	LH Same	GPM :	203.00	APD :	0.76 in.WG
Sup.Conn - Qty / Size :	(1) 2-1/2"			Water Velocity :	3.52 ft/s
Ret.Conn - Qty / Size :	(1) 2-1/2"			Water PD :	13.25 ft

ARI CERTIFIED 'Rated in Accordance with ARI Standard 410'

Ventrol

Coil Selection / Rating 2006.100

Job Name: Bond Hill Academy
Tag: HC-1
Entered By: User Name
Date: 07/13/06
Serial #: 0

Hot Water		5WC - 4 - 48 x 115 x 1 - 6 AL	
Individual Coil Construction		**Entering Conditions**	**Leaving Conditions**
(Qty) FH x FL :	(2) 48.00 x 115.00	ACFM : 38,000	Total Heat : 976,068 Btu/Hr
Rows - FPI :	1 - 6	SCFM : 38,000	Sensible Heat : 976,068 Btu/Hr
Serpentine :	0.250	Altd : 0 ft	
Total Face Area :	76.67 sq.ft	EDB : 45.0°F	LDB : 68.7°F
Fin Thick / Mat. :	0.008" / AL		
Tube O.D. / Wall :	5/8" / 0.020"		
Tube Material :	CU	EWT : 180.0°F	LWT : 139.5°F
Case Material :	16 GA GALV	Fluid : Water	Actual FV : 495.7 ft/min
Conn Location :	LH Same	GPM : 55.00	APD : 0.06 in.WG
Sup.Conn - Qty / Size :	(1) 1-1/2"		Water Velocity : 3.81 ft/s
Ret.Conn - Qty / Size :	(1) 1-1/2"		Water PD : 6.69 ft

ARI CERTIFIED 'Rated in Accordance with ARI Standard 410'

Ventrol

Ventrol Air Handling Systems Inc

HEAT WHEEL SELECTION

Printed on 07/13/06

Innergy tech inc.
389 Notre-Dame,
Notre-Dame-du-Bon-Conseil,
QC Canada J0C 1A0 Tel.:
(800) 203-9015 Fax:
(819) 336-2283

Project name: Bond Hill Academy
Location:
Engineer/Customer:
Date: 07/13/06
Unit Tag: AHU-1
Quote #:

Engineering submittal data

Summer

ERW3000 Total energy wheel

ROTARY AIR-TO-AIR

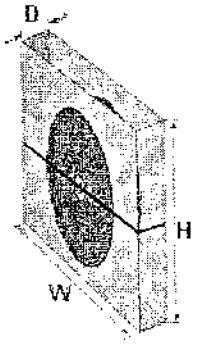
TOTAL ENERGY RECOVERY WHEEL PERFORMANCE

Rated in Accordance with ASHRAE Standard 84-91

HWL is a UL recognize component, construction only.

Application ratings based on ARI 1060-2001 certification program

Wheel model:	ERW3000-T-88
Face area (sq. ft):	20
Motor power (hp):	1/2
Dimensions (in):	
Depth (D):	16
Width (W):	95
Height (H):	95
Weight (lb):	1398
Wheel speed (rpm):	20
Purge static pressure (in wg):	0
Purge Airflow (cfm):	0
Purge angle (deg):	0
Face velocity of supply air (ft/min):	668
Face velocity of return air (ft/min):	450
Altitude (ft):	0



Performance

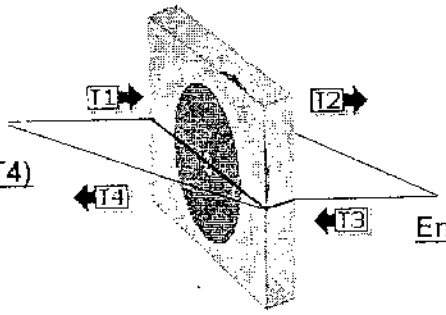
	Effectiveness	*Capacity*
Sensible	84.6 %	138894 Btu/hr
Latent	78.0 %	173291 Btu/hr
Total	81.0 %	312185 Btu/hr

Entering supply air (T1)

37.39 Btu/lb
14100 cfm
93 DB °F
74 WB °F
95.7 gr/lb
41.2 RH %

Leaving exhaust air (T4)

34.31 Btu/lb
9500 cfm
90.5 DB °F
70.6 WB °F
80 gr/lb
37.3 RH %
0.56 A.P.D.
450 fpm



Leaving supply air (T2)

32.42 Btu/lb
14100 cfm
83.9 DB °F
68.2 WB °F
78.3 gr/lb
45.1 RH %
0.92 A.P.D.
668 fpm

Entering exhaust air (T3)

28.27 Btu/lb
9500 cfm
77 DB °F
62.8 WB °F
62.6 gr/lb
46.3 RH %

Innergy tech inc.
389 Notre-Dame,
Notre-Dame-du-Bon-Conseil,
QC Canada J0C 1A0 Tel.: (800) 203-9015 Fax: (819) 336-2283

Project name: Bond Hill Academy
Location:
Engineer/Customer:
Date: 07/13/06
Unit Tag: AHU-1
Quote #:

General Notes

1- Heat exchanger must permit drainage of condensate.

2- Air filters should be installed in front of both entering air flows sides of the unit to reduce wheel media fouling.

3- Air streams composition should be compatible with wheel media material.

4- If the enthalpy wheel will be used at -34F (-37C) or below, please consult Innergy tech for recommendations on how to maintain the speed reducer at an acceptable working temperature.

5- The energy saving estimation does not consider the effect of the frost control system.

6- For more information contact the manufacturer or his distributor.

7- All prices are unitary prices, some set-up charges may be applied. Contact Innergy tech inc for volume discount.

Warranty

This rotary Air-to-Air exchanger is a high quality product, built and packed with care. All systems are guaranteed for one (1) year from the shipment date against any operational defects due to parts and/or manufacturing. The warranty applies to all cases where damage is not a result of poor installation, improper use, improper AHU design, mistreatment or negligence, acts of Gods or any other circumstances beyond the control of Innergy tech inc. Also, Innergy tech inc. will not be held responsible for any bodily injuries or damages to personal property or real estate and shall not be liable for any consequential loss or damages.

The sole liability of Innergy tech inc. shall be, at its option: A)to refund the purchase price of the equipment, B)to repair any defective parts, or C)to supply replacement parts EXW the factory where parts are manufactured with all freight costs paid by customer.

This warranty supersedes all prior warranties.

Printed on 07/13/06

Innergy tech inc.
389 Notre-Dame,
Notre-Dame-du-Bon-Conseil,
QC Canada J0C 1A0 Tel.:
(800) 203-9015 Fax:
(819) 336-2283

Project name: Bond Hill Academy
Location:
Engineer/Customer:
Date: 07/13/06
Unit Tag: AHU-1
Quote #:

Engineering submittal data

Winter

ERW3000 Total energy wheel

ROTARY AIR-TO-AIR

TOTAL ENERGY RECOVERY WHEEL PERFORMANCE

Rated in Accordance with ASHRAE Standard 84-91
HWL is a UL recognize component, construction only.
Application ratings based on ARI 1060-2001 certification program

Wheel model:	ERW3000-T-88
Face area (sq. ft):	20
Motor power (hp):	1/2
Dimensions (in):	
Depth (D):	16
Width (W):	95
Height (H):	95
Weight (lb):	1398
Wheel speed (rpm):	20
Purge static pressure (in wg):	0
Purge Airflow (cfm):	0
Purge angle (deg):	0
Face velocity of supply air (ft/min):	668
Face velocity of return air (ft/min):	450
Altitude (ft):	0

Performance

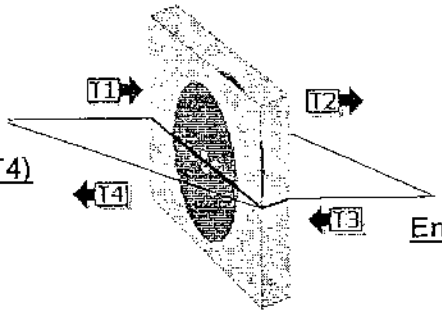
	Effectiveness	*Capacity*
Sensible	84.6 %	564255 Btu/hr
Latent	83.5 %	184560 Btu/hr
Total	84.1 %	748815 Btu/hr

Entering supply air (T1)

1.42 Btu/lb
14100 cfm
5 DB °F
2 WB °F
1.5 gr/lb
20.7 RH %

Leaving exhaust air (T4)

5.4 Btu/lb
9500 cfm
15 DB °F
15 WB °F
11.8 gr/lb
100 RH %
0.56 A.P.D.
450 fpm



Leaving supply air (T2)

13.36 Btu/lb
14100 cfm
42.1 DB °F
35.9 WB °F
21.2 gr/lb
53.9 RH %
0.92 A.P.D.
668 fpm

Entering exhaust air (T3)

22.49 Btu/lb
9500 cfm
70 DB °F
54 WB °F
36.5 gr/lb
33.6 RH %

Innergy tech inc.
389 Notre-Dame,
Notre-Dame-du-Bon-Conseil,
QC Canada J0C 1A0 Tel.:
(800) 203-9015 Fax:
(819) 336-2283

Project name: Bond Hill Academy
Location:
Engineer/Customer:
Date: 07/13/06
Unit Tag: AHU-1
Quote #:

General Notes

1- Heat exchanger must permit drainage of condensate.

2- Air filters should be installed in front of both entering air flows sides of the unit to reduce wheel media fouling.

3- Air streams composition should be compatible with wheel media material.

4- If the enthalpy wheel will be used at -34F (-37C) or below, please consult Innergy tech for recommendations on how to maintain the speed reducer at an acceptable working temperature.

5- The energy saving estimation does not consider the effect of the frost control system.

6- For more information contact the manufacturer or his distributor.

7- All prices are unitary prices, some set-up charges may be applied. Contact Innergy tech inc for volume discount.

Warranty

This rotary Air-to-Air exchanger is a high quality product, built and packed with care. All systems are guaranteed for one (1) year from the shipment date against any operational defects due to parts and/or manufacturing. The warranty applies to all cases where damage is not a result of poor installation, improper use, improper AHU design, mistreatment or negligence, acts of Gods or any other circumstances beyond the control of Innergy tech inc. Also, Innergy tech inc. will not be held responsible for any bodily injuries or damages to personal property or real estate and shall not be liable for any consequential loss or damages.

The sole liability of Innergy tech inc. shall be, at its option: A)to refund the purchase price of the equipment, B)to repair any defective parts, or C)to supply replacement parts EXW the factory where parts are manufactured with all freight costs paid by customer.

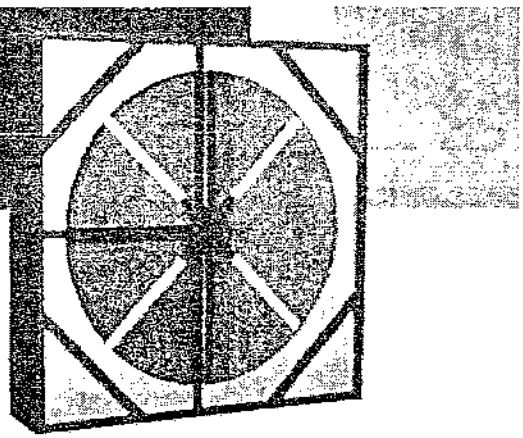
This warranty supersedes all prior warranties.

Ventrol

Ventrol Air Handling Systems Inc

HEAT WHEEL VFD & FROST CONTROL

ERW3000 SERIES
Energy Recovery Wheels



VFD and controller system specifications for enthalpy wheel series ERW3000

1) The wheel manufacturer shall provide the entire control system for the wheel, including but not limited to the variable frequency drive, a disconnect switch and a sensor for the exhaust leaving air temperature.

2) The VFD and controller system shall be specifically designed to prevent frost build-up in an enthalpy wheel.

3) The controller shall include a sequence of operation to avoid frost build-up in the enthalpy wheel.

4) The VFD and controller shall include a sensor in the leaving exhaust air to vary the wheel speed between full speed and zero in order to maintain the leaving exhaust temperature set point.

5) The VFD and controller system shall be ETL listed to UL 508C Power Conservation Equipment and CSA C22.2 No. 14 Industrial Control Equipment.

6) The VFD and controller system components, except the temperature sensor, shall be assembled in a Nema 4/12 enclosure.

7) The VFD and controller system shall include a fusible disconnect switch and a motor overload protection.

8) The VFD shall be able to send a fault signal to a building management system.

9) The VFD and controller system shall permit to stop and start the rotation of the wheel by a dry contact.

10) The VFD and controller system shall enable soft-starts of the wheel, taking approximately 30 seconds to ramp up the wheel to maximum speed.

Options

- Ambient temperature actuates ON-OFF control to facilitate a summer-winter changeover cycle. Unwanted heat pick-up in the make-up air stream in the 55°F to 75°F ambient temperature range will be eliminated.
- GFI utility outlet, service light and heater.
- Rotation fault sensor.

Innergy tech inc

Carson School

Supporting Documentation

Ohio Mercantile Self Direct Program

Application Guide & Cover Sheet

Questions? Call 1-866-380-9580 or visit www.duke-energy.com.

Email this form along with completed Mercantile Self Direct Prescriptive or Custom applications, proof of payment, energy savings calculations and spec sheets to SelfDirect@Duke-Energy.com. You may also fax to 1-513-419-5572.

Mercantile customers, defined as using at least 700,000 kWh annually are eligible for the Mercantile Self Direct program. Please indicate mercantile qualification:

- ☐ a single Duke Energy Ohio account
- ☒ multiple accounts in Ohio (energy usage with other utilities may be counted toward the total)

Please list Duke Energy account numbers below (attach listing of multiple accounts an/or billing history for other utilities as required):

Account Number	Annual Usage	Account Number	Annual Usage
4620-3671-01			

Self Direct rebates are available for completed Custom projects that have not previously received a Duke Energy Smart $aver® Custom Incentive. Self Direct incentives are applicable to Prescriptive measures that were installed more than 90 days prior to submission to Duke Energy and have not previously received a Duke Energy Prescriptive rebate.

Self Direct Program requirements dictate that certain projects that may be Prescriptive in nature under the Smart $aver program must be evaluated using the Custom process. Use the table on page two as a guide to determine which Self Direct program fits your project(s). Apply for Self Direct projects using the appropriate application forms in conjunction with this cover sheet. Where Mercantile Self Direct Prescriptive applications are listed, please refer to the measure list on that application. If your measure is not listed, you may be eligible for a Self Direct Custom rebate. Self Direct Custom applications, like Smart $aver Custom applications, should include detailed analysis of pre-project and post-project energy usage and project costs. Please indicate which type of rebate applications are included in the table provided on page two.

Please check each box to indicate completion of the following program requirements:

☐ All sections of appropriate application(s) are completed	☐ Proof of payment.*	☐ Manufacturer's Spec sheets	☐ Energy model/calculations and detailed inputs for Custom applications

* If a single payment record is intended to demonstrate the costs of both Prescriptive & Custom projects, please include an additional document with an estimated breakout of costs for each Prescriptive and Custom energy conservation measure.

Application Type	Replaced equipment at end of lifetime or because equipment failed**	Replaced fully operational equipment to improve efficiency***	New Construction
Lighting	MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐	MSD Prescriptive Lighting ☐	MSD Prescriptive Lighting ☐
		MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐	MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐
Heating & Cooling	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Heating & Cooling ☐
			MSD Custom Part 1 ☒ MSD Custom General Worksheet ☒
Window Films, Programmable Thermostats, & Guest Room Energy Management Systems	MSD Custom Part 1 ☐ MSD Custom General and/or EMS Worksheet(s) ☐	MSD Prescriptive Heating & Cooling ☐	MSD Custom Part 1 ☐ MSD Custom General and/or EMS Worksheet(s) ☐
Chillers & Thermal Storage	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Chillers & Thermal Storage ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
Motors & Pumps	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Motors, Pumps & Drives ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
VFDs	Not Applicable	MSD Prescriptive Motors, Pumps & Drives ☐	MSD Custom Part 1 ☐ MSD Custom VFD Worksheet ☐
		MSD Custom Part 1 ☐ MSD Custom VFD Worksheet ☐	
Food Service	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Food Service ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
Process	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Process ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
		MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	
Energy Management Systems	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐
Behavioral* & No/Low Cost**	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐		

** Under the Self Direct program, failed equipment and equipment at the end of its useful life are evaluated differently than early replacement of fully functioning equipment. **All equipment replacements due to failure or old age will be evaluated via the Custom program.**

*** Please ensure that you include the age of the replaced equipment for measures classified as "Early Replacement" in your application as well as the estimated date that you would have otherwise replaced the existing equipment if you had not chosen a more energy efficient option.

**** Behavioral energy efficiency and demand reduction projects must be both measurable and verifiable. Provide justification with your application.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Proposed energy efficiency measures may be eligible for Self-Direct Custom rebates if they clearly reduce electrical consumption and/or demand as compared to the appropriate baseline.

Before you complete this application, please note the following important criteria:

- Submitting this application does not guarantee a rebate will be approved.
- Rebates are based on electricity conservation only.
- Electric demand and/or energy reductions must be well documented with auditable calculations.
- Incomplete applications cannot be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, beginning on page 6.

Notes on the Application Process

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact your Duke Energy Ohio, Inc account manager or the Duke Energy Smart $aver® team at 1-866-380-9580.

Every application must include calculations of the baseline electrical usage and the electrical usage of the proposed high-efficiency equipment/system. Monthly calculations are best. You, the Duke Energy Ohio customer, or your equipment vendor / engineer should perform these calculations and submit them to Duke Energy for review. *We strongly encourage the use of modeling software (such as eQuest or comparable) for complex projects.*

Upon receipt of your application, an acknowledgement email will be sent to you with an estimated response time based on an initial assessment of your application. The application review may include some communication to resolve any questions about the project or to request additional information. Applications that are received complete without missing information have a faster review time.

There are two ways to submit your completed application.

Email your scanned form to: SelfDirect@duke-energy.com

Or, fax your form to 513-419-5572

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

1. Contact Information (Required)

Duke Energy Customer Contact Information									
Company Name	Cincinnati Public Schools								
Address	2651 Burnett Ave								
Project Contact	Don Elbe								
City	Cincinatti	State	OH	Zip Code	45219				
Title	Utility Management Coordinator								
Office Phone	614-580-3352	Mobile Phone		Fax					
E-mail Address	elbedon@cpsboe.k12.oh.us								

Equipment Vendor / Contractor / Architect / Engineer Contact Information									
Company Name	Plug Smart								
Address	1275 Kinnear Road Suite 229								
City	Columbus	State	OH	Zip Code	43212				
Project Contact	Lucas Dixon								
Title	Operations Manager								
Office Phone	614-580-3352	Mobile Phone		Fax	1-800-518-5576				
E-mail Address	lucas.dixon@plugsmart.com								
Describe Role	Ensures rebate is correctly applied for								

Payment Information					
Payee Legal Company Name (as shown on Federal income tax return):	Cincinnati Public Schools				
Mailing Address	2651 Burnett Ave				
City	Cincinatti	State	OH	Zip Code	45219
Type of organization (check one) ☐ Individual/Sole Proprietor ☐ Corporation ☐ Partnership ☐ Unit of Government ☐ Non-Profit (non-corporation)					
Payee Federal Tax ID # of Legal Company Name Above:	31-6000758				
Who should receive incentive payment? (select one) ☒ Customer ☐ Vendor (Customer must sign below)					
If the vendor is to receive payment, please sign below: I hereby authorize payment of incentive directly to vendor: Customer Signature _____ Date____/___/_____ (mm/dd/yyyy)					

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

2. Project Information (Required)

A. Please indicate project type:
- ☒ New Construction
- ☐ Expansion at an existing facility
- ☐ Replacing equipment due to equipment failure
- ☐ Replacing equipment that is estimated to have remaining useful life of 2 years or less
- ☐ Replacing equipment that is estimated to have remaining useful life of more than 2 years
- ☐ Behavioral, operational and/or procedural programs/projects

B. Please describe your project, or attach a detailed project description that describes the project.
New public pre kindergarten - 8th grade school.

C. When did you start and complete implementation?
Start date / (mm/yyyy) End date / 2008 (mm/yyyy)

D. Are you also applying for Self-Direct Prescriptive incentives and, if so, which one(s)[1]?
Lighting Controls

E. Please indicate which worksheet(s) you are submitting for this application (check all that apply):
- ☐ Lighting
- ☐ Variable Frequency Drive (VFD)
- ☐ Compressed Air
- ☐ Energy Management System (EMS)
- ☒ General (for projects not easily submitted using one of the above worksheets)

F. Please tell us if there is anything about your electrical energy projections (either for the baseline or the proposed project) that you are either unsure about or for which you have made significant assumptions. Attach additional sheets as needed.

Required: Attach a supplier or contractor invoice or other equivalent information documenting the Implementation Cost for each project listed in your application. (Note: self-install costs cannot be included in the Implementation Cost)

[1] If your project involves some equipment that is eligible for prescriptive incentives and some equipment that is likely eligible for custom incentives, and if it is feasible to separate the equipment for the energy analysis, then the equipment will be evaluated separately. If it is not feasible to separate the equipment for analysis, then the equipment will be evaluated together in the custom application.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

3. Signature (Required – must be signed by Duke Energy customer)

Customer Consent to Release of Personal Information

I, (insert name) Don Elbe, do hereby consent to Duke Energy disclosing my Duke Energy Ohio, Inc Account Number and Federal Tax ID Number to its subcontractors solely for the purpose of administering Duke Energy Ohio's Mercantile Self-Direct Program. I understand that such subcontractors are contractually bound to otherwise maintain my Duke Energy Ohio, Inc Account Number and Federal Tax ID Number in the strictest of confidence.

I realize that under the rules and regulations of the public utilities commission, I may refuse to allow Duke Energy Ohio, Inc to release the information set forth above. By my signature, I freely give Duke Energy Ohio, Inc permission to release the information designated above.

Application Signature

I certify that I meet the eligibility requirements of the Duke Energy Ohio, Inc Mercantile Self Direct Custom Incentives Program and that all information provided within this application is correct to the best of my knowledge. I agree to the terms and conditions set forth for this program. I certify that the numbers, energy savings, and responses shown on this form are correct. Further, I certify that the taxpayer identification number is current and correct. I am not subject to backup withholding because: (a) I am exempt from backup withholding; or (b) I have not been notified by the IRS that I am subject to backup withholding as a result of a failure to report all interest or dividends; or (c) the IRS has notified me that I am no longer subject to backup withholding. I am a U.S. citizen (includes a U.S. resident alien).

Don Elbe

Duke Energy Ohio, Inc Customer Signature

Print Name Don Elbe

Date 12/30/2011

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Checklist for completing the Application

INCOMPLETE APPLICATIONS WILL RESULT IN DELAYS IN DUKE ENERGY PROCESSING YOUR APPLICATION AND NOTIFYING YOU CONCERNING AY REBATES. Before submitting the application and the required supplementary information, use the following checklist to ensure that your application is complete and the information in the application is accurate. (Note: this checklist is for your use only – do not submit this checklist with your application)

Section No. & Title	Have You:
1. Contact Information	☐ Completed the contact information for the Duke Energy customer? ☐ Completed the contact information for the equipment vendor / project engineer that can answer questions about the technical aspects of the project, if that is a different person than above?
2. Project Information	☐ Answered the questions A-E, including providing a description of your project. ☐ Completed and attached the lighting, compressed air, VFD, EMS and/or General worksheet(s)?
3. Signature	☐ Signed your name? ☐ Printed your name? ☐ Entered the date?
Supplementary information (Required)	☐ Attached a supplier or contractor's invoice or other equivalent information documenting the Implementation Cost for projects listed in your application? (Note: self-install costs cannot be included in the Implementation Cost) ☐ (If submitting the General Worksheet) attached calculations documenting the energy usage and energy savings for **each** project listed in your application?

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact:

- your Duke Energy account manager
  or,
- the Duke Energy Smart $aver® team at 1-866-380-9580.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Instructions/Terms/Conditions

Note: Please keep for your records- do not submit with the application

1. Energy service companies or contractors may assist in preparing the application, but an authorized representative of the customer must sign this application to be eligible to participate in the Mercantile Self Direct Program. Completion of this application does not guarantee the approval of a Self Direct Custom Rebate.

2. Once all documentation requested in this application is received by *Duke Energy Ohio, Inc,* and any follow-up information requested by *Duke Energy* is received, the rebate amount for each Energy Conservation Measure (ECM) will be communicated to the customer. The rebate amount will be based on ECM energy savings and ECM incremental installation cost.

3. All rebates require approval by the Public Utilities Commission of Ohio. *Duke Energy Ohio, Inc* will submit an application for rebate on the customer's behalf upon customer attestation to program terms, conditions and requirements as outlined in the rebate offer letter and upon customer completion of attestation documents required by the Public Utilities Commission of Ohio.

4. *Duke Energy Ohio, Inc* will issue a Self Direct Custom Rebate check, based on the approved rebate amount for each ECM, upon receiving approval from the Public Utilities Commission of Ohio. *Duke Energy* Ohio, Inc does not guarantee PUCO approval.

5. With the application, the customer must provide a list of all sites where the ECMs were installed. *Duke Energy Ohio, Inc* requests that sites of similar size, hours of operation and energy consuming characteristics be grouped together in one application for the determination of the rebate amount. The application should identify the site where each unique ECM was installed.

6. Based on the information submitted with the application and the information gathered both before and after the initial installation of the ECM, *Duke Energy Ohio, Inc* will calculate the rebate amount for each ECM.

7. *Duke Energy Ohio, Inc* may conduct random site inspections of a sample of the locations where the ECMs are installed to verify installation and operability of the ECMs and to obtain information needed to calculate the Approved Incentive Amount.

8. Customers are encouraged to retain copies of all forms, invoices and supporting documentation for their records.

9. Approved rebates are valid for 6 months from the date communicated to the customer by *Duke Energy Ohio, Inc,* subject to the expiration of measure eligibility based on project completion dates and application submission deadlines as defined by PUCO. Customers are encouraged to execute their rebate offer contracts and PUCO-required affidavits promptly to ensure eligibility is not forfeited.

10. *Duke Energy Ohio, Inc* reserves the right to recover all unrecoverable costs associated with the project approval if the customer decides not to execute the rebate contract, after the project is approved by *Duke Energy Ohio, Inc.*

11. Projects financially supported by other funding sources will be evaluated on a case-by-case basis for potential partial funding from *Duke Energy Ohio, Inc*.

12. Participants must be *Duke Energy Ohio, Inc* nonresidential, mercantile customers with the project sites in the *Duke Energy Ohio, Inc* service territory.

13. Customers or trade allies may not use any *Duke Energy* logo without prior written permission.

14. Only trade allies registered with *Duke Energy* are eligible to participate.

15. All equipment must be new. Used or rebuilt equipment is not eligible for incentives. All old existing equipment must be removed on retrofit projects.

16. Disclaimers: *Duke Energy Ohio, Inc*
    a. does not endorse any particular manufacturer, product or system design within the program;
    b. will not be responsible for any tax liability imposed on the customer as a result of the payment of incentives;
    c. does not expressly or implicitly warrant the performance of installed equipment. (Contact your contractor for details regarding equipment warranties.);
    d. is not responsible for the proper disposal/recycling of any waste generated or obsolete or old equipment as a result of this project;
    e. is not liable for any damage caused by the installation of the equipment nor for any damage caused by the malfunction of the installed equipment; and
    f. reserves the right to change or discontinue this program at any time. The acceptance of program applications is determined solely by *Duke Energy Ohio, Inc.*

The General Worksheet is part 2 of the application. Do not submit this file without submitting a completed Part1 Custom Application document file, which can be found at www.duke-energy com. This worksheet is for all projects that are not easily submitted through one of the other worksheets

Before you complete this application, please note the following important criteria:

- Incentive approval is required PRIOR to equipment purchase, or any other activity which would indicate that the Duke Energy customer has already decided to proceed.
- Submitting this application does not guarantee an incentive will be approved.
- Incentives are based on electricity conservation only.
- Electric demand and/or energy reductions must be well documented with auditable calculations.
- Simple payback without incentive must be greater than 1 year.
- Incomplete applications will not be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, found in the Custom Application Part 1 document.

Please enter your information and data into the cells that are shaded.
Cells in white are locked and cannot be written over.

Duke Energy Customer Contact Information (Match the information in Application Part 1):

Name	Michael Burson
Company	Cincinnati Public Schools

Equipment Vendor / Project Engineer Contact Information

Name	Lucas Dixon
Company	Plug Smart

Before proceeding with the custom application, please verify that your project is not on the prescriptive incentive application.
The prescriptive incentive applications can be found at:

KY http://www.duke-energy.com/kentucky-business/energy-management/energy-efficiency-incentives asp
Kentucky only: custom incentives only available to K-12 school facilities; prescriptive incentives available for those not on rate TT.
OH http://www.duke-energy.com/ohio-business/energy-management/energy-efficiency-incentives.asp
NC http://www.duke-energy.com/north-carolina-business/energy-management/energy-efficiency-incentives.asp
SC http://www.duke-energy.com/south-carolina-business/energy-management/energy-efficiency-incentives asp

Prescriptive incentives are already pre-approved and the application is submitted after project implementation.
Take note of the equipment eligibility on the prescriptive application before planning to utilize the prescriptive application.

List of Sites (Required)

App No.	
Rev.	

Provide a list of sites addressed by this custom incentive application

Site ID (see note 1)	**Duke Energy Electric Account Number(s)** (see note 2)	**Facility Address**	**List of Proposed Projects at each site**	**Annual Hours of Operation**	**Gross Square Footage**	**Conditioned Square Footage**	**Facility Age (years)**
225	*12345678 01*	*Example: 123 Main Street, Anywhere USA 12345*	*Project Name(s)*	*5,840*	*42,000*	*38,000*	*12*
	4620-3671-01	*4323 Glenway Ave Cincinnati OH 45205*	*Heat Recovery Wheels*	*700*			*3*

1 **Site ID**
Can be a store number, building name or other way to identify the location. If there is only one site involved in this application, then a Site ID is not necessary.

2 **Account Numbers**
Must match the facility of the proposed project(s). If there are multiple meters at a site, only include the meters that pertain to the project(s).

For each project, answer the following questions (use one worksheet per project)

App No.	0
Rev.	0

Project Name: Heat recovery wheels

How would you classify this project? (Place an x in all boxes that apply.)

Lighting		**Heating/Cooling**	X	**Air Compressor**		**Energy Management System**	
VFD		**Motors/Pumps**		**Process Equipment**		**Other, describe below:**	

Brief Project Description

Describe the Baseline (see note 3) Equipment/System	Describe the Proposed High Efficiency Project
No heat recovery wheels installed	Heat recovery wheels installed.

If Existing Equipment is the Baseline, how many years of useful life remain or how many years until replacement?

Detailed Project Description Attached? Yes (Required)

Operating Hours (see note 4)

	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
24 x 7	**Start Hour**	**End Hour**	**Start Hour**	**End Hour**	**Start Hour**	**End Hour**		
No	***7:00 AM***	***3:30 PM***					***14***	***700***

Energy Savings

	Baseline (see Note 3)	Proposed	Savings	Describe how energy numbers were calculated
Annual Electric Energy	23,435 kWh	0 kWh	23,435 kWh	
Electric Demand	0 kW	0 kW	0 kW	
Calculations attached	Yes	Yes	(Required)	ne is listed as the savings with proposed at 0 kWh. See attached DUKE.CincPublic_Evar

Simple Payback

Average electric rate ($/kWh) on the applicable accounts (see note 6)			$0.10
Estimated annual electric savings			$2,344
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels			
Incremental cost to implement the project (equipment & installation) (see note 7)			
Copy of vendor proposal is attached (see note 8)			Yes
Simple Electric Payback in years (see note 9)	0	**Total Payback in years**	0

3 Baseline
Retrofit projects: the existing equipment is the baseline unless that equipment must be replaced for some reason anyway.
New construction projects or where the existing equipment must be replaced anyway: the baseline is the standard option in today's market, taking into account any applicable organizational, local, state or federal codes or standards currently in effect.

4 Operating Hours
Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

5 Weeks of Use in Year
If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why: Savings only calculated for summer hours, gas heating systems are used during the winter.

6 Average electric rate ($/kWh)
If you do not know your average electric rate, use $0.10/kWh.

7 Incremental cost to implement the project
Costs exclude self installation costs. Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

8 Copy of vendor proposal is attached
Vendor proposal of proposed system is always required.
New construction projects or where the existing equipment must be replaced anyway, vendor proposal of baseline must also be attached.

9 Simple Electric Payback
If the simple electric payback is less than 1 year, then no incentive can be approved. Double check average electric rate for correct payback.

March 13, 2012

To whom it may concern:

This letter is to confirm that for the renovation to Cincinnati Public school **Carson Elementary (4323 Glenway Ave)**, for the **custom** rebate application, the energy recovery project was installed with a minimum unit cost listed below.

Thybar TV7490 Energy Recovery Units	2	$8,000.00	$16,000.00

TOTAL	**$16,000.00**

This is also to confirm that for the renovation to **Carson Elementary (4323 Glenway Ave)**, for the **prescriptive** rebate application, occupancy sensors and a chiller was installed with a minimum unit cost listed below.

DESCRIPTION	Model Number	QUANTITY	Nominal Size (Tons)	PRICE/FIXTURE	AMOUNT
SelfDirect Occupancy Sensor	DT-200, WS-200, WT-600, WT-2200	165	-	$117.89	$19,451.85
SelfDirect Chiller - Air - Screw	Trane Chiller RTAA125	2	60	$72,000.00	$144,000.00

TOTAL	**$163,451.85**

Thank you for your attention to this matter,

Don Elbe

Don Elbe
Utility Management Coordinator

APPLICATION AND CERTIFICATE FOR PAYMENT

TO OWNER:

PROJECT:
Carson Elementary
4323 Glenway Avenue
Cincinnati, OH 45205

APPLICATION NO: 18
PERIOD TO: 02/20/09
PROJECT NO:
CONTRACT DATE:

FROM CONTRACTOR:
Hilvert & Pope Electric, Inc.
11070 Southland Road
Cincinnati, OH 45240

VIA ARCHITECT:

CONTRACT FOR: ELECTRICAL

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for Payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM.....	$	1736800
2. Net change by Change Orders.....	$	45895
3. CONTRACT SUM TO DATE.....	$	1782695
4. TOTAL COMPLETED & STORED TO DATE.....	$	1,782,695
5. RETAINAGE:		
a. 8-50% of Completed Labor $		
b. 8% of Stored Material $		
Total Retainage	$	0
6. TOTAL EARNED LESS RETAINAGE.....	$	1782695
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate).....	$	1781779
8. CURRENT PAYMENT DUE.....	$	916
9. BALANCE TO FINISH, PLUS RETAINAGE.....	$	0

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total change orders approved in previous months by Owner	44599	
Total approved this Month	1296	
TOTALS	45895	0
Net change by Change Orders		45895

The Contractor certified that the work covered by this pay reques has been completed in accordance with the Contract Document and that all prgress payments previously paid bythe State have been applied by the Contractor to discharge in full all Contractor's obligations inclurred in connection with the work covered by all prior pay requests.

Ken Hilvert
Contractor

2-20-09
Date

Based upon on-site observations, the firm affirms that the work ahs prgressed to the percentage of completeness indicated on the pay request.

Doug Potts
Construction Manager

2/23/09
Date

Architect

Date

Approved:

School District Treasurer

Date

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D+E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	COMPLETED AND STORED TO DATE (D+E+F)	% (G/C)	BALANCE TO FINISH (C-G)	RETAINAGE
1	BONDING	21,000	21,000	0		21,000	100%	0	0
2	MOBILIZATION	5,000	5,000	0		5,000	100%	0	400
3	DEMOBILZATION	2,000	2,000	0		2,000	100%	0	160
4	REGULAR CLEAN-UP	3,000	3,000	0		3,000	100%	0	240
5	PUNCH LIST	6,000	6,000	0		6,000	100%	0	480
6	CLOSE OUT ITEMS	4,000	4,000	0		4,000	100%	0	320
7	SUBMITTALS	3,000	3,000	0		3,000	100%	0	240
8	COORDINATION	4,000	4,000	0		4,000	100%	0	320
9	FIELD SUPERVISION	80,000	80,000	0		80,000	100%	0	6,400
10	TEMP POWER	20,000	20,000	0		20,000	100%	0	1,600
11	DEMOLITION	4,000	4,000	0		4,000	100%	0	320
12	SITE CONDUIT & WIRE - LAB	30,000	30,000	0		30,000	100%	0	2,400
13	SITE CONDUIT & WIRE - MAT	40,000	40,000	0		40,000	100%	0	0
14	LIGHT FIXTURES - LABOR	50,000	50,000	0		50,000	100%	0	4,000
15	LIGHT FIXTURES - MATERIAL	140,000	140,000	0		140,000	100%	0	2,800
16	CONDUIT - LABOR	90,000	90,000	0		90,000	100%	0	7,200
17	CONDUIT - MATERIAL	110,000	110,000	0		110,000	100%	0	0
18	WIRE/CABLE - LABOR	50,000	50,000	0		50,000	100%	0	4,000
19	WIRE/CABLE - MATERIAL	80,000	80,000	0		80,000	100%	0	0
20	DEVICES - LABOR	6,000	6,000	0		6,000	100%	0	480
21	DEVICES - MATERIAL	8,000	8,000	0		8,000	100%	0	160
22	F/A - LABOR	10,000	10,000	0		10,000	100%	0	800
23	F/A - MATERIAL	18,000	18,000	0		18,000	100%	0	360
24	AUDIO VISUAL - LABOR	30,000	30,000	0		30,000	100%	0	2,400
25	AUDIO VISUAL - MATERIAL	140,000	140,000	0		140,000	100%	0	2,800
26	CLOCKS - LABOR	10,000	10,000	0		10,000	100%	0	800
27	CLOCKS - MATERIAL	48,000	48,000	0		48,000	100%	0	960
28	BROADBAND - LABOR	10,000	10,000	0		10,000	100%	0	800
29	BROADBAND - MATERIAL	49,000	49,000	0		49,000	100%	0	980
30	WATTSTOPPER - LAB	15,000	15,000	0		15,000	100%	0	1,200
31	WATTSTOPPER - MAT	25,000	25,000	0		25,000	100%	0	500
32	POWER PACKAGE - LAB	35,000	35,000	0		35,000	100%	0	2,800
33	POWER PACKAGE - MAT	90,000	90,000	0		90,000	100%	0	1,800
34	TECHNOLOGY - LABOR	20,000	20,000	0		20,000	100%	0	1,600
35	TECHNOLOGY - MATERIAL	129,000	129,000	0		129,000	100%	0	2,580
36	GENERATOR & A.T.S - LAB	8,000	8,000	0		8,000	100%	0	640
37	GENERATOR & A.T.S - MAT	30,000	30,000	0		30,000	100%	0	600
38	NETWORK ELECTRONICS -L	10,000	10,000	0		10,000	100%	0	800
39	NETWORK ELECTRONICS -M	70,000	70,000	0		70,000	100%	0	1,400
40	SECURITY SYSTEM - LABOR	30,000	30,000	0		30,000	100%	0	2,400
41	SECURITY SYSTEM - MATERIAL	170,000	170,000	0		170,000	100%	0	3,400
42	OWNER TRAINING - LABOR	2,000	2,000	0		2,000	100%	0	160
43	ALLOWANCE	15,000	15,000	0		15,000	100%	0	1,200
44	FINAL CLEAN-UP	2,800	2,800	0		2,800	100%	0	224
45	TRAILER TELEPHONES	9,000	8,084	916		9,000	100%	0	162
46	UPS - LABOR	1,000	1,000	0		1,000	100%	0	80
47	UPS - MATERIAL	4,000	4,000	0		4,000	100%	0	80
48	CHANGE ORDER #1	6,831	6,831	0		6,831	100%	0	137
49	CHANGE ORDER #2	6,167	6,167	0		6,167	100%	0	123
50	CHANGE ORDER #3	14,582	14,582	0		14,582	100%	0	292
51	CHANGE ORDER #4	1,729	1,729	0		1,729	100%	0	35
52	CHANGE ORDER #5	9,911	9,911	0		9,911	100%	0	198
53	CHANGE ORDER #6	404	404	0		404	100%	0	8
54	CHANGE ORDER #7	4,975	4,975	0		4,975	100%	0	100
55	CHANGE ORDER #8	616	616	0		616	100%	0	12
56	CHANGE ORDER #9	680	680	0		680	100%	0	14
	TOTAL	1,782,695	1,781,779	916	0	1,782,695	100%	0	63,965

The Ohio School Facilities Commission
10 West Broad Street
Suite 1400
Columbus, Ohio 43215

Contractor's Name: Feldkamp Enterprises, Inc.
Address: 3642 Muddy Creek Road, Cincinnati, Ohio 45238

Contractor Pay Application Summary

Project Name: CARSON
Bid Package No.:

1	Original Contract Amount	$ 1,463,000.00
2	Net Changes to Date	$ 242.00
3	Current Contract Amount	$ 1,463,242.00
4	Labor Completed to Date	$ 671,000.00
5	Material Completed to Date	$ 792,242.00
6	Total Work Completed to Date	$ 1,463,242.00
7	Store Material to Date	$ 0.00
8	Less Retained to Date	$ 0.00
9	Total Amount Due	$ 1,463,242.00
10	Less Previous Payments	$ 1,462,136.00
11	Less Amount Retained to Cover Lien	$ 0.00
12	Less Amount Retained for Liquidated Damages	$ 0.00
13	Less Other Amounts Withheld	$ 0.00
14	Current Due	$ 1,106.00
15	Balance to Complete	$ 0.00

The Ohio School Facilities Commission approval required for the following contract adjustments:

1. Assessment of liquidated damages
2. Other amounts withheld

The Ohio School Facilities Commission _____ Date _____

Comments:

APPLICATION AND CERTIFICATE FOR PAYMENT

TO OWNER:	Cincinnati Public Schools 2315 Iowa Street Cincinnati, Ohio 45206	**PROJECT:**	Carson Elementary 4323 Glenway Avenue Cincinnati, Ohio 45205	**APPLICATION No:** **PERIOD TO:** **PROJECT NOS:** **CONTRACT DATE:** **INVOICE NO:**	16 10/31/08 1230-16
FROM CONTRACTOR:	Feldkamp Enteprises, Inc. 3642 Muddy Creek Road Cincinnati, Ohio 45238	**VIA ARCHITECT:**			
CONTRACT FOR:	HVAC & PIPING				

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment as shown below, in connection with the Contract Continuation sheet is attached.

1. ORIGINAL CONTRACT SUM	$	1,463,000.00
2. Net Change by Change Orders	$	242.00
3. CONTRACT SUM TO DATE	$	1,463,242.00
4. TOTAL COMPLETED & STORED TO DATE	$	1,463,242.00
5. RETAINAGE		
a. 8-50% of Completed Labor	$	-
b. 8% of Stored Material	$	-
Total Retainage	$	-
6. TOTAL EARNED LESS RETAINAGE	$	1,463,242.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT	$	1,462,136.00
8. CURRENT PAYMENT DUE	$	1,106.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE	$	-

Change Order/Contract	ADDITIONS	DEDUCTIONS
Total Changes approved in Previous months by Owner	3634.00	
Total approved this month	1106.00	-4498.00
TOTALS	4740.00	-4498.00
NET CHANGES by Change Order	242.00	

The Contractor certified that the work covered by this pay request has been completed in accordance with the Contract Documents and that all progress payments previously paid by CPS have been applied by the Contract to discharge in full all of Contractor's obligations incurred in connection with the work covered by all prior pay requests.

Contractor — Date: 10/31/2008

NOTARIAL SEAL STATE OF OHIO

Brett Meye
Notary Public, State
My Commission Expires

Based upon on-site observations, the Architect certifies that the Work has progressed to the point indicated on the pay request.

Architect — Date: 11-4-08

Construction Manager — Date: 11/4/08

Approved:

School District — Date

ITEM NUMBER	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED	TOTAL COMPLETED & STORED TO DATE	%	BALANCE TO FINISH	RETAINAGE
			PREVIOUS APPS.	THIS PERIOD					
1	BOND	16,000.00	16,000.00	0.00	0.00	16,000.00	100%	0.00	0.00
2	SUBMITTALS	5,000.00	5,000.00	0.00	0.00	5,000.00	100%	0.00	0.00
3	CLEAN UP	5,000.00	5,000.00	0.00	0.00	5,000.00	100%	0.00	0.00
4	PUNCH LIST	3,000.00	3,000.00	0.00	0.00	3,000.00	100%	0.00	0.00
5	ALLOWANCE	10,000.00	10,000.00	0.00	0.00	10,000.00	100%	0.00	0.00
6	M HVAC Equipment	332,000.00	332,000.00	0.00	0.00	332,000.00	100%	0.00	0.00
7	L HVAC Equipment	50,000.00	50,000.00	0.00	0.00	50,000.00	100%	0.00	0.00
8	M Hydronic Equipment	26,000.00	26,000.00	0.00	0.00	26,000.00	100%	0.00	0.00
9	L Hydronic Equipment	10,000.00	10,000.00	0.00	0.00	10,000.00	100%	0.00	0.00
10	M Boilers	65,000.00	65,000.00	0.00	0.00	65,000.00	100%	0.00	0.00
11	L Boilers	10,000.00	10,000.00	0.00	0.00	10,000.00	100%	0.00	0.00
12	M HW/CW Piping	115,000.00	115,000.00	0.00	0.00	115,000.00	100%	0.00	0.00
13	L HW/CW Piping	222,000.00	222,000.00	0.00	0.00	222,000.00	100%	0.00	0.00
14	SUBCONTRACTORS								0.00
15	M Insulation	30,000.00	30,000.00	0.00	0.00	30,000.00	100%	0.00	0.00
16	L Insulation	55,000.00	55,000.00	0.00	0.00	55,000.00	100%	0.00	0.00
17	M Temp Control	52,000.00	52,000.00	0.00	0.00	52,000.00	100%	0.00	0.00
18	L Temp Control	78,000.00	78,000.00	0.00	0.00	78,000.00	100%	0.00	0.00
19	L Temp Engineering	10,000.00	10,000.00	0.00	0.00	10,000.00	100%	0.00	0.00
20	L Air/Water Balance	12,000.00	12,000.00	0.00	0.00	12,000.00	100%	0.00	0.00
21	SHEETMETAL								0.00
22	L Coordination Drawing	35,000.00	35,000.00	0.00	0.00	35,000.00	100%	0.00	0.00
23	M Coordination Drawing	2,000.00	2,000.00	0.00	0.00	2,000.00	100%	0.00	0.00
24	L VAV Boxes	12,000.00	12,000.00	0.00	0.00	12,000.00	100%	0.00	0.00
25	M VAV Boxes	2,000.00	2,000.00	0.00	0.00	2,000.00	100%	0.00	0.00
26	L Curbs	4,000.00	4,000.00	0.00	0.00	4,000.00	100%	0.00	0.00
27	M Curbs	2,000.00	2,000.00	0.00	0.00	2,000.00	100%	0.00	0.00
28	L Fans & Vents	4,000.00	4,000.00	0.00	0.00	4,000.00	100%	0.00	0.00
29	M Fans & Vents	22,000.00	22,000.00	0.00	0.00	22,000.00	100%	0.00	0.00
30	L Kitchen Hood System	4,000.00	4,000.00	0.00	0.00	4,000.00	100%	0.00	0.00
31	M Kitchen Hood System	17,000.00	17,000.00	0.00	0.00	17,000.00	100%	0.00	0.00
32	L Duct	115,000.00	115,000.00	0.00	0.00	115,000.00	100%	0.00	0.00
33	M Duct	115,000.00	115,000.00	0.00	0.00	115,000.00	100%	0.00	0.00
34	L Air Devices	8,000.00	8,000.00	0.00	0.00	8,000.00	100%	0.00	0.00
35	M Air Devices	8,000.00	8,000.00	0.00	0.00	8,000.00	100%	0.00	0.00
36	L Boiler Flue	3,000.00	3,000.00	0.00	0.00	3,000.00	100%	0.00	0.00
37	M Boiler Flue	4,000.00	4,000.00	0.00	0.00	4,000.00	100%	0.00	0.00
38	CO#1 Bulletin #7	2,705.00	2,705.00	0.00	0.00	2,705.00	100%	0.00	0.00
39	CO#2 Pads & Valves	929.00	929.00	0.00	0.00	929.00	100%	0.00	0.00
40	CO#3 Unused Allowance	(4,498.00)	(4,498.00)	0.00	0.00	(4,498.00)	100%	0.00	0.00
41	CO#4 Dryer Vents	1,106.00	0.00	1,106.00	0.00	1,106.00	100%	0.00	0.00
	Total	1,463,242.00	1,462,136.00	1,106.00	0.00	1,463,242.00	100%	0.00	0.00

The Ohio School Facilities Commission
10 West Broad Street
14th Floor
Columbus, Ohio 43215
Phone: 614-466-6290 Fax: 614-466-7749

CHANGE ORDER

X ADD DEDUCT

Contract Reference No. 38-01962-005025-B132X - 520970

CM # - Controlling Board # - OSFC Building IRN # - District Project # - District Purchase Order #

Change Order No. 5 (BP#) - 004 (CO#)

Change Order Date 9/29/2008

Contractor Name: Feldkamp Enterprises

Project: Cincinnati Public Schools
CPS - Carson Elementary School
4323 Glenway Ave.
Cincinnati, Ohio 45205
#10960PA-3

Contract Days Changed 0

Revised Completion Date No change

Reason for Change Order:
*Design Clarification

Local Funded Initiative (List breakdown % below)

97.9 % Project Construction Fund

2.1 % Local Initiative

PCO	Item	Description/Justification	Amount
122	001	CB-11: Added Dryer Vent (Co-Fund)	$1,083.00
122	002	CB-11: Added Dryer Vent (LFI)	$23.00
		Per Bulletin 11 dated 7/28/08, Feldkamp installed the added dryer vent for Locker Room 2017A. It was surface mounted and painted to match the wall.	

Original Contract	$1,463,000.00
Previous Changes	($864.00)
This Change	$1,106.00
Revised Contract	$1,463,242.00

The compensation or time extension provided by this Change Order constitutes full and complete satisfaction for all direct and indirect costs, and interest related thereto, which has been or may be incurred in connection with this change to the work, including but not limited to, any delays, inefficiencies, disruption, extended overhead, acceleration, and the cumulative impact of this and other change orders issues as of this date.

CONTRACTOR'S ACCEPTANCE
Feldkamp Enterprises
3642 Muddy Creek
Cincinnati, OH 45238

Authorized Signature 10/2/08 Date

ARCHITECT'S RECOMMENDATION
GBBN Architects Inc.
332 East 8th Street
Cincinnati, OH 45202

Authorized Signature Date

SCHOOL DISTRICT ACCEPTANCE
Cincinnati Public Schools
2651 Burnet Avenue
Cincinnati, OH 45219

Board Authorized Signature Date

CHANGE ORDER RECOMMENDED

Construction Manager Date
Turner/DAG/TYS

Project Name: Carson Elementary School 10/2/2006

Thybar Corporation AIRX ERC DESIGN POINT ANALYSIS

DESIGN CONDITIONS	Dry Bulb, F	Wet Bulb, F	Enthalpy, Btu/lb
SUMMER, Outdoor	92.00	74.00	38.15
SUMMER, Indoor	75.00	63.00	28.94
WINTER, Outdoor	.00	-2.00	.31
WINTER, Indoor	70.00	53.00	22.25

Project Unit: ERV-1	**Model Number:** TV-7490	
SUPPLY AIR FLOW RATE, cfm	10010	10010
EXHAUST AIR FLOW RATE, cfm	8010	8010
Latent Effectiveness	75.96%	76.75%
Sensible Effectiveness	81.67%	82.58%
Measured Effectiveness (S/W)	79.4%	81.7%

SUPPLY AIR CONDITIONS	**Summer**	**Winter**
Dry Bulb Temperature, F	80.59	44.70
Wet Bulb Temperature, F	67.17	37.04
Enthalpy, Btu/lb	32.19	14.07
Relative Humidity, %	50.6	48.0

DESIGN LOADS, Btu/h	**Summer**	**Winter**
Outside Air, Sensible	172,229	765,017
Outside Air, Latent	216,811	233,833
Outside Air, Total	389,040	998,850

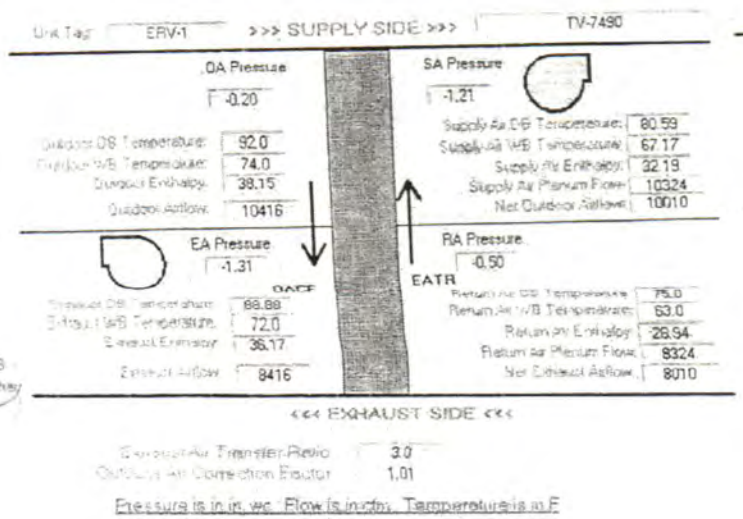
RECOVERED LOADS, Btu/h	**Summer**	**Winter**
Sensible Recovered	113,884	445,029
Latent Recovered	133,862	169,997
Total Recovered	247,746	615,026
Net OA Load	141,294	383,824

INSTALLED HVAC REDUCTION

COOLING, Tons	20.65
HEATING, Btu/h	615,026

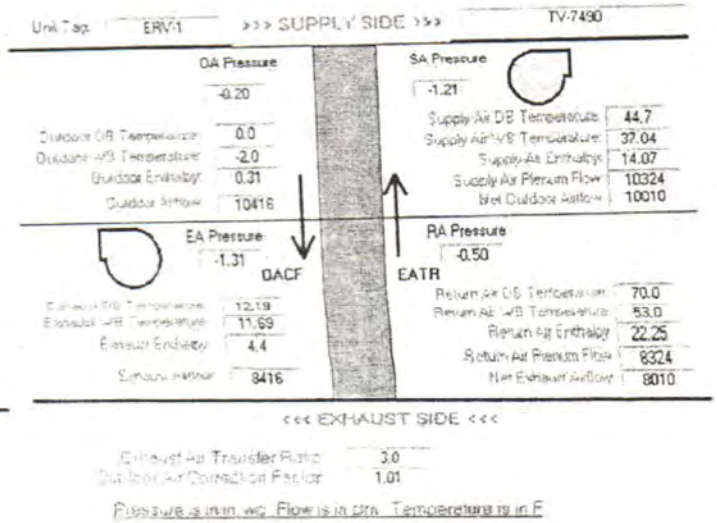
RF

Summer Process Diagram



Pressure is in in. wc. Flow is in cfm. Temperature is in F

Winter Process Diagram



Pressure is in in. wc. Flow is in cfm. Temperature is in F

Project Name: Carson Elementary School 10/2/2006

Thybar Corporation AIRX ERC DESIGN POINT ANALYSIS

DESIGN CONDITIONS	Dry Bulb, F	Wet Bulb, F	Enthalpy, Btu/lb
SUMMER, Outdoor	92.00	74.00	38.15
SUMMER, Indoor	75.00	63.00	28.94
WINTER, Outdoor	.00	-2.00	.31
WINTER, Indoor	70.00	53.00	22.25

Project Unit: ERV-2	**Model Number:** TV-7490	
SUPPLY AIR FLOW RATE, cfm	10958	10958
EXHAUST AIR FLOW RATE, cfm	8958	8958
Latent Effectiveness	73.38%	74.14%
Sensible Effectiveness	79.45%	80.34%
Measured Effectiveness (S/W)	77.0%	79.4%

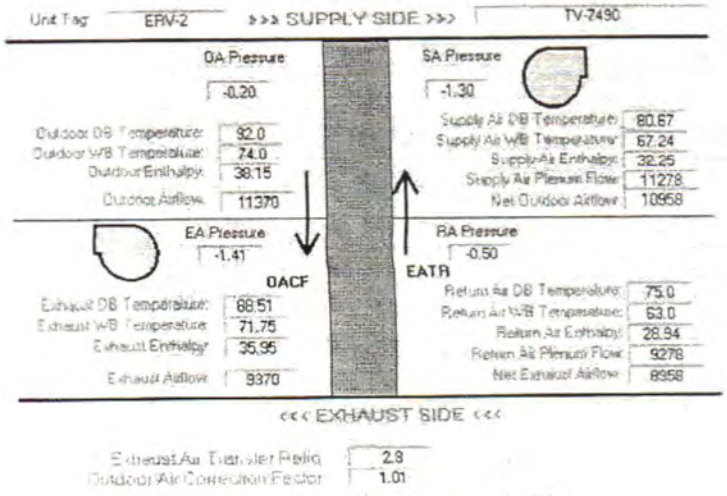
SUPPLY AIR CONDITIONS	**Summer**	**Winter**
Dry Bulb Temperature, F	80.67	44.36
Wet Bulb Temperature, F	67.24	36.76
Enthalpy, Btu/lb	32.25	13.94
Relative Humidity, %	50.7	48.0

DESIGN LOADS, Btu/h	**Summer**	**Winter**
Outside Air, Sensible	188,512	837,978
Outside Air, Latent	237,310	256,134
Outside Air, Total	425,822	1,094,113

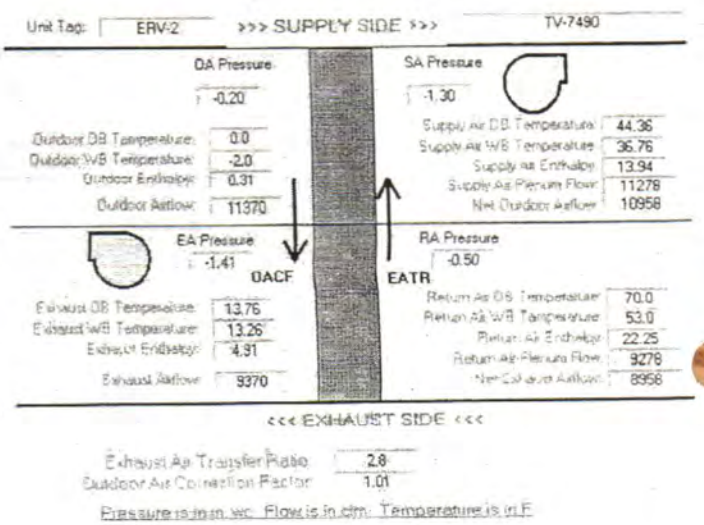
RECOVERED LOADS, Btu/h	**Summer**	**Winter**
Sensible Recovered	123,898	483,833
Latent Recovered	144,652	184,275
Total Recovered	268,550	668,108
Net OA Load	157,271	426,005

INSTALLED HVAC REDUCTION		
COOLING, Tons	22.38	
HEATING, Btu/h		668,108

Summer Process Diagram



Winter Process Diagram



Tag Data - Water Cooled Helical Rotary Chillers (Duplex) (Qty: 2)

Item	Tag(s)	Qty	Description	Model Number
A1	C-1, C-2	2	125 Ton Series R w/Remote Cond	RTUA125

Product Data - Water Cooled Helical Rotary Chillers (Duplex)

Item: A1 Qty: 2 Tag(s): C-1, C-2

Series R(TM) Compressor Chiller
Factory Assigned
125 Nominal Tons
460 Volt/60 Hertz/3 Phase
Y-delta Closed Transition Starter
Standard Cooling 40 to 65 degrees F
UL/CUL Listing
Not ASHRAE 90.1/CSA compliant
Outside ARI certification
LonTalk communication interface module
Power Disconnect Switch
Elastomeric Isolators (Fld)
Low Ambient Lockout Sensor (Fld)
Ship with skid (flat bed truck)
Sound Attenuator - Field Installed (Fld)
150 psi NEMA 1 Flow Switch x 1 (Fld)
2nd - 5th Year Replacement Compressor Parts Warranty

TRANE®

Series R®
Rotary Liquid Chiller

70 to 125 Tons
Water-Cooled and Condenserless

Built For the Industrial and Commercial Markets

November 1999

RLC-DS-4

Performance Data

Table P-20 – ARI Part-Load Performance

Unit Size	% Load	Tons	EER	IPLV
RTUA 70	100	68.4	10.2	
	75	51.3	12.0	**13.5**
	50	34.2	14.6	
	25	17.1	15.2	
RTUA 80	100	78.3	10.1	
	75	58.7	11.7	**13.1**
	50	39.2	14.9	
	25	19.6	11.7	
RTUA 90	100	87.2	9.6	
	75	65.4	10.2	**11.7**
	50	43.6	12.9	
	25	21.8	12.6	
RTUA 100	100	95.0	9.2	
	75	71.3	10.4	**11.9**
	50	47.5	12.8	
	25	23.8	14.0	
RTUA 110	100	102.4	9.2	
	75	76.8	10.4	**12.0**
	50	51.2	13.1	
	25	25.6	13.9	
RTUA125	100	111.0	9.2	
	75	83.3	10.5	**11.9**
	50	55.5	12.9	
	25	27.8	13.3	

Table P-21 – Performance Data Adjustment Factors

Fouling Factor	Chilled Water Temp. Drop	Altitude											
		Sea Level			2000 Feet			4000 Feet			6000 Feet		
		CAP	GPM	kW	CAP	GPM	kW	CAP	GPM	kW	CAP	GPM	kW
	8	1.000	1.249	1.000	0.996	1.245	1.004	0.991	1.240	1.007	0.987	1.234	1.014
0.00010	10	1.000	1.000	1.000	0.997	0.996	1.004	0.993	0.992	1.007	0.988	0.988	1.015
	12	1.001	0.835	1.001	0.997	0.832	1.004	0.993	0.828	1.009	0.988	0.824	1.015
	14	1.003	0.716	1.001	0.999	0.714	1.004	0.994	0.711	1.009	0.990	0.708	1.015
	16	1.004	0.628	1.001	1.000	0.626	1.005	0.997	0.623	1.009	0.991	0.620	1.016
	8	0.988	1.235	0.996	0.984	1.230	1.000	0.980	1.225	1.004	0.975	1.220	1.010
0.00025	10	0.988	0.989	0.998	0.986	0.985	1.000	0.981	0.981	1.004	0.977	0.976	1.011
	12	0.990	0.825	0.998	0.987	0.822	1.000	0.983	0.819	1.005	0.978	0.815	1.011
	14	0.991	0.708	0.998	0.988	0.706	1.001	0.984	0.703	1.005	0.980	0.700	1.011
	16	0.993	0.621	0.999	0.990	0.619	1.001	0.986	0.617	1.006	0.981	0.614	1.012

Fairview School

Supporting Documentation

Ohio Mercantile Self Direct Program

Application Guide & Cover Sheet

Questions? Call 1-866-380-9580 or visit www.duke-energy.com.

Email this form along with completed Mercantile Self Direct Prescriptive or Custom applications, proof of payment, energy savings calculations and spec sheets to SelfDirect@Duke-Energy.com. You may also fax to 1-513-419-5572.

Mercantile customers, defined as using at least 700,000 kWh annually are eligible for the Mercantile Self Direct program. Please indicate mercantile qualification:

- ☐ a single Duke Energy Ohio account
- ☒ multiple accounts in Ohio (energy usage with other utilities may be counted toward the total)

Please list Duke Energy account numbers below (attach listing of multiple accounts an/or billing history for other utilities as required):

Account Number	Annual Usage	Account Number	Annual Usage
3880-3662-01			

Self Direct rebates are available for completed Custom projects that have not previously received a Duke Energy Smart $aver® Custom Incentive. Self Direct incentives are applicable to Prescriptive measures that were installed more than 90 days prior to submission to Duke Energy and have not previously received a Duke Energy Prescriptive rebate.

Self Direct Program requirements dictate that certain projects that may be Prescriptive in nature under the Smart $aver program must be evaluated using the Custom process. Use the table on page two as a guide to determine which Self Direct program fits your project(s). Apply for Self Direct projects using the appropriate application forms in conjunction with this cover sheet. Where Mercantile Self Direct Prescriptive applications are listed, please refer to the measure list on that application. If your measure is not listed, you may be eligible for a Self Direct Custom rebate. Self Direct Custom applications, like Smart $aver Custom applications, should include detailed analysis of pre-project and post-project energy usage and project costs. Please indicate which type of rebate applications are included in the table provided on page two.

Please check each box to indicate completion of the following program requirements:

☐ All sections of appropriate application(s) are completed	☐ Proof of payment.*	☐ Manufacturer's Spec sheets	☐ Energy model/calculations and detailed inputs for Custom applications

* If a single payment record is intended to demonstrate the costs of both Prescriptive & Custom projects, please include an additional document with an estimated breakout of costs for each Prescriptive and Custom energy conservation measure.

Application Type	Replaced equipment at end of lifetime or because equipment failed**	Replaced fully operational equipment to improve efficiency***	New Construction
Lighting	MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐	MSD Prescriptive Lighting ☐	MSD Prescriptive Lighting ☐
		MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐	MSD Custom Part 1 ☒ Custom Lighting Worksheet ☐
Heating & Cooling	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Heating & Cooling ☐
			MSD Custom Part 1 ☒ MSD Custom General Worksheet ☒
Window Films, Programmable Thermostats, & Guest Room Energy Management Systems	MSD Custom Part 1 ☐ MSD Custom General and/or EMS Worksheet(s) ☐	MSD Prescriptive Heating & Cooling ☐	MSD Custom Part 1 ☐ MSD Custom General and/or EMS Worksheet(s) ☐
Chillers & Thermal Storage	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Chillers & Thermal Storage ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
Motors & Pumps	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Motors, Pumps & Drives ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
VFDs	Not Applicable	MSD Prescriptive Motors, Pumps & Drives ☐	MSD Custom Part 1 ☐ MSD Custom VFD Worksheet ☐
		MSD Custom Part 1 ☐ MSD Custom VFD Worksheet ☐	
Food Service	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Food Service ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
Process	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Process ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
		MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	
Energy Management Systems	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐
Behavioral* & No/Low Cost**	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐		

** Under the Self Direct program, failed equipment and equipment at the end of its useful life are evaluated differently than early replacement of fully functioning equipment. **All equipment replacements due to failure or old age will be evaluated via the Custom program.**

*** Please ensure that you include the age of the replaced equipment for measures classified as “Early Replacement” in your application as well as the estimated date that you would have otherwise replaced the existing equipment if you had not chosen a more energy efficient option.

**** Behavioral energy efficiency and demand reduction projects must be both measurable and verifiable. Provide justification with your application.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Proposed energy efficiency measures may be eligible for Self-Direct Custom rebates if they clearly reduce electrical consumption and/or demand as compared to the appropriate baseline.

Before you complete this application, please note the following important criteria:

- Submitting this application does not guarantee a rebate will be approved.
- Rebates are based on electricity conservation only.
- Electric demand and/or energy reductions must be well documented with auditable calculations.
- Incomplete applications cannot be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, beginning on page 6.

Notes on the Application Process

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact your Duke Energy Ohio, Inc account manager or the Duke Energy Smart $aver® team at 1-866-380-9580.

Every application must include calculations of the baseline electrical usage and the electrical usage of the proposed high-efficiency equipment/system. Monthly calculations are best. You, the Duke Energy Ohio customer, or your equipment vendor / engineer should perform these calculations and submit them to Duke Energy for review. *We strongly encourage the use of modeling software (such as eQuest or comparable) for complex projects.*

Upon receipt of your application, an acknowledgement email will be sent to you with an estimated response time based on an initial assessment of your application. The application review may include some communication to resolve any questions about the project or to request additional information. Applications that are received complete without missing information have a faster review time.

There are two ways to submit your completed application.

Email your scanned form to: SelfDirect@duke-energy.com

Or, fax your form to 513-419-5572

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

1. Contact Information (Required)

Duke Energy Customer Contact Information									
Company Name	Cincinnati Public Schools								
Address	2651 Burnett Ave								
Project Contact	Don Elbe								
City	Cincinatti	State	OH	Zip Code	45219				
Title	Utility Management Coordinator								
Office Phone	513-363-0754	Mobile Phone		Fax					
E-mail Address	elbedon@cpsboe.k12.oh.us								

Equipment Vendor / Contractor / Architect / Engineer Contact Information					
Company Name	Plug Smart				
Address	1275 Kinnear Road Suite 229				
City	Columbus	State	OH	Zip Code	43212
Project Contact	Lucas Dixon				
Title	Operations Manager				
Office Phone	614-580-3352	Mobile Phone		Fax	1-800-518-5576
E-mail Address	lucas.dixon@plugsmart.com				
Describe Role	Ensures rebate is correctly applied for				

Payment Information					
Payee Legal Company Name (as shown on Federal income tax return):	Cincinnati Public Schools				
Mailing Address	2651 Burnett Ave				
City	Cincinatti	State	OH	Zip Code	45219
Type of organization (check one) ☐ Individual/Sole Proprietor ☐ Corporation ☐ Partnership ☒ Unit of Government ☐ Non-Profit (non-corporation)					
Payee Federal Tax ID # of Legal Company Name Above:	31-6000758				
Who should receive incentive payment? (select one) ☒ Customer ☐ Vendor (Customer must sign below)					
If the vendor is to receive payment, please sign below: I hereby authorize payment of incentive directly to vendor: Customer Signature _____ Date____/___/_____ (mm/dd/yyyy)					

2. Project Information (Required)

A. Please indicate project type:
- ☒ New Construction
- ☐ Expansion at an existing facility
- ☐ Replacing equipment due to equipment failure
- ☐ Replacing equipment that is estimated to have remaining useful life of 2 years or less
- ☐ Replacing equipment that is estimated to have remaining useful life of more than 2 years
- ☐ Behavioral, operational and/or procedural programs/projects

B. Please describe your project, or attach a detailed project description that describes the project.
New K-6 magnet schools with a focus on learning the German language.

C. When did you start and complete implementation?
Start date / (mm/yyyy) End date 08/2008 (mm/yyyy)

D. Are you also applying for Self-Direct Prescriptive incentives and, if so, which one(s)[1]?
Lighting Controls

E. Please indicate which worksheet(s) you are submitting for this application (check all that apply):
- ☒ Lighting
- ☐ Variable Frequency Drive (VFD)
- ☐ Compressed Air
- ☐ Energy Management System (EMS)
- ☒ General (for projects not easily submitted using one of the above worksheets)

F. Please tell us if there is anything about your electrical energy projections (either for the baseline or the proposed project) that you are either unsure about or for which you have made significant assumptions. Attach additional sheets as needed.

Required: Attach a supplier or contractor invoice or other equivalent information documenting the Implementation Cost for each project listed in your application. (Note: self-install costs cannot be included in the Implementation Cost)

[1] If your project involves some equipment that is eligible for prescriptive incentives and some equipment that is likely eligible for custom incentives, and if it is feasible to separate the equipment for the energy analysis, then the equipment will be evaluated separately. If it is not feasible to separate the equipment for analysis, then the equipment will be evaluated together in the custom application.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

3. Signature (Required – must be signed by Duke Energy customer)

Customer Consent to Release of Personal Information

I, (insert name) Don Elbe, do hereby consent to Duke Energy disclosing my Duke Energy Ohio, Inc Account Number and Federal Tax ID Number to its subcontractors solely for the purpose of administering Duke Energy Ohio's Mercantile Self-Direct Program. I understand that such subcontractors are contractually bound to otherwise maintain my Duke Energy Ohio, Inc Account Number and Federal Tax ID Number in the strictest of confidence.

I realize that under the rules and regulations of the public utilities commission, I may refuse to allow Duke Energy Ohio, Inc to release the information set forth above. By my signature, I freely give Duke Energy Ohio, Inc permission to release the information designated above.

Application Signature

I certify that I meet the eligibility requirements of the Duke Energy Ohio, Inc Mercantile Self Direct Custom Incentives Program and that all information provided within this application is correct to the best of my knowledge. I agree to the terms and conditions set forth for this program. I certify that the numbers, energy savings, and responses shown on this form are correct. Further, I certify that the taxpayer identification number is current and correct. I am not subject to backup withholding because: (a) I am exempt from backup withholding; or (b) I have not been notified by the IRS that I am subject to backup withholding as a result of a failure to report all interest or dividends; or (c) the IRS has notified me that I am no longer subject to backup withholding. I am a U.S. citizen (includes a U.S. resident alien).

Don Elbe

Duke Energy Ohio, Inc Customer Signature

Print Name Don Elbe

Date 12/30/2011

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Checklist for completing the Application

INCOMPLETE APPLICATIONS WILL RESULT IN DELAYS IN DUKE ENERGY PROCESSING YOUR APPLICATION AND NOTIFYING YOU CONCERNING AY REBATES. Before submitting the application and the required supplementary information, use the following checklist to ensure that your application is complete and the information in the application is accurate. (Note: this checklist is for your use only – do not submit this checklist with your application)

Section No. & Title	Have You:
1. Contact Information	☐ Completed the contact information for the Duke Energy customer? ☐ Completed the contact information for the equipment vendor / project engineer that can answer questions about the technical aspects of the project, if that is a different person than above?
2. Project Information	☐ Answered the questions A-E, including providing a description of your project. ☐ Completed and attached the lighting, compressed air, VFD, EMS and/or General worksheet(s)?
3. Signature	☐ Signed your name? ☐ Printed your name? ☐ Entered the date?
Supplementary information (Required)	☐ Attached a supplier or contractor's invoice or other equivalent information documenting the Implementation Cost for projects listed in your application? (Note: self-install costs cannot be included in the Implementation Cost) ☐ (If submitting the General Worksheet) attached calculations documenting the energy usage and energy savings for **each** project listed in your application?

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact:

- your Duke Energy account manager
  or,
- the Duke Energy Smart $aver® team at 1-866-380-9580.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Instructions/Terms/Conditions

Note: Please keep for your records- do not submit with the application

1. Energy service companies or contractors may assist in preparing the application, but an authorized representative of the customer must sign this application to be eligible to participate in the Mercantile Self Direct Program. Completion of this application does not guarantee the approval of a Self Direct Custom Rebate.

2. Once all documentation requested in this application is received by *Duke Energy Ohio, Inc,* and any follow-up information requested by *Duke Energy* is received, the rebate amount for each Energy Conservation Measure (ECM) will be communicated to the customer. The rebate amount will be based on ECM energy savings and ECM incremental installation cost.

3. All rebates require approval by the Public Utilities Commission of Ohio. *Duke Energy Ohio, Inc* will submit an application for rebate on the customer's behalf upon customer attestation to program terms, conditions and requirements as outlined in the rebate offer letter and upon customer completion of attestation documents required by the Public Utilities Commission of Ohio.

4. *Duke Energy Ohio, Inc* will issue a Self Direct Custom Rebate check, based on the approved rebate amount for each ECM, upon receiving approval from the Public Utilities Commission of Ohio. *Duke Energy* Ohio, Inc does not guarantee PUCO approval.

5. With the application, the customer must provide a list of all sites where the ECMs were installed. *Duke Energy Ohio, Inc* requests that sites of similar size, hours of operation and energy consuming characteristics be grouped together in one application for the determination of the rebate amount. The application should identify the site where each unique ECM was installed.

6. Based on the information submitted with the application and the information gathered both before and after the initial installation of the ECM, *Duke Energy Ohio, Inc* will calculate the rebate amount for each ECM.

7. *Duke Energy Ohio, Inc* may conduct random site inspections of a sample of the locations where the ECMs are installed to verify installation and operability of the ECMs and to obtain information needed to calculate the Approved Incentive Amount.

8. Customers are encouraged to retain copies of all forms, invoices and supporting documentation for their records.

9. Approved rebates are valid for 6 months from the date communicated to the customer by *Duke Energy Ohio, Inc,* subject to the expiration of measure eligibility based on project completion dates and application submission deadlines as defined by PUCO. Customers are encouraged to execute their rebate offer contracts and PUCO-required affidavits promptly to ensure eligibility is not forfeited.

10. *Duke Energy Ohio, Inc* reserves the right to recover all unrecoverable costs associated with the project approval if the customer decides not to execute the rebate contract, after the project is approved by *Duke Energy Ohio, Inc.*

11. Projects financially supported by other funding sources will be evaluated on a case-by-case basis for potential partial funding from *Duke Energy Ohio, Inc*.

12. Participants must be *Duke Energy Ohio, Inc* nonresidential, mercantile customers with the project sites in the *Duke Energy Ohio, Inc* service territory.

13. Customers or trade allies may not use any *Duke Energy* logo without prior written permission.

14. Only trade allies registered with *Duke Energy* are eligible to participate.

15. All equipment must be new. Used or rebuilt equipment is not eligible for incentives. All old existing equipment must be removed on retrofit projects.

16. Disclaimers: *Duke Energy Ohio, Inc*
    a. does not endorse any particular manufacturer, product or system design within the program;
    b. will not be responsible for any tax liability imposed on the customer as a result of the payment of incentives;
    c. does not expressly or implicitly warrant the performance of installed equipment. (Contact your contractor for details regarding equipment warranties.);
    d. is not responsible for the proper disposal/recycling of any waste generated or obsolete or old equipment as a result of this project;
    e. is not liable for any damage caused by the installation of the equipment nor for any damage caused by the malfunction of the installed equipment; and
    f. reserves the right to change or discontinue this program at any time. The acceptance of program applications is determined solely by *Duke Energy Ohio, Inc.*

The General Worksheet is part 2 of the application. Do not submit this file without submitting a completed Part1 Custom Application document file, which can be found at www.duke-energy com. This worksheet is for all projects that are not easily submitted through one of the other worksheets

Before you complete this application, please note the following important criteria:

Submitting this application does not guarantee an incentive will be approved.
Incentive already decided to proceed.
Electric demand and/or energy reductions must be well documented with auditable calculations.
Incomplete applications will not be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, found in the Mercantile Self Direct Custom Application Part 1 document.

Please enter your information and data into the cells that are shaded.
Cells in white are locked and cannot be written over.

Duke Energy Customer Contact Information (Match the information in Application Part 1):

Name	Don Elbe
Company	Cincinnati Public Schools

Equipment Vendor / Project Engineer Contact Information

Name	Lucas Dixon
Company	Plug Smart

Before proceeding with the custom application, please verify that your project is not on the Self-Direct Prescriptive application.
The prescriptive incentive applications can be found at:
http //www.duke-energy.com/ohio-large-business/smart-saver/mercantile-self-direct.asp
Prescriptive rebate amounts are pre-approved.

List of Sites (Required)

App No.	
Rev.	

Provide a list of sites addressed by this custom incentive application

Site ID (see note 1)	Duke Energy Electric Account Number(s) (see note 2)	Facility Address	List of Proposed Projects at each site	Annual Hours of Operation	Gross Square Footage	Conditioned Square Footage	Facility Age (years)
225	*12345678 01*	*Example: 123 Main Street, Anywhere USA 12345*	*Project Name(s)*	*5,840*	*42,000*	*38,000*	*12*
	3880-3662-01	*3645 Clifton Avenue Cincinnati OH 45220*	*Heat Recovery Wheels*	*1,225*	*84,144*	*84,144*	*3*

1 Site ID
Can be a store number, building name or other way to identify the location. If there is only one site involved in this application, then a Site ID is not necessary.

2 Account Numbers
Must match the facility of the proposed project(s). If there are multiple meters at a site, only include the meters that pertain to the project(s).

For each project, answer the following questions (use one worksheet per project)

App No.	0
Rev.	0

Project Name: **Heat Recovery Units**

How would you classify this project? (Place an x in all boxes that apply.)

Lighting		**Heating/Cooling**	X	**Air Compressor**		**Energy Management System**	
VFD		**Motors/Pumps**		**Process Equipment**		**Other, describe below:**	

Brief Project Description

Describe the Baseline (see note 3) Equipment/System	Describe the Proposed High Efficiency Project
No heat recovery units installed on air handlers	**Heat recovery units installed on air handlers.**

If Existing Equipment is the Baseline, how many years of useful life remain or how many years until scheduled replacement?

Detailed Project Description Attached? Yes (Required)

Operating Hours (see note 4)

	Weekday		Saturday		Sunday		Weeks of Use in Year (see note 5)	Total Annual Hours of Use
24 x 7	**Start Hour**	**End Hour**	**Start Hour**	**End Hour**	**Start Hour**	**End Hour**		
	7:00 AM	***3:00 PM***					***29***	***1,225***

Energy Savings

	Baseline (see Note 3)	Proposed	Savings	Describe how energy numbers were calculated
Annual Electric Energy	34,653 kWh	0 kWh	34,653 kWh	
Electric Demand	0 kW	0 kW	0 kW	
Calculations attached	Yes	Yes	(Required)	he is listed as the savings with proposed at 0 kWh. See attached DUKE.CincPublic_Evar

Simple Payback

Average electric rate ($/kWh) on the applicable accounts (see note 6)			$0.10
Estimated annual electric savings			$3 465
Other annual savings in addition to electric savings, such as operations, maintenance, other fuels			
Incremental cost to implement the project (equipment & installation) (see note 7)			
Copy of vendor proposal is attached (see note 8)			Yes
Simple Electric Payback in years (see note 9)	0	**Total Payback in years**	0

3 Baseline
Retrofit projects: the existing equipment is the baseline.
New construction projects: the baseline is the standard option in today's market, taking into account any applicable organizational, local, state or federal codes or standards currently in effect.

4 Operating Hours
Describe when the equipment is typically used. If the project is proposed for more than one site, provide any variations in operating hours between the sites on a separate sheet.

5 Weeks of Use in Year
If the equipment is not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when usage is not expected and why: Savings only calculated for summer hours, gas heating systems are used during the winter.

6 Average electric rate ($/kWh)
If you do not know your average electric rate, use $0.10/kWh.

7 Incremental cost to implement the project
Costs exclude self installation costs. Retrofit projects, incremental cost is the total cost of the proposed project. New construction or where the existing equipment must be replaced anyway, then incremental cost is the premium of the proposed high efficiency project over baseline.

8 Copy of vendor invoice is attached
Vendor invoices detailing costs of the project are always required.
New construction projects or where the existing equipment must be replaced anyway, vendor proposal of baseline must also be attached.

9 Simple Electric Payback
If the simple electric payback is less than 1 year, the rebate structure is affected. Double check average electric rate for correct payback.

March 2, 2012

To whom it may concern:

This letter is to confirm that for the renovation to Cincinnati Public school **Fairview Elementary (3645 Clifton Ave)**, for the **custom** rebate application, the lighting project was installed with a minimum unit cost listed below.

DESCRIPTION	QUANTITY	PRICE/FIXTURE	AMOUNT
R1 - Metalux 2GC8-332A	513	$95.00	$48,735.00
R6 - Portfolio C6142E	8	$60.00	$480.00
R12 - Metalux 2GC8-232A125	37	$90.00	$3,330.00
W7 - Metalux BAU-232	6	$60.00	$360.00
CL4 - Metalux W-332A	8	$55.00	$440.00
R9 - Halo H800E277	3	$75.00	$225.00
CL3 - Metalux W-332A	14	$55.00	$770.00
R5 - Portfolio C6152E	32	$60.00	$1,920.00
R10 - Portfolio M7600TQF	3	$163.00	$489.00
W2 - Elliptipar F113-H242	13	$126.00	$1,638.00
52 - Shaper 482-10-CFL	10	$153.00	$1,530.00
R7 - Metalux GC8-232A125	151	$80.00	$12,080.00
R11 - Metalux 2GC8-332A125	84	$95.00	$7,980.00
CL6 - Fail-Safe FWS-332	2	$109.00	$218.00
CH1 - Metalux DIM-232	36	$94.00	$3,384.00
W5 - Metalux BC-232	7	$78.00	$546.00
W6 - Lumark ICVW1G	2	$32.00	$64.00
R3 - Metalux 2EP3GX-332S36I	28	$105.00	$2,940.00
S1 - Lumark MH SE ENGR 21 C	31	$189.00	$5,859.00
R8 - Metalux 2GC8FA-432A125	5	$56.00	$280.00
W4 - Steplyte RSC2 F13	4	$179.00	$716.00
CL5 - Fail-Safe FWS-332	23	$109.00	$2,507.00
NovelAire ECW 844 Energy Conservation Wheel	3	$8,000.00	$24,000

TOTAL	**$120,491**

This is also to confirm that for the renovation to **Fairview Elementary (3645 Clifton Ave)**, for the **prescriptive** rebate application, occupancy sensors were installed with a minimum unit cost listed below.

DESCRIPTION	QUANTITY	PRICE/FIXTURE	AMOUNT
Occupancy Sensors - WT 11 CM-PDT-10	45	$117.89	$5,305.05

TOTAL	**$5,305.05**

Thank you for your attention to this matter,

Don Elbe
Utility Management Coordinator

APPLICATION AND CERTIFICATE FOR PAYMENT

TO OWNER:
CINCINNATI PUBLIC SCHOOLS
2315 IOWA AVENUE
CINCINNATIO, OHIO 45206

PROJECT:
FAIRVIEW ELEMENTARY SCHOOL
3645 CLIFTON AVENUE
CINCINNATI, OHIO 45220

APPLICATION No: 21
PERIOD TO: 10/31/08
PROJECT NOS: 04026
CONTRACT DATE:

FROM CONTRACTOR:
BEACON ELECTRIC COMPANY
7815 REDSKY DRIVE
CINCINNATI, OHIO 45249

VIA ARCHITECT:
GLASERWORKS
304 EAST EIGHT
CINCINNATI, OHIO 45202-2231

CONTRACT FOR: FAIRVIEW ELEMENTARY BP # 7

MELISSA M. LAWSON
Notary Public, State of Ohio
My Commission Expires August 13, 2013

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment as shown below, in connection with the Contract
Continuation sheet is attached.

1. ORIGINAL CONTRACT SUM.....$	$	1,675,000.00
2. Net Change by Change Orders.....$	$	83,221.00
3. CONTRACT SUM TO DATE.....$	$	1,758,221.00
4. TOTAL COMPLETED & STORED TO DATE.....$	$	1,758,221.00
5. RETAINAGE		
a. 8-50% of Completed Labor.....$		
b. 8% of Stored Material.....$		
Total Retainage.....$	$	-
6. TOTAL EARNED LESS RETAINAGE.....$	$	1,758,221.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT.....$	$	1,749,245.00
8. CURRENT PAYMENT DUE.....$	$	8,976.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE.....$	$	-

Change Order/Contract	ADDITIONS	DEDUCTIONS
Total Changes approved in Previous months by Owner	$ 74,245.00	
Total approved this month	$ 8,976.00	
TOTALS	$ 83,221.00	
NET CHANGES by Change Order	$ 83,221.00	

The Contractor certified that the work covered by this pay request has been completed in accordance with the Contract Documents and that all progress payments previously paid by the State have been applied by the Contractor to discharge in full all of Contractor's obligations incurred in connection with the work covered by all prior pay requests.

Contractor — Date: 10.20.08

Based upon on-site observations, the firm affirms that the work has progressed to the percentage of completeness indicated on the pay request.

Architect — Date: 10/28/08

Construction Manager — Date: 10/27/08

Approved:

School District Treasurer — Date

CONTINUATION SHEET

APPLICATION NUMBER: 21 PERIOD TO: 10/31/2008

ITEM NUMBER	DESCRIPTION OF WORK		SCHEDULED VALUE	WORK COMPLETED PREVIOUS APPS.	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED	TOTAL COMPLETED & STORED TO DATE	%	BALANCE TO FINISH	RETAINAGE 0%
	GENERAL CONDITIONS									
1	BOND/INSURANCE		35,275.00	35,275.00	$ -	0.00	$ 35,275.00	100.00%	0.00	$ -
2	PERMITS & FEES		25,500.00	25,500.00	$ -	0.00	$ 25,500.00	100.00%	0.00	$ -
3	GC-SUBMITTALS	LABOR	8,300.00	8,300.00	$ -	0.00	$ 8,300.00	100.00%	0.00	$ -
	GC-SUBMITTALS	MATERIAL	4,150.00	4,150.00	$ -	0.00	$ 4,150.00	100.00%	0.00	$ -
4	GC- CLEAN-UP	LABOR	9,960.00	9,960.00	$ -	0.00	$ 9,960.00	100.00%	0.00	$ -
	GC- CLEAN-UP	MATERIAL	2,490.00	2,490.00	$ -	0.00	$ 2,490.00	100.00%	0.00	$ -
5	PUNCHLIST	LABOR	2,490.00	2,490.00	$ -	0.00	$ 2,490.00	100.00%	0.00	$ -
	PUNCHLIST	MATERIAL	1,660.00	1,660.00	$ -	0.00	$ 1,660.00	100.00%	0.00	$ -
6	TEMPORARY POWER	LABOR	33,200.00	33,200.00	$ -	0.00	$ 33,200.00	100.00%	0.00	$ -
	TEMPORARY POWER	MATERIAL	37,350.00	37,350.00	$ -	0.00	$ 37,350.00	100.00%	0.00	$ -
7	ALLOWANCES GENERAL	MATERIAL	15,000.00	15,000.00	$ -	0.00	$ 15,000.00	100.00%	0.00	$ -
	ALLOWANCES DSL / TELE	MATERIAL	9,000.00	9,000.00	$ -	0.00	$ 9,000.00	100.00%	0.00	$ -
8	CLOSE-OUT		5,000.00	5,000.00	$ -	0.00	$ 5,000.00	100.00%	0.00	$ -
9	ATTIC STOCK TO OWNER		2,075.00	2,075.00	$ -	0.00	$ 2,075.00	100.00%	0.00	$ -
10	TRAINING		1,660.00	1,660.00	$ -	0.00	$ 1,660.00	100.00%	0.00	$ -
	SITE WORK									
11	BRCH/FEEDER-CONDUIT	LABOR	20,750.00	20,750.00	$ -	0.00	$ 20,750.00	100.00%	0.00	$ -
12	BRCH/FEEDER-CONDUIT	MATERIAL	17,015.00	17,015.00	$ -	0.00	$ 17,015.00	100.00%	0.00	$ -
13	BRANCH/FEEDER-WIRE	LABOR	7,885.00	7,885.00	$ -	0.00	$ 7,885.00	100.00%	0.00	$ -
14	BRANCH/FEEDER-WIRE	MATERIAL	7,470.00	7,470.00	$ -	0.00	$ 7,470.00	100.00%	0.00	$ -
15	LIGHT FIXTURES	LABOR	14,940.00	14,940.00	$ -	0.00	$ 14,940.00	100.00%	0.00	$ -
16	LIGHT FIXTURES	MATERIAL	20,750.00	20,750.00	$ -	0.00	$ 20,750.00	100.00%	0.00	$ -
17	TRENCHING/BACKFILL	LABOR	26,560.00	26,560.00	$ -	0.00	$ 26,560.00	100.00%	0.00	$ -
18	TRENCHING/BACKFILL	MATERIAL	53,950.00	53,950.00	$ -	0.00	$ 53,950.00	100.00%	0.00	$ -
	1st Floor North									
19	ELECTRICAL EQUIPMENT	LABOR	37,350.00	37,350.00	$ -	0.00	$ 37,350.00	100.00%	0.00	$ -
20	ELECTRICAL EQUIPMENT	MATERIAL	124,500.00	124,500.00	$ -	0.00	$ 124,500.00	100.00%	0.00	$ -
21	BRCH/FEEDER-CONDUIT	LABOR	70,550.00	70,550.00	$ -	0.00	$ 70,550.00	100.00%	0.00	$ -
22	BRCH/FEEDER-CONDUIT	MATERIAL	45,650.00	45,650.00	$ -	0.00	$ 45,650.00	100.00%	0.00	$ -
23	BRANCH/FEEDER-WIRE	LABOR	9,960.00	9,960.00	$ -	0.00	$ 9,960.00	100.00%	0.00	$ -
24	BRANCH/FEEDER-WIRE	MATERIAL	62,250.00	62,250.00	$ -	0.00	$ 62,250.00	100.00%	0.00	$ -
	TOTAL		712,690.00	712,690.00	0.00	0.00	712,690.00	100.00%	0.00	0.00

CONTINUATION SHEET

APPLICATION NUMBER: 21 PERIOD TO: 10/31/2008

ITEM NUMBER	DESCRIPTION OF WORK		SCHEDULED VALUE	WORK COMPLETED PREVIOUS APPS.	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED	TOTAL COMPLETED & STORED TO DATE	%	BALANCE TO FINISH	RETAINAGE
25	LIGHT FIXTURES	LABOR	16,600.00	16,600.00	$ -	0.00	$ 16,600.00	100.00%	0.00	$ -
26	LIGHT FIXTURES	MATERIAL	53,950.00	53,950.00	$ -	0.00	$ 53,950.00	100.00%	0.00	$ -
27	DEVICES/EQUIPMENT	LABOR	12,450.00	12,450.00	$ -	0.00	$ 12,450.00	100.00%	0.00	$ -
28	DEVICES/EQUIPMENT	MATERIAL	9,960.00	9,960.00	$ -	0.00	$ 9,960.00	100.00%	0.00	$ -
	1st Floor South									
29	ELECTRICAL EQUIPMENT	LABOR	8,300.00	8,300.00	$ -	0.00	$ 8,300.00	100.00%	0.00	$ -
30	ELECTRICAL EQUIPMENT	MATERIAL	20,750.00	20,750.00	$ -	0.00	$ 20,750.00	100.00%	0.00	$ -
31	BRCH/FEEDER-CONDUIT	LABOR	14,940.00	14,940.00	$ -	0.00	$ 14,940.00	100.00%	0.00	$ -
32	BRCH/FEEDER-CONDUIT	MATERIAL	15,770.00	15,770.00	$ -	0.00	$ 15,770.00	100.00%	0.00	$ -
33	BRANCH/FEEDER-WIRE	LABOR	8,300.00	8,300.00	$ -	0.00	$ 8,300.00	100.00%	0.00	$ -
34	BRANCH/FEEDER-WIRE	MATERIAL	9,130.00	9,130.00	$ -	0.00	$ 9,130.00	100.00%	0.00	$ -
35	LIGHT FIXTURES	LABOR	6,640.00	6,640.00	$ -	0.00	$ 6,640.00	100.00%	0.00	$ -
36	LIGHT FIXTURES	MATERIAL	16,600.00	16,600.00	$ -	0.00	$ 16,600.00	100.00%	0.00	$ -
37	DEVICES/EQUIPMENT	LABOR	4,565.00	4,565.00	$ -	0.00	$ 4,565.00	100.00%	0.00	$ -
38	DEVICES/EQUIPMENT	MATERIAL	4,150.00	4,150.00	$ -	0.00	$ 4,150.00	100.00%	0.00	$ -
	2nd Floor South									
39	ELECTRICAL EQUIPMENT	LABOR	8,300.00	8,300.00	$ -	0.00	$ 8,300.00	100.00%	0.00	$ -
40	ELECTRICAL EQUIPMENT	MATERIAL	20,750.00	20,750.00	$ -	0.00	$ 20,750.00	100.00%	0.00	$ -
41	BRCH/FEEDER-CONDUIT	LABOR	9,960.00	9,960.00	$ -	0.00	$ 9,960.00	100.00%	0.00	$ -
42	BRCH/FEEDER-CONDUIT	MATERIAL	12,450.00	12,450.00	$ -	0.00	$ 12,450.00	100.00%	0.00	$ -
43	BRANCH/FEEDER-WIRE	LABOR	8,300.00	8,300.00	$ -	0.00	$ 8,300.00	100.00%	0.00	$ -
44	BRANCH/FEEDER-WIRE	MATERIAL	9,130.00	9,130.00	$ -	0.00	$ 9,130.00	100.00%	0.00	$ -
45	LIGHT FIXTURES	LABOR	5,810.00	5,810.00	$ -	0.00	$ 5,810.00	100.00%	0.00	$ -
46	LIGHT FIXTURES	MATERIAL	12,450.00	12,450.00	$ -	0.00	$ 12,450.00	100.00%	0.00	$ -
47	DEVICES/EQUIPMENT	LABOR	4,150.00	4,150.00	$ -	0.00	$ 4,150.00	100.00%	0.00	$ -
48	DEVICES/EQUIPMENT	MATERIAL	3,320.00	3,320.00	$ -	0.00	$ 3,320.00	100.00%	0.00	$ -
	TOTAL		1,009,415.00	1,009,415.00	0.00	0.00	1,009,415.00	100.00%	0.00	0.00

CONTINUATION SHEET

APPLICATION NUMBER: 21 PERIOD TO: 10/31/2008

ITEM NUMBER	DESCRIPTION OF WORK		SCHEDULED VALUE	WORK COMPLETED PREVIOUS APPS.	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED	TOTAL COMPLETED & STORED TO DATE	%	BALANCE TO FINISH	RETAINAGE
	3rd Floor South									
49	ELECTRICAL EQUIPMENT	LABOR	4,150.00	$ 4,150.00	$ -	0.00	$ 4,150.00	100.00%	0.00	$ -
50	ELECTRICAL EQUIPMENT	MATERIAL	20,750.00	$ 20,750.00	$ -	0.00	$ 20,750.00	100.00%	0.00	$ -
51	BRCH/FEEDER-CONDUIT	LABOR	4,565.00	$ 4,565.00	$ -	0.00	$ 4,565.00	100.00%	0.00	$ -
52	BRCH/FEEDER-CONDUIT	MATERIAL	4,150.00	$ 4,150.00	$ -	0.00	$ 4,150.00	100.00%	0.00	$ -
53	BRANCH/FEEDER-WIRE	LABOR	4,565.00	$ 4,565.00	$ -	0.00	$ 4,565.00	100.00%	0.00	$ -
54	BRANCH/FEEDER-WIRE	MATERIAL	8,300.00	$ 8,300.00	$ -	0.00	$ 8,300.00	100.00%	0.00	$ -
55	LIGHT FIXTURES	LABOR	4,565.00	$ 4,565.00	$ -	0.00	$ 4,565.00	100.00%	0.00	$ -
56	LIGHT FIXTURES	MATERIAL	8,300.00	$ 8,300.00	$ -	0.00	$ 8,300.00	100.00%	0.00	$ -
57	DEVICES/EQUIPMENT	LABOR	3,320.00	$ 3,320.00	$ -	0.00	$ 3,320.00	100.00%	0.00	$ -
58	DEVICES/EQUIPMENT	MATERIAL	3,320.00	$ 3,320.00	$ -	0.00	$ 3,320.00	100.00%	0.00	$ -
	Equip & Systems									
59	GENERATOR/ATS 16622	LABOR	6,225.00	$ 6,225.00	$ -	0.00	$ 6,225.00	100.00%	0.00	$ -
60	GENERATOR/ATS 16622	MATERIAL	32,370.00	$ 32,370.00	$ -	0.00	$ 32,370.00	100.00%	0.00	$ -
61	WIRE BASKET TRAY 16136	LABOR	9,960.00	$ 9,960.00	$ -	0.00	$ 9,960.00	100.00%	0.00	$ -
62	WIRE BASKET TRAY 16136	MATERIAL	12,450.00	$ 12,450.00	$ -	0.00	$ 12,450.00	100.00%	0.00	$ -
63	FIRE ALARM 16721	LABOR	10,375.00	$ 10,375.00	$ -	0.00	$ 10,375.00	100.00%	0.00	$ -
64	FIRE ALARM 16721	MATERIAL	16,600.00	$ 16,600.00	$ -	0.00	$ 16,600.00	100.00%	0.00	$ -
65	SECURITY 17910	LABOR	7,055.00	$ 7,055.00	$ -	0.00	$ 7,055.00	100.00%	0.00	$ -
66	SECURITY 17910	MATERIAL	29,050.00	$ 29,050.00	$ -	0.00	$ 29,050.00	100.00%	0.00	$ -
67	CCTV 17930	LABOR	9,130.00	$ 9,130.00	$ -	0.00	$ 9,130.00	100.00%	0.00	$ -
68	CCTV 17930	MATERIAL	42,330.00	$ 42,330.00	$ -	0.00	$ 42,330.00	100.00%	0.00	$ -
69	VOICE/DATA 17150	LABOR	29,050.00	$ 29,050.00	$ -	0.00	$ 29,050.00	100.00%	0.00	$ -
70	VOICE/DATA 17150	MATERIAL	123,360.00	$ 123,360.00	$ -	0.00	$ 123,360.00	100.00%	0.00	$ -
71	PA SYSTEM 17750	LABOR	8,715.00	$ 8,715.00	$ -	0.00	$ 8,715.00	100.00%	0.00	$ -
72	PA SYSTEM 17750	MATERIAL	20,750.00	$ 20,750.00	$ -	0.00	$ 20,750.00	100.00%	0.00	$ -
	TOTAL		1,432,820.00	1,432,820.00	0.00	0.00	1,432,820.00	100.00%	0.00	0.00

CONTINUATION SHEET

APPLICATION NUMBER: 21 PERIOD TO: 10/31/2008

ITEM NUMBER	DESCRIPTION OF WORK		SCHEDULED VALUE	WORK COMPLETED PREVIOUS APPS.	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED	TOTAL COMPLETED & STORED TO DATE	%	BALANCE TO FINISH	RETAINAGE
73	CLASSROOM REINFORCEMENT 17830	LABOR	2,075.00	2,075.00	$ -	0.00	$ 2,075.00	100.00%	0.00	$ -
74	CLASSROOM REINFORCEMENT 17830	MATERIAL	6,850.00	6,850.00	$ -	0.00	$ 6,850.00	100.00%	0.00	$ -
75	VOCAL RM SOUND 16821	LABOR	2,075.00	2,075.00	$ -	0.00	$ 2,075.00	100.00%	0.00	$ -
76	VOCAL RM SOUND 16821	MATERIAL	3,320.00	3,320.00	$ -	0.00	$ 3,320.00	100.00%	0.00	$ -
77	GYM SOUND 17824	LABOR	4,565.00	4,565.00	$ -	0.00	$ 4,565.00	100.00%	0.00	$ -
78	GYM SOUND 17824	MATERIAL	12,450.00	12,450.00	$ -	0.00	$ 12,450.00	100.00%	0.00	$ -
79	CAFETRIA SOUND SYSTEM 17821	LABOR	3,320.00	3,320.00	$ -	0.00	$ 3,320.00	100.00%	0.00	$ -
80	CAFETRIA SOUND SYSTEM 17821	MATERIAL	9,130.00	9,130.00	$ -	0.00	$ 9,130.00	100.00%	0.00	$ -
81	MUSIC ROOM SND 17827	LABOR	2,490.00	2,490.00	$ -	0.00	$ 2,490.00	100.00%	0.00	$ -
82	MUSIC ROOM SND 17827	MATERIAL	6,640.00	6,640.00	$ -	0.00	$ 6,640.00	100.00%	0.00	$ -
83	VIDEO DISTRIBUTION 17410	LABOR	4,565.00	4,565.00	$ -	0.00	$ 4,565.00	100.00%	0.00	$ -
84	VIDEO DISTRIBUTION 17410	MATERIAL	9,960.00	9,960.00	$ -	0.00	$ 9,960.00	100.00%	0.00	$ -
85	VIDEO PLAYBACK PROJECTION 17430	LABOR	9,960.00	9,960.00	$ -	0.00	$ 9,960.00	100.00%	0.00	$ -
86	VIDEO PLAYBACK PROJECTION 17430	MATERIAL	82,000.00	82,000.00	$ -	0.00	$ 82,000.00	100.00%	0.00	$ -
87	NETWORK EQUIP 17210	LABOR	4,565.00	4,565.00	$ -	0.00	$ 4,565.00	100.00%	0.00	$ -
88	NETWORK EQUIP 17210	MATERIAL	65,400.00	65,400.00	$ -	0.00	$ 65,400.00	100.00%	0.00	$ -
89	SCOREBOARD 16660	LABOR	1,875.00	1,875.00	$ -	0.00	$ 1,875.00	100.00%	0.00	$ -
90	SCOREBOARD 16660	MATERIAL	5,465.00	5,465.00	$ -	0.00	$ 5,465.00	100.00%	0.00	$ -
91	UPS 17260	LABOR	675.00	675.00	$ -	0.00	$ 675.00	100.00%	0.00	$ -
92	UPS 17260	MATERIAL	4,800.00	4,800.00	$ -	0.00	$ 4,800.00	100.00%	0.00	$ -
93	CHANGE ORDER # 1		2,701.00	2,701.00	$ -	0.00	$ 2,701.00	100.00%	0.00	
94	CHANGE ORDER # 2		16,998.00	16,998.00	$ -	0.00	$ 16,998.00	100.00%	0.00	$ -
95	CHANGE ORDER # 3		3,446.00	3,446.00	$ -	0.00	$ 3,446.00	100.00%	0.00	$ -
96	CHANGE ORDER # 4		6,267.00	6,267.00	$ -	0.00	$ 6,267.00	100.00%	0.00	$ -
97	CHANGE ORDER # 5		1,551.00	1,551.00	$ -	0.00	$ 1,551.00	100.00%	0.00	$ -
98	CHANGE ORDER # 6		22,005.00	22,005.00	$ -	0.00	$ 22,005.00	100.00%	0.00	$ -
97	CHANGE ORDER # 7		3,658.00	3,658.00	$ -	0.00	$ 3,658.00	100.00%	0.00	$ -
98	CHANGE ORDER # 8		8,863.00	8,863.00	$ -	0.00	$ 8,863.00	100.00%	0.00	$ -
99	CHANGE ORDER # 9									$ -
100	CHANGE ORDER # 10		7,011.00	7,011.00	$ -	0.00	$ 7,011.00	100.00%	0.00	
101	CHANGE ORDER # 11		1,745.00	1,745.00	$ -	0.00	$ 1,745.00	100.00%	0.00	$ -
102	CHANGE ORDER # 12		389.00	0.00	$ 389.00	0.00	$ 389.00	100.00%	0.00	$ -
103	CHANGE ORDER # 13		8,167.00	0.00	$ 8,167.00	0.00	$ 8,167.00	100.00%	0.00	$ -
104	CHANGE ORDER # 14		420.00	0.00	$ 420.00	0.00	$ 420.00	100.00%	0.00	$ -
	TOTAL		1,758,221.00	1,749,245.00	8,976.00	0.00	1,758,221.00	100.00%	0.00	0.00

LABOR

Said affiant further says that the following shows the names and addresses of every unpaid laborer in the employ of [2] _____ Beacon Electric Company furnishing labor under said contract, giving the amount, if any, which is due, or to become due, for labor done to date hereof.

NOTE–If the fact is that every laborer has been paid in full, then recite: "Every laborer has been paid in full." If not, then give each unpaid laborer's name and address and the amount due or to become due.

NAME	ADDRESS	HOURS	Amount Due or to Become Due for Labor Furnished to Date Hereof	
EVERY LABORER HAS BEEN PAID IN FULL				

Affiant further states that there is due or to become due to Beacon Electric Company for work performed or machinery, material or fuel furnished to Cincinnati Public School (Owner or Contractor) to date hereof under said contracts, the sum of $ 8,976.00.

That the amounts due or to become due to said sub-contractors, material men and laborers, for work done or machinery, material or fuel furnished to the date hereof, to [2] Beacon Electric Company are fully and correctly set forth opposite their names, respectively, in the aforesaid statements, and further evidenced by certificates of every person furnishing machinery, material or fuel, hereto attached, and made a part hereof.

Affiant further says that [6] Beacon Electric Company has not employed or purchased or procured machinery, material or fuel from, or sub-contracted with any person, firm or corporation, other than

NOTE–The above must be accompanied by "Certificate of Materialman." In lieu of such certificate, there may be furnished a written waiver of lien, a written release or receipt

or fuel to [2] Beacon Electric Company giving the amount, if any, which is due, or to become due, to them, or any o them, for machinery, material or fuel furnished to date hereof, under said contracts.

NAME	ADDRESS	Kind of Machinery, Material or Fuel	Amount Due or to Become Due for Material Furnished to Date Hereof	
		ALL MATERIAL HAS BEEN PAID IN FULL		

RECEIVED

OCT 2 8 2008

glaserworks

Cincinnati Public Schools
2315 Iowa Avenue
Cincinnati, Ohio 45206

RECEIVED

OCT 2 8 2008

glaserworks

Contractor's Name: **BEACON ELECTRIC COMPANY**
Address: 7815 REDSKY DRIVE, CINCINNATI, OHIO 45249

Date: October 25, 2008
Application # 21

Contractor Pay Application Summary

Project Name FAIRVIEW ELEMENTARY SCHOOL
Bid Package No. # 7

1	Original Contract Amount	$ 1,675,000.00
2	Net Changes to Date	$ 83,221.00
3	Current Contract Amount	$ 1,758,221.00
4	Labor Completed to Date	$ -
5	Material Completed to Date	$ -
6	Total Work Completed to Date	$ 1,758,221.00
7	Store Material to Date	$ -
8	Less Retained to Date	$ -
9	Total Amount Due	$ 1,758,221.00
10	Less Previous Payments	$ 1,749,245.00
11	Less Amount Retained to Cover Lien	$ -
12	Less Amount Retained for Liquidated Damages	$ -
13	Less Other Amounts Withheld	$ -
14	Current Due	$ 8,976.00
15	Balance to Complete	$ -

OSFC approval required for the following contract adjustments:

1. Assessment of liquidated damages
2. Other amounts withheld

Ohio School Facilities Commission _____ Date _____

Comments:

Turner DAG TYS
Rebuilding Cincinnati Public Schools

October 31, 2008

Angie Tolle
Cincinnati Public Schools
2315 Iowa Avenue
Cincinnati, OH 45206

Dear Angie:

Attached is **Pay Application** for the **Fairview School, please process for payment.**

Contractor	Application #	Monthly Billing	Total Billing To Date	Contract Amount to Date
~~BP#4 Ken Rogers~~	~~#20~~	~~$ 15,128.00~~	~~$ 817,766.00~~	~~$ 817,766.00~~
BP#6 Feldkamp	#22	$ 30,321.20	$1,442,872.00	$1,442,872.00
BP#7 Beacon	#21	$ 8,976.00	$1,758,221.00	$1,758,221.00

Please call if you have any questions.

Sincerely,
TURNER/DAG/TYS

James T. De Lage/bcs

James T. De Lage
Project Executive

/bcs

Attachments

cc: Paul Duffy - Glaserworks
Manasseh Robinson - Turner/DAG/TYS
File 0025 –10960PA

T:PROJECTS/FAIRVIEW/00250 Pay Application/2008-10-31 Combined pay app.doc

APPLICATION AND CERTIFICATE FOR PAYMENT

TO OWNER:	Cincinnati Public Schools	**PROJECT:**	Fairview Elementary 3645 Clifton Avenue Cincinnati, Ohio 45220	**APPLICATION No:** **PERIOD TO:** **PROJECT NOS:** **CONTRACT DATE:** **INVOICE NO:**	22 10/31/08 08/11/06 1219-RET
FROM CONTRACTOR:	Feldkamp Enteprises, Inc. 3642 Muddy Creek Road Cincinnati, Ohio 45238	**VIA ARCHITECT:**			
CONTRACT FOR:	HVAC & PIPING				

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment as shown below, in connection with the Contract
Continuation sheet is attached.

1. ORIGINAL CONTRACT SUM	$	1,463,000.00
2. Net Change by Change Orders	$	(20,128.00)
3. CONTRACT SUM TO DATE	$	1,442,872.00
4. TOTAL COMPLETED & STORED TO DATE	$	1,442,872.00
5. RETAINAGE		
a. 8-50% of Completed Labor	$	-
b. 8% of Stored Material	$	-
Total Retainage	$	-
6. TOTAL EARNED LESS RETAINAGE	$	1,442,872.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT	$	1,412,550.80
8. CURRENT PAYMENT DUE	$	30,321.20
9. BALANCE TO FINISH, INCLUDING RETAINAGE	$	-

Change Order/Contract	ADDITIONS	DEDUCTIONS
Total Changes approved in Previous months by Owner	16136.00	-36264.00
Total approved this month	0.00	0.00
TOTALS	16136.00	-36264.00
NET CHANGES by Change Order		-20128.00

The Contractor certified that the work covered by this pay request has been completed in accordance with the Contract Documents and that all progress payments previously paid by CPS have been applied by the Contract to discharge in full all of Contractor's obligations incurred in connection with the work covered by all prior pay requests.

Contractor — Date: 10/31/2008

Brett Meyer
Notary Public, State of Ohio
My Commission Expires 11-18-2012

Based upon on-site observations, the [illegible] the work has progressed to the point indicated on the pay request.

Architect — Date: 10/28/08

Construction Manager — Date: 10/27/08

Approved:

School District — Date

ITEM NUMBER	DESCRIPTION OF WORK		SCHEDULED VALUE	WORK COMPLETED PREVIOUS APPS.	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED	TOTAL COMPLETED & STORED TO DATE	%	BALANCE TO FINISH	RETAINAGE
Fairview Elementary										
	HVAC									
1	SHEETMETAL									
2	L Coordination Drawings	LABOR	50,000.00	50,000.00	0.00	0.00	50,000.00	100.00%	0.00	0.00
3	M COORDINATION DRAWINGS	MATERIAL	2,000.00	2,000.00	0.00	0.00	2,000.00	100.00%	0.00	0.00
4	L MOBILIZATION	LABOR	2,000.00	2,000.00	0.00	0.00	2,000.00	100.00%	0.00	0.00
5	M MOBILIZATION	MATERIAL	2,000.00	2,000.00	0.00	0.00	2,000.00	100.00%	0.00	0.00
6	L VAV Boxes	LABOR	10,000.00	10,000.00	0.00	0.00	10,000.00	100.00%	0.00	0.00
7	M VAV Boxes	MATERIAL	20,000.00	20,000.00	0.00	0.00	20,000.00	100.00%	0.00	0.00
8	L Fans	LABOR	3,000.00	3,000.00	0.00	0.00	3,000.00	100.00%	0.00	0.00
9	M Fans	MATERIAL	6,000.00	6,000.00	0.00	0.00	6,000.00	100.00%	0.00	0.00
10	L Double Wall Flue	LABOR	2,500.00	2,500.00	0.00	0.00	2,500.00	100.00%	0.00	0.00
11	M Double Wall Flue	MATERIAL	9,000.00	9,000.00	0.00	0.00	9,000.00		0.00	0.00
12	L Ductwork	LABOR	141,750.00	141,750.00	0.00	0.00	141,750.00	100.00%	0.00	0.00
13	M Ductwork	MATERIAL	141,750.00	141,750.00	0.00	0.00	141,750.00	100.00%	0.00	0.00
14	BOND	LABOR	15,000.00	15,000.00	0.00	0.00	15,000.00	100.00%	0.00	0.00
15	SUBMITTALS	LABOR	5,000.00	5,000.00	0.00	0.00	5,000.00	100.00%	0.00	0.00
16	MOBILIZATION	LABOR	5,000.00	5,000.00	0.00	0.00	5,000.00	100.00%	0.00	0.00
17	CLEAN-UP	LABOR	3,500.00	3,500.00	0.00	0.00	3,500.00	100.00%	0.00	0.00
18	PUNCHLIST	LABOR	3,000.00	3,000.00		0.00	3,000.00	100.00%	0.00	0.00
19	ALLOWANCE	LABOR	10,000.00	10,000.00	0.00	0.00	10,000.00	100.00%	0.00	0.00
20	M HVAC Equipment	MATERIAL	310,000.00	310,000.00	0.00	0.00	310,000.00	100.00%	0.00	0.00
21	L HVAC Equipment	LABOR	26,200.00	26,200.00	0.00	0.00	26,200.00	100.00%	0.00	0.00
22	M Hydronic Equipment	MATERIAL	20,000.00	20,000.00	0.00	0.00	20,000.00	100.00%	0.00	0.00
23	L Hydronic Equipment	LABOR	5,500.00	5,500.00	0.00	0.00	5,500.00	100.00%	0.00	0.00
24	M Boilers	MATERIAL	40,000.00	40,000.00	0.00	0.00	40,000.00	100.00%	0.00	0.00
25	L Boilers	LABOR	8,000.00	8,000.00	0.00	0.00	8,000.00	100.00%	0.00	0.00
26	M HW/CW Piping	MATERIAL	94,000.00	94,000.00	0.00	0.00	94,000.00	100.00%	0.00	0.00
27	L HW/CW Piping	LABOR	175,000.00	175,000.00	0.00	0.00	175,000.00	100.00%	0.00	0.00
28	SUBCONTRACTORS									
29	M Insulation	MATERIAL	75,000.00	75,000.00	0.00	0.00	75,000.00	100.00%	0.00	0.00
30	L Insulation	LABOR	120,000.00	120,000.00	0.00	0.00	120,000.00	100.00%	0.00	0.00
31	M Temp Controls	MATERIAL	40,000.00	40,000.00	0.00	0.00	40,000.00	100.00%	0.00	0.00
32	L Temp Controls	LABOR	80,000.00	80,000.00	0.00	0.00	80,000.00	100.00%	0.00	0.00
33	L Egineering	LABOR	20,000.00	20,000.00	0.00	0.00	20,000.00	100.00%	0.00	0.00
34	L Air/Water Balance	LABOR	12,800.00	12,800.00	0.00	0.00	12,800.00	100.00%	0.00	0.00
35	Close-out Documents	LABOR	5,000.00	5,000.00	0.00	0.00	5,000.00	100.00%	0.00	0.00
36	CO#1 Deduct Piping/Insulation	LABOR	(36,264.00)	(36,264.00)	0.00	0.00	(36,264.00)	100.00%	0.00	0.00
37	CO #2 Sound Blanket	LABOR	9,882.00	9,882.00	0.00	0.00	9,882.00	100.00%	0.00	0.00
38	CO#3 Modify Return Air	LABOR	6,254.00	6,254.00	0.00	0.00	6,254.00	100.00%	0.00	0.00
	Total Labor		678,122.00	668,240.00	0.00	0.00	678,122.00	100.00%	0.00	0.00
	Total Material		764,750.00	764,750.00	0.00	0.00	764,750.00	100.00%	0.00	0.00
			1,442,872.00	1,432,990.00	0.00	0.00	1,442,872.00	100.00%	0.00	0.00

The Ohio School Facilities Commission
10 West Broad Street
Suite 1400
Columbus, Ohio 43215

Contractor's Name: Feldkamp Enterprises, Inc.
Address: 3642 Muddy Creek Road, Cincinnati, Ohio 45238

Contractor Pay Application Summary

Project Name: Fairview Elementary
Bid Package No.:

1	Original Contract Amount	$	1,463,000.00
2	Net Changes to Date	$	-20,128.00
3	Current Contract Amount	$	1,442,872.00
4	Labor Completed to Date	$	678,122.00
5	Material Completed to Date	$	764,750.00
6	Total Work Completed to Date	$	1,442,872.00
7	Store Material to Date	$	0.00
8	Less Retained to Date	$	0.00
9	Total Amount Due	$	1,442,872.00
10	Less Previous Payments	$	1,412,550.80
11	Less Amount Retained to Cover Lien	$	0.00
12	Less Amount Retained for Liquidated Damages	$	0.00
13	Less Other Amounts Withheld	$	0.00
14	Current Due	$	30,321.20
15	Balance to Complete	$	0.00

The Ohio School Facilities Commission approval required for the following contract adjustments:

1. Assessment of liquidated damages
2. Other amounts withheld

The Ohio School Facilities Commission _____ Date _____

Comments:

Table 9. AHRI and Part Load Performance - 60 Hz - I-P units

Standard efficiency			
Unit Size	Full Load Tons	Full Load EER	IPLV
140	138.3	9.7	**13.6**
155	151.8	9.8	**14.0**
170	166.1	9.9	**14.0**
185	182.0	9.8	**13.9**
200	198.9	9.7	**13.6**
225	218.6	9.7	**13.9**
250	240.0	9.7	**13.7**
275	266.2	9.8	**14.6**
300	298.9	9.7	**14.2**
350	340.0	9.6	**14.3**
400	401.2	9.7	**14.7**
450	441.8	9.6	**15.0**
500	483.9	9.6	**15.0**

High efficiency			
Unit Size	Full Load Tons	Full Load EER	IPLV
140	142.0	10.2	**13.8**
155	157.3	10.4	**14.5**
170	171.3	10.5	**14.5**
185	188.1	10.4	**14.3**
200	206.1	10.3	**14.0**
225	223.1	10.1	**14.1**
250	246.3	10.2	**14.0**
275	275.5	10.5	**14.8**
300	308.8	10.3	**14.4**
350	346.5	10.5	**15.4**
400	415.6	10.2	**14.7**

1. IPLV values are rated in accordance with AHRI Standard 550/590.
2. EER and IPLV values include compressors, condenser fans, and control kW.

Table 10. AHRI and Part Load Performance - 50 Hz - I-P units

Standard Efficiency			
Unit Size	Full Load Tons	Full Load EER	IPLV
140	133.7	9.4	**14.4**
155	146.3	9.3	**14.4**
170	159.6	9.3	**14.1**
185	175.9	9.4	**14.5**
200	193.4	9.5	**14.2**
250	230.1	9.4	**16.1**
275	256.8	9.3	**15.7**
300	290.7	9.4	**15.7**
350	322.7	9.3	**16.2**
375	356.7	9.4	**16.4**
400	390.1	9.4	**16.4**

High Efficiency			
Unit Size	Full Load Tons	Full Load EER	IPLV
120	114.4	10.0	**14.8**
130	127.1	10.2	**15.2**
140	140.6	10.3	**15.1**
155	152.9	10.2	**15.1**
170	166.0	10.1	**14.8**
185	183.4	10.2	**15.2**
200	201.8	10.3	**14.9**
250	238.6	10.0	**16.0**
275	267.9	10.1	**16.1**
300	302.5	10.2	**16.2**
350	335.7	10.0	**16.4**
375	370.9	10.1	**16.6**
400	406.9	10.2	**16.6**

1. IPLV values are rated in accordance with AHRI Standard 550/590.
2. EER and IPLV values include compressors, condenser fans, and control kW.

Feldkamp Enterprises inc.
Fax: (513) 347-4506
Website: www.feldkamphvac.com

SUBMITTAL DATA

Project:	Fairview Elementary School
Project / P.O.#	1219
Specification Section:	15855
Architect/Engineer:	Glaserworks
Submittal For:	Air Handling Units
Manufacturer:	Trane
Supplier:	Trane
Contact Name & Phone #	Stephanie Myers: (513) 771-8884

Comments:

Mollie Lane 1/29/2007

RECEIVED BY
FELDKAMP ENTERPRISES, INC.

- [X] APPROVED
- [ ] APPROVED AS NOTED
- [ ] NOT APPROVED
- [ ] RESUBMIT
- [ ] REVISION NOTED

SPEC SECTION 15855

Record Submittal

Trane
A Division of American Standard Inc.

Prepared For:
Feldkamp Enterprises Inc

Date: *January 23, 2007*

Sold To:
Feldkamp Enterprises Inc
3642 Muddy Creek
CINCINNATI, OH 45238

Job Name:
Fairview Elementary School

Trane is pleased to provide the enclosed submittal for your review and approval.

Product Summary

Qty	Product	
3	Indoor Central Station Air Handler Units	Tag: AHU-1, AHU-2 & AHU-3
	Reference: Section 15682	

Submittal Notes:

Supply and Return Fan Motors are inverter balanced. The VFD's are to be field installed.

AHU-1
- Provided 56KW Electric Heat Output per Specs.
- Added a Small Access Module downstream of the Electric Heat Module
- Changed Access Module upstream from Electric Heat Module from Medium to Small Size Module
- Changed Electric Heat Module to 11,788 CFM per Specs.
- Changed Energy Wheel to 12500 Nominal CFM
- Please Note: Unit Length is now 314.50

AHU-2
- Changed Cooling Coil to 130 Fin Spacing per Specs.
- Added a Small Access Module downstream of the Electric Heat Module
- Changed Access Module upstream from Electric Heat Module from Extended Medium to Small Size Module
- Please Note: Unit Length is now 364.50

AHU-3
- Changed Heating Coil to 2 Row coil which corrected the MBH to 1042 MBH & 66.83 GPM
- Changed Supply Fan Motor External Static Pressure to 4.25 per Specs.
- Added a Small Access Module downstream of the Electric Heat Module
- Changed Access Module upstream from Electric Heat Module from Extended Medium to Small Size Module
- Please Note: Unit Length is now 364.50

The attached information describes the equipment we propose to furnish for this project, and is submitted for your approval.

Stephanie Myers
Trane
10300 Springfield Pike
Cincinnati, OH 45215
Phone: (513) 771-8884
Fax: (513) 772-7281

Performance Data - Indoor Central Station Air Handler Units

Tags	AHU-2			AHU-3		
Unit level selections						
Actual airflow (cfm)	23253			23849		
Length (in)	364.500			364.500		
Rigging unit weight (lb)	15909.7			15817.9		
Installed unit weight (lb)	16334.6			16277.9		
Fan module						
Position	#1	#12		#1	#12	
Fan airflow (cfm)	23253	23253		23849	23849	
External static pressure (in H2O)	2.25	4.25		2.25	4.25	
Total static pressure (in H2O)	3.92	7.92		4.02	7.49	
Fan module pressure drop (in H2O)	2.25	4.25		2.25	4.25	
Design temperature (F)	70.00	70.00		70.00	70.00	
Minimum temperature (F)	10.00	10.00		10.00	10.00	
Speed (rpm)	1074	1645		1093	1629	
Brake horsepower (hp)	20.206	39.617		21.333	38.891	
Width (in)	120.000	120.000		120.000	120.000	
Height (in)	75.000	75.000		75.000	75.000	
Weight (lb)	2623.6	3218.5		2623.6	3218.5	
Access/turning module						
Position	#3,#5		#9,#11	#3,#5		#9,#11
Module length (in)	14.500		20.000	14.500		20.000
Module weight (lb)	318.7		392.0	318.7		392.0
Module width (in)	120.000		120.000	120.000		120.000
Module height (in)	75.000		75.000	75.000		75.000
Coil module						
Position	#4	#8	#10	#4	#8	#10
Coil design airflow (cfm)	13449	23253	23253	12862	23849	23849
Total capacity (MBh)	218.56	1013.67	1006.52	208.40	1042.81	943.57
Dry coil weight (lb)	-	272.7	982.5	-	374.9	967.5
Entering dry bulb (F)	0.00	60.89	77.30	0.00	60.98	77.30
Entering wet bulb (F)	-	-	65.50	-	-	65.50
Fluid temperature rise (F)	-	-	14.23	-	-	13.93
Fluid temperature drop (F)	-	32.68	-	-	31.18	-
Sensible capacity (MBh)	-	-	677.34	-	-	656.69
Fluid volume (gal)	-	11.15	39.71	-	15.37	39.71
Leaving dry bulb (F)	15.04	101.08	50.85	15.00	101.30	52.30
Leaving wet bulb (F)	-	-	50.75	-	-	52.20
Entering fluid temperature (F)	-	180.00	44.00	-	180.00	44.00
Leaving fluid temperature (F)	-	147.32	58.23	-	148.82	57.93
Standard fluid flow rate (gpm)	-	62.00	141.00	-	66.83	135.00
Fluid pressure drop (ft H2O)	-	1.75	10.36	-	0.86	4.07
Air pressure drop (in H2O)	0.04	0.12	0.84	0.03	0.12	0.99
Face velocity (ft/min)	-	470	470	-	500	483
Face area (sq ft)	48.76	49.43	49.43	48.76	47.69	49.43
Wet coil weight (lb)	-	365.6	1314.5	-	502.9	1299.5
Coil fouling factor (hr-sq ft-deg F/Btu)	-	0.00050	0.00000	-	0.00050	0.00000
Fluid velocity (ft/sec)	-	2.13	2.42	-	1.76	2.32
Coil module pressure drop (in H2O)	0.04	0.12	0.84	0.03	0.12	0.99
Fluid type	-	Water	Water	-	Water	Water
Module length (in)	48.000	14.500	20.000	48.000	14.500	20.000
Module weight (lb)	1611.6	701.5	1725.8	1611.6	838.8	1710.8
Amp draw (A)	77.07	-	-	73.49	-	-
Module width (in)	120.000	120.000	120.000	120.000	120.000	120.000
Module height (in)	75.000	75.000	75.000	75.000	75.000	75.000

Tags	AHU-2			AHU-3		
Low limit interlock wiring	No LLT wired to starter,vfd	No LLT wired to starter,vfd	No LLT wired to starter,vfd	No LLT wired to starter,vfd	No LLT wired to starter,vfd	No LLT wired to starter,vfd
Energy recovery module						
Position	#6			#6		
Leaving supply airflow (cfm)	23253			23849		
Min ventilation airflow (cfm)	13449			12862		
Exhaust airflow (cfm)	13449			12862		
Re-circulating damper airflow (cfm)	9448			10654		
OACF (%)	101.00			100.92		
EATR (%)	2.58			2.52		
OATR airflow (cfm)	495			455		
EATR airflow (cfm)	356			333		
Supply air wheel PD (in H2O)	1.04			1.13		
Supply air wheel PD - economizing (in H2O)	0.53			0.58		
Exhaust air wheel PD (in H2O)	1.03			1.12		
Exhaust air wheel PD - economizing (in H2O)	0.53			0.58		
Max supply level module PD (in H2O)	1.04			1.13		
Max exhaust level module PD (in H2O)	1.67			1.77		
Re-circulating damper area (sq ft)	10.77			10.77		
Re-circulating damper PD (in H2O)	0.17			0.21		
Exhaust air bypass damper area (sq ft)	7.29			6.32		
Exhaust air bypass damper PD (in H2O)	0.53			0.66		
Outside air bypass damper area (sq ft)	7.29			6.32		
Outside air bypass damper PD (in H2O)	0.53			0.66		
Outside air ESP (in H2O)	1.00			1.00		
Return air ESP (in H2O)	1.00			1.00		
Total eff -winter (%)	72.62			71.05		
Sensible eff -winter (%)	73.30			71.66		
Latent eff -winter (%)	71.88			70.45		
Total eff -summer (%)	72.63			71.11		
Sensible eff -summer (%)	73.30			71.66		
Latent eff -summer (%)	71.88			70.45		
Winter return EDB (F)	70.00			70.00		
Winter return EWB (F)	58.00			58.00		
Winter outside EDB (F)	11.00			11.00		
Winter outside EWB (F)	-2.00			-2.00		
Winter ventilation DB (F)	54.24			53.28		
Winter ventilation WB (F)	47.67			47.01		
Winter ventilation RH (%)	61.71			62.75		
Winter supply LDB (F)	60.89			60.98		
Winter supply LWB (F)	52.27			52.36		
Winter supply RH (%)	56.06			56.08		
Winter exhaust LDB (F)	29.07			29.83		
Winter exhaust LWB (F)	27.10			27.77		
Summer return EDB (F)	75.00			75.00		
Summer return EWB (F)	63.50			63.50		
Summer outside EDB (F)	92.00			92.00		
Summer outside EWB (F)	74.00			74.00		
Summer ventilation DB (F)	79.75			80.01		
Summer ventilation WB (F)	66.76			66.91		
Summer ventilation RH (%)	50.97			50.78		
Summer supply LDB (F)	77.75			77.70		
Summer supply LWB (F)	65.41			65.37		
Summer supply RH (%)	52.02			52.01		
Summer exhaust LDB (F)	87.46			87.18		
Summer exhaust LWB (F)	71.35			71.20		

Tags	AHU-2			AHU-3		
Filter pressure drop (in H2O)	0.64			0.65		
Total energy saved -summer (MBh)	386.08			361.39		
Latent energy saved -summer (MBh)	204.51			191.66		
Sensible energy saved -summer (MBh)	187.90			175.65		
Humidity recovered -winter (lb/hr)	351.22			329.81		
Sensible energy saved -winter (MBh)	663.29			619.29		
Width (in)	120.000			120.000		
Height (in)	150.000			150.000		
Length (in)	67.000			67.000		
Weight (lb)	2734.0			2555.0		
Filter module						
Position	#7			#7		
Filter airflow (cfm)	23253			23849		
Filter area (sq ft)	51.60			51.60		
Filter pressure drop (in H2O)	0.77			0.34		
Filter module pressure drop (in H2O)	0.77			0.34		
Module length (in)	29.500			29.500		
Module weight (lb)	976.2			976.2		
Module width (in)	120.000			120.000		
Module height (in)	75.000			75.000		
Air mixing module						
Position	#2			#2		
Back opening airflow (cfm)	23255			12862		
Back entry pressure drop (in H2O)	0.22			0.07		
Front opening airflow (cfm)	23255			12862		
Filter airflow (cfm)	23255			12862		
Filter pressure drop (in H2O)	0.64			0.56		
Total filter pressure drop (in H2O)	0.64			0.56		
Module total pressure drop (in H2O)	0.86			0.63		
Module length (in)	48.000			48.000		
Module weight (lb)	1322.1			1322.1		
Module width (in)	120.000			120.000		
Module height (in)	75.000			75.000		

Tags	AHU-1		
Unit level selections			
Actual airflow (cfm)	14096		
Length (in)	314.500		
Rigging unit weight (lb)	9199.7		
Installed unit weight (lb)	9393.0		
Fan module			
Position	#1	#12	
Fan airflow (cfm)	14096	14096	
External static pressure (in H2O)	1.75	2.25	
Total static pressure (in H2O)	3.43	5.93	
Fan module pressure drop (in H2O)	1.75	2.25	
Design temperature (F)	70.00	70.00	
Minimum temperature (F)	10.00	10.00	
Speed (rpm)	1332	1931	
Brake horsepower (hp)	12.237	20.765	
Width (in)	91.000	91.000	
Height (in)	56.500	56.500	
Weight (lb)	1315.5	1655.5	

Tags	AHU-1		
Access/turning module			
Position	**#3,#5**		**#9,#11**
Module length (in)	11.000		15.500
Module weight (lb)	190.7		239.3
Module width (in)	91.000		91.000
Module height (in)	56.500		56.500
Coil module			
Position	**#4**	**#8**	**#10**
Coil design airflow (cfm)	11788	14096	14096
Total capacity (MBh)	192.00	639.02	534.65
Dry coil weight (lb)	-	139.1	460.4
Entering dry bulb (F)	0.00	56.84	76.40
Entering wet bulb (F)	-	-	64.90
Fluid temperature rise (F)	-	-	14.02
Fluid temperature drop (F)	-	27.76	-
Sensible capacity (MBh)	-	-	374.81
Fluid volume (gal)	-	4.33	18.81
Leaving dry bulb (F)	15.08	98.64	52.25
Leaving wet bulb (F)	-	-	52.04
Entering fluid temperature (F)	-	180.00	44.00
Leaving fluid temperature (F)	-	152.24	58.02
Standard fluid flow rate (gpm)	-	46.00	76.00
Fluid pressure drop (ft H2O)	-	4.59	18.77
Air pressure drop (in H2O)	0.11	0.15	0.68
Face velocity (ft/min)	-	522	486
Face area (sq ft)	24.96	27.00	29.01
Wet coil weight (lb)	-	175.1	617.7
Coil fouling factor (hr-sq ft-deg F/Btu)	-	0.00050	0.00000
Fluid velocity (ft/sec)	-	3.18	3.26
Coil module pressure drop (in H2O)	0.11	0.15	0.68
Fluid type	-	Water	Water
Module length (in)	40.000	11.000	15.500
Module weight (lb)	984.0	378.2	871.9
Amp draw (A)	67.71	-	-
Module width (in)	91.000	91.000	91.000
Module height (in)	56.500	56.500	56.500
Low limit interlock wiring	No LLT wired to starter,vfd	No LLT wired to starter,vfd	No LLT wired to starter,vfd
Energy recovery module			
Position	**#6**		
Leaving supply airflow (cfm)	14096		
Min ventilation airflow (cfm)	11788		
Exhaust airflow (cfm)	11788		
Re-circulating damper airflow (cfm)	2019		
OACF (%)	101.44		
EATR (%)	2.39		
OATR airflow (cfm)	463		
EATR airflow (cfm)	289		
Supply air wheel PD (in H2O)	1.04		
Supply air wheel PD - economizing (in H2O)	0.67		
Exhaust air wheel PD (in H2O)	1.02		
Exhaust air wheel PD - economizing (in H2O)	0.67		
Max supply level module PD (in H2O)	1.04		
Max exhaust level module PD (in H2O)	1.68		
Re-circulating damper area (sq ft)	8.05		
Re-circulating damper PD (in H2O)	0.01		

Tags	AHU-1		
Exhaust air bypass damper area (sq ft)	6.32		
Exhaust air bypass damper PD (in H2O)	0.55		
Outside air bypass damper area (sq ft)	6.32		
Outside air bypass damper PD (in H2O)	0.55		
Outside air ESP (in H2O)	1.00		
Return air ESP (in H2O)	1.00		
Total eff -winter (%)	72.65		
Sensible eff -winter (%)	73.32		
Latent eff -winter (%)	71.90		
Total eff -summer (%)	72.65		
Sensible eff -summer (%)	73.32		
Latent eff -summer (%)	71.90		
Winter return EDB (F)	70.00		
Winter return EWB (F)	58.00		
Winter outside EDB (F)	11.00		
Winter outside EWB (F)	-2.00		
Winter ventilation DB (F)	54.26		
Winter ventilation WB (F)	47.67		
Winter ventilation RH (%)	61.70		
Winter supply LDB (F)	56.84		
Winter supply LWB (F)	49.51		
Winter supply RH (%)	59.54		
Winter exhaust LDB (F)	29.06		
Winter exhaust LWB (F)	27.09		
Summer return EDB (F)	75.00		
Summer return EWB (F)	63.50		
Summer outside EDB (F)	92.00		
Summer outside EWB (F)	74.00		
Summer ventilation DB (F)	79.75		
Summer ventilation WB (F)	66.76		
Summer ventilation RH (%)	50.97		
Summer supply LDB (F)	78.97		
Summer supply LWB (F)	66.24		
Summer supply RH (%)	51.39		
Summer exhaust LDB (F)	87.46		
Summer exhaust LWB (F)	71.35		
Filter pressure drop (in H2O)	0.65		
Total energy saved -summer (MBh)	339.31		
Latent energy saved -summer (MBh)	179.73		
Sensible energy saved -summer (MBh)	165.14		
Humidity recovered -winter (lb/hr)	308.66		
Sensible energy saved -winter (MBh)	582.95		
Width (in)	91.000		
Height (in)	113.000		
Length (in)	57.500		
Weight (lb)	1830.0		
Filter module			
Position	**#7**		
Filter airflow (cfm)	14096		
Filter area (sq ft)	28.00		
Filter pressure drop (in H2O)	0.80		
Filter module pressure drop (in H2O)	0.80		
Module length (in)	24.500		
Module weight (lb)	568.7		
Module width (in)	91.000		
Module height (in)	56.500		

Tags	AHU-1		
Air mixing module			
Position	#2		
Back opening airflow (cfm)	14096		
Back entry pressure drop (in H2O)	0.25		
Front opening airflow (cfm)	14096		
Filter airflow (cfm)	14096		
Filter pressure drop (in H2O)	0.65		
Total filter pressure drop (in H2O)	0.65		
Module total pressure drop (in H2O)	0.91		
Module length (in)	56.500		
Module weight (lb)	929.1		
Module width (in)	91.000		
Module height (in)	56.500		

Kilgour School

Supporting Documentation

Ohio Mercantile Self Direct Program

Application Guide & Cover Sheet

Questions? Call 1-866-380-9580 or visit www.duke-energy.com.

Email this form along with completed Mercantile Self Direct Prescriptive or Custom applications, proof of payment, energy savings calculations and spec sheets to SelfDirect@Duke-Energy.com. You may also fax to 1-513-419-5572.

Mercantile customers, defined as using at least 700,000 kWh annually are eligible for the Mercantile Self Direct program. Please indicate mercantile qualification:

- ☐ a single Duke Energy Ohio account
- ☒ multiple accounts in Ohio (energy usage with other utilities may be counted toward the total)

Please list Duke Energy account numbers below (attach listing of multiple accounts an/or billing history for other utilities as required):

Account Number	Annual Usage	Account Number	Annual Usage
2730-3614-01			

Self Direct rebates are available for completed Custom projects that have not previously received a Duke Energy Smart $aver® Custom Incentive. Self Direct incentives are applicable to Prescriptive measures that were installed more than 90 days prior to submission to Duke Energy and have not previously received a Duke Energy Prescriptive rebate.

Self Direct Program requirements dictate that certain projects that may be Prescriptive in nature under the Smart $aver program must be evaluated using the Custom process. Use the table on page two as a guide to determine which Self Direct program fits your project(s). Apply for Self Direct projects using the appropriate application forms in conjunction with this cover sheet. Where Mercantile Self Direct Prescriptive applications are listed, please refer to the measure list on that application. If your measure is not listed, you may be eligible for a Self Direct Custom rebate. Self Direct Custom applications, like Smart $aver Custom applications, should include detailed analysis of pre-project and post-project energy usage and project costs. Please indicate which type of rebate applications are included in the table provided on page two.

Please check each box to indicate completion of the following program requirements:

☐ All sections of appropriate application(s) are completed	☐ Proof of payment.*	☐ Manufacturer's Spec sheets	☐ Energy model/calculations and detailed inputs for Custom applications

* If a single payment record is intended to demonstrate the costs of both Prescriptive & Custom projects, please include an additional document with an estimated breakout of costs for each Prescriptive and Custom energy conservation measure.

Application Type	Replaced equipment at end of lifetime or because equipment failed**	Replaced fully operational equipment to improve efficiency***	New Construction
Lighting	MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐	MSD Prescriptive Lighting ☐	MSD Prescriptive Lighting ☐
		MSD Custom Part 1 ☐ Custom Lighting Worksheet ☐	MSD Custom Part 1 ☒ Custom Lighting Worksheet ☐
Heating & Cooling	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Heating & Cooling ☐
			MSD Custom Part 1 ☒ MSD Custom General Worksheet ☒
Window Films, Programmable Thermostats, & Guest Room Energy Management Systems	MSD Custom Part 1 ☐ MSD Custom General and/or EMS Worksheet(s) ☐	MSD Prescriptive Heating & Cooling ☐	MSD Custom Part 1 ☐ MSD Custom General and/or EMS Worksheet(s) ☐
Chillers & Thermal Storage	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Chillers & Thermal Storage ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
Motors & Pumps	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Motors, Pumps & Drives ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
VFDs	Not Applicable	MSD Prescriptive Motors, Pumps & Drives ☐	MSD Custom Part 1 ☐ MSD Custom VFD Worksheet ☐
		MSD Custom Part 1 ☐ MSD Custom VFD Worksheet ☐	
Food Service	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Food Service ☐
			MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
Process	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	MSD Prescriptive Process ☐	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐
		MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐	
Energy Management Systems	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐	MSD Custom Part 1 ☐ MSD Custom EMS Worksheet ☐
Behavioral* & No/Low Cost**	MSD Custom Part 1 ☐ MSD Custom General Worksheet ☐		

** Under the Self Direct program, failed equipment and equipment at the end of its useful life are evaluated differently than early replacement of fully functioning equipment. **All equipment replacements due to failure or old age will be evaluated via the Custom program.**

*** Please ensure that you include the age of the replaced equipment for measures classified as “Early Replacement” in your application as well as the estimated date that you would have otherwise replaced the existing equipment if you had not chosen a more energy efficient option.

**** Behavioral energy efficiency and demand reduction projects must be both measurable and verifiable. Provide justification with your application.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Proposed energy efficiency measures may be eligible for Self-Direct Custom rebates if they clearly reduce electrical consumption and/or demand as compared to the appropriate baseline.

Before you complete this application, please note the following important criteria:

- Submitting this application does not guarantee a rebate will be approved.
- Rebates are based on electricity conservation only.
- Electric demand and/or energy reductions must be well documented with auditable calculations.
- Incomplete applications cannot be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, beginning on page 6.

Notes on the Application Process

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact your Duke Energy Ohio, Inc account manager or the Duke Energy Smart $aver® team at 1-866-380-9580.

Every application must include calculations of the baseline electrical usage and the electrical usage of the proposed high-efficiency equipment/system. Monthly calculations are best. You, the Duke Energy Ohio customer, or your equipment vendor / engineer should perform these calculations and submit them to Duke Energy for review. *We strongly encourage the use of modeling software (such as eQuest or comparable) for complex projects.*

Upon receipt of your application, an acknowledgement email will be sent to you with an estimated response time based on an initial assessment of your application. The application review may include some communication to resolve any questions about the project or to request additional information. Applications that are received complete without missing information have a faster review time.

There are two ways to submit your completed application.

Email your scanned form to: SelfDirect@duke-energy.com

Or, fax your form to 513-419-5572

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

1. Contact Information (Required)

Duke Energy Customer Contact Information								
Company Name	Cincinnati Public Schools							
Address	2651 Burnett Ave							
Project Contact	Don Elbe							
City	Cincinatti	State	OH	Zip Code	45219			
Title	Utility Management Coordinator							
Office Phone	513-363-0754	Mobile Phone		Fax				
E-mail Address	elbedon@cpsboe.k12.oh.us							

Equipment Vendor / Contractor / Architect / Engineer Contact Information					
Company Name	Plug Smart				
Address	1275 Kinnear Road Suite 229				
City	Columbus	State	OH	Zip Code	43212
Project Contact	Lucas Dixon				
Title	Operations Manager				
Office Phone	614-580-3352	Mobile Phone		Fax	1-800-518-5576
E-mail Address	lucas.dixon@plugsmart.com				
Describe Role	Ensures rebate is correctly applied for				

Payment Information					
Payee Legal Company Name (as shown on Federal income tax return):	Cincinnati Public Schools				
Mailing Address	2651 Burnett Ave				
City	Cincinatti	State	OH	Zip Code	45219
Type of organization (check one) ☐ Individual/Sole Proprietor ☐ Corporation ☐ Partnership ☒ Unit of Government ☐ Non-Profit (non-corporation)					
Payee Federal Tax ID # of Legal Company Name Above:	31-6000758				
Who should receive incentive payment? (select one) ☒ Customer ☐ Vendor (Customer must sign below)					
If the vendor is to receive payment, please sign below: I hereby authorize payment of incentive directly to vendor: Customer Signature _____ Date____/___/_____ (mm/dd/yyyy)					

2. Project Information (Required)

A. Please indicate project type:
- ☒ New Construction
- ☐ Expansion at an existing facility
- ☐ Replacing equipment due to equipment failure
- ☐ Replacing equipment that is estimated to have remaining useful life of 2 years or less
- ☐ Replacing equipment that is estimated to have remaining useful life of more than 2 years
- ☐ Behavioral, operational and/or procedural programs/projects

B. Please describe your project, or attach a detailed project description that describes the project.
New elementary school in the CPS district

C. When did you start and complete implementation?
Start date / (mm/yyyy) End date 08/2008 (mm/yyyy)

D. Are you also applying for Self-Direct Prescriptive incentives and, if so, which one(s)[1]?

E. Please indicate which worksheet(s) you are submitting for this application (check all that apply):
- ☒ Lighting
- ☐ Variable Frequency Drive (VFD)
- ☐ Compressed Air
- ☐ Energy Management System (EMS)
- ☐ General (for projects not easily submitted using one of the above worksheets)

F. Please tell us if there is anything about your electrical energy projections (either for the baseline or the proposed project) that you are either unsure about or for which you have made significant assumptions. Attach additional sheets as needed.

Required: Attach a supplier or contractor invoice or other equivalent information documenting the Implementation Cost for each project listed in your application. (Note: self-install costs cannot be included in the Implementation Cost)

[1] If your project involves some equipment that is eligible for prescriptive incentives and some equipment that is likely eligible for custom incentives, and if it is feasible to separate the equipment for the energy analysis, then the equipment will be evaluated separately. If it is not feasible to separate the equipment for analysis, then the equipment will be evaluated together in the custom application.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

3. Signature (Required – must be signed by Duke Energy customer)

Customer Consent to Release of Personal Information

I, (insert name) Don Elbe, do hereby consent to Duke Energy disclosing my Duke Energy Ohio, Inc Account Number and Federal Tax ID Number to its subcontractors solely for the purpose of administering Duke Energy Ohio's Mercantile Self-Direct Program. I understand that such subcontractors are contractually bound to otherwise maintain my Duke Energy Ohio, Inc Account Number and Federal Tax ID Number in the strictest of confidence.

I realize that under the rules and regulations of the public utilities commission, I may refuse to allow Duke Energy Ohio, Inc to release the information set forth above. By my signature, I freely give Duke Energy Ohio, Inc permission to release the information designated above.

Application Signature

I certify that I meet the eligibility requirements of the Duke Energy Ohio, Inc Mercantile Self Direct Custom Incentives Program and that all information provided within this application is correct to the best of my knowledge. I agree to the terms and conditions set forth for this program. I certify that the numbers, energy savings, and responses shown on this form are correct. Further, I certify that the taxpayer identification number is current and correct. I am not subject to backup withholding because: (a) I am exempt from backup withholding; or (b) I have not been notified by the IRS that I am subject to backup withholding as a result of a failure to report all interest or dividends; or (c) the IRS has notified me that I am no longer subject to backup withholding. I am a U.S. citizen (includes a U.S. resident alien).

Don Elbe

Duke Energy Ohio, Inc Customer Signature

Print Name Don Elbe

Date 12/30/2011

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Checklist for completing the Application

INCOMPLETE APPLICATIONS WILL RESULT IN DELAYS IN DUKE ENERGY PROCESSING YOUR APPLICATION AND NOTIFYING YOU CONCERNING AY REBATES. Before submitting the application and the required supplementary information, use the following checklist to ensure that your application is complete and the information in the application is accurate. (Note: this checklist is for your use only – do not submit this checklist with your application)

Section No. & Title	Have You:
1. Contact Information	☐ Completed the contact information for the Duke Energy customer? ☐ Completed the contact information for the equipment vendor / project engineer that can answer questions about the technical aspects of the project, if that is a different person than above?
2. Project Information	☐ Answered the questions A-E, including providing a description of your project. ☐ Completed and attached the lighting, compressed air, VFD, EMS and/or General worksheet(s)?
3. Signature	☐ Signed your name? ☐ Printed your name? ☐ Entered the date?
Supplementary information (Required)	☐ Attached a supplier or contractor's invoice or other equivalent information documenting the Implementation Cost for projects listed in your application? (Note: self-install costs cannot be included in the Implementation Cost) ☐ (If submitting the General Worksheet) attached calculations documenting the energy usage and energy savings for **each** project listed in your application?

If you have any questions concerning how to complete any portion of the application or what supplementary information is required, please contact:

- your Duke Energy account manager
  or,
- the Duke Energy Smart $aver® team at 1-866-380-9580.

Mercantile Self Direct
Nonresidential Custom Rebate Application
PART 1

Instructions/Terms/Conditions

Note: Please keep for your records- do not submit with the application

1. Energy service companies or contractors may assist in preparing the application, but an authorized representative of the customer must sign this application to be eligible to participate in the Mercantile Self Direct Program. Completion of this application does not guarantee the approval of a Self Direct Custom Rebate.

2. Once all documentation requested in this application is received by *Duke Energy Ohio, Inc,* and any follow-up information requested by *Duke Energy* is received, the rebate amount for each Energy Conservation Measure (ECM) will be communicated to the customer. The rebate amount will be based on ECM energy savings and ECM incremental installation cost.

3. All rebates require approval by the Public Utilities Commission of Ohio. *Duke Energy Ohio, Inc* will submit an application for rebate on the customer's behalf upon customer attestation to program terms, conditions and requirements as outlined in the rebate offer letter and upon customer completion of attestation documents required by the Public Utilities Commission of Ohio.

4. *Duke Energy Ohio, Inc* will issue a Self Direct Custom Rebate check, based on the approved rebate amount for each ECM, upon receiving approval from the Public Utilities Commission of Ohio. *Duke Energy* Ohio, Inc does not guarantee PUCO approval.

5. With the application, the customer must provide a list of all sites where the ECMs were installed. *Duke Energy Ohio, Inc* requests that sites of similar size, hours of operation and energy consuming characteristics be grouped together in one application for the determination of the rebate amount. The application should identify the site where each unique ECM was installed.

6. Based on the information submitted with the application and the information gathered both before and after the initial installation of the ECM, *Duke Energy Ohio, Inc* will calculate the rebate amount for each ECM.

7. *Duke Energy Ohio, Inc* may conduct random site inspections of a sample of the locations where the ECMs are installed to verify installation and operability of the ECMs and to obtain information needed to calculate the Approved Incentive Amount.

8. Customers are encouraged to retain copies of all forms, invoices and supporting documentation for their records.

9. Approved rebates are valid for 6 months from the date communicated to the customer by *Duke Energy Ohio, Inc,* subject to the expiration of measure eligibility based on project completion dates and application submission deadlines as defined by PUCO. Customers are encouraged to execute their rebate offer contracts and PUCO-required affidavits promptly to ensure eligibility is not forfeited.

10. *Duke Energy Ohio, Inc* reserves the right to recover all unrecoverable costs associated with the project approval if the customer decides not to execute the rebate contract, after the project is approved by *Duke Energy Ohio, Inc.*

11. Projects financially supported by other funding sources will be evaluated on a case-by-case basis for potential partial funding from *Duke Energy Ohio, Inc*.

12. Participants must be *Duke Energy Ohio, Inc* nonresidential, mercantile customers with the project sites in the *Duke Energy Ohio, Inc* service territory.

13. Customers or trade allies may not use any *Duke Energy* logo without prior written permission.

14. Only trade allies registered with *Duke Energy* are eligible to participate.

15. All equipment must be new. Used or rebuilt equipment is not eligible for incentives. All old existing equipment must be removed on retrofit projects.

16. Disclaimers: *Duke Energy Ohio, Inc*
    a. does not endorse any particular manufacturer, product or system design within the program;
    b. will not be responsible for any tax liability imposed on the customer as a result of the payment of incentives;
    c. does not expressly or implicitly warrant the performance of installed equipment. (Contact your contractor for details regarding equipment warranties.);
    d. is not responsible for the proper disposal/recycling of any waste generated or obsolete or old equipment as a result of this project;
    e. is not liable for any damage caused by the installation of the equipment nor for any damage caused by the malfunction of the installed equipment; and
    f. reserves the right to change or discontinue this program at any time. The acceptance of program applications is determined solely by *Duke Energy Ohio, Inc.*

The Lighting Worksheet is part 2 of the application. Do not submit this file without submitting a completed Part1 Custom Application document file, which can be found at www.duke-energy.com.

Before you complete this application, please note the following important criteria:

- Incentive approval is required PRIOR to equipment purchase, or any other activity which would indicate that the Duke Energy customer has already decided to proceed.
- Submitting this application does not guarantee an incentive will be approved.
- Incentives are based on electricity conservation only.
- Electric demand and/or energy reductions must be well documented with auditable calculations.
- Simple payback without incentive must be greater than 1 year.
- Incomplete applications will not be reviewed; all fields are required.

Refer to the complete list of Instructions and Disclaimers, found in the Custom Application Part 1 document.

Please enter your information and data into the cells that are shaded.
Cells in white are locked and cannot be written over.

Duke Energy Customer Contact Information (Match the information in Application Part 1):

Name	Don Elbe
Company	Cincinnati Public Schools

Equipment Vendor / Project Engineer Contact Information

Name	Lucas Dixon
Company	Plug Smart

Before proceeding with the custom application, please verify that your project is not on the prescriptive incentive application.
The prescriptive incentive applications can be found at:

KY http://www.duke-energy.com/kentucky-business/energy-management/energy-efficiency-incentives.asp
Kentucky only: custom incentives only available to K-12 school facilities; prescriptive incentives available for those not on rate TT.
OH http://www.duke-energy.com/ohio-business/energy-management/energy-efficiency-incentives.asp
NC http://www.duke-energy.com/north-carolina-business/energy-management/energy-efficiency-incentives.asp
SC http://www.duke-energy.com/south-carolina-business/energy-management/energy-efficiency-incentives.asp

Prescriptive incentives are already pre-approved and the application is submitted after project implementation.
Take note of the equipment eligibility on the prescriptive application before planning to utilize the prescriptive application.

Please enter your information and data into the cells that are shaded.
Cells in white are locked and cannot be written over.

List of Sites (Required)

Project/ Site (see note 1)	Site Name	Electric Account Number(s) (see note 2)	Site Address	Area (sq ft)	Location within Facility	Location Type	Indoor or Outdoor?
Example	*Distribution Center*	*12345678 01*	*Example: 123 Main Street, Anywhere USA 12345*	*1000*	*Warehouse*	*Industrial*	*Indoor*
1	Kilgour	2730-3614-01	1339 Herschel Ave Cincinatti Ohio 45208	67,232	Classroom	K-12	Indoor
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

If your application involves more than 20 lighting projects, please check here and use multiple worksheets. ☐

1 Project/Site
You can write over the default project/site number with a store #, building identifier, or other reference that distinguishes one project/location from another.

2 Electric Account Number(s)
If there are multiple meters at a site, only include the Duke Energy account numbers that pertain to the project.
Currently active account number(s) are required for an existing facility. For new construction, write in "new construction."

	Hours of Use (see note 3)									Controls (see note 5)			
		Weekday		Saturday		Sunday		Weeks of Use in Year (see note 4)	Total Annual Hours of Use	Existing		Proposed	
Project/ Site	24 x 7	Start Hour	End Hour	Start Hour	End Hour	Start Hour	End Hour			Type of Control	Hours Reduction	Type of Control	Description
Example	*No*	*8:00 AM*	*7:00 PM*	*10:00 AM*	*6:00 PM*	*1:00 PM*	*6:00 PM*	*52*	*3,536*	*None*	*0%*	*Occupancy*	*Applying for Prescriptive Incentive*
1	No	6:30:00 AM	5:00:00 PM					52	2,730	None		Occupancy	*Applying for Prescriptive Incentive*
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

3 Hours of Use

For unoccupied times, leave applicable cells blank.

4 Weeks of Use in Year

If the lighting fixtures are not in use 52 weeks during the year (for example, during holiday or summer break), provide an explanation of when they are not expected to be in use and why:

5 Controls

Please attach more description of existing and/or proposed controls if more space is needed. If sufficient description is not provided, then controls portion of project will not be evaluated. Attach assumptions and calculations to support estimated reduction in hours that result from the controls.

New occupancy sensors should be applied for through the prescriptive application unless ineligible for prescriptive.

New or upgraded EMS/building controls require a separate application part 2. Without the separate application, EMS portion of the project will not be evaluated for an incentive.

	Existing Fixture(s)								
Project/ Site	**Existing Fixture Installation Year** (see note 6)	**Fixture Type**	**Fixture Manufacturer** (see note 6)	**Fixture Model Number** (see note 6)	**Lamps per Fixture**	**Fixture Size**	**Fixture Input Power (watts)** (see note 7)	**Quantity of Fixtures**	**Total Demand (kW)**
Example	*1995*	*High Pressure Sodium*	*Manufacturer*	*Model #*	*1*		*190*	*175*	*33*
1	2008	Other (enter by typing	COMcheck	1	1	1	78,538	1	79
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
Application Total								**1**	**79**

6 Information on Existing Fixture(s)
Optional - please provide as much information as you can.
For new construction projects, provide information on the light fixture(s) that would meet the building code in your location.

7 Fixture Input Power (watts)
Provide actual input power (in watts), not nominal power rating. For example, a 400 watt (nominal) metal halide fixture has a typical input power of approximately 459 watts.

	Proposed Fixture(s)										Projected Savings			
Project/ Site	Fixture Type	Fixture Manufacturer (see note 8)	Fixture Model Number (see note 8)	Warranty of Proposed Fixtures (years)	Lamps per Fixture	Fixture Input Power (watts) (see note 9)	Quantity of Fixtures	Total Demand (kW)	Lumen Output per Fixture	Lumen/ Sq Ft	Demand (kW)	Annual Energy (kWh)	Other Annual Savings $ (see note 10)	Incremental Project Cost $ (see note 11)
Example	*T8 Fluorescent*	*Manufacturer*	*Model #*	*5.0*	*1.0*	*78*	*225*	*18*		*0*		*55,515*	*$1,265*	*$29,215*
1	COMcheck	1	1	5.0	1.0	69,221	1	*69*		0	9	25,435		
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
Application Total							**1**	**69**			**9**	**25,435**	**$0**	**$0**

Average Electric Rate $/kWh $0.10 **Project Simple Electric Payback** (see note 12) **years**

8 Fixture Manufacturer and Model Number

Attach a scanned copy of a spec sheet for each fixture that includes the input power (watts), lumen output and other relevant information.
For eligible LED fixtures, refer to the FAQs for Custom Incentives found at www.duke-energy.com and attach required documents if necessary.

9 Fixture Input Power (watts)

Provide actual input power (in watts), not nominal power rating. For example, a 400 watt (nominal) metal halide fixture has a typical input power of approximately 459 watts.

10 Other Annual Savings $

Optional. Estimate other annual savings in addition to electric (for example operations/maintenance savings).

11 Incremental Project Cost $

Attach a copy of a formal proposal with the projected project costs.
For new construction projects, a formal proposal is also required with the projected costs for the light fixture(s) that would meet the building code in your location.

12 Project Simple Electric Payback

If the simple payback on the project is less than 1 year, then the project is not eligible for a custom incentive. Please check that the electric rate is accurate based on history.

March 2, 2012

To whom it may concern:

This letter is to confirm that for the renovation to Cincinnati Public school **Kilgour Elementary (1339 Herschel)**, for the **custom** rebate application, the lighting project was installed with a minimum unit cost listed below.

DESCRIPTION	QUANTITY	PRICE/FIXTURE	AMOUNT
R3A - Metalux 2EP3GX-332S361	23	$105.00	$2,415.00
W5 - Metalux BAU-217	16	$60.00	$960.00
R1 - Metalux 2GC-332A	147	$95.00	$13,965.00
S2 - Centris 9506T03RN	151	$306.00	$46,206.00
R4A - Metalux 2GC-332A	19	$95.00	$1,805.00
R4 - Metalux 2GC-332A	66	$95.00	$6,270.00
R3 - Metalux 2EP3GX-332S361	96	$105.00	$10,080.00
R7 - Portfolio C6132	14	$213.00	$2,982.00
W1 - Lumark IP	1	$189.00	$189.00
CH1 - Metalux DIM-232	32	$94.00	$3,008.00
S3 - Corelite IPW P-2 8'	18	$639.00	$11,502.00
S6 - Corelite IPW P-2 4'	4	$639.00	$2,556.00
W4 - Metalux BC-232	17	$78.00	$1,326.00
R2 - Metalux 2EP3GX-332S361	7	$105.00	$735.00
W7 - Portfolio M8605	1	$163.00	$163.00
S5 - Corelite IQWB 12'	2	$639.00	$1,278.00
S4 - Spectrum SP6VF132EX	7	$153.00	$1,071.00
R9 - Cooper Halo H800	3	$75.00	$225.00
W2 - Prescolite ALCFQ13EB	6	$51.00	$306.00
S1 - Lithonia TPGE	25	$210.00	$5,250.00
CL3 - Fail Safe FWS-332	12	$109.00	$1,308.00
R5 - Lithonia 2SPG-432FW	14	$119.00	$1,666.00
R8 - Lithonia 2AV-G-332	29	$266.00	$7,714.00

TOTAL	**$122,980.00**

This is also to confirm that for the renovation to **Kilgour Elementary (1339 Herschel)**, for the **prescriptive** rebate application, occupancy sensors, motors, and chillers were installed with a minimum unit cost listed below.

DESCRIPTION	Model Number	QUANTITY	Nominal Size (Tons)	PRICE/FIXTURE	AMOUNT
SelfDirect Occupancy Sensor	01-110, 01-300-BAS	35	-	$117.89	$4,126.15
SelfDirect Motor	US Motors D15P2D	1	-	$2,158.00	$2,158.00
SelfDirect Motor	US Motors D30P2D	1	-	$3,615.00	$3,615.00
SelfDirect Chiller - Air - Reciprocal	York YCAL0124EC	2	124	$148,800.00	$297,600.00

TOTAL	**$307,499.15**

Thank you for your attention to this matter,

Don Elbe

Don Elbe
Utility Management Coordinator

APPLICATION AND CERTIFICATE FOR PAYMENT

TO OWNER:
CINCINNATI PUBLIC SCHOOLS
2315 IOWA ST
CINCINNATI, OHIO 45206

PROJECT:
KILGOUR ELEMENTARY SCHOOL
1339 HERSHEL AVENUE
CINCINNATI, OHIO 45208

APPLICATION No: RETAINAGE
PERIOD TO: 9/30/2008
PROJECT NOS:
CONTRACT DATE: 1/12/2007

FROM CONTRACTOR:
STAPLETON ELECTRIC CO
4845 STATE ROUTE 128
CLEVES, OHIO 45002-9752

VIA ARCHITECT:
CHAMPLIN/HAUPT, INC
424 EAST FOURTH STREET
CINCINNATI, OHIO 45202

INV.#15841

CONTRACT FOR: ELECTRICAL

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment as shown below, in connection with the Contract
Continuation sheet is attached.

1.	ORIGINAL CONTRACT SUM	$	1,629,000.00
2.	Net Change by Change Orders	$	122,313.00
3.	CONTRACT SUM TO DATE	$	1,751,313.00
4.	TOTAL COMPLETED & STORED TO DATE	$	1,751,313.00
5.	RETAINAGE		
	a. 8.50% of Completed Labor	$	0.00
	b. 8% of Stored Material	$	0.00
	Total Retainage	$	0.00
6.	TOTAL EARNED LESS RETAINAGE	$	1,751,313.00
7.	LESS PREVIOUS CERTIFICATES FOR PAYMEN	$	1,725,269.78
8.	CURRENT PAYMENT DUE	$	26,043.22
9.	BALANCE TO FINISH, INCLUDING RETAINAGE	$	0.00

Change Order/Contract	ADDITIONS	DEDUCTIONS
Total Changes approved in Previous months by Owner	122313.00	
Total approved this month		
TOTALS	122313.00	
NET CHANGES by Change Order	122313.00	

The Contractor certified that the work covered by this pay request has been completed in accordance with the Contract Documents and that all progress payments previously paid by the State have been applied by the Contractor to discharge in full all of Contractor's obligations incurred in connection with the work covered by all prior pay requests.

David J Stapleton — Contractor (David J. Stapleton) — 9/24/2008 — Date

Based upon on-site observations, the firm affirms that the work has progressed to the percentage of completeness indicated on the pay request.

Blatt — Architect — 7/8/09 — Date

Stewart — Construction Manager — 6.5.09 — Date

Approved:

School District Treasurer — Date

AIA Type Document
Application and Certification for Payment

TO: CINCINNATI PUBLIC SCHOOLS
2315 IOWA ST
CINCINNATI, OH 45206

PROJECT: KILGOUR ELEMENTARY SCHOOL
1339 HERSCHEL AVENUE
CINCINNATI, OHIO 45208

APPLICATION NO: 19
PERIOD TO: 09/30/08
JOB NO: C06962
INVOICE NO: 18881
APP.DATE: 09/24/08
PROJECT NO: PO# 515477

DISTRIBUTION TO:
__ OWNER
__ ARCHITECT
__ CONTRACTOR

FROM(CONTRACTOR): STAPLETON ELECTRIC CO.
4845 STATE ROUTE 128
CLEVES, OH 45002-9752

VIA(ARCHITECT): CHAMPLIN/HAUPT,INC
424 EAST FOURTH STREET
CINCINNATI, OHIO 45202
ARCHITECTS

CONTRACT FOR: ELECTRICAL PO# 515477

CONTRACT DATE:01/12/07

ITEM	DESCRIPTION		SCHEDULED VALUE	PREVIOUS APPLICATIONS	COMPLETED THIS PERIOD	STORED MATERIAL	COMPLETED +STORED	%	BALANCE	RETAINAGE
100010	JOB START UP		15,000.00	15,000.00	0.00	0.00	15,000.00	100.00	0.00	0.00
100020	DEMO		14,000.00	14,000.00	0.00	0.00	14,000.00	100.00	0.00	0.00
100030	PERF BOND		16,000.00	16,000.00	0.00	0.00	16,000.00	100.00	0.00	0.00
100040	TEMPORARY ELECTRIC	LABOR	9,000.00	9,000.00	0.00	0.00	9,000.00	100.00	0.00	0.00
100050	TEMPORARY ELECTRIC	MATERIAL	9,000.00	9,000.00	0.00	0.00	9,000.00	100.00	0.00	0.00
100060	EXT POLES & LIGHTS	LABOR	4,000.00	4,000.00	0.00	0.00	4,000.00	100.00	0.00	0.00
100070	EXT POLES & LIGHTS	MATERIAL	12,000.00	12,000.00	0.00	0.00	12,000.00	100.00	0.00	0.00
100080	EXT.POLES & LIGHTS	ROUGH LABOR	10,000.00	10,000.00	0.00	0.00	10,000.00	100.00	0.00	0.00
100090	EXT POLES & LIGHTS	ROUGH MATER	12,000.00	12,000.00	0.00	0.00	12,000.00	100.00	0.00	0.00
100100	ROUGH IN RENOV	LABOR	137,750.00	137,750.00	0.00	0.00	137,750.00	100.00	0.00	0.00
100110	ROUGH IN RENOV	MATERIAL	137,750.00	137,750.00	0.00	0.00	137,750.00	100.00	0.00	0.00
100120	ROUGH IN NEW ADD	LABOR	40,000.00	40,000.00	0.00	0.00	40,000.00	100.00	0.00	0.00
100130	ROUGH IN NEW ADD	MATERIAL	40,000.00	40,000.00	0.00	0.00	40,000.00	100.00	0.00	0.00
100140	LIGHTING RENOV	LABOR	40,000.00	40,000.00	0.00	0.00	40,000.00	100.00	0.00	0.00
100150	LIGHTING RENOV	MATERIAL	80,000.00	80,000.00	0.00	0.00	80,000.00	100.00	0.00	0.00
100160	LIGHTING NEW ADD	LABOR	15,000.00	15,000.00	0.00	0.00	15,000.00	100.00	0.00	0.00
100170	LIGHTING NEW ADD	MATERIAL	35,000.00	35,000.00	0.00	0.00	35,000.00	100.00	0.00	0.00
100180	WIRING DEVICES	LABOR	4,000.00	4,000.00	0.00	0.00	4,000.00	100.00	0.00	0.00
100190	WIRING DEVICES	MATERIAL	4,000.00	4,000.00	0.00	0.00	4,000.00	100.00	0.00	0.00
100200	FIRE ALARM	LABOR	6,000.00	6,000.00	0.00	0.00	6,000.00	100.00	0.00	0.00
100210	FIRE ALARM	MATERIAL	26,000.00	26,000.00	0.00	0.00	26,000.00	100.00	0.00	0.00
100220	CABLE TRAY	LABOR	10,000.00	10,000.00	0.00	0.00	10,000.00	100.00	0.00	0.00
100230	CABLE TRAY	MATERIAL	10,000.00	10,000.00	0.00	0.00	10,000.00	100.00	0.00	0.00
100240	SCOREBOARD	LABOR	1,000.00	1,000.00	0.00	0.00	1,000.00	100.00	0.00	0.00
100250	SCOREBOARD	MATERIAL	4,000.00	4,000.00	0.00	0.00	4,000.00	100.00	0.00	0.00
100260	GENERATOR	LABOR	2,500.00	2,500.00	0.00	0.00	2,500.00	100.00	0.00	0.00
100270	GENERATOR	MATERIAL	17,000.00	17,000.00	0.00	0.00	17,000.00	100.00	0.00	0.00
100280	SWITCH GEAR	LABOR	20,000.00	20,000.00	0.00	0.00	20,000.00	100.00	0.00	0.00
100290	SWITCH GEAR	MATERIAL	68,000.00	68,000.00	0.00	0.00	68,000.00	100.00	0.00	0.00
100300	FEEDERS	LABOR	85,000.00	85,000.00	0.00	0.00	85,000.00	100.00	0.00	0.00
100310	FEEDERS	MATERIAL	120,000.00	120,000.00	0.00	0.00	120,000.00	100.00	0.00	0.00
100318	AA#11 $426.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100319	AA#10 $452.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

(Continued)

PROJECT: KILGOUR ELEMENTARY SCHOOL JOB NO: C06962 APPLICATION NO: 19 APP.DATE: 09/24/08

ITEM	DESCRIPTION		SCHEDULED VALUE	PREVIOUS APPLICATIONS	COMPLETED THIS PERIOD	STORED MATERIAL	COMPLETED +STORED	%	BALANCE	RETAINAGE
100320	GENERAL ALLOW	LUMP SUM	15,000.00	15,000.00	0.00	0.00	15,000.00	100.00	0.00	0.00
100321	AA#1 1492.00 PCO#086		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100322	AA#2 1978.00 PCO#076		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100323	AA#3 2880.00 PCO#090		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100324	AA#4 360.00 PCO#095		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100325	AA#5 1415.00 PCO#122		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100326	AA#6 $1726.00 PCO#083		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100327	AA#7 $913.00 PCO #123		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100328	AA# 8 $1121.00 PCO#151		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100329	AA#9 $2202.00 PCO#159		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100330	17150 COMMUN CONN	LABOR	52,778.00	52,778.00	0.00	0.00	52,778.00	100.00	0.00	0.00
100340	17150 COMMUN CONN	MATERIAL	109,223.00	109,223.00	0.00	0.00	109,223.00	100.00	0.00	0.00
100350	17210 DATA NETWORK	LABOR	4,200.00	4,200.00	0.00	0.00	4,200.00	100.00	0.00	0.00
100360	17210 DATA NETWORK	MATERIAL	41,798.00	41,798.00	0.00	0.00	41,798.00	100.00	0.00	0.00
100370	17260 UPS	LABOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100380	17260 UPS	MATERIAL	3,975.00	3,975.00	0.00	0.00	3,975.00	100.00	0.00	0.00
100390	17410-17430 VIDEO	LABOR	17,600.00	17,600.00	0.00	0.00	17,600.00	100.00	0.00	0.00
100400	17410-17430 VIDEO	MATERIAL	124,049.00	124,049.00	0.00	0.00	124,049.00	100.00	0.00	0.00
100410	17750 PA SYSTEM	LABOR	14,552.00	14,552.00	0.00	0.00	14,552.00	100.00	0.00	0.00
100420	17550 PA SYSTEM	MATERIAL	29,504.00	29,504.00	0.00	0.00	29,504.00	100.00	0.00	0.00
100430	17821 STUDENT DINE	LABOR	3,200.00	3,200.00	0.00	0.00	3,200.00	100.00	0.00	0.00
100440	17821 STUDENT DINE	MATERIAL	17,218.00	17,218.00	0.00	0.00	17,218.00	100.00	0.00	0.00
100450	17824 GYM SOUND	LABOR	4,000.00	4,000.00	0.00	0.00	4,000.00	100.00	0.00	0.00
100460	17824 GYM SOUND	MATERIAL	17,847.00	17,847.00	0.00	0.00	17,847.00	100.00	0.00	0.00
100470	17827 MUSIC	LABOR	880.00	880.00	0.00	0.00	880.00	100.00	0.00	0.00
100480	17827 MUSIC ROOM	MATERIAL	5,769.00	5,769.00	0.00	0.00	5,769.00	100.00	0.00	0.00
100490	7830 CLASS RM SOUND	LABOR	4,400.00	4,400.00	0.00	0.00	4,400.00	100.00	0.00	0.00
100500	17830 CLASS RM SOUND	MATERIAL	38,771.00	38,771.00	0.00	0.00	38,771.00	100.00	0.00	0.00
100510	17910 ACCESS CONT	LABOR	8,800.00	8,800.00	0.00	0.00	8,800.00	100.00	0.00	0.00
100520	17910 ACCESS CONT	MATERIAL	29,116.00	29,116.00	0.00	0.00	29,116.00	100.00	0.00	0.00
100530	17930 CCTV	LABOR	7,600.00	7,600.00	0.00	0.00	7,600.00	100.00	0.00	0.00
100540	17930 CCTV	MATERIAL	59,540.00	59,540.00	0.00	0.00	59,540.00	100.00	0.00	0.00
100550	17730 CLOCKS	LABOR	1,120.00	1,120.00	0.00	0.00	1,120.00	100.00	0.00	0.00
100560	17730 CLOCKS	MATERIAL	14,060.00	14,060.00	0.00	0.00	14,060.00	100.00	0.00	0.00
100570	AA#12 PCO #206		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
901010	CO# 1, CO#001 PCO#021		-5,896.00	-5,896.00	0.00	0.00	-5,896.00	100.00	0.00	0.00
901020	CO# 2, CO#002 FWO#059		2,174.00	2,174.00	0.00	0.00	2,174.00	100.00	0.00	0.00
901030	CO# 3, CO#3 PCO#060		8,814.00	8,814.00	0.00	0.00	8,814.00	100.00	0.00	0.00
901040	CO# 6, CO#6 BULL #005		4,206.00	4,206.00	0.00	0.00	4,206.00	100.00	0.00	0.00
901050	CO# 4, CO#4 PCO #037		11,880.00	11,880.00	0.00	0.00	11,880.00	100.00	0.00	0.00
901060	CO# 7, CO#7 PCO #112		2,023.00	2,023.00	0.00	0.00	2,023.00	100.00	0.00	0.00
901070	CO# 8, CO#08 PCO124		1,784.00	1,784.00	0.00	0.00	1,784.00	100.00	0.00	0.00
901080	CO# 10, CO#010 PCO#138		1,917.00	1,917.00	0.00	0.00	1,917.00	100.00	0.00	0.00
901090	CO# 5, CO# 5 BULLETIN #07		14,507.00	14,507.00	0.00	0.00	14,507.00	100.00	0.00	0.00
901100	CO# 11 PCO182 OTIME		3,605.00	3,605.00	0.00	0.00	3,605.00	100.00	0.00	0.00
901110	CO# 14, PCO# 152		7,391.00	7,391.00	0.00	0.00	7,391.00	100.00	0.00	0.00

(Continued)

PROJECT: KILGOUR ELEMENTARY SCHOOL JOB NO: C06962 APPLICATION NO: 19 APP.DATE: 09/24/08

ITEM	DESCRIPTION	SCHEDULED VALUE	PREVIOUS APPLICATIONS	COMPLETED THIS PERIOD	STORED MATERIAL	COMPLETED +STORED	%	BALANCE	RETAINAGE
901120	CO# 12, CO#012 PCO#177	1,030.00	1,030.00	0.00	0.00	1,030.00	100.00	0.00	0.00
901130	CO# 09, CO# 009BULLETIN #29	21,524.00	21,524.00	0.00	0.00	21,524.00	100.00	0.00	0.00
901140	CO# 19, CO# 019	4,594.00	4,594.00	0.00	0.00	4,594.00	100.00	0.00	0.00
901150	CO# 17, CO# 17 PCO #34,#143	8,861.00	8,861.00	0.00	0.00	8,861.00	100.00	0.00	0.00
901170	CO# 16, CO#16	6,456.00	6,456.00	0.00	0.00	6,456.00	100.00	0.00	0.00
901180	CO# 15, CO#15	6,393.00	6,393.00	0.00	0.00	6,393.00	100.00	0.00	0.00
901190	CO# 13, CO #13 PCO #178,181	2,232.00	2,232.00	0.00	0.00	2,232.00	100.00	0.00	0.00
901210	CO# 18, CO#18	3,181.00	3,181.00	0.00	0.00	3,181.00	100.00	0.00	0.00
901220	CO# 21, CO#021	3,095.00	3,095.00	0.00	0.00	3,095.00	100.00	0.00	0.00
901230	CO# 20, CO#020	3,146.00	3,146.00	0.00	0.00	3,146.00	100.00	0.00	0.00
901240	CO# 22, CO#022	2,047.00	2,047.00	0.00	0.00	2,047.00	100.00	0.00	0.00
901250	CO# 23, CO# 023	2,123.00	2,123.00	0.00	0.00	2,123.00	100.00	0.00	0.00
901260	CO# 24, CO# 024 PCO 209,220,	1,769.00	1,769.00	0.00	0.00	1,769.00	100.00	0.00	0.00
901270	CO# 25, CO# 025 PCO 244,249	737.00	737.00	0.00	0.00	737.00	100.00	0.00	0.00
901280	CO# 27, PCO #252, 256	271.00	271.00	0.00	0.00	271.00	100.00	0.00	0.00
901290	CO# 28, PCO #253, 255	710.00	710.00	0.00	0.00	710.00	100.00	0.00	0.00
901300	CO# 26, CO#026 PCO #248	1,739.00	0.00 1739.00	0.00	0.00	0.00	0.00	~~1,739.00~~ 0.00	0.00
	REPORT TOTALS	1,751,313.00	1,749,574.00	0.00	0.00	1,749,574.00	99.90	~~1,739.00~~ 0.00	0.00

Affidavit of Prime Contractor

State of Ohio)
)
County of Hamilton)
September 23, 2008

David J. Stapleton being first duly sworn, says that he is (1) President of (2) Stapleton Electric Co. 4845 State Route 128, Cleves, OH 45002 the contractor having a contract with **CINCINNATI PUBLIC SCHOOLS**, the **CONTRACTOR** for (3) KILGOUR ELEMENTARY SCHOOL ,situated on or around or in front of the following described property at 1339 HERSHEL AVE known as: KILGOUR ELEMENTARY SCHOOL whereof (4) CINCINNATI PUBLIC SCHOOL DISTRICT was the owner, part owner or lessee.

SUBCONTRACTORS

Affidavit further says that the following shows the names and addresses of every subcontractor in its employ, giving the amount, if any, which is due, or to become due to them, or any of them, for work done or machinery, material or fuel furnished to the date hereof under said contract.

NAME	ADDRESS	TRADE	AMOUNT DUE OR TO BECOME DUE FROM THIS DRAW FOR WORK AND MATERIALS	
			$	

MATERIALMEN

Affiant further says that the following shows the names and addresses of every person furnishing machinery, material or fuel to it, giving the amount, if any, which is due, or to become due to them, or any of them, for machinery, material or fuel furnished to date hereof under said contract.

NAME	ADDRESS	KIND OF MACHINERY, MATERIAL OR FUEL	AMOUNT DUE OR TO BECOME DUE FROM THIS DRAW FOR MATERIAL	
NONE				

LABORERS

Affiant further says that the following shows the names and addresses of every unpaid laborer in its employ furnishing labor under said contract, giving the amount, if any, which is due, or to become due, for labor done to date hereof.

Note- if the fact is that every laborer has been paid in full and then recites: Every laborer has been paid in full". If not, then give each unpaid laborer's name and address and the amount due or to become due.

NAME	ADDRESS	HOURS	AMOUNT DUE OR TO BECOME DUE FROM THIS DRAW FOR LABOR FURNISHED	
Every Laborer has been Paid in Full				

Affidavit further states that there is due or to become due to (2) Stapleton Electric Co., 4845 State Route 128, Cleves, OH 45002 for work performed or machinery, material or fuel furnished to **CINCINNATI PUBLIC SCHOOL DISTRICT**. To date hereof under said contracts, the sum of $1736,612.00.

That the amounts due or to become due to said subcontractors, materialmen and laborers for work done or machinery, material or fuel furnished to the date hereof to (2) Stapleton Electric Co., 4845 State Route 128,Cleves, OH 45002 Are fully and correctly set forth opposite their names, respectively, in the aforesaid statements, and further evidenced by certificates of every person furnishing machinery, material or fuel, attached hereto and made a part hereof.

Affiant further says that (2) Stapleton Electric Co., 4845 State Route 128, Cleves, OH 45002 has not employed or purchased or procured machinery, material or fuel from, or subcontracted with any person, firm or corporation, other than those above mentioned, and owes for no labor performed, or machinery, material or fuel furnished, under said contracts, other than above set forth.

David J. Stapleton

CONTRACTOR SIGNATURE **David J. Stapleton/President**

SWORN TO BEFORE ME AND SUBSCRIBED IN MY PRESENCE, at Cleves, Ohio,

This 23rd day of September, 2008

Kathleen A Leopold

Kathleen A. Leopold, Notary Public
KATHLEEN A. LEOPOLD
Notary Public, State of Ohio
My Commission Expires November 7, 2008

1. Pres., Treas., Owner, or authorized agent, as case may be.
2. Name and address of Subcontractor
3. Brief description of project.
4. Name of project owner from page 1 of Subcontract Agreement

Cincinnati Public Schools
2315 Iowa Avenue
Cincinnati, Ohio 45206

STAPLETON ELECTRIC CO.
4845 STATE ROUTE 128
CLEVES, OHIO 45002

Contractor Pay Application Summary

RETAINAGE

Project Name: KILGOUR ELEMENTARY SCHOOL PO# 515477
Bid Package No.

1	Original Contract Amount	$	1,629,000.00
2	Net Changes to Date	$	122,313.00
3	Current Contract Amount	$	1,751,313.00
4	Labor Completed to Date	$	$674,962.25
5	Material Completed to Date	$	797,390.75
6	Total Work Completed to Date	$	1,751,313.00
7	Store Material to Date	$	278,960.00
8	Less Retained to Date	$	0.00
9	Total Amount Due	$	1,736,612.00
10	Less Previous Payments	$	1,725,269.78
11	Less Amount Retained to Cover Lien	$	
12	Less Amount Retained for Liquidated Damages	$	
13	Less Other Amounts Withheld	$	
14	Current Due	$	26,043.22
15	Balance to Complete including retainage	$	0.00

OSFC approval required for the following contract adjustments:

1. Assessment of liquidated damages
2. Other amounts withheld

Ohio School Facilities Commission _____ Date _____

Comments:

Turner DAG TYS
Rebuilding Cincinnati Public Schools

December 11, 2009

Angie Tolle
Cincinnati Public Schools
2315 Iowa Avenue
Cincinnati, OH 45206

Dear Angie:

Attached are **Pay Applications** for the **Kilgour School, please process payment for the January 8, 2009 check distribution.**

Contractor	Application #	Monthly Billing	Total Billing To Date	Contract Amount to Date
BP#3&5 Feldkamp	**#18**	**$ 61,804.00.00**	**$2,680,995.00**	**$2,680,995.00**

Please call if you have any questions.

Sincerely,
TURNER/DAG/TYS

James T. DeLage bcs

James T. DeLage
Project Executive

/bcs

Attachments

cc: Jay Darenthal – Champlin/Haupt
Rob Marks – Turner/DAG/TYS
File 0025 – 10960PA

T:PROJECTS/Kilgour/00250 Pay Application/2008-12-11 Feldkamp Pay App. Ltr. Doc

APPLICATION AND CERTIFICATE FOR PAYMENT AIA DOCUMENT G702 (Instructions on reverse side) PAGE ONE OF PAGES

TO OWNER: Cincinnati Public Schools
2315 Iowa Avenue
Cincinnati, OH 45206

PROJECT: Kilgour Elementary
1339 Herschel Avenue
Cincinnati, OH 45208

APPLICATION NO.: 18
PERIOD TO: 11/30/08
PROJECT NOS.:

Distribution to:
☐ OWNER
☐ ARCHITECT
☐ CONTRACTOR
☐
☐

FROM CONTRACTOR: Feldkamp Enterprises, Inc.
3642 Muddy Creek
Cincinnati, OH 45238

VIA ARCHITECT:

CONTRACT DATE: 12/29/06

CONTRACT FOR: ~~Kilgour Elementary~~

INVOICE NO: 1224RETB

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM		$ 2,542,000.00
2. Net change by Change Orders		$ 138,995.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)		$ 2,680,995.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)		$ 2,680,995.00
5. RETAINAGE:		
a. 0% of Completed Work (Columns D + E on G703)	$ 0.00	
b. 0% of Stored Material (Column F on G703)	$ 0.00	
Total Retainage (Line 5a + 5b or Total in Column I of G703)		$ 0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 Total)		$ 2,680,995.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)		$ 2,619,191.00
8. CURRENT PAYMENT DUE		$ 61,804.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)		$ 0.00

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	155,484.00	11,227.00
Total approved this Month	0.00	5,262.00
TOTALS	155,484.00	16,489.00
NET CHANGES by Change Order	138,995.00	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR: Feldkamp Enterprises, Inc.

By: _____ Date: 2/10/2009

State of: Ohio
County of: Hamilton
Subscribed and sworn to before me this 10th day of Feb-09

Notary Public: _____
My Commission expires: 11/18/12

NOTARIAL SEAL STATE OF OHIO

Brett Meyer
Notary Public, State of Ohio
My Commission Expires 11-18-2012

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $ 61,804.00

(Attach explanation if amount certified differs from the amount applied for. Initial all figures on this Application and on the Continuation Sheet that are changed to conform to the amount certified.)

ARCHITECT

By: _____ Date: 12/9/09

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

12/4/09

CONTINUATION SHEET

AIA DOCUMENT G703 (Instructions on reverse side)

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APPLICATION DATE: 11/30/2008
PERIOD TO: 11/30/2008
ARCHITECT'S PROJECT NO.:

A	B	C	D	E	F	G		H	I	
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE) RATE)	
1	HVAC	0	0	0	0	0	***		0	0
2	L Coordination Draw.	50,000	50,000	0	0	50,000	100		0	0
3	M Coordination Draw.	2,000	2,000	0	0	2,000	100		0	0
4	L Mobilization	3,000	3,000	0	0	3,000	100		0	0
5	M Mobilization	3,000	3,000	0	0	3,000	100		0	0
6	L Attic Hole Cutting	61,000	61,000	0	0	61,000	100		0	0
7	M Attic Hole Cutting	2,000	2,000	0	0	2,000	100		0	0
8	L Attic Exist Bldg Duct	84,000	84,000	0	0	84,000	100		0	0
9	M Attic Exist Bldg Duct	70,000	70,000	0	0	70,000	100		0	0
10	L 1st Flr Exist-Bldg Duct	30,000	30,000	0	0	30,000	100		0	0
11	M 1st Flr Exist-Bldg Duct	23,000	23,000	0	0	23,000	100		0	0
12	L Base-Exist Bldg Duct	27,000	27,000	0	0	27,000	100		0	0
13	M Base-Exist Bldg Duct	22,000	22,000	0	0	22,000	100		0	0
14	L Exist-Bldg Air Devices	8,000	8,000	0	0	8,000	100		0	0
15	M Exist-Bldg Air Devices	8,000	8,000	0	0	8,000	100		0	0
16	L Fans	10,000	10,000	0	0	10,000	100		0	0
17	M Fans	20,000	20,000	0	0	20,000	100		0	0
18	L VAV Boxes	2,000	2,000	0	0	2,000	100		0	0
19	M VAV Boxes	3,000	3,000	0	0	3,000	100		0	0
20	L Flue	2,000	2,000	0	0	2,000	100		0	0
21	M Flue	6,000	6,000	0	0	6,000	100		0	0
22	L Addition Gym Duct	11,000	11,000	0	0	11,000	100		0	0
23	M Addition Gym Duct	6,000	6,000	0	0	6,000	100		0	0
24	L 1st Flr Add-Duct	14,000	14,000	0	0	14,000	100		0	0
25	M 1st Flr Add-Duct	10,000	10,000	0	0	10,000	100		0	0

CONTINUATION SHEET

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26	L 2nd Flr Add-Duct	9,000	9,000		0	9,000	100	0	0	0
27	M 2nd Flr Add-Duct	6,000	6,000		0	6,000	100	0	0	0
28	L Addition Air Devices	4,000	4,000		0	4,000	100	0	0	0
29	M Addtion Air Devices	4,000	4,000		0	4,000	100	0	0	0
30	PLUMBING	0	0		0	0	***	0	0	0
31	COORDINATION	10,000	10,000		0	10,000	100	0	0	0
32	MOBILIZATION	5,000	5,000		0	5,000	100	0	0	0
33	PLUMBING PERMIT	6,000	6,000		0	6,000	100	0	0	0
34	BOND	10,000	10,000		0	10,000	100	0	0	0
35	SUBMITTALS	5,000	5,000		0	5,000	100	0	0	0
36	SUPERVISION	15,000	15,000		0	15,000	100	0	0	0
37	ALLOWANCE	10,000	10,000		0	10,000	100	0	0	0
38	L Blwgrd Sant & Strm-Exist	25,000	25,000		0	25,000	100	0	0	0
39	M Blwgrd Sant & Strm-Exist	12,000	12,000		0	12,000	100	0	0	0
40	L Blwgrd Sant & Strm New Bldg	9,000	9,000		0	9,000	100	0	0	0
41	M Blwgrd Sant & Strm New Bldg	8,000	8,000		0	8,000	100	0	0	0
42	L Abovegrd Sant & Strm Exist	57,000	57,000		0	57,000	100	0	0	0
43	M Abovegrd Sant & Strm Exist	31,000	31,000		0	31,000	100	0	0	0
44	L Abovegrd Sant New Bldg	8,000	8,000		0	8,000	100	0	0	0
45	M Abovegrd Sant New Bldg	5,000	5,000		0	5,000	100	0	0	0
46	L Abovegrd Strm Exist Bldg	18,000	18,000		0	18,000	100	0	0	0

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47	M Abovegrd Strm Exist Bldg	9,000	9,000		0	0 9,000	100	0	0	0
48	L Abovegrd Strm New Bldg	8,000	8,000		0	0 8,000	100	0	0	0
49	M Abovegrd Strm New Bldg	5,000	5,000		0	0 5,000	100	0	0	0
50	L Domestic Water Exist Bldg	64,000	64,000		0	0 64,000	100	0	0	0
51	M Domestic Water Exist Bldg	39,000	39,000		0	0 39,000	100	0	0	0
52	L Domestic Water New Bldg	29,000	29,000		0	0 29,000	100	0	0	0
53	M Domestic Water New Bldg	18,000	18,000		0	0 18,000	100	0	0	0
54	L Gas Piping	17,000	17,000		0	0 17,000	100	0	0	0
55	M Gas Piping	8,000	8,000		0	0 8,000	100	0	0	0
56	L Air Piping	3,000	3,000		0	0 3,000	100	0	0	0
57	M Air Piping	2,000	2,000		0	0 2,000	100	0	0	0
58	L Cutting & Patching	18,000	18,000		0	0 18,000	100	0	0	0
59	M Cutting & PAtching	15,000	15,000		0	0 15,000	100	0	0	0
60	L Clean Up	6,000	6,000		0	0 6,000	100	0	0	0
61	M Clen Up	2,000	2,000		0	0 2,000	100	0	0	0
62	L Drain Carriers Cleanouts	12,000	12,000		0	0 12,000	100	0	0	0
63	M Drains Carriers CLeanouts	15,000	15,000		0	0 15,000	100	0	0	0
64	L Water Heater	8,000	8,000		0	0 8,000	100	0	0	0
65	M Water Heater	18,000	18,000		0	0 18,000	100	0	0	0
66	L Plumbing Fixtures	22,000	22,000		0	0 22,000	100	0	0	0
67	M Plumbing Fixtures	38,000	38,000		0	0 38,000	100	0	0	0
68	L Insulation	14,000	14,000		0	0 14,000	100	0	0	0

CONTINUATION SHEET

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69	M Insulation	22,000	22,000		0	0 22,000	100	0	0	0
70	L Site Water	25,000	25,000		0	0 25,000	100	0	0	0
71	M Site Water	31,000	31,000		0	0 31,000	100	0	0	0
72	WATER TAP FEE	14,000	14,000		0	0 14,000	100	0	0	0
73	CIVIL LAYOUT	4,000	4,000		0	0 4,000	100	0	0	0
74	SEWER TAP FEE	51,000	51,000		0	0 51,000	100	0	0	0
75	L Site Storm	75,000	75,000		0	0 75,000	100	0	0	0
76	M Site Storm	94,000	94,000		0	0 94,000	100	0	0	0
77	L Site Santitary	14,000	14,000		0	0 14,000	100	0	0	0
78	M Site Sanitary	11,000	11,000		0	0 11,000	100	0	0	0
79	L Street Cutting & Restoration	2,000	2,000		0	0 2,000	100	0	0	0
80	M Street Cutting & Restoration	1,000	1,000		0	0 1,000	100	0	0	0
81	L Punchlist	3,000	3,000		0	0 3,000	100	0	0	0
82	M Punclist	1,000	1,000		0	0 1,000	100	0	0	0
83	L Closeout	2,000	2,000		0	0 2,000	100	0	0	0
84	M Closeout	1,000	1,000		0	0 1,000	100	0	0	0
85	PIPING	0	0		0	0 0	***	0	0	0
86	BOND	20,000	20,000		0	0 20,000	100	0	0	0
87	SUBMITTALS	10,000	10,000		0	0 10,000	100	0	0	0
88	PUNCHLIST	8,000	8,000		0	0 8,000	100	0	0	0
89	ALLOWANCE	10,000	10,000		0	0 10,000	100	0	0	0
90	CLOSEOUT DOCUMENTS	5,000	5,000		0	0 5,000	100	0	0	0
91	M HVAC Equipment	260,000	260,000		0	0 260,000	100	0	0	0

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92	L HVAC Equipment	30,000	30,000		0	0 30,000	100		0	0
93	M Hydronic Equipment	25,000	25,000		0	0 25,000	100		0	0
94	L Hydronic Equipment	6,000	6,000		0	0 6,000	100		0	0
95	M Boilers	40,000	40,000		0	0 40,000	100		0	0
96	L Boilers	7,500	7,500		0	0 7,500	100		0	0
97	M Hot Water Piping	60,000	60,000		0	0 60,000	100		0	0
98	L Hot Water Piping	180,000	180,000		0	0 180,000	100		0	0
99	M Chilled Water Piping	45,000	45,000		0	0 45,000	100		0	0
100	L Chilled Water Piping	110,000	110,000		0	0 110,000	100		0	0
101	SUBCONTRACTORS	0	0		0	0 0	***		0	0
102	M Insulation	48,500	48,500		0	0 48,500	100		0	0
103	L Insulation	70,000	70,000		0	0 70,000	100		0	0
104	M Temp Control	58,000	58,000		0	0 58,000	100		0	0
105	L Temp Control	60,000	60,000		0	0 60,000	100		0	0
106	L Engineering	20,000	20,000		0	0 20,000	100		0	0
107	L Air/Water Balance	14,000	14,000		0	0 14,000	100		0	0
108	CO#1 Saw Cutting Plumbing	7,103	7,103		0	0 7,103	100		0	0
109	CO#2 Grease Interceptor	11,178	11,178		0	0 11,178	100		0	0
110	CO#3 Add Manhole	18,595	18,595		0	0 18,595	100		0	0
111	CO#4 Main Sanitary Drain	24,691	24,691		0	0 24,691	100		0	0
112	CO#5 Roof Sumps	4,264	4,264		0	0 4,264	100		0	0
113	CO#6 New Sinks Rm 101B	3,378	3,378		0	0 3,378	100		0	0
114	CO#7 Sewer Line Replacement	22,440	22,440		0	0 22,440	100		0	0

CONTINUATION SHEET

AIA DOCUMENT G703 (Instructions on reverse side)

PAGE OF 6 PAGES

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ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE) RATE)	
115	CO#8 Gas Line Replacement	16,472	16,472		0	16,472	100	0	0	0
116	CO#9 Roof Drain/Move Sink	7,309	7,309		0	7,309	100	0	0	0
117	CO#10 Ductboard Jacket	16,402	16,402		0	16,402	100	0	0	0
118	CO#11 Water Coolers	3,457	3,457		0	3,457	100	0	0	0
119	CO#12 Remove Concrete	10,388	10,388		0	10,388	100	0	0	0
120	CO#13 Sitework Changes	4,702	4,702		0	4,702	100	0	0	0
121	CO#14 North Parking Lot	-10,197	-10,197		0	-10,197	100	0	0	0
122	CO#15 Damaged Conduits	-1,030	-1,030		0	-1,030	100	0	0	0
123	CO#16 Modify Boiler Louvers	1,770	1,770		0	1,770	100	0	0	0
124	CO#17 Elevator Equip Dampers	401	401		0	401	100	0	0	0
125	CO#18 Pipin Valves	1,830	1,830		0	1,830	100	0	0	0
126	CO#19 Kitchen MUA Unit	1,104	1,104		0	1,104	100	0	0	0
127	CO#20 Replace Sidewalk	-1,581	0	-1,581	0	-1,581	100	0	0	0
128	CO#21 Replace Ceiling Tiles	-3,681	0	-3,681	0	-3,681	100	0	0	0
		2,680,995	2,686,257	-5,262	0	2,680,995	100	0	0	0

G703-1992

KILGORE SCHOOL

TYPE: RESTROOM SENSOR
CAT. #: **MODEL 01-110**

novitas, inc.

TWO-WAY LARGE ROOM & INDOOR GARAGE SENSOR

- **Automatic electronic lighting control.**
- **Sleek styling.**
- **Full coverage. No gaps.**
- **Adjustable sensitivity control.**
- **Replaceable circuit board.**
- **Convenient and safe for occupants. Silent.**
- **Combines with a Novitas Switchpack.**
- **Five-year warranty.**

How It Operates:

The 01-110 is a motion sensor that controls lighting and other electrical loads automatically based on the presence or absence of people. The Sensor activates a Novitas® Switchpack to turn loads on and off.

The Sensor produces a low-intensity, inaudible sound. It detects changes in acoustic waves caused by motion such as reaching for the telephone, turning the pages of a book, walking into a room, etc. The Sensor does not respond to audible sound. When the Sensor detects motion, the relay in the connected Switchpack is closed and the lights are turned on. If no motion occurs within a pre-set period of time, the lights are turned off. To ensure continuous light when people are present, the time delay can be set from 15 seconds (for installer testing) to 30 minutes. The recommended time delay is usually 6-8 minutes. People who remain very still for long periods may need a longer time delay.

Special Features:

- Design ensures complete coverage in all corners of a room.
- Fixed angle position makes installation fast and accurate. No swivel to adjust. No accidental change in coverage.
- Manual override switch turns load on easily if Sensor ever fails.
- Snap-out circuit board allows fast, easy replacement without affecting hard wiring or mounting.
- Multiple frequencies can segment space for greater savings.
- Crystal control provides consistent and stable performance. Frequency variations will not exceed ±0.005 percent.
- Up to ten Switchpacks can be controlled in a single lighting zone. Up to 20 amps per Switchpack.
- Convenient access to controls under faceplate allows for easy adjustments by installer.
- Teflon-insulated pigtails are fire-rated for ceiling plenums.
- Removable shunt prevents unnecessary "lights on" following power sweeps in facilities with computer control systems.

Range & Coverage:

Use in areas from 1,270 to 2,850 square feet. Minor motion coverage up to 1,872 square feet. See Coverage Diagrams. For areas outside the range of coverage, refer to other Novitas technical sheets. Multiple sensors may be wired together for complete coverage of larger areas. If partitions between 49" and 71" are present, see Coverage Diagrams. For greater partition heights, each partitioned area should be treated as an individual space with floor-to-ceiling walls. Range and coverage vary slightly according to room shape and acoustics. In "soft" rooms with carpet and drapes, coverage may be reduced by approximately 15 percent. An adjustable Sensitivity Control permits adaptation to different areas.

The NEMA WD 7 Guide and robotic method were utilized to verify coverage patterns.

Lighting Sweep Applications:

When Sensors are used in conjunction with computer systems that "sweep" power off at night and turn power on in the morning, the installer should remove the JP2 shunt from the printed circuit board to avoid a "lights on" following the power-on sweep (see Printed Circuit Board Diagram). In facilities where no computer sweeps are used, leave the shunt in the factory default setting.

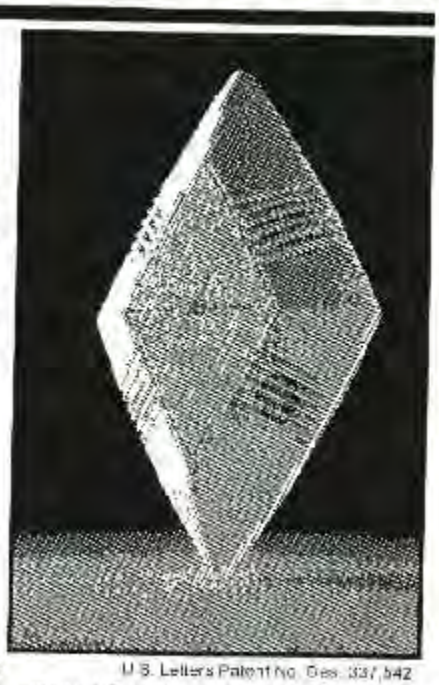
Multiple Frequencies:

Large open areas can be divided into individually controlled spaces without gaps in coverage. Each adjacent area can be independently controlled by using alternate frequency Sensors. Three frequencies are available:

Frequency A = 25 KHz (Standard)

Frequency B = 27 KHz

Frequency C = 32 KHz



U.S. Letters Patent No. Des. 337,842

Coverage is slightly reduced with frequencies B and C (refer to Novitas Customer Service for coverage dimensions).

Mounting:

The Sensor mounts through a single 3/4" hole in the ceiling tile. All hardware is provided. An adapter plate is available to allow mounting to a standard fixture ring and junction box.

Wiring:

Novitas Sensors are provided with Teflon-insulated pigtails. Sensors and Switchpacks are interconnected by 18 AWG Class 2 wiring per NEC 725. Use UL-recognized Teflon-insulated wire approved for plenum areas per NEC 725-2 (c) where required.

Power Requirements:

15 VDC from Novitas Switchpack only. Up to five Sensors may be powered from one Switchpack.

Output:

Open collector output can switch up to ten Novitas Switchpacks.

Housing:

Handsome design. Medium impact injection-molded housing. ABS resin complies with UL 94V0. Off-white color may be easily painted to match custom ceilings. Sensor guard available.

Size & Weight:

3-3/4" x 6" x 1" (94mm x 151mm x 24mm). DWH. Approximately 4 oz. (113.6 g).

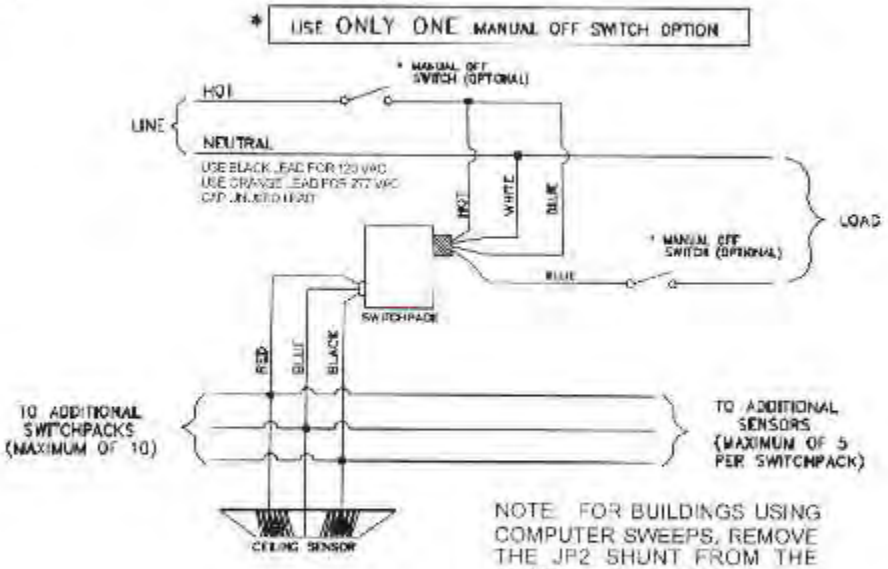
Installation Considerations:

The Sensor must have a clear view of the area to be controlled. It should not be blocked from "seeing" people by high partitions. (For partitioned areas, refer to Coverage Diagrams.) The Sensor will not "see" through glass. Mounting height should be kept below 12 feet. Avoid pointing into hallways. To prevent false activation, the Sensor should be mounted four feet away from the path of strong air turbulence for standard sensitivity settings and at least six feet away for maximum sensitivity settings. Not for use where temperatures fall below 32° F or exceed 100° F. For indoor use only.

Note: The life of some compact fluorescent lamps (CFLs) is shortened by frequent automatic or manual switching. Check with CFL and ballast manufacturer to determine effects of cycling.

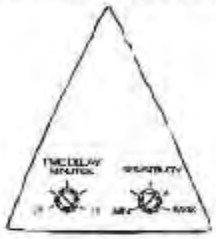
MODEL 01-110

Wiring Diagram

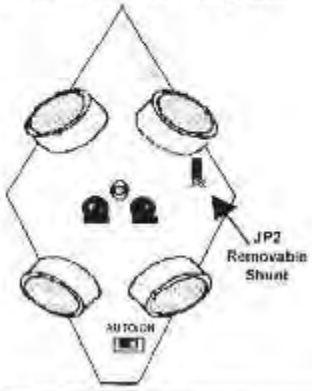


NOTE: FOR BUILDINGS USING COMPUTER SWEEPS, REMOVE THE JP2 SHUNT FROM THE PRINTED CIRCUIT BOARD.

Sensor Controls Under Coverplate



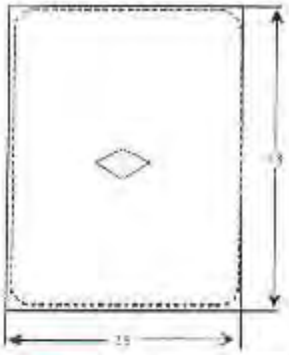
Printed Circuit Board Diagram



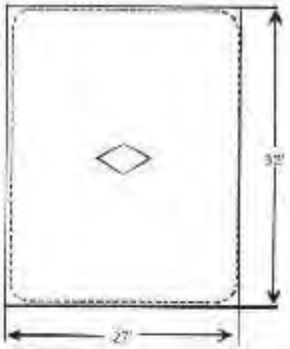
Minor Motion Coverage in Enclosed Rooms (1,872 Sq. Ft. Maximum)

(At Maximum Sensitivity)

NON-PARTITIONED AREAS
No partitions or partitions under 49" in height



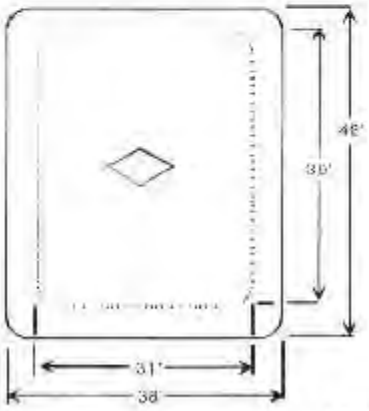
PARTITIONED AREAS
Partition heights of 49" to 71"



Coverage In Open Areas - Multiple Sensor Applications

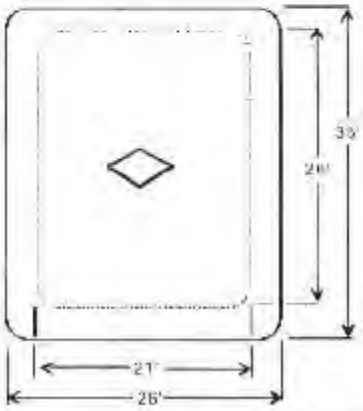
(At Maximum Sensitivity)

NON-PARTITIONED AREAS
No partitions or partitions under 49" in height



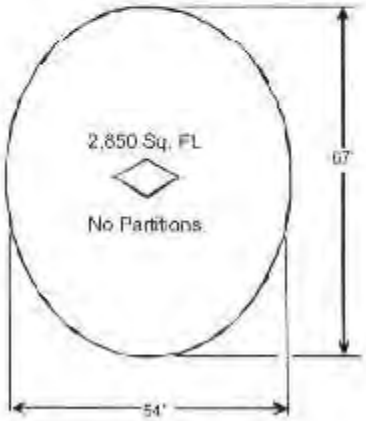
1/2 Step Walk Coverage

PARTITIONED AREAS
Partition heights of 49" to 71"



Motion-At-Desk Coverage

MAXIMUM COVERAGE
Major Motion



Novitas, Inc., 370 Amapola Ave., No. 212, Torrance, CA 90501 ((310) 218-5360 FAX (310) 218-5370 L1221

KILGORE SCHOOL

TYPE: CLASSROOM SENSOR
CAT. #: **MODEL 01-300-BAS**

novitas, inc.

SUPER DUAL TECH SENSOR (TWO-WAY)

- **Ultrasonic & passive infrared sensors. 360° coverage.**
- **Real-time self-adjusting sensitivity and time delay.**
- **Microprocessor-based Airflow Tolerant Technology.**
- **Manual On/Off switch capability.**
- **BAS interface with "Zero Time Delay" option.**
- **Immune to RFI, EMI and voltage fluctuations.**
- **Five-year warranty.**

How It Operates:

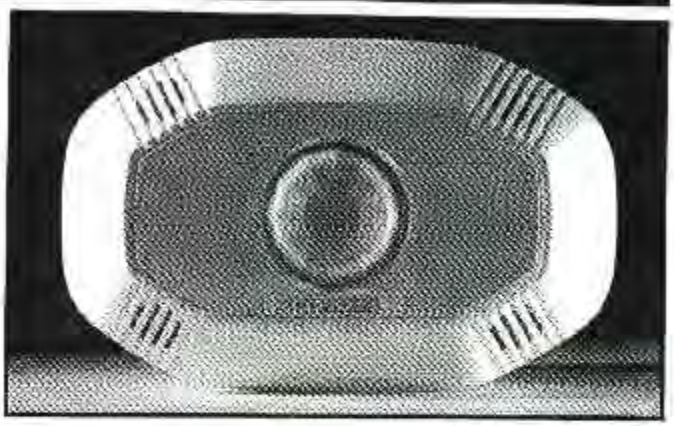
The Super Dual Tech Sensor provides superior performance in lighting and HVAC control through the most effective combination of passive infrared (PIR) and ultrasonic technologies. This pairing helps eliminate false activation in rooms with heavy airflow while providing full coverage without gaps. Separate, concurrent time delays for each technology avoid inadvertent lights out in occupied rooms. Microprocessor-based Airflow Tolerant Technology™ safeguards against false activation during vacancy by filtering out the portion of the frequency spectrum related to air movement. This advanced dual tech sensor is best used to control lighting and HVAC in classrooms, computer rooms and other challenging applications.

The 01-300-BAS activates a Novitas® Switchpack to turn loads on and off. Lights turn on when the PIR sensor detects motion. In the standard configuration, lights stay on if either technology detects occupancy. When the room is vacated, lights turn off after the time delay elapses. Digital microprocessor-based circuitry allows time delay settings from 15 seconds (for installer testing) to 30 minutes. The Sensor can also be configured to maintain lighting with both technologies.

The 01-300-BAS offers the most versatile connections available. A built-in isolated Form C relay may be configured for either a Building Automation System (BAS) or Alarm system interface via a DIP switch. When connecting the 01-300-BAS to a BAS, any of the following may be used: (1) Form C relay output, with or without time delay option, (2) open collector output, with or without pull-up feature, and (3) direct BAS connection. See Power Requirements and Wiring Diagram.

Special Features:

- Self-adjusts sensitivity and time delay in real-time to optimize performance and minimize the need for follow-up adjustments.
- False activation from corridor activity is avoided by the self-adjusting sensitivity feature.
- Coverage remains stable regardless of environmental conditions.
- Separate, concurrent time delays for ultrasonic and infrared sensors avoid inadvertent lights out in occupied rooms.
- Simplifies installation with 10-minute time delay default when potentiometer is left at minimum setting.
- Airflow Tolerant Technology resists false activation in high airflow environments.
- DIP switch selectable lighting sweep option prevents unnecessary "lights on" following power sweeps in facilities with computer control systems.
- Internal pull-up option via shunt simplifies BAS interface.
- "Zero Time Delay" DIP switch is available in both BAS and Alarm modes for building management systems equipped with an internal timing function.
- Complements existing security system. Alarm function avoids false alarm activation through detection redundancy testing.
- DIP switch permits override should a Sensor ever fail.
- Snap-out circuit board allows fast, easy replacement without affecting hard wiring or mounting.
- Manual On/Off option via a wall switch, BAS relay remains active during occupancy.
- Fully self-resetting; lights turned off manually in Automatic On mode stay off during occupancy. After the room is vacated and the time



Patent Pending

- A 10-second grace period allows lights to be turned on by motion anywhere in the room after being turned off due to inactivity.
- Crystal control provides consistent and stable performance. Frequency variations will not exceed ±0.005 percent.
- Bi-color LED indicates which technology detects motion.

Range & Coverage:

Use in areas from 300 to 1,750 square feet. Coverage for normal desktop motion is 900 square feet.

Mounting:

Ceiling mount permits optimum location of sensor and reduces tampering. Fixed angle position makes installation fast and accurate. The Sensor mounts through a 3/4" hole in the ceiling tile using provided hardware. An adapter plate is available to allow mounting to a standard fixture ring and junction box.

Wiring:

Novitas Sensors are provided with Teflon insulated pigtails. Sensors and Switchpacks are interconnected using 18 AWG class 2 wiring per NEC 725. Use UL-recognized Teflon insulated wire for plenum areas per NEC 725-2(b) where required.

Power Requirements:

15 VDC from Novitas Switchpack. Up to five Sensors may be powered by one Novitas Switchpack. Direct connection to a Building Automation System is possible if the BAS provides between 10 and 30 VDC at 25mA. Sensor circuit includes jumper selectable pull-ups which enable the BAS to recognize the sensor's open collector output.

Output:

Up to 10 Novitas Switchpacks may be connected to one Sensor with 20 amps maximum per Switchpack.

Housing:

Impact-resistant injection molded housing in off-white. ABS resin complies with UL 94V0. Protective sensor guard available.

Size & Weight:

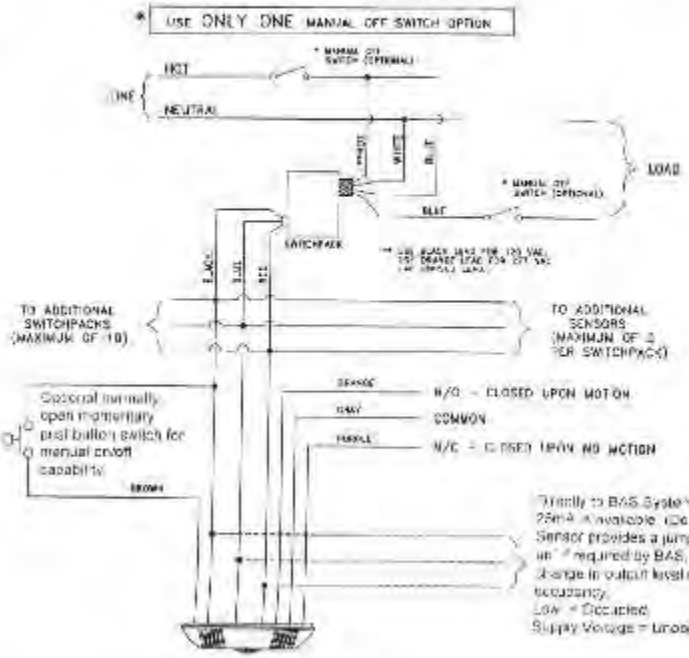
1-5/12" x 3-3/4" x 6-1/12" (37mm x 100mm x 154mm) HDW. Approximately 6 oz. (170g).

Installation Considerations:

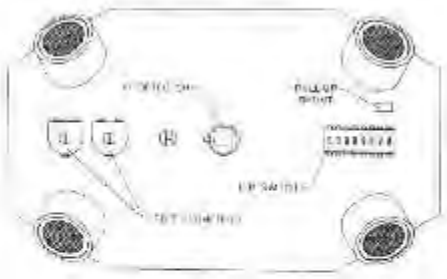
For indoor use only. For best results, mounting height should be kept below 12 feet; temperatures should be above 60°F and below 90°F. Note: The life of some compact fluorescent lamps (CFLs) is shortened by frequent automatic or manual switching

MODEL 01-300-BAS

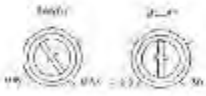
Wiring Diagram



Printed Circuit Board Diagram



Potentiometers

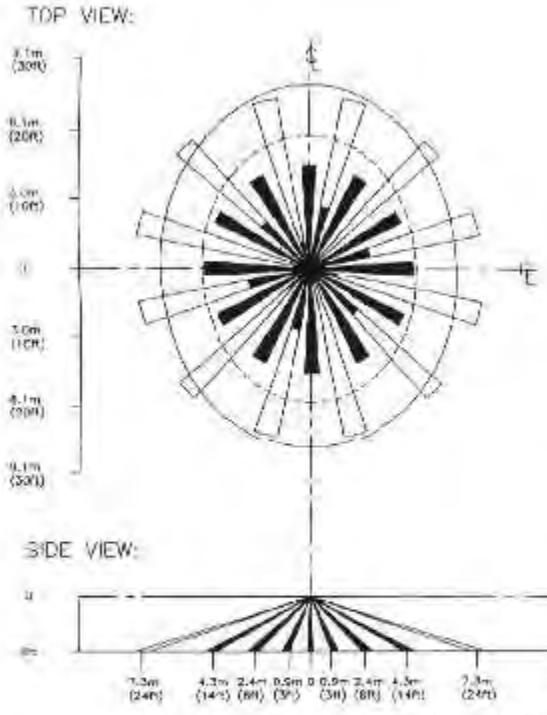


Dip Switch

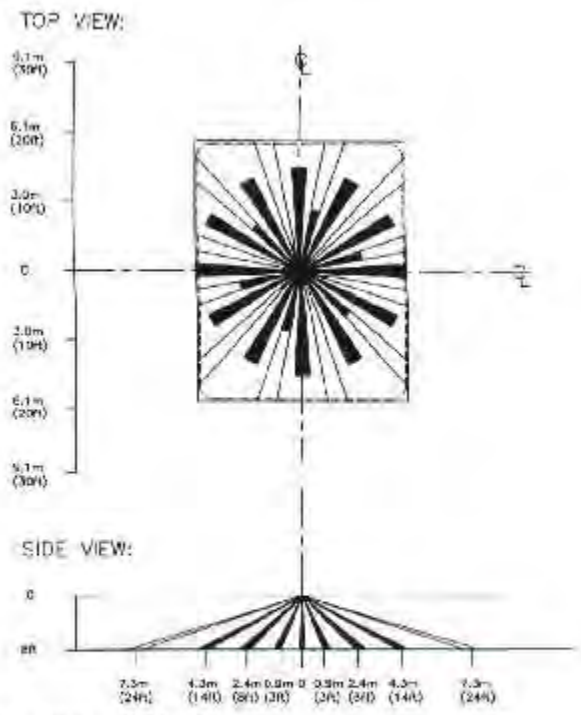
DIP SWITCH CONTROLLING:

1 - AUTO CHANNEL ON
2 - LIGHTING SWEEP
3 - CITY SPOT
4 - US SELF-ADJUST
5 - M SELF-ADJUST
6 - CASE LAMP
7 - SERVICE DELAY
8 - MANUAL OVERRIDE

Coverage in Open Areas



Coverage in Enclosed Areas



— ULTRASONIC 1/2 STEP WALK COVERAGE
— ULTRASONIC MOTION-AT-DESK COVERAGE

FAIL-SAFE®

DESCRIPTION

Designed to retain the aesthetics of a commercial wraparound, Fail-Safe's FWS Series assures owners an unbreakable, maintenance free, one time installation. Ideally suited for high abuse areas that must maintain a clean, well lighted appearance. Fail-Safe's FWS comes as ceiling or wall mounted, one to four lamp units to provide general ambient illumination.

Catalog #	Type
FWS-332-277V-DLS1/DLS-WS-1/GTD-VRSD	CL3-GTD
Project: KILGORE SCHOOL	
Comments:	
Prepared by:	Date:

APPLICATION

The FWS Series is specifically designed for use in public access areas where vandalism may occur and for areas that must maintain a clean, well-lighted appearance. Ideal for schools, dormitories, hallways, locker rooms, shower facilities, and restrooms.

SPECIFICATION FEATURES

A···Lens
Nominal .156, UV stabilized, clear #72, impact resistant, prismatic polycarbonate refractor for high efficiency, low surface brightness and maximum strength.

B···Fasteners
Captive, stainless steel tamperproof torxhead screws prevent unauthorized access.

C···Housing
One-formed 16 ga. CRS with welded and ground ends and internal weld bands for added strength. Standard white high reflectance polyester powder coat finish. Gloss: 85%; Reflectance: 88%; Hardness Minimum: 2H; Salt Spray: 500 hours.

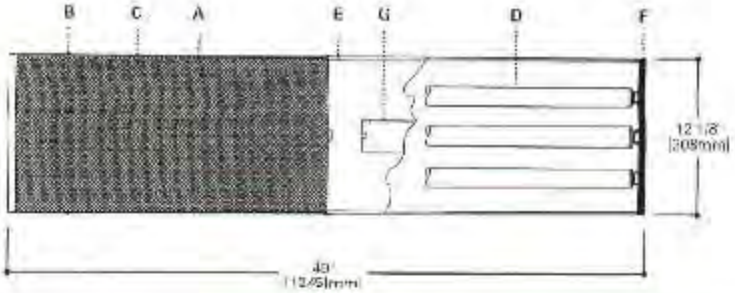
D···Lamps
(By Others)

E···Lens Retention
Double wall lens channel captivates lens to prevent unauthorized fixture penetration.

F···Gasket
Concealed, polyurethane end gaskets inhibit the entrance of environmental contaminants.

G···Ballast
Copper wound HPF, rapid start, Class P, CBM/ETL ballast is standard.

Labels
U.L. listed, C.S.A. certified, standard wet label.

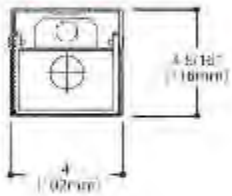


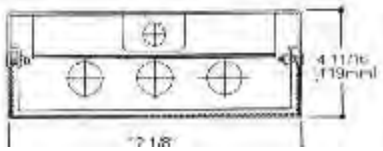
FWS

17W–120W
Fluorescent

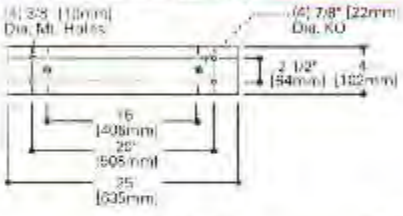
POLYCARBONATE
HIGH ABUSE LUMINAIRE
Clear Prismatic or White
1 and 3 Lamp

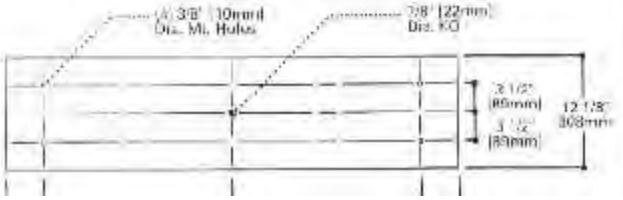
SIDE DIMENSIONS





MOUNTING DIMENSIONS



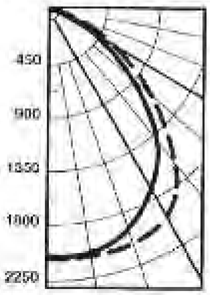


ENERGY DATA

For Energy Management related technical data to support the performance of this fixture series, refer to the ordering information for input wattage.

PHOTOMETRICS

Candlepower Distribution



Test No. 4870
FWS-340-120
Lamp=(3) F40T12RS/WW
Lumens=3200
Spacing Criteria
⊥=1.4 ||=1.2
Efficiency=55.0%

— — ⊥
—— ||

Candlepower

Deg.	⊥	||
0	2107	2107
5	2111	2107
15	2123	2044
25	2105	1876
35	1929	1567
45	1290	912
55	705	595
65	438	298
75	381	139
85	359	31
90	282	7

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Luminaire
0-30	1641	17.1	31.3
0-40	2765	28.8	52.8
0-60	4137	43.1	79.0
0-90	4933	51.4	94.1
90-180	307	3.2	5.9
0-180	5240	54.6	100.0

Coefficient of Utilization

rc	80%				70%			50%		30%		10%		0%
rw	70	50	30	10	50	30	10	50	10	50	10	50	10	0
RCR														
0	47	47	47	47	46	46	46	43	43	41	41	39	39	38
1	44	42	40	39	41	39	38	39	38	37	35	35	34	33
2	40	37	35	33	36	34	32	35	31	33	30	32	29	28
3	37	34	31	29	33	30	28	31	27	30	27	29	25	25
4	35	31	27	25	30	27	25	29	24	27	24	26	23	22
5	32	28	24	22	27	24	22	26	21	25	21	24	21	20
6	30	25	21	19	25	22	20	24	19	23	19	22	19	18
7	28	23	20	18	23	20	18	22	17	21	17	20	17	16
8	26	21	18	16	21	18	16	20	15	19	15	19	15	14
9	24	19	16	14	19	16	14	18	14	18	14	17	13	13
10	22	18	15	13	17	14	13	17	12	16	12	16	12	11

rc=Ceiling reflectance, rw=Wall reflectance, RCR=Room cavity ratio
CU Data Based on 20% Effective Floor Cavity Reflectance.

ORDERING INFORMATION

SAMPLE NUMBER: FWS-340-120-LE3-GLR

Product Family

FWS

FWS=High Abuse Surface Luminaire

Lamp Type

2'
117=(1) 17W T8 Lamp
317=(3) 17W T8 Lamp
120=(1) 20W T12 Lamp[4]
320=(3) 20W T12 Lamp[4]
140BX=(1) 40W Biaxial Lamp
340BX=(3) 40W Biaxial Lamp

4'
132=(1) 32W T8 Lamp
332=(3) 32W T8 Lamp
140=(1) 40W T12 Lamp
340=(3) 40W T12 Lamp

Voltage[3]

120=120V
277=277V
347=347V

Ballast[2]

LE3=Energy Saving Ballast
LEOC8=Energy Saving Ballast for use with T8 Lamp

Electronic Ballast[1]
EB81=(1) Ballast for use with T8 Lamp
EB82=(2) Ballasts for use with T8 Lamp
EB21=(1) Ballast for use with T12 Lamp[2]
EB22=(2) Ballasts for use with T12 Lamp[2]
EBX1=(1) Ballast for use with Biaxial Lamp
EBX2=(2) Ballasts for use with Biaxial Lamp

Options

EBP=Emergency Battery Pack
ELR=End Lens Retention
FNL=Fluorescent Night Light (Lamp by others)
FNL13=Fluorescent Night Light (13W Lamp, Lamp by others)
GLR=Fuse and Holder
OPL=Opal Diffuser
RIF=Radio Interference Filter
SPS=Security Push Button On/Off Switch

Accessories (order separately)

VRSD=TORX®-Head Vandal Resistant Screwdriver

GTD - BODINE GENERATOR TRANSFER DEVICE

Notes:
For additional options consult Cooper Lighting Representative.
Specifications and Dimensions subject to change without notice.
[1] For specific [illegible] specify brand and catalog number.
[2] Electronic ballast not available with F20T12 lamps.
[3] Products also available in non-U.S. voltages and for [illegible] international markets. Consult your Cooper Lighting Representative for availability and ordering information.

METALUX®

Catalog #	2GC-332A125-UNV-L8735-ER82-GTD 41	Type
Project	KILGORE SCHOOL	R1-GTD
Comments		
Prepared by		Date

DESCRIPTION

GC8 is a premium grade specification lensed troffer series. This innovative, high quality luminaire is dedicated to the latest T8 lamp and micro electronic ballast technology for optimal performance and energy efficiency. The GC8 is compatible with all of today's popular ceiling systems and is available with a number of options and accessories for application versatility.

APPLICATION

The GC8 Series features efficiency, quality and performance. The series is an excellent choice for commercial office spaces, schools, hospitals or retail merchandising areas.

SPECIFICATION FEATURES

A – Construction

Rigid housing is die formed of code gauge prime cold rolled steel and features full length die-formed stiffeners for added strength. Side flanges are hemmed. Innovative design provides superior lens brightness uniformity and visual comfort. Micro ballast cover*** reduces ballast shadow for superior lens brightness uniformity and is easily removed without tools. Die formed captive lampholder brackets fully enclose lampholder wiring permitting easy lampholder replacement. Heavy endplates are securely attached with interlocking tabs and screws. Four auxiliary fixture and suspension points provided. KOs for continuous row wiring. Endplates have integral Grid-lock feature for safety and convenience.

B – Electrical

Ballasts are CBM/ETL Class "P" and are positively secured by mounting bolts. Pressure lock lampholders. UL/CUL listed. Suitable for damp locations.**

C – Finish

Multistage, iron phosphate pretreatment ensures maximum bonding and rust inhibition. Housing and ballast cover finished with new 90% reflective white enamel for superior performance. "PAF" Painted After Fabrication option also available.

D – Hinging/Latching

Positive cam action spring loaded steel latches with baked white enamel finish. Safety-lock T-hinges allow hinging and latching either side.

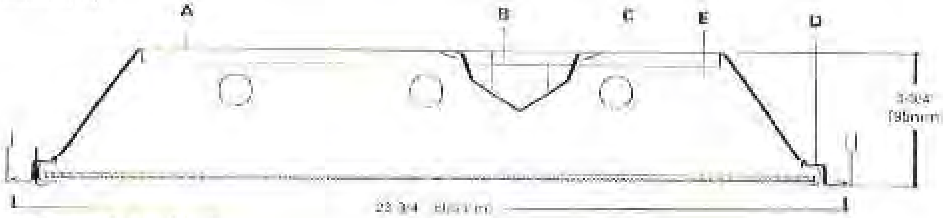
E – Frame/Shielding

Die formed, heavy gauge, flat steel door with reinforced mitered corners and baked white enamel finish. Flat and regressed aluminum doors also available. Positive light seals. Light stabilized 100% virgin acrylic prismatic lens. Standard #12 pattern. Numerous additional shielding options available.

2GC8332

2' X 4' TROFFER
3 LAMP

Specification T8 Troffer



*Approximate overall nominal depth

ENERGY DATA

Input Watts:
EB Ballast & STD Lamps
332 (91)

ES Ballast & STD Lamps
332 (108)

Luminaire Efficacy Rating
LER = FL-69
Catalog Number 2GC8-332A

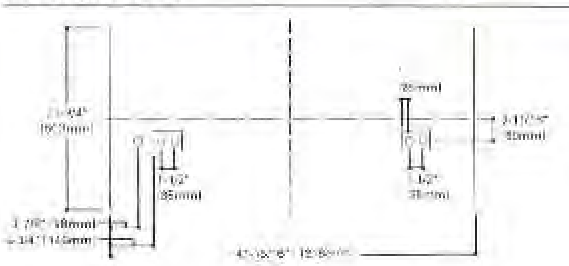
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.46

*Reference the lamp/ballast data in the Technical Section for specific lamp/ballast requirements.

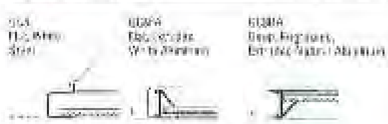
** Contact Pro Sales Technical Support.

*** For sleek ballast cover for biaxial lamps and emergency option.

MOUNTING DATA



DOOR FRAMES



LAMP CONFIGURATIONS

CEILING COMPATIBILITY

G
Grid/Exposed Standard

G
Concealed T

G
Slot Grid

F
Flange Trim With Supporting Swing Gates

C
Modular Trim With Supporting Swing Gates

Ceiling Type	Trim Type
Exposed Grid	G
Concealed T	C
Slot Grid	G

PHOTOMETRICS

2GC8-332A-PAF
Electronic Ballast
(3) FO32/35K lamps
2800 lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.3 x mounting height
Efficiency 83.0%
Test Report 2GC8332APAFHRPFIES
LER = FL-73
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.29

Candela

Angle	Along II	45°	Across ⊥
0	2698	2685	2685
5	2679	2679	2685
10	2641	2653	2675
15	2586	2612	2630
20	2504	2545	2587
25	2382	2452	2512
30	2248	2330	2473
35	2062	2172	2284
40	1851	1960	2113
45	1592	1727	1907
50	1322	1464	1593
55	1072	1168	1273
60	534	886	767
65	277	596	584
70	187	373	197
75	124	251	107
80	73	120	104
85	37	128	116
90	0	0	0

Coefficients of Utilization

Effective floor cavity reflectance 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
RCR																		
0	99	99	99	99	97	97	97	97	92	92	92	88	88	88	85	85	85	83
1	91	87	84	81	89	85	82	79	82	79	77	78	76	74	75	74	72	71
2	83	77	71	67	81	75	71	66	72	68	64	70	66	62	67	64	62	60
3	75	68	61	56	74	67	61	56	64	59	55	62	58	54	60	56	53	51
4	70	61	54	48	68	60	53	48	57	52	47	56	51	47	54	50	46	44
5	63	54	47	42	63	54	47	42	52	46	41	50	45	41	48	44	40	39
6	58	49	42	37	56	48	42	37	47	41	36	45	40	36	44	39	35	34
7	53	45	38	33	54	45	37	32	43	37	32	42	36	32	41	36	32	30
8	52	41	34	29	50	40	37	30	38	33	30	38	33	26	37	32	29	27
9	47	37	31	23	47	37	31	26	36	30	26	35	30	22	34	28	25	24
10	46	35	28	24	44	35	31	24	33	29	24	33	31	24	32	27	24	22

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixture
0-30	3124	25.3	30.5
0-40	5484	41.5	49.1
0-60	8077	63.0	64.6
0-90	8975	83.0	100.0
0-180	8975	83.0	100.0

Typical VCP Percentages

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	63	67	60	61
30 x 30	56	61	53	52
30 x 60	49	54	43	47
60 x 30	60	63	55	62
60 x 60	50	53	45	49

2GC8-332A
Electronic Ballast
(3) FO32/35K lamps
2800 lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.3 x mounting height
Efficiency 81.3%
Test Report 2GC8332A.IES
LER = FL-69
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.45

Candela

Angle	Along II	45°	Across ⊥
0	2624	2631	2631
5	2624	2629	2634
10	2553	2605	2621
15	2536	2581	2593
20	2407	2502	2542
25	2354	2417	2468
30	2214	2303	2371
35	2040	2148	2203
40	1837	1954	2096
45	1576	1697	1873
50	1327	1442	1509
55	1050	1105	1259
60	614	857	548
65	504	507	561
70	441	357	408
75	326	243	305
80	245	203	306
85	142	124	115
90	0	0	0

Coefficients of Utilization

Effective floor cavity reflectance 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
RCR																		
0	97	97	97	97	95	95	95	95	91	91	91	87	87	87	83	83	82	80
1	89	85	82	79	87	84	81	78	80	78	78	77	75	73	74	73	71	68
2	82	75	70	66	80	74	69	65	71	67	63	68	65	62	66	63	61	59
3	76	67	60	55	73	65	60	55	63	58	54	61	57	53	59	56	55	50
4	69	60	53	47	67	58	52	47	56	51	46	55	50	46	54	49	45	44
5	64	53	46	41	62	53	46	41	51	43	41	48	44	40	46	43	41	38
6	59	48	41	36	57	48	41	36	45	40	36	45	38	31	43	36	36	33
7	55	44	37	32	53	43	37	32	43	36	32	41	36	32	40	35	31	30
8	51	40	33	29	50	40	33	29	36	33	30	37	33	31	37	32	28	27
9	48	37	30	26	46	36	30	26	35	32	26	33	29	26	34	29	26	24
10	45	35	28	23	44	34	28	23	33	27	23	32	27	23	31	27	23	22

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixture
0-30	2688	24.9	30.5
0-40	3429	40.0	50.0
0-60	4780	58.7	[illegible]
0-90	7895	87.6	100.0
0-180	7895	87.6	100.0

Typical VCP Percentages

Room Size Ft.	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	64	68	61	65
30 x 30	58	62	55	59
30 x 60	45	53	44	45
60 x 30	60	64	58	62
60 x 60	50	53	48	49

ORDERING INFORMATION

SAMPLE NUMBER: 2GC8-332A-120V-EB81-U

2=2' Width

Trim Type
G=Grid/Lay-in – Standard
G=Concealed [illegible]
G=Slot Grid [illegible]
F=Flange Trim
C=Modular Trim

Series
C8-Specification T8 Troffer

Standard–Flat White Steel Door (Leave Blank)
FA–Flat White Extruded Aluminum Door
RA–3/8" Regressed White Extruded Aluminum Door
FAN–Flat Natural Extruded Aluminum Door
RAN–3/8" Regressed Natural Extruded Aluminum Door
FAB–Flat Black Extruded Aluminum Door
RAB–3/8" Regressed Black Extruded Aluminum Door

Number of Lamps
3 Lamps
(Not included)

Wattage (Length)
32=32W T8 48"

A=#12 Pattern Acrylic
A125–#12 Pattern Acrylic (.125" Thick)
A19/156=#19 Pattern Acrylic (.156" Thick)
[illegible]
PB1S–Silver Parabolic Louver (1/2" x 1/2" x 1/2")
DA–Diffused Flat – Matte White Acrylic (Additional Shielding Also Available. See Accessory Section)

Voltage
120V=120 Volt
277V=277 Volt
347V=347 Volt
UNV=Universal Voltage 120-277

Options
GL=Single Element Fuse
GM=Double Element Fuse
Lamps=Lamps Installed
[illegible]
Emergency=EM Installed

Ballast Type
EB8_ – T8 Electronic Instant Start, Total Harmonic Distortion < 20%
No. of Ballast 1, 2 or 3
EB8_/PLUS– T8 Electronic Instant Start, High Ballast Factor >1.13, Total Harmonic Distortion < 20%
No. of Ballast 1, 2 or 3
ER8_ – T8 Electronic Program Rapid Start, Total Harmonic Distortion < 10%
No. of Ballast 1, 2 or 3
TEB8 – T8 Electronic Instant Start, Total Harmonic Distortion < 10%
No. of Ballast 1, 2 or 3
DLS–Digital Lighting System Dimming

Options
PAF=Painted After Fabrication
FR=Suitable for Fire Rated Applications
EQ=T-BAR Safety Earthquake Clips
MEP=Modified End Plate/ For End [illegible] Applications
20GA/REP=20 Gauge Riveted Endplates, For use in New York City
RLS=Rotor Lock Socket (T8 Lamps Only)
(See options & accessories)

Packaging
U=Unit Pack
PAL=Job Pack, out of carton
PALC=Job Pack, in carton

L8741 - T8 4100K LAMPS FURNISHED & INSTALLED
GTD - BODINE GENERATOR TRANSFER DEVICE

SHIPPING INFORMATION

Catalog No.	Wt.
2GC8-332A	31 lbs.

NOTES: [illegible]

Specifications & dimensions subject to change without notice. Consult your Cooper Lighting [illegible]

METALUX®

Catalog #	2GC-332A125-UNV L8735-ER82	Type
Project	KILGORE SCHOOL	R1
Comments		
Prepared by		Date

DESCRIPTION

GC8 is a premium grade specification lensed troffer series. This innovative, high quality luminaire is dedicated to the latest T8 lamp and micro electronic ballast technology for optimal performance and energy efficiency. The GC8 is compatible with all of today's popular ceiling systems and is available with a number of options and accessories for application versatility.

APPLICATION

The GC8 Series features efficiency, quality and performance. The series is an excellent choice for commercial office spaces, schools, hospitals or retail merchandising areas.

2GC8332

2' X 4' TROFFER
3 LAMP
Specification T8 Troffer

SPECIFICATION FEATURES

A - Construction
Rigid housing is die formed of code gauge prime cold rolled steel and features full length die-formed stiffeners for added strength. Side flanges are hemmed. Innovative design provides superior lens brightness uniformity and visual comfort. Micro ballast cover*** reduces ballast shadow for superior lens brightness uniformity and is easily removed without tools. Die formed captive lampholder brackets fully enclose lampholder wiring permitting easy lampholder replacement. Heavy endplates are securely attached with interlocking tabs and screws. Four auxiliary fixture end suspension points provided. KOs for continuous row wiring. Endplates have integral Grid-lock feature for safety and convenience.

B - Electrical
Ballasts are CBM/ETL Class "P" and are positively secured by mounting bolts. Pressure lock lampholders. UL/CUL listed. Suitable for damp locations.**

C - Finish
Multistage, iron phosphate pretreatment ensures maximum bonding and rust inhibition. Housing and ballast cover finished with new 90% reflective white enamel for superior performance. "PAF" Painted After Fabrication option also available.

D - Hinging/Latching
Positive cam action spring loaded steel latches with baked white enamel finish. Safety-lock T-hinges allow hinging and latching either side.

E - Frame/Shielding
Die formed, heavy gauge, flat steel door with reinforced mitered corners and baked white enamel finish. Flat and regressed aluminum doors also available. Positive light seals. Light stabilized 100% virgin acrylic prismatic lens. Standard #12 pattern. Numerous additional shielding options available.

*maximum overall nominal length

ENERGY DATA

Input Watts:
FR Ballast & STD Lamps
332 (91)

ES Ballast & STD Lamps
332 (108)

Luminaire Efficacy Rating
LER = FL-69
Catalog Number 2GC8-332A

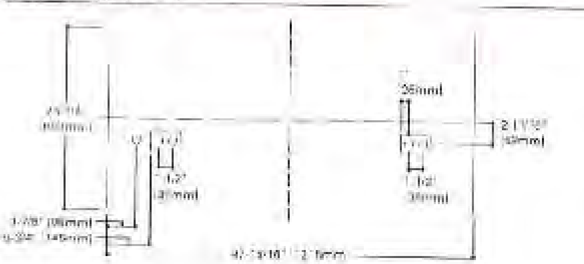
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.45

*Reference the lamp/ballast data in the Technical Section for specific lamp/ballast requirements.

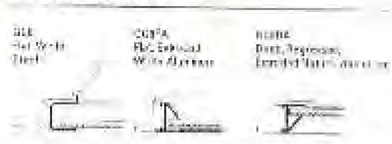
**Consult the Sales Technical Support.

***Full sized ballast cover for plastic lamps and emergency option.

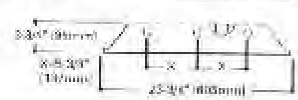
MOUNTING DATA



DOOR FRAMES



LAMP CONFIGURATIONS



CEILING COMPATIBILITY

G	G	G	F	C
Grid/Lay-in Standard	Concealed T	Slot Grid	Flange Trim With Supporting Swing Gates	Modular Trim With Supporting Swing Gates

Ceiling Type	Trim Type
Exposed Grid	G
Concealed T	G
Slot Grid	G
Flange	F
Metal Pan	C

Verify compatibility, consult

PHOTOMETRICS

2GC8-332A-PAF
Electronic Ballast
(3) FO32/35K lamps
2800 lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.3 x mounting height
Efficiency 83.0%
Test Report: 2GC8332APAFHRPP.IES
LER = FL-73
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.29

Candela

Angle	Along II	45°	Across ⊥
0	2588	2606	2588
5	2579	2679	2588
10	2541	2626	2573
15	2535	2613	2550
20	2404	2546	2507
25	2392	2357	2612
30	2240	2327	2475
35	2159	2175	2286
40	1851	1955	2110
45	1302	1721	1891
50	1372	1461	1598
55	1076	1183	1278
60	834	801	857
65	617	609	694
70	447	373	491
75	326	281	301
80	276	168	294
85	115	123	110
90	1	9	0

2GC8-332A
Electronic Ballast
(3) FO32/35K lamps
2800 lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.3 x mounting height
Efficiency 81.6%
Test Report: 2GC8332A.IES
LER = FL-69
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.46

Candela

Angle	Along II	45°	Across ⊥
0	2634	2634	2634
5	2624	2620	2635
10	2653	2609	2621
15	2536	2565	2809
20	2461	2703	2542
25	2354	2417	2464
30	2214	2209	2377
35	2040	2148	2263
40	1831	1943	2089
45	1526	1697	1822
50	1321	1443	1580
55	1060	1163	1245
60	824	862	948
65	604	582	667
70	441	351	489
75	325	246	305
80	246	203	230
85	142	125	128
90	0	1	0

Coefficients of Utilization

2GC8-332A-PAF — Effective floor cavity reflectance 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
RCR																		
0	93	93	93	93	97	97	97	97	92	92	92	88	88	[illegible]	[illegible]	[illegible]	85	83
1	87	83	84	81	80	85	82	79	82	79	77	78	76	74	76	74	72	71
2	82	77	71	67	81	75	70	66	73	69	64	70	66	63	67	64	62	60
3	76	69	62	58	74	67	61	58	64	60	55	62	57	54	60	56	53	51
4	70	62	54	49	68	58	53	48	57	52	47	55	51	47	54	49	46	44
5	65	54	47	42	63	53	47	42	53	46	41	50	45	41	49	44	40	39
6	60	49	42	34	58	42	42	37	47	41	36	45	40	36	44	39	36	34
7	56	45	38	33	54	44	37	32	43	37	33	42	36	32	41	36	32	30
8	52	41	34	29	50	40	34	29	39	33	30	38	32	29	37	32	29	27
9	48	37	31	28	47	37	31	28	36	30	28	35	31	25	34	29	26	24
10	45	35	28	24	44	34	28	24	33	28	24	33	27	24	32	27	24	22

2GC8-332A — Effective floor cavity reflectance 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
RCR																		
0	97	97	97	97	93	93	93	93	91	91	91	87	87	87	83	83	83	82
1	89	86	82	79	87	84	81	78	80	78	75	77	77	73	74	72	71	69
2	82	75	70	65	80	74	69	65	71	67	63	68	65	62	66	63	61	59
3	75	67	60	55	73	66	60	56	63	58	54	61	57	53	59	55	53	50
4	69	60	53	47	67	58	52	47	56	51	46	55	50	46	53	49	45	44
5	64	53	46	41	62	53	46	41	51	45	41	49	44	40	48	43	40	38
6	59	48	41	36	57	48	41	36	46	40	36	45	39	35	43	38	35	33
7	55	44	37	32	53	43	37	32	42	36	32	41	36	32	40	35	31	30
8	51	40	33	29	50	40	33	29	39	33	29	37	32	28	37	32	28	27
9	48	37	30	26	46	36	30	26	35	30	26	35	29	26	34	29	25	24
10	45	34	28	24	44	34	28	23	33	27	23	32	27	23	31	27	23	22

Zonal Lumen Summary

2GC8-332A-PAF

Zone	Lumens	%Lamp	%Fixture
0-30	2124	25.3	30.5
0-40	3464	41.3	49.4
0-60	5361	63.9	84.0
0-90	6975	83.3	100.0
0-180	6975	83.0	100.0

Typical VCP Percentages

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	63	57	60	54
30 x 30	55	61	55	58
30 x 30	43	50	47	47
60 x 30	61	63	59	62
60 x 60	39	52	46	45

Zonal Lumen Summary

2GC8-332A

Zone	Lumens	%Lamp	%Fixture
0-30	2083	24.3	30.5
0-40	3429	40.8	50.0
0-60	5768	68.7	84.1
0-90	6855	81.6	100.0
0-180	6855	81.6	100.0

Typical VCP Percentages

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	64	60	61	55
30 x 30	59	62	55	59
30 x 60	49	52	46	48
60 x 30	60	64	56	62
60 x 60	50	52	52	48

ORDERING INFORMATION

SAMPLE NUMBER: 2GC8-332A-120V-EB81-U

2=2' Width

Trim Type
G=Grid/Lay-in—Standard
G=Concealed T
G=Slot Grid[1]
F=Flange Trim
C=Modular Trim

Series
C8=Specification T8 T-a9V

Standard=Flat White Steel Door (Leave Blank)
FA=Flat White Extruded Aluminum Door
RA=3/8" Regressed White Extruded Aluminum Door
FAN=Flat Natural Extruded Aluminum Door
RAN=3/8" Regressed Natural Extruded Aluminum Door
FAB=Flat Black Extruded Aluminum Door
RAB=3/8" Regressed Black Extruded Aluminum Door

Number of Lamps[2]
3 Lamps
(Not included)

Wattage (Length)
32=32W T8 (48")

A=#12 Pattern Acrylic
A125=#12 Pattern Acrylic (.125" Thick)
A19/156=#19 Pattern Acrylic (.156" Thick)
IMA 48=Injection Molded Acrylic (.150" Thick)
PB1S=Silver Parabolic Louver (1/2" x 1/2" x 1/2")
DA=Dropped Dish—Matte White Acrylic (Additional shielding media available. See accessories section.)

Voltage[3]
120V=120 Volt
277V=277 Volt
347V=347 Volt
UNV=Universal Voltage 120-277[4]

Options
GL=Single Element Fuse
GM=Double Element Fuse
Lamps=Lamps Installed
Flex=Flex Installed
Emergency=EM installed

Ballast Type[3]
EB8_=T8 Electronic Instant Start, Total Harmonic Distortion < 20%
No. of Ballast
1, 2 or 3
EB8_/PLUS=T8 Electronic Instant Start, High Ballast Factor >1.13, Total Harmonic Distortion < 20%
No. of Ballast
1, 2 or 3
ER8_=T8 Electronic Program Rapid Start, Total Harmonic Distortion < 10%
No. of Ballast
1, 2 or 3
TEB8_=T8 Electronic Instant Start, Total Harmonic Distortion < 10%
No. of Ballast
1, 2 or 3
DLS=Digital Lighting System Dimming

Options
PAF=Painted After Fabrication
FR=Suitable for Fire Rated Applications
EQ=T-BAR Safety Earthquake Clips[1]
MEP=Modified End Plate/ for End Feed Applications
20GA/REP=20 Gauge Riveted End plates. For use in New York City.
RLS=Rotor Lock Socket (T8 Lamps Only)
(See options & accessories)

Packaging
U=Unit Pack
PAL=Job Pack out of carton
PALC=Job Pack, in carton

L8735 – T8 3500K LAMPS FURNISHED & INSTALLED

SHIPPING INFORMATION

Catalog No.	Wt.
2GC8-332A	31 lbs.

NOTES: [1]Add EQ Grid Clip is recommended for all 15/16" ceiling systems. [2]Standard 3-lamp center ballast compartment on 3-lamp fixtures. [3]Products also available in non-US voltages and frequencies for international markets. [4]Not available when specifying emergency. Ballast must be specified.

Specifications & dimensions subject to change without notice. Consult your Cooper Lighting Representative for availability and ordering information.

METALUX®

DESCRIPTION

The Paralux III Series features recessed aesthetics and the latest in energy efficient technology. The luminaire incorporates a true 3" deep precision cell louver into a nominal 5-1/2" deep para-contoured fixture housing. This combination creates a total high performance parabolic optical assembly for optimum performance. The series is compatible with all of today's popular ceiling systems and is available with a number of options and accessories for application versatility.

Catalog # 2EP3GX-332S36I-UNV-L8735-ER82-2BC-GTD	Type
Project KILGORE SCHOOL	R2-GTD/
Comments	R3-GTD
Prepared by	Date

APPLICATION

The high performance luminaire is designed to offer maximum efficiency and performance for today's unique interior specifications. The Paralux III series is an excellent choice for commercial office spaces, schools, hospitals or retail merchandising areas.

2EP3GAX340
332

18 Cell

2' X 4' PARABOLIC 3 LAMP SEMI-SPECULAR OR SPECULAR LOUVER

Paralux III Recessed Static or Air Supply Troffer

SPECIFICATION FEATURES

A - Construction

Nominal 5-1/2" deep, para-contoured housing, die formed of code gauge, prime cold rolled steel. Die embossed housing has full length die formed stiffeners for added strength. Contoured ballast/wireway cover is easily removed without tools. Die formed captive lampholder bracket fully encloses lampholder wiring permitting easy lampholder replacement. Heavy end plates are securely attached with interlocking tabs and screws. Four auxiliary fixture end suspension points provided. KOs for continuous row wiring. End plates have labor saving integral Grid-Lock feature for safety and convenience. Housing features enable fixture to be converted from Grid to T-option or vice versa in the field.*

B - Electrical**

Ballasts are CBM/ETL Class "P" and are positively secured by mounting bolts. Pressure lock lampholders. UL/CUL listed. Suitable for damp locations.

C - Finish

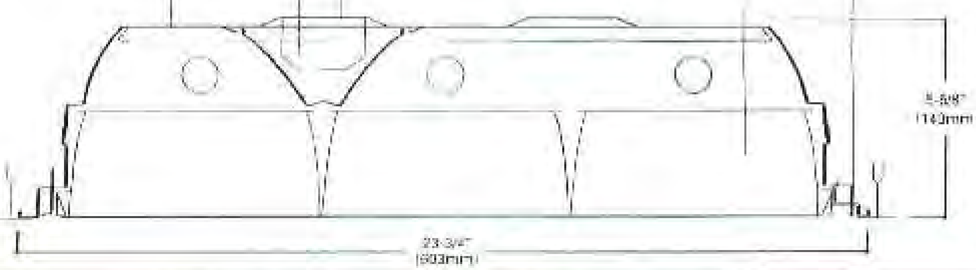
Lighting grade, baked white enamel finish. Multistage, iron phosphate pretreatment ensures maximum bonding and rust inhibition.

D - Hinging/Latching

Positive cam action spring loaded, self locking, black steel latches. Safety lock T-hinges allow hinging and latching either side.

E - Louver

Die formed of low iridescent, vertical grain anodized aluminum. Finish is Anodic oxide coating. Accurate precision parabolic cells are held in place with interlocking feature. True-cut mitered corners. Black reveal with integral mechanical light seal around entire perimeter of louver. Louver protected from construction contaminants by polyethylene cover.



ENERGY DATA

Input Watts:

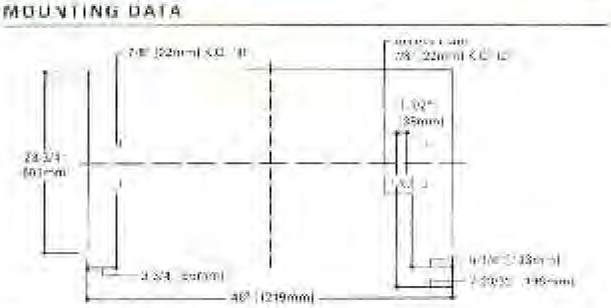
EB Ballast & STD Lamps
340 (110)
332 (81)

ES Ballast & STD Lamps
340 (138)
332 (102)

Luminaire Efficacy Rating
LER = FP-60
Catalog Number: 2EP3GAX-332

Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $4.00

MOUNTING DATA



LAMP CONFIGURATIONS

CEILING COMPATIBILITY

G Grid/Lay-in Standard

T Concealed T

T Slot Grid

F Flange Trim With Supporting Swing Gates

M2 Modular Trim With Supporting Swing Gates

Ceiling Type	Trim Type
Exposed Grid	G
Concealed T	G or T
Slot Grid	Z or T
Flange	F
Concealed Spline	M2
Metal Pan	M2

(Verify compatibility / consult the Sales Technical Support.)

*Converts by access to housing only. Approximate at sliding rod assemblies must be utilized.

**Reference the lamp/ballast data in the Technical Section for specific lamp/ballast requirements.

PHOTOMETRICS

2EP3GAX-332S36I
Electronic Ballast
F32/35K Lamps
2800 Lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.6 x mounting height
Efficiency 69.4%
Test Report: 2EP3GX332S36I.IES
LER = FP-60
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $4.00

Coefficients of Utilization

Effective floor cavity reflectance 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
RCR																		
0	83	83	83	83	81	81	81	81	77	77	77	74	74	74	71	71	71	69
1	76	75	73	71	76	73	71	70	71	69	38	69	67	65	68	65	64	62
2	72	68	64	61	71	67	53	60	64	62	59	62	60	56	60	58	57	55
3	67	61	57	53	66	60	56	53	58	55	52	56	53	51	55	52	50	49
4	62	55	50	46	61	54	50	46	53	48	45	51	48	45	50	47	44	43
5	57	49	44	40	55	49	44	40	47	43	39	46	42	39	45	41	38	37
6	53	45	39	35	52	44	38	35	40	38	35	42	38	34	41	37	34	33
7	49	40	35	31	48	40	34	31	35	34	30	38	33	30	37	32	30	29
8	45	36	30	27	44	35	30	26	35	30	26	34	29	26	33	25	26	25
9	41	32	27	23	40	32	26	22	31	26	23	30	26	23	28	25	22	21
10	38	29	24	20	37	29	24	20	25	23	20	27	23	20	27	23	20	19

Candela

Angle	Along II	45°	Across
0	2312	2312	2312
5	2265	2306	2324
10	2251	2289	2347
15	2189	2274	2396
20	2108	2238	2451
25	2007	2236	2506
30	1891	2206	2630
35	1762	2179	2766
40	1617	2153	2280
45	1449	2001	1423
50	1267	1462	960
55	1043	885	807
60	782	671	656
65	443	325	213
70	142	106	79
75	46	38	35
80	18	16	15
85	6	5	4
90	0	0	0

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixture
0-30	1903	22.7	32.6
0-40	3325	[illegible]	[illegible]
0-60	5425	64.6	93.0
0-90	5834	69.4	100.0
0-180	5834	69.4	100.0

Typical VCP Percentages

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	76	72	82	79
30 x 30	83	79	87	83
30 x 60	86	83	89	86
60 x 30	85	82	88	86
60 x 60	88	85	90	88

ORDERING INFORMATION

SAMPLE NUMBER: 2EP3GAX-332S36I-120V-EB81-U

HR=Heat Removal[7]
HRDO=Heat Removal Damper Open
HRDC=Heat Removal Damper Closed

Width
2=2' Width

EP=Paralux Louver

3=3" Louver Depth

Trim Type
G=Grid/Lay-in (Standard)
G or T=Concealed T
G or T=Slot Grid[2]
F=Flange Trim
MZ=Modular Trim
Convertible fixture[1] Standard G (Grid) Type Fixtures can be field converted to F option or vice versa. Fixtures also adaptable to all flanged ceiling conditions.

AX=Air Supply Floating Louver
X=Blank Side/Floating Louver – Non-Air Supply (Omit A)
AVX=Air Supply Floating Louver with Directional Air Vane (Add V)

Number of Lamps[1]
3 lamps
(Not included)

Wattage (Length)
32=32W T8 (48")
40=40W T12 (48")

Louver Color
S=Silver
G=Gold
W=White

Cell Configuration
36=3 Rows of 6, 18 Cell

Louver Finish
H=Semi-Specular/Haze (Gold only)
I=Semi-Specular/Haze (Low Iridescent) Standard (Silver Only)
MI=Specular/Mirrored (Low Iridescent) (Silver Only)
P=Painted (White only)

Voltage[3]
120V=120 Volt
277V=277 Volt
347V=347 Volt
UNV=Universal Voltage 120-277[3]

Options
GL=Single Element Fuse
GM=Double Element Fuse
WTR=White Reveal
Lamps=Lamps Installed
Flex=Flex Installed
Emergency=EM Installed

Ballast Type[5]
LE3=T12 Magnetic Energy Saving
LEOC8=T8 Magnetic Energy Saving
EB8_=T8 Electronic Instant Start, Total Harmonic Distortion < 20%
No. of Ballast 1, 2 or 3
EB0_/PLUS=T8 Electronic Instant Start, High Ballast Factor > 1.18, Total Harmonic Distortion < 20%
No. of Ballast 1, 2 or 3
ER8_=T8 Electronic Program Rapid Start, Total Harmonic Distortion < 10%
No. of Ballast 1, 2 or 3
TEB8_=T8 Electronic Instant Start, Total Harmonic Distortion < 10%
No. of Ballast 1, 2 or 3
EB2_=T12 Electronic Rapid Start
No. of Ballast 1 or 2
DLS=Digital Lighting System Dimming

Options
PAF=Painted After Fabrication
RIFT=Radio Interference Suppressor
FR=Suitable for Fire Rated Applications
EQ=T BAR Safety Earthquake Clips[8]
MEP=Modified End Plate
For End Filter Application (See Accessory Section)
20GA/REP=20 Gauge Riveted Endplates, For use in New York City.
RLS=Rotor Lock Socket (T8 Lamps Only)
(Additional options available. See Accessory Section)

Packaging
U=Unit Pack
PAL=Job Pack, out of carton
PALC=Job Pack, in carton

L8735 - T8 3500K LAMPS INSTALLED
2BC - 2ND BALLAST COVER
GTD - BODINE GENERATOR TRANSFER DEVICE

NOTES: [1] [illegible] available in heat removal. [7] Air [illegible] recommended for [illegible] ceiling systems. [1] Convertibility applies to [illegible] [illegible] [2] Standard [illegible] ballast on [illegible] fixtures. [3] Products [illegible] available in non US voltages [illegible] markets. [illegible] Not available when specifying [illegible] voltage [illegible].

[illegible] Specifications & [illegible] subject to change without notice. Consult your [illegible] Lighting Representative for availability and ordering information.

SHIPPING INFORMATION

Catalog No.	Wt.
2EP3GAX-332S36I	42 lbs.

METALUX®

DESCRIPTION

The Paralux III Series features recessed aesthetics and the latest in energy efficient technology. The luminaire incorporates a true 3" deep precision cell louver into a nominal 5-1/2" deep para-contoured fixture housing. This combination creates a total high performance parabolic optical assembly for optimum performance. The series is compatible with all of today's popular ceiling systems and is available with a number of options and accessories for application versatility.

Catalog #	Type
2EP3GX-332S36I-UNV-LB735-ER82-2BC 4	R2/R3
Project: KILGORE SCHOOL	
Comments	
Prepared by	Date

APPLICATION

The high performance luminaire is designed to offer maximum efficiency and performance for today's unique interior specifications. The Paralux III series is an excellent choice for commercial office spaces, schools, hospitals or retail merchandising areas.

SPECIFICATION FEATURES

A – Construction

Nominal 5-1/2" deep, para-contoured housing, die formed of code gauge, prime cold rolled steel. Die embossed housing has full length die formed stiffeners for added strength. Contoured ballast/wireway cover is easily removed without tools. Die formed captive lampholder bracket fully encloses lampholder wiring permitting easy lampholder replacement. Heavy end plates are securely attached with interlocking tabs and screws. Four auxiliary fixture end suspension points provided. KOs for continuous row wiring. End plates have labor saving integral Grid-Lock feature for safety and convenience. Housing features enable fixture to be converted from Grid to T-option or vice versa in the field.*

B – Electrical**

Ballasts are CBM/ETL Class "P" and are positively secured by mounting bolts. Pressure lock lampholders. UL/CUL listed. Suitable for damp locations.

C – Finish

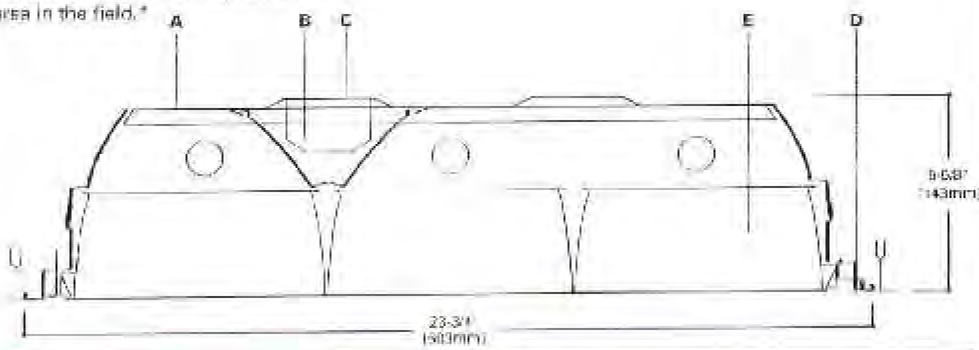
Lighting grade, baked white enamel finish. Multistage, iron phosphate pretreatment ensures maximum bonding and rust inhibition.

D – Hinging/Latching

Positive cam action spring loaded, self locking, black steel latches. Safety lock T-hinges allow hinging and latching either side.

E – Louver

Die formed of low iridescent, vertical grain anodized aluminum. Finish is Anodic oxide coating. Accurate precision parabolic cells are held in place with interlocking feature. True-cut mitered corners. Black reveal with integral mechanical light seal around entire perimeter of louver. Louver protected from construction contaminants by polyethylene cover.



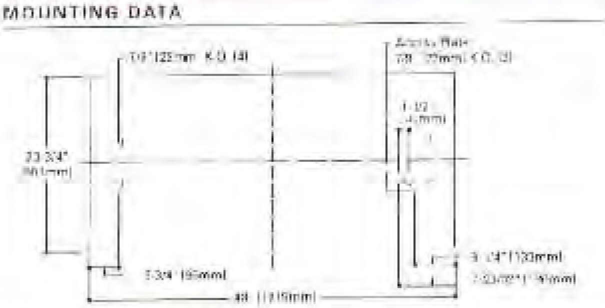
2EP3GAX340 332

18 Cell

2' X 4' PARABOLIC 3 LAMP SEMI-SPECULAR OR SPECULAR LOUVER

Paralux III Recessed Static or Air Supply Troffer

MOUNTING DATA



LAMP CONFIGURATIONS

CEILING COMPATIBILITY

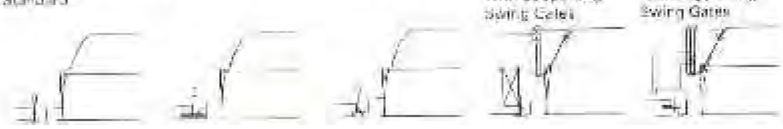
G – Grid/Lay-In Standard

T – Concealed T

T – Slot Grid

F – Flange Trim With Supporting Swing Gates

MZ – Modular Trim With Supporting Swing Gates



Ceiling Type	Trim Type
Exposed Grid	G
Concealed T	G or T
Slot Grid	G or T
Plaster	F
Concealed Spline	MZ
Metal Pan	MZ

(Verify compatibility / consult Pre-Sales Technical Support.)

ENERGY DATA

Input Watts:

EB Ballast & STD Lamps

340 (110)

332 (97)

ES Ballast & STD Lamps

340 (100)

[illegible]

Luminaire Efficacy Rating

LER = FP-60

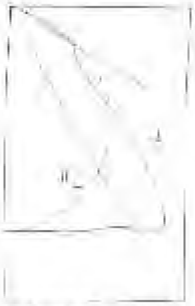
Catalog Number: 2EP3GAX-332

Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $4.30

*Compatibility applies to housing only. Appropriate mounting materials must be utilized.

**Reference the lamp/ballast data in the Technical Section for specific lamp/ballast requirements.

PHOTOMETRICS



2EP3GAX-332S36I
Electronic Ballast
F32/35K Lamps
2800 Lumens

Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.6 x mounting height

Efficiency 69.4%

Test Report: 2EP3GX332S36I.IES

LER = FP-60

Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $4.00

Coefficients of Utilization

Effective floor cavity reflectance 20%

ρc	80%				70%				50%			30%			10%			0%
ρw	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	83	83	83	83	81	81	81	81	77	77	77	74	74	74	71	71	71	69
1	78	75	73	71	76	73	71	70	71	69	68	68	67	65	66	65	64	62
2	72	68	64	61	71	67	63	60	64	62	59	62	60	58	60	58	57	55
3	67	61	57	53	66	60	56	53	58	55	52	56	53	51	55	52	50	49
4	62	55	50	46	61	54	50	46	53	49	45	51	48	45	50	47	44	43
5	57	49	44	40	56	49	44	40	47	43	39	46	42	39	45	41	39	37
6	53	45	39	35	52	44	39	35	43	38	35	42	38	34	41	37	34	33
7	49	40	35	31	48	40	34	31	39	34	30	38	32	30	37	33	30	29
8	45	36	30	27	44	35	30	26	35	30	26	34	29	26	33	29	26	25
9	41	32	27	23	40	32	26	22	31	26	23	30	26	23	28	25	22	21
10	38	29	24	20	37	29	24	20	28	23	20	27	23	20	27	23	20	19

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixture
0-30	1903	22.7	32.6
0-40	3285	39.1	55.3
0-60	5425	64.6	93.0
0-90	5834	69.4	100.0
0-180	5834	69.4	100.0

Typical VCP Percentages

	Height Along		Height Across	
Room Size (Ft.)	8.5'	10.0'	8.5'	10.0'
20 x 20	76	73	82	79
30 x 30	83	79	87	83
30 x 60	86	83	89	86
60 x 30	85	82	89	86
60 x 60	89	85	90	89

Candela

Angle	Along ∥	45°	Across ⊥
0	2312	2312	2312
5	2295	2308	2324
10	2251	2289	2347
15	2183	2274	2396
20	2103	2258	2451
25	2007	2235	2580
30	1891	2205	2636
35	1762	2173	2766
40	1617	2153	2259
45	1449	2001	1422
50	1257	1303	960
55	1043	885	887
60	782	571	666
65	443	325	243
70	142	106	79
75	45	38	35
80	13	16	15
85	6	5	4
90	6	0	0

ORDERING INFORMATION

SAMPLE NUMBER 2EP3GAX-332S36I-120V-EB81-U

HP=Heat Removal[1]
HRDO=Heat Removal Damper Open
HRDC=Heat Removal Damper Closed

Width
2=2' Width

EP=Parallux Louver

3=3" Louver Depth

Trim Type
G=Grid/Lay-in (Standard)
G or T=Concealed T
G or T=Slot Grid[2]
F=Flange Trim
MZ=Modular Trim
Convertible Fixture[3] Standard G, G or T type fixtures convert field convertible. Flange or suspension. Fixture also adaptable with flanged or modular trims.

AX=Air Supply Floating Louver
X=Blank Side/Floating Louver - Non-Air Supply (Omit A)
AVX=Air Supply Floating Louver with Directional Air Vane (Add V)

Number of Lamps[4]
3=Three (Recommended)

Wattage (Length)
32=32W T8 (48")
40=40W T12 (48")

Louver Color
S=Silver
G=Gold
W=White

Cell Configuration
36=3 Rows of 6, 18 Cell

Louver Finish
H=Semi-Specular/Haze (Gold only)
I=Semi-Specular/Haze Low Iridescent Standard (Silver Only)
M=Specular/Mirrored (Low Iridescent) (Silver Only)
P=Painted (White only)

Voltage[5]
120V=120 Volt
277V=277 Volt
347V=347 Volt
UNV=Universal Voltage 120-277[6]

Options
GL=Single Element Fuse
GM=Double Element Fuse
WTR=White Reveal
Lamps=Lamps Installed
Flex=Flex Installed
Emergency=EM Installed

Ballast Type[7]
LE1=T12 Magnetic Energy Saving
LEOC8=T8 Magnetic Energy Saving
EB8_=T8 Electronic Instant Start, Total Harmonic Distortion < 20%
No. of Ballast 1, 2 or 3
EB8_/PLUS=T8 Electronic Instant Start, High Ballast Factor >1.13, Total Harmonic Distortion < 20%
No. of Ballast 1, 2 or 3
ER8_=T8 Electronic Program Rapid Start Total Harmonic Distortion < 10%
No. of Ballast 1, 2 or 3
TEB8_=T8 Electronic Instant Start, Total Harmonic Distortion < 10%
No. of Ballast 1, 2 or 3
EB2_=T12 Electronic Rapid Start.
No. of Ballast 1 or 2
DLS=Digital Lighting System Dimming

Options
PAF=Painted After Fabrication
RIF1=Radio Interference Suppressor
FR=Suitable for Fire Rated Applications
EQ=T-BAR Safety Earthquake Clips[8]
MEP=Molded End Plate
For Dust Filter Applications (See Accessory Section)
20GA/REP=20 Gauge Riveted Endplates. For use in New York City.
RLS=Rotor-Lock Socket (T8 Lamps Only)
(Additional options available. See Accessory Section)

Packaging
U=Unit Pack
PAL=Job Pack out of carton
PALC=Job Pack in carton

L8735 - T8 3500K LAMPS INSTALLED
2BC - 2ND BALLAST COVER

NOTES: [1] [illegible] not available in heat removal. [2] An EQ Grid Clip is recommended for ... systems. [3] Convertibility applies to ... [4] Standard ... ballast ... [5] ... also available in ... voltages ... [6] Not available when specifying ... [illegible]

For complete product data reference the ... Specifications & dimensions subject to change without notice. Consult your Cooper Lighting Representative for availability and ordering information.

SHIPPING INFORMATION

Catalog No.	Wt.
2EP3GAX-332S36I	42 lbs.

METALUX®

DESCRIPTION

GC8 is a premium grade specification lensed troffer series. This innovative, high quality luminaire is dedicated to the latest T8 lamp and micro electronic ballast technology for optimal performance and energy efficiency. The GC8 is compatible with all of today's popular ceiling systems and is available with a number of options and accessories for application versatility.

Catalog # 2GC-332A125-UNV-L8735-ER81-GTD 41	Type R4-GTD
Project KILGORE SCHOOL	
Comments	
Prepared by	Date

APPLICATION

The GC8 Series features efficiency, quality and performance. The series is an excellent choice for commercial office spaces, schools, hospitals or retail merchandising areas.

2GC8332

2' X 4' TROFFER
3 LAMP

Specification T8 Troffer

SPECIFICATION FEATURES

A—Construction

Rigid housing is die formed of code gauge prime cold rolled steel and features full length die-formed stiffeners for added strength. Side flanges are hemmed. Innovative design provides superior lens brightness uniformity and visual comfort. Micro ballast cover*** reduces ballast shadow for superior lens brightness uniformity and is easily removed without tools. Die formed captive lampholder brackets fully enclose lampholder wiring permitting easy lampholder replacement. Heavy endplates are securely attached with interlocking tabs and screws. Four auxiliary fixture end suspension points provided. KOs for continuous row wiring. Endplates have integral Grid-lock feature for safety and convenience.

B—Electrical

Ballasts are CBM/ETL Class "P" and are positively secured by mounting bolts. Pressure lock lampholders. UL/CUL listed. Suitable for damp locations.**

C—Finish

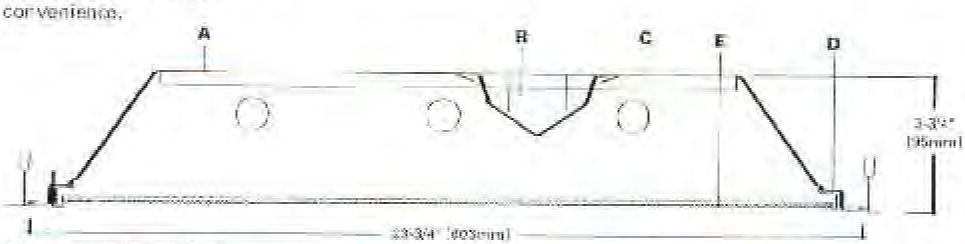
Multistage iron phosphate pretreatment ensures maximum bonding and rust inhibition. Housing and ballast cover finished with new 90% reflective white enamel for superior performance. "PAF" Painted After Fabrication option also available.

D—Hinging/Latching

Positive cam action spring loaded steel latches with baked white enamel finish. Safety-lock T-hinges allow hinging and latching either side.

E—Frame/Shielding

Die formed, heavy gauge, flat steel door with reinforced mitered corners and baked white enamel finish. Flat and regressed aluminum doors also available. Positive light seals. Light stabilized 100% virgin acrylic prismatic lens. Standard #12 pattern. Numerous additional shielding options available.



*maximum overall nominal depth

ENERGY DATA

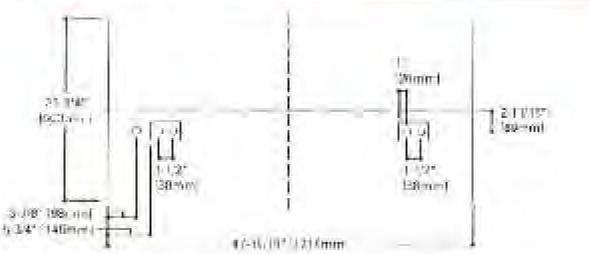
Input Watts:
EB Ballast & STD Lamps
332 (91)

ES Ballast & STD Lamps
332 (106)

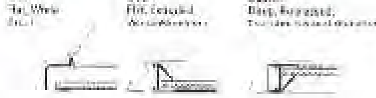
Luminaire Efficacy Rating
LER = FL-69
Catalog Number: 2GC8-332A

Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.48

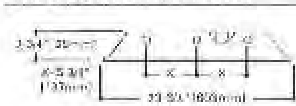
MOUNTING DATA



DOOR FRAMES



LAMP CONFIGURATIONS



CEILING COMPATIBILITY

G Grid/Lay-in Standard — G Concealed T — G Slot Grid — F Flange Trim With Supporting Swing Gates — C Modular Trim With Supporting Swing Gates

Ceiling Type	Trim Type
Exposed Grid	G
Concealed T	G
Slot Grid	G
Flange	F
Metal Pan	C

(Verify compatibility/consult factory.)

*Refer to the ... section of the Technical Section for specific lamp/ballast requirements.

**Consult Pre Sales Technical Support.

***Raised ballast cover for biaxial lamps and emergency option.

COOPER LIGHTING

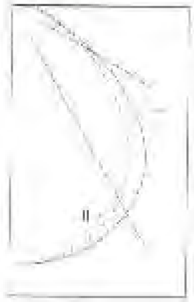
ADF031937
(Supersedes ADF021576)

PHOTOMETRICS

2GC8-332A-PAF
Electronic Ballast
(3) FO32/35K lamps
2800 lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.3 x mounting height
Efficiency 83.0%
Test Report: 2GC8332APAFPAF.IES
LER = FL-73
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.29

Candela

Angle	Along II	45°	Across ⊥
0	2656	2656	2656
5	2673	2619	2656
10	2641	2656	2620
15	2585	2612	2640
20	2504	2546	2581
25	2395	2457	2512
30	2248	2333	2411
35	2059	2173	2288
40	1851	1983	2118
45	543	1721	1951
50	1322	1404	1649
55	1013	1100	1278
60	681	805	981
65	612	495	714
70	447	373	492
75	323	251	387
80	218	139	254
85	117	173	118
90	2	2	3



2GC8-332A
Electronic Ballast
(3) FO32/35K lamps
2800 lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.3 x mounting height
Efficiency 81.6%
Test Report: 2GC8332A.IES
LER = FL-68
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.46

Candela

Angle	Along II	45°	Across ⊥
0	2634	2634	2634
5	2624	2628	2634
10	2593	2626	2621
15	2539	2598	2593
20	2461	2503	2547
25	2354	2417	2466
30	2214	2303	2371
35	2040	2146	2253
40	1821	1944	2039
45	1520	1697	1872
50	1251	1442	1580
55	1052	1185	1252
60	814	552	940
65	606	562	662
70	441	351	486
75	325	246	325
80	246	208	308
85	142	126	178
90	0	0	6

Coefficients of Utilization (2GC8-332A-PAF)

Effective floor cavity reflectance 20%

ρc	80%				70%				50%			30%			10%			0%
ρw	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	99	99	99	99	97	97	97	97	92	92	92	88	88	88	85	85	85	83
1	91	87	84	81	89	85	82	79	82	79	77	79	76	74	75	74	72	71
2	82	77	[illegible]	67	81	75	70	66	72	68	64	70	66	62	67	64	62	60
3	75	69	[illegible]	58	74	67	61	56	64	59	55	62	58	54	60	56	53	51
4	70	61	54	48	68	60	53	48	57	52	47	55	51	47	54	49	46	44
5	65	54	47	42	63	53	47	42	52	46	41	50	45	41	49	44	40	38
6	60	49	42	37	58	48	42	37	47	41	36	45	40	36	44	39	35	34
7	56	45	38	33	54	44	37	32	43	37	32	42	36	32	40	35	32	30
8	52	41	34	29	50	40	34	29	39	33	29	38	33	29	37	32	28	27
9	48	37	31	26	47	37	31	26	36	30	26	35	30	26	34	29	26	24
10	45	34	28	24	44	34	28	24	33	28	24	33	27	24	32	27	24	22

Coefficients of Utilization (2GC8-332A)

Effective floor cavity reflectance 20%

ρc	80%				70%				50%			30%			10%			0%
ρw	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
RCR																		
0	97	97	97	97	95	95	95	95	91	91	91	87	87	87	83	83	83	82
1	89	86	82	79	87	84	81	78	82	79	76	77	75	73	74	73	71	69
2	82	75	70	67	80	74	69	65	71	67	63	68	65	62	66	63	61	59
3	76	67	60	55	73	65	60	55	63	58	54	61	57	53	59	55	52	50
4	70	60	53	47	67	59	53	47	58	52	48	55	52	46	53	49	45	44
5	64	53	46	41	62	53	46	41	51	46	41	49	44	40	48	43	40	38
6	59	48	41	36	57	47	41	36	46	40	35	45	39	35	43	39	35	33
7	55	44	37	32	53	43	37	32	42	36	32	41	36	32	40	35	31	30
8	51	40	33	29	50	40	33	29	39	33	28	37	32	28	37	32	28	27
9	47	37	30	26	46	36	30	26	36	30	26	35	29	26	34	29	25	24
10	44	34	28	24	44	34	28	24	33	27	23	32	27	23	31	27	23	22

Zonal Lumen Summary (2GC8-332A-PAF)

Zone	Lumens	%Lamp	%Fixture
0-20	2124	25.3	30.5
0-40	3484	41.5	49.9
0-60	5601	66.7	84.0
0-90	6975	83.0	100.0
0-180	6975	83.0	100.0

Typical VCP Percentages (2GC8-332A-PAF)

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	63	67	60	64
30 x 20	58	61	55	58
30 x 30	49	53	54	57
40 x 30	65	63	56	59
60 x 60	47	52	45	49

Zonal Lumen Summary (2GC8-332A)

Zone	Lumens	%Lamp	%Fixture
0-30	2089	24.9	30.5
0-40	3429	40.8	50.0
0-60	5765	68.7	84.1
0-90	6855	81.6	100.0
0-180	6855	81.6	100.0

Typical VCP Percentages (2GC8-332A)

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	64	63	67	65
30 x 20	62	62	53	59
30 x 30	48	52	44	48
40 x 30	58	64	58	62
60 x 60	50	52	41	40

ORDERING INFORMATION

SAMPLE NUMBER: 2GC8-332A-120V-EB81-U

2=2' Width

Trim Type
G=Grid/Lay-in – Standard
T=Concealed T
G=Slot Grid
F=Flange Trim
C=Modular Trim

Series
C8=Specification T8 Troffer

Standard=Flat White Steel Door (Lipped Bezel)
FA=Flat White Extruded Aluminum Door
RA=3/8" Regressed White Extruded Aluminum Door
FAN=Flat Natural Extruded Aluminum Door
RAN=3/8" Regressed Natural Extruded Aluminum Door
FAB=Flat Black Extruded Aluminum Door
RAB=3/8" Regressed Black Extruded Aluminum Door

Number of Lamps
3=3 Lamps (Per Fixture)

Wattage (Length)
32=32W T8 (48")

A=#12 Pattern Acrylic
A125=#12 Pattern Acrylic (.125" Thick)
A19/156=#19 Pattern Acrylic (.156" Thick)
IMA-48=Injection Molded Acrylic (.110" Thick)
PR15=Silver Parabolic Louver (1/2" x 1/2" x 1/2")
DA=Dropped Dish – Matte White Acrylic (Additional Shielding Media Available. See Accessory Section)

Voltage
120V=120 Volt
277V=277 Volt
347V=347 Volt
UNV=Universal Voltage 120-277

Options
GL=Single Element Fuse
GM=Double Element Fuse
Lamps=Lamps Installed
Flex=Flex Installed
Emergency=EM Installed

Ballast Type
EB8_=T8 Electronic Instant Start, Total Harmonic Distortion ≤ 20%
No. of Ballast 1, 2 or 3
EB8_/PB/20=T8 Electronic Instant Start, High Ballast Factor >1.13, Total Harmonic Distortion ≤ 20%
No. of Ballast 1, 2 or 3
ER8_=T8 Electronic Program Rapid Start, Total Harmonic Distortion ≤ 10%
No. of Ballast 1, 2 or 3
TEB8_=T8 Electronic Instant Start, Total Harmonic Distortion ≤ 10%
No. of Ballast 1, 2 or 3
DLS=Digital Lighting System Dimming

Options
PAF=Painted After Fabrication
FR=Suitable for Fire Rated Applications
EQ=T-BAR Safety Earthquake Clips
MEP=Modified End Plates for End Fill Applications
20GA/REP=20 Gauge Riveted Endplates. For use in New York City.
RLS=Rotor-Lock Socket (T5 Lamps Only)
See Options & Accessories

Packaging
U=Unit Pack
PAL=Job Pack out of carton
PALC=Job Pack in carton

→ LCT35 – T8 3500K LAMPS FURNISHED & INSTALLED
→ GTD – BODINE GENERATOR TRANSFER DEVICE

SHIPPING INFORMATION

Catalog No.	Wt.
2GC8-332A	31 lbs.

METALUX

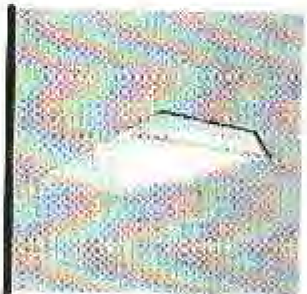
DESCRIPTION

GC8 is a premium grade specification lensed troffer series. This innovative, high quality luminaire is dedicated to the latest T8 lamp and micro electronic ballast technology for optimal performance and energy efficiency. The GC8 is compatible with all of today's popular ceiling systems and is available with a number of options and accessories for application versatility.

Catalog #	2GC-332A125-UNV-L8735-ER81 41	Type
Project	KILGORE SCHOOL	R4
Comments		
Prepared by		Date

APPLICATION

The GC8 Series features efficiency, quality and performance. The series is an excellent choice for commercial office spaces, schools, hospitals or retail merchandising areas.



2GC8332

2' X 4' TROFFER
3 LAMP
Specification T8 Troffer

SPECIFICATION FEATURES

A – Construction

Rigid housing is die formed of code gauge prime cold rolled steel and features full length die-formed stiffeners for added strength. Side flanges are hemmed. Innovative design provides superior lens brightness uniformity and visual comfort. Micro ballast cover*** reduces ballast shadow for superior lens brightness uniformity and is easily removed without tools. Die formed captive lampholder brackets fully enclose lampholder wiring permitting easy lampholder replacement. Heavy endplates are securely attached with interlocking tabs and screws. Four auxiliary fixture end suspension points provided. KOs for continuous row wiring. Endplates have integral Grid-lock feature for safety and convenience.

B – Electrical

Ballasts are CBM/ETL Class "P" and are positively secured by mounting bolts. Pressure lock lampholders. UL/CUL listed. Suitable for damp locations.**

C – Finish

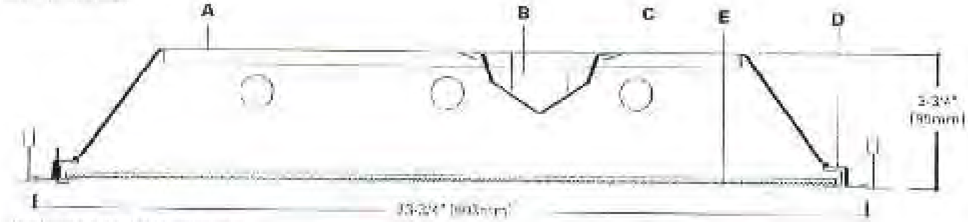
Multistage, iron phosphate pretreatment ensures maximum bonding and rust inhibition. Housing and ballast cover finished with new 90% reflective white enamel for superior performance. "PAF" Painted After Fabrication option also available.

D – Hinging/Latching

Positive cam action spring loaded steel latches with baked white enamel finish. Safety-lock T-hinges allow hinging and latching either side.

E – Frame/Shielding

Die formed, heavy gauge, flat steel door with reinforced mitered corners and baked white enamel finish. Flat and regressed aluminum doors also available. Positive light seals. Light stabilized 100% virgin acrylic prismatic lens. Standard #12 pattern. Numerous additional shielding options available.



*maximum overall nominal depth

ENERGY DATA

Input Watts:

EB Ballast & STD Lamps
332 (91)

ES Ballast & STD Lamps
332 (108)

Luminaire Efficacy Rating:
LER – FL-60
Catalog Number: 2GC8-332A

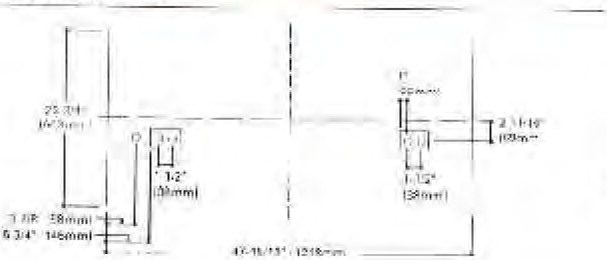
Yearly Cost of 1000 lumens,
3000 hrs at .08 KWH = $5.40

*Reference the lamp/ballast data in the Technical Section for specific lamp/ballast requirements.

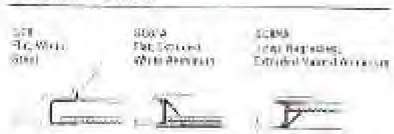
**Consult the Sales Technical Support.

***Full sized ballast cover for bipolar lamps and emergency options.

MOUNTING DATA



DOOR FRAMES



LAMP CONFIGURATIONS

CEILING COMPATIBILITY

Ceiling Type	Trim Type
Exposed Grid	G
Concealed T	G
Slot Grid	G
Flange	F
Metal Pan	D

(verify compatibility / consult factory)

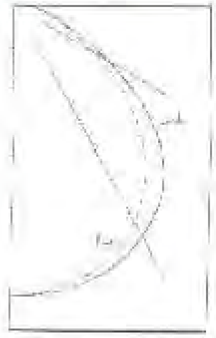
PHOTOMETRICS

2GC8-332A-PAF

Electronic Ballast
(3) FO32/35K lamps
2800 lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.3 x mounting height
Efficiency 83.0%
Test Report: 2GC8332APAFHRPP.IES
LER = FL-73
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.29

Candela

Angle	Along II	45°	Across ⊥
0	2655	2685	2606
5	2618	2619	2588
10	2641	2655	2570
15	2565	2512	2640
20	2601	2548	2567
25	2392	2457	2532
30	2248	2337	2413
35	2020	2175	2258
40	2051	1960	2119
45	1582	1721	1861
50	1333	1464	1568
55	1070	1188	1273
60	831	885	967
65	617	595	694
70	447	373	497
75	324	257	351
80	238	155	294
85	137	131	122
90	0	0	0



2GC8-332A

Electronic Ballast
(3) FO32/35K lamps
2800 lumens
Spacing criterion: (II) 1.2 x mounting height, (⊥) 1.3 x mounting height
Efficiency 81.6%
Test Report: 2GC8332A.IES
LER = FL-69
Yearly Cost of 1000 lumens, 3000 hrs at .08 KWH = $3.46

Candela

Angle	Along II	45°	Across ⊥
0	2624	2632	2624
5	2624	2628	2634
10	2603	2606	2521
15	2539	2558	2583
20	2451	2464	2542
25	2354	2417	2408
30	2214	2303	2271
35	2040	2146	2253
40	1831	1944	2099
45	1626	1697	1872
50	1367	1472	1580
55	1060	1185	1259
60	814	833	940
65	664	602	667
70	441	351	486
75	325	245	385
80	245	203	305
85	142	125	178
90	0	0	0

Coefficients of Utilization (2GC8-332A-PAF)

Effective floor cavity reflectance 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
RCR																		
0	99	99	99	99	97	97	97	97	92	92	92	89	89	89	85	85	85	85
1	91	87	84	[illegible]	89	85	81	79	83	79	77	76	76	74	76	74	72	71
2	83	77	71	67	81	75	70	66	72	68	64	70	66	63	67	64	55	60
3	76	68	61	56	74	67	61	56	64	59	55	62	57	54	60	56	53	51
4	70	61	54	48	68	59	53	48	57	52	47	55	51	47	54	49	46	44
5	65	54	47	42	63	53	47	42	52	46	41	50	45	41	49	44	40	39
6	60	49	42	37	58	48	42	37	47	41	36	45	40	36	44	39	35	34
7	55	45	38	33	54	44	37	32	43	37	32	42	36	32	40	36	32	30
8	52	41	34	29	50	40	34	29	39	33	29	38	33	29	37	32	29	27
9	48	37	31	26	47	37	31	26	36	30	26	35	30	26	34	29	26	24
10	45	35	28	24	44	34	28	24	33	28	24	33	27	24	32	27	24	22

Coefficients of Utilization (2GC8-332A)

Effective floor cavity reflectance 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
RCR																		
0	97	97	97	97	95	95	95	95	91	91	91	87	87	87	83	83	83	82
1	89	86	82	79	87	84	81	78	80	78	75	77	75	73	74	73	71	69
2	82	75	70	66	80	74	69	65	71	67	63	68	65	62	66	63	61	59
3	75	67	60	55	73	65	60	55	63	58	54	61	57	53	59	55	52	50
4	69	60	53	47	67	59	53	47	56	51	46	55	50	46	53	48	45	44
5	64	53	48	41	62	53	46	41	[illegible]	45	41	49	44	40	48	43	40	38
6	59	48	41	36	57	48	41	36	46	40	36	45	39	35	43	39	35	33
7	55	44	37	32	53	43	37	32	42	36	32	41	35	32	40	35	31	30
8	51	40	33	29	50	40	33	28	38	33	28	37	32	28	37	32	28	27
9	48	37	30	26	46	36	30	26	35	29	26	35	29	26	34	29	25	24
10	45	34	28	24	44	34	28	23	32	27	23	32	27	22	31	27	23	22

Zonal Lumen Summary (2GC8-332A-PAF)

Zone	Lumens	%Lamp	%Fixture
0-30	2122	25.3	30.5
0-40	3394	40.5	48.5
0-60	5887	[illegible]	[illegible]
0-90	6975	83.0	100.0
0-180	6975	83.0	100.0

Typical VCP Percentages (2GC8-332A-PAF)

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	53	67	60	64
30 x 30	54	61	55	58
30 x 60	44	52	44	47
60 x 30	54	63	58	63
60 x 60	50	53	45	49

Zonal Lumen Summary (2GC8-332A)

Zone	Lumens	%Lamp	%Fixture
0-30	2080	24.9	30.5
0-40	3428	40.8	50.0
0-60	5760	68.7	84.1
0-90	6855	81.6	100.0
0-180	6855	81.6	100.0

Typical VCP Percentages (2GC8-332A)

Room Size (Ft.)	Height Along 8.5'	Height Along 10.0'	Height Across 8.5'	Height Across 10.0'
20 x 20	54	68	51	65
30 x 30	52	62	55	59
30 x 60	49	52	44	48
60 x 30	50	54	50	52
60 x 60	46	53	45	48

ORDERING INFORMATION

SAMPLE NUMBER: 2GC8-332A-120V-EB81-U

2=2' Width

Trim Type
G=Grid/Lay-in (Standard)
G=Concealed T
G=Slot Grid
F=Flange Trim
C=Modular Trim

Series
C8=Specification T8 Troffer

Standard=Flat White Steel Door (Leave Blank)

Number of Lamps
3 Lamps (Not included)

Wattage (Length)
32=32W T8 (48")

A=#12 Pattern Acrylic
A125=#12 Pattern Acrylic (.125" Thick)
A19/156=#19 Pattern Acrylic (.156" Thick)
IMA 48=Injection Molded Acrylic (.150" Thick)
PB1S=Silver Parabolic Louver (1/2" x 1/2" x 1/2")
DA=Dropped Dish - Matte White Acrylic (Additional Shielding Media Available. See Accessory Section.)

Voltage
120V=120 Volt
277V=277 Volt
347V=347 Volt
UNV=Universal Voltage 120-277

Options
GL=Single Element Fuse
GM=Double Element Fuse
Lamps=Lamps Installed
Flex=Flex Installed
Emergency=EM Installed

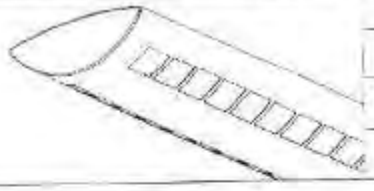
Ballast Type
EB8_=T8 Electronic Instant Start, Total Harmonic Distortion < 20%
No. of Ballast 1, 2 or 3
EB8_/PLUS=T8 Electronic Instant Start, High Ballast Factor >1.15, Total Harmonic
No. of

Options
PAF=Painted After Fabrication
FR=Suitable for Fire Rated Applications
EQ=T-BAR Safety Earthquake Clips
MEP=Modified End Plate/ For End Feed Applications
20GA/REP=20 Gauge Riveted Endplates. For use in New York City.
RLS=Rotor-Lock Socket (T8 Lamps Only)
(See options & accessories)

Packaging
U=Unit Pack
PAL=Job Pack, out of carton
PALC=Job Pack, in carton

KILGORE SCHOOL

TYPE: S2
CAT. #: 9506T03RN-16'-277V-10%-PS-WHITE-2 CIRCUIT



Suspended
3 T8
Direct/Indirect
9506T03 or 9507T03 C/R

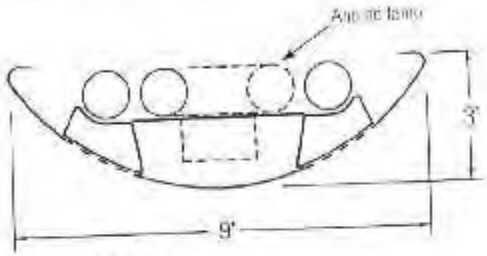
High performance optical system designed to accommodate up to four T8 or T5 HO lamps.
Available in a wide range of factory colors.
Three lighting distributions to choose from: Direct/Indirect, Semi-indirect, or Indirect.
Factory pre-wired with quick-wire connectors for fast, easy installation.
Affordable pricing & fast delivery - standard orders can ship in 9 working days.

Order Number Guide

→ <10% PROGRAMMED RAPID START BALLAST

950	–	T03	–	–	– –	–	–	E	–
Series	*Type*	*Lamps*	*Lower Optics*	*Upper Optics*	*Length*	*Wiring Options*	*Voltage*	*Ballast*	*Finish*
Centris	6 - Direct/ Indirect	3 T8	C - Solid baffle w/ solid housing	N - None (30% Down)	04 - 4ft 08 - 8ft 12 - 12ft	1 - 1 cct 2 - 2cct	1 - 120V 2 - 277V	Electronic	W - Standard White C - Factory Color* X - Custom Color
	7 - Direct/ Indirect High Performance		D - Round perf baffle w/ solid housing	F - Dust cover D - VD Kit* (Variable Optics) Y - Lamp separator	*16 - 16 FT	3 - 1cct w/ Emergency ckt 4 - 2cct w/ Emergency ckt 5 - 1cct w/ Battery Pack 6 - 2cct w/ Battery Pack 7 - 1cct w/ Dimming 8 - 1cct w/ Thru Wire 9 - 2cct w/ Thru Wire	3 - 347V* X - Custom		*See factory color chart.
				*Not available with High Performance		Consult factory for complete list of standard wiring options	*Consult factory for availability		

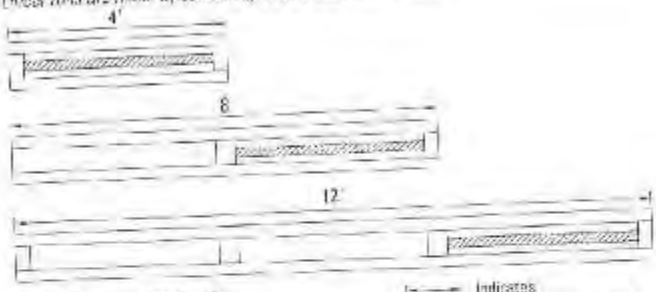
Cross Section



Weight 3.0 lb/ft

Modules

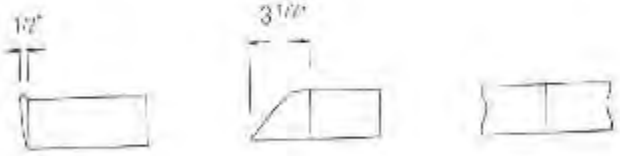
Linear runs are made by combining 4ft, 8ft and 12ft modules



Indicates location of Optional single gang switching controls all lamps OR Optional battery pack (standard controls one lamp only).

Indicates Module length / Mounting distance *Module length does not include crossover

Ends / Joints



END-CAP (Standard)

SCULPTURED END-CAP (Option)

INLINE JOINT

Baffle Detail

Solid baffle

Perf baffle

F - Dust cover

D - VD kit

Y - Lamp separator

LD168 Rev. 2

 Phone: 604.888.8611 Toll Free Fax: 1.800.665-LEDA (5332) Fax: 604.888.2103 Email: info@ledalite.com www.ledalite.com

Ledalite

Suspended | 3 T8 | Direct/Indirect | 9506T03 or 9507T03 C/R

Specifications

Housing
Die-formed 20 gauge cold-rolled steel.

Optical System
Constructed of 96% reflective white steel, and a perforated optical filter with acrylic overlay to produce a Direct/Indirect distribution. High Performance (HP) option utilizes additional highly specular aluminum reflectors. Louvers are white blades spaced 2.45" apart and are 0.77" deep (18 cells per 4ft section). Perforation of louver blades and housing are optional. Variable Optics™ option provides the ability to add additional downlight where needed.

Endcaps
Die-cast endcap or optional die-cast sculptured endcap.

Joints & Intersections
Self-aligning joining system with hands-free pre-joining with access.

Mounting
Aircraft cable gripper is tamper-resistant and provides infinite vertical adjustment capability. Aircraft cable, canopy and cable gripper independently tested to meet stringent safety requirements.

Electrical
All luminaires shall be factory pre-wired to section ends with quick-wire connectors.

Ballast
Electronic.

Approvals
Certified to UL & CSA standards.

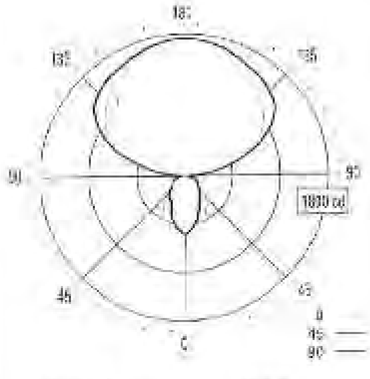
Finish
High-quality powder coat, factory applied to meet AAMA 2603-98. Available in Ledalite Standard White (textured matte finish), a selection of optional factory colors (see factory color chart), or custom colors. Consult factory for details.

Available with Response Integrated Controls. See www.ledalite.com for details.

Due to continuing product improvements, Ledalite reserves the right to change specifications without notice.

Photometry

Standard - CN/RN



Report # 2101530
Efficiency 84.1%
Peak Candela Value 1740 @ 180°
Peak Zenith Ratio 1.0:1

AVERAGE LUMINANCE (cd/m²)

Vert. angle	Horizontal angle 0	45	90
55	1429	1206	912
65	940	796	815
75	819	789	801
85	1072	[illegible]	962

CANDELA DISTRIBUTION

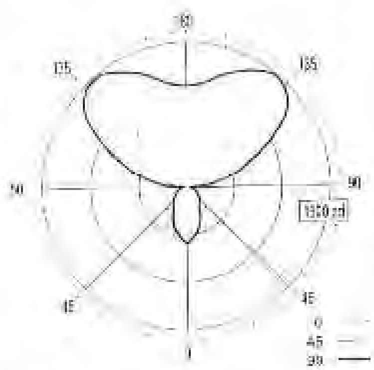
Vert. Angle	Horizontal Angle 0	22.5	45	67.5	90	Zonal Lumens
0	727	727	727	727	727	
5	723	712	701	681	685	67
15	653	620	592	556	562	187
25	568	505	471	418	412	215
35	452	391	337	316	322	224
45	320	282	260	259	245	213
55	201	191	194	198	170	173
65	98	111	125	152	166	133
75	52	52	98	96	102	90
85	23	35	53	58	52	52
90	7	29	45	53	51	
95	51	147	215	193	212	203
105	350	625	655	547	676	612
115	647	771	1032	1058	1096	913
125	927	996	1235	1339	1377	1049
135	1179	1235	1357	1459	1511	1039
145	1385	1432	1470	1551	1582	928
155	1554	1555	1597	1518	1631	735
165	1666	1595	1581	1599	1596	475
175	1730	1730	1734	1723	1740	155
180	1740	1740	1740	1740	1740	

COEFFICIENTS OF UTILIZATION (%)

Ceiling	80				70			50			0
Wall	70	50	30	10	70	50	30	50	30	10	0
RCR											
0	80	80	80	80	73	73	73	55	55	55	12
1	76	72	68	65	67	64	61	48	45	44	12
2	69	63	58	54	61	56	52	42	39	37	10
3	63	55	50	45	56	49	44	37	34	31	9
4	57	49	43	38	50	45	38	33	29	26	7
5	53	43	37	32	46	38	33	29	25	22	7
6	48	39	32	28	42	37	29	26	22	19	6
7	45	35	29	24	38	31	26	24	20	17	5
8	41	31	25	21	36	28	23	21	18	15	5
9	38	28	23	19	34	25	20	19	16	13	4
10	35	26	21	17	31	23	19	18	14	12	4

Based on a floor reflectance of 0.2

High Performance - CN/RN



Report # 2101032
Efficiency 85.8%
Peak Candela Value 1872 @ 140
Peak Zenith Ratio 1.4:1

AVERAGE LUMINANCE (cd/m²)

Vert. angle	Horizontal angle 0	45	90
55	1442	919	856
65	918	727	769
75	730	647	[illegible]
85	725	570	403

CANDELA DISTRIBUTION

Vert. Angle	Horizontal Angle 0	22.5	45	67.5	90	Zonal Lumens
0	744	744	744	744	744	
5	738	725	711	688	695	68
15	686	632	587	564	568	199
25	584	511	479	421	421	219
35	465	391	335	309	312	222
45	336	282	247	237	242	203
55	203	183	170	174	183	164
65	95	109	117	132	142	118
75	47	51	59	74	76	73
85	17	28	43	47	51	43
90	6	28	41	47	50	
95	78	158	205	171	235	158
105	273	372	644	614	684	608
115	494	383	1126	1070	1121	958
125	709	1043	1446	1542	1604	1153
135	912	1149	1537	1771	1349	1124
145	1038	1223	1523	1750	1529	953
155	1106	1270	1468	1523	1365	671
165	1282	1310	1377	1460	1477	393
175	1327	1333	1341	1360	1351	130
180	1333	1333	1333	1333	1333	

COEFFICIENTS OF UTILIZATION (%)

Ceiling	80				70			50			0
Wall	70	50	30	10	70	50	30	50	30	10	0
RCR											
0	83	83	83	83	73	73	73	54	54	54	14
1	79	75	69	66	68	65	61	47	45	44	12
2	69	61	55	50	60	56	52	42	39	37	10
3	63	55	50	45	56	49	44	37	34	31	8
4	58	49	43	35	50	43	38	33	29	26	7
5	53	44	37	32	46	39	34	29	25	23	6
6	48	39	33	28	42	35	29	26	22	20	6
7	45	35	30	24	39	32	28	24	20	17	5
8	41	32	25	21	36	29	23	21	18	15	5
9	38	29	23	19	34	27	20	19	16	13	4
10	36	26	21	17	32	25	18	18	14	12	4

Based on a floor reflectance of 0.2

METALUX®

DESCRIPTION

The BA Series features a brushed aluminum finish that is a quiet complement to any interior environment. The injection molded end plates have been designed to match the brushed housing finish. The wall bracket offers effective down and up lighting functions that have been incorporated into this series with contemporary styling and architectural appeal. The BA Series also features the latest in energy efficient technology for outstanding performance.

Catalog # BAU-217-UNV-ER81	Type W5
Project KILGORE SCHOOL	
Comments	
Prepared by	Date

APPLICATION

The BA Series architectural wall bracket styling contributes aesthetic appeal to contemporary decor, providing ideal lighting conditions for all areas in which comfortable, concentrated illumination is specified. Healthcare facility patient rooms, powder rooms, dressing rooms and work areas.

BA,BAU220
217
230
225
240
232

SPECIFICATION FEATURES

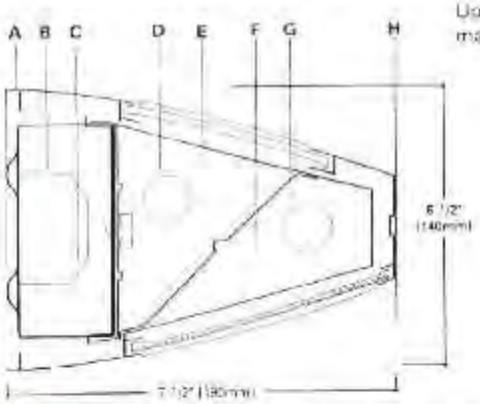
A - Lens Housing Construction
Lens housing is constructed of premium grade extruded anodized aluminum with a brushed finish. It's easily removed for installation and maintenance. High impact, injection molded end plates have matching brushed aluminum finish.

B - Internal Channel Construction
Internal steel channel is die formed of code gauge prime cold rolled steel. Channel cover is secured by quarter-turn fasteners for easy wireway access. Internal channel back has numerous K.O's for easy installation.

C - Electrical
Ballast are CBM/ETI Class "P" and positively secured by mounting bolts. Pressure lock lampholders, UL/CUL listed. Suitable for damp locations.

D - Lens Housing Finish
Extruded brushed aluminum lens housing has a clear anodic coating. Sturdy, high impact injection molded end plates have matching brushed aluminum-type finish. Decorative recessed walnut trim-stripe, front and ends.

E - Internal Channel Finish
Internal channel and all steel reflective surfaces are finished with electrostatically applied baked white polyester powder enamel. Multi-stage cleaning cycle, iron phosphate coating with rust inhibitor. Conveyorized application and baking times are accurately controlled at an elevated temperature.



F - Internal Light Baffle
Optional internal light baffle is available for up, down or combination lighting. (BAUB)

G - Latching
Lens housing secured to internal channel by spring-loaded latches.

H - Shielding
Downlight diffuser is 100% virgin prismatic acrylic, #12 pattern. Low brightness even illumination is provided. Uplight diffuser is smooth matte opal acrylic.

SPECIFICATION
WALL BRACKET

2' Wall Bracket
2 Lamp T5 or HTS

3' or 4' Wall Bracket
2 Lamp

ENERGY DATA

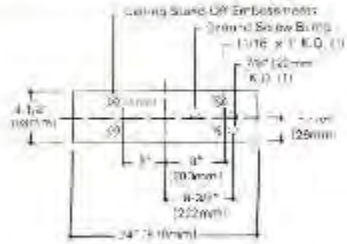
Input Watts
EB Ballast & STD Lamps
217 (35)
230 (50)
225 (47)
240 (72)
232 (61)

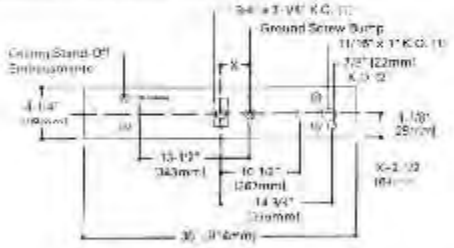
ES Ballast & STD Lamps
220 (58)
217 (45)
230 (74)
225 (63)
240 (86)
232 (71)

Luminaire Efficacy Rating
LER = FL-44
Catalog Number: BA-232A

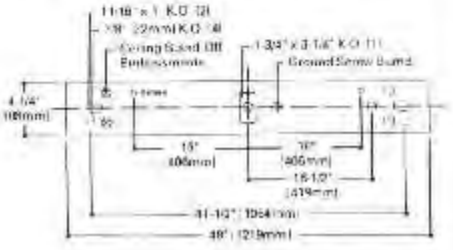
Yearly Cost of 1000 lumens,
3000 hrs at .08 KWH = $5.45

MOUNTING DATA





LAMP CONFIGURATIONS



ADF020688
(Supersedes ADF000193)

PHOTOMETRICS

Energy Saving Ballast. F32T8 lamps rated at 2850 lumens. Spacing Criterion: (II)1.0 x mounting height, (L)1.2 x mounting height.

Light Loss Factor .74. For complete photometric report request report BA232.ILS

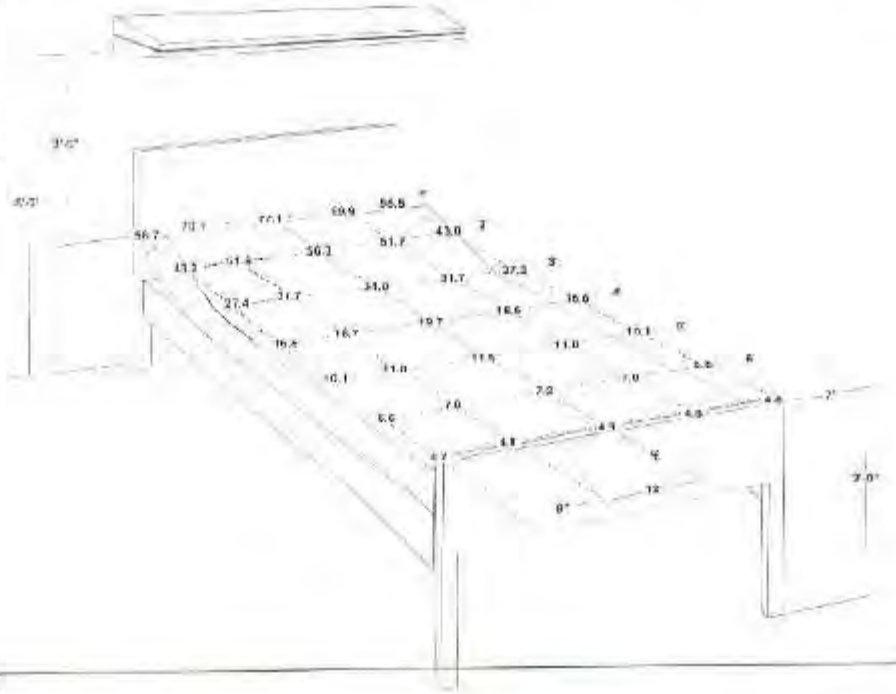
BA-232A
Lamps (2) F32T8/35K
Lumens 2850

Conditions

Room Size	12' Width x 14' Length
Ceiling Height	9'-0"

Reflectance

Ceiling	80%
Walls	50%
Floor	20%

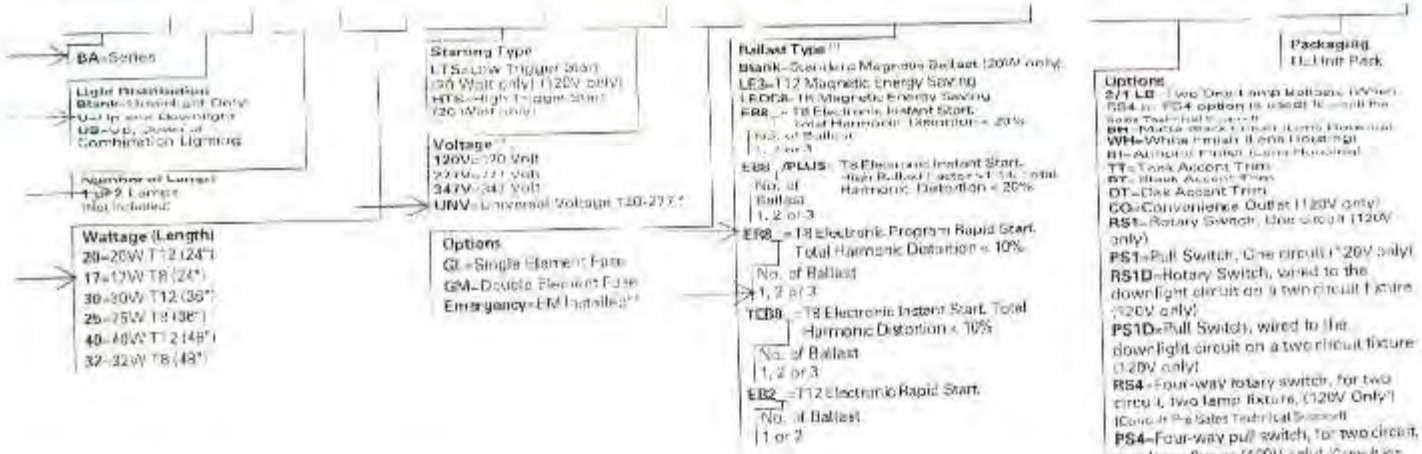


Scale is Exaggerated on Fixture

Application and Mounting

ORDERING INFORMATION

SAMPLE NUMBER: BA-232A-120V-EB61-U



NOTES: [1] Products also available in non-US voltages and frequencies for international projects. [2] Not available when specifying an emergency voltage must be specified. [3] Not available for 2' version.

Specifications & dimensions subject to change without notice. Consult your Cooper Lighting representative for availability and ordering information.

SHIPPING INFORMATION

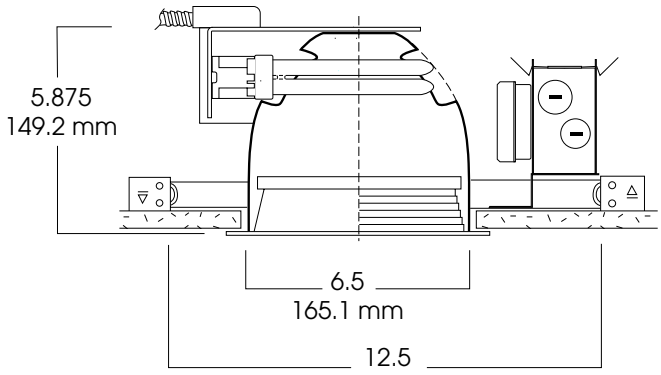
Catalog No.	Wt.
BA-232	18 lbs.

SPECTRUM LIGHTING, INC.
COMMERCIAL & ARCHITECTURAL LIGHTING

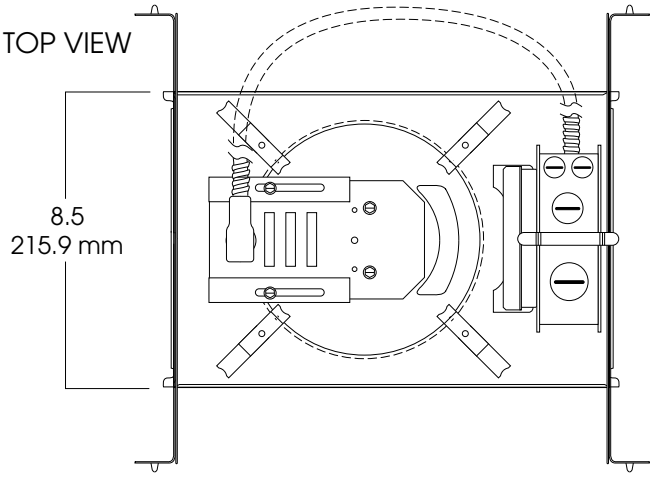
7" HORIZONTAL FLUORESCENT SHALLOW LENSED SPLAY 2 x 26 WATT /1 X 42 WATT MAX

7HF
SERIES

SIDE VIEW



TOP VIEW



FIXTURE SPECIFICATIONS

FIXTURE	#LAMP	WATTS	BALLAST TYPE
SP7HF	2 Quad	13	**EX -** Electronic 120/277 (standard)
		18	**DA1 -** Advance MK10 Dimming120
		26	**DA2-** Advance MK10 Dimming 277
	1 Lamp PLT	13	**DL1-** Lutron Compact SE Dimming120
		18	**DL2 -**Lutron Compact SE Dimming277
		26	**DM7X-** Advance MK7 Dimming120/277
		32	
		42	

TRIM SPECIFICATIONS

TRIM NO:

7420- 2 lamps 13W - 26W (Quad only)
7425- 1 lamp 13W-42W PLT

SPLAY/FLANGE:

WS -White Splay/Flange (standard)
SG -Soft Glow Alzak Splay/White Flange
RW -Regressed Baffled Splay White
RB -Regressed Baffled Splay Black W/White Flange

LENS

GL - Clear Temp Glass Lens
CA - ClearAcrylic Lens
FG - Frosted Glass Lens
FA - Flat Alba Lens
FL - Fresnel Glass Lens
DO - Drop Opal Glass Lens
PG - Prismatic Glass Lens

TYPICAL ORDER

Line item 1 (FRAME): **SP7HF126EX**
Line Item 2 (TRIM): **7425 WS PG**

PRODUCT INFORMATION

- Specular clear shallow plenum alzak reflector w/regressed/ baffled lens splay.
- Specular clear Alzak reflector, white flange.
- 20 gauge galvanized frame.
- 12" bar hangers expandable to 24" standard
- Junction box pre-wired, grounded.
- Electronic ballast 120/277v standard.
- Ballast serviceable from the ceiling aperture.
- Suitable for use in damp location.
- UL listed.
- Wet location (WL) available.

FRAME OPTIONS

RM - Remodeler (Cut Away).
FS - Fusing
EM - Emergency (Specify voltage)
EMIT - Emergency W/integral test switch(Specify voltage)
BH27 - 27" Mounting Bars (2 Per Set).
PR - Plaster Ring (see available depths).

TRIM OPTIONS

GS - Gasket (For Reflector).
WL - Wet location

SUBMITTAL WORKSHEET

FIXTURE NO.
FRAME-IN-KIT NO.
FIXTURE TYPE

SPECTRUM LIGHTING, INC. 994 Jefferson Street – Fall River, MA 02721 • TEL: 508-678-2303 • FAX: 508-678-2260

SL-8130 Series- Recessed Horizontal Step Light

Compact fluorescent, LED or incandescent
Specification-grade design and construction
IBEW union made in the USA

Specifications

Construction:

Heavy-duty cast aluminum face plate.

18 ga. electro galvanized steel housing, suitable for embedding in concrete.

Face finishes:

Matte black powder coat is standard.

Optional white, dark bronze or silver powder coat.

Illumination:

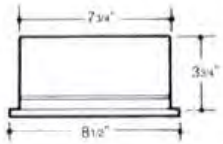
Incandescent: For use of one 25-watt A-19 medium base lamp(by others).

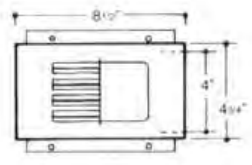
Compact fluorescent: For use of one 7 or 9 watt twin tube, 13 watt or 18 watt quad tube lamp(by others), supplied with voltage-specific (120V or 277V) electronic ballast.

LEDs: 6, 12 or 18 bright white (louver face) or 20 bright white (open face, indirect illumination) LEDs.

HOW TO ORDER

Example: SL-8130-PLD18-W-SPC (An SL-8130 for use of an 18 watt compact fluorescent lamp, silver powder coat face, for wet location and/or concrete pour.)





Catalog No.	Catalog No.	Lamp
Louver Face	**Glass Face**	
SL-8130	SL-8130-G-W	One 25-Watt A-19 Medium Base Incandescent Lamp SL-8130-G with incandescent lamp suitable for outdoor, wet location, or poured concrete only.
SL-8130-PL7	SL-8130-PL7-G	One 7-Watt Twin Tube Fluorescent Lamp
SL-8130-PL9	SL-8130-PL9-G	One 9-Watt Twin Tube Compact Fluorescent Lamp

SL-8130-PLD13	SL-8130-PLD13-G	One 13-Watt Quad Tube Compact Fluorescent Lamp
SL-8130-PLD18	SL-8130-PLD18-G	One 18-watt Quad Tube Compact Fluorescent Lamp
SL-8130-LED		6 White LEDs is standard. Also offered with 12 or 18 LEDs (please specify).
	SL-8130-G-LED	20 White LEDs

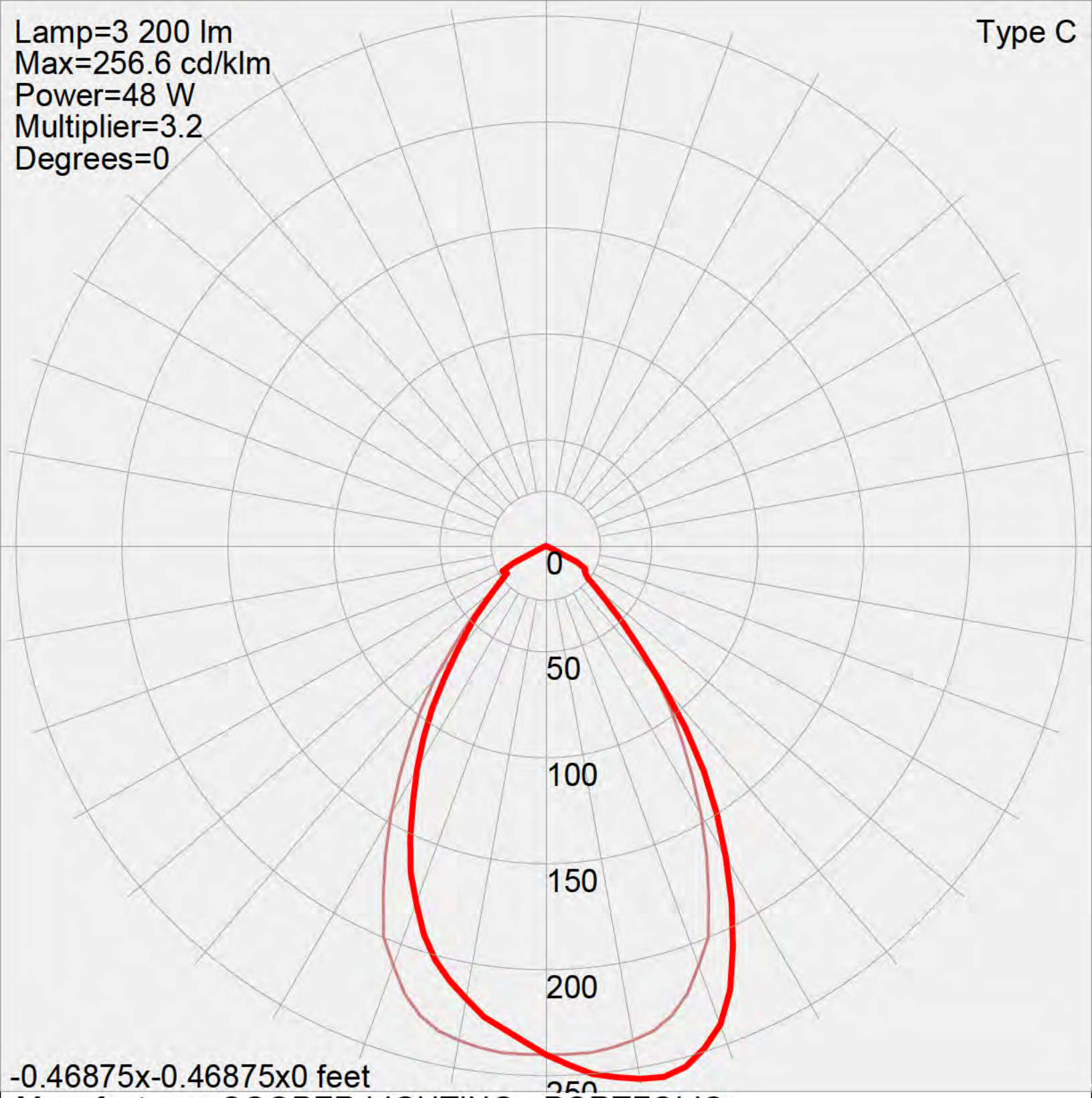
Options:

Catalog Suffix:

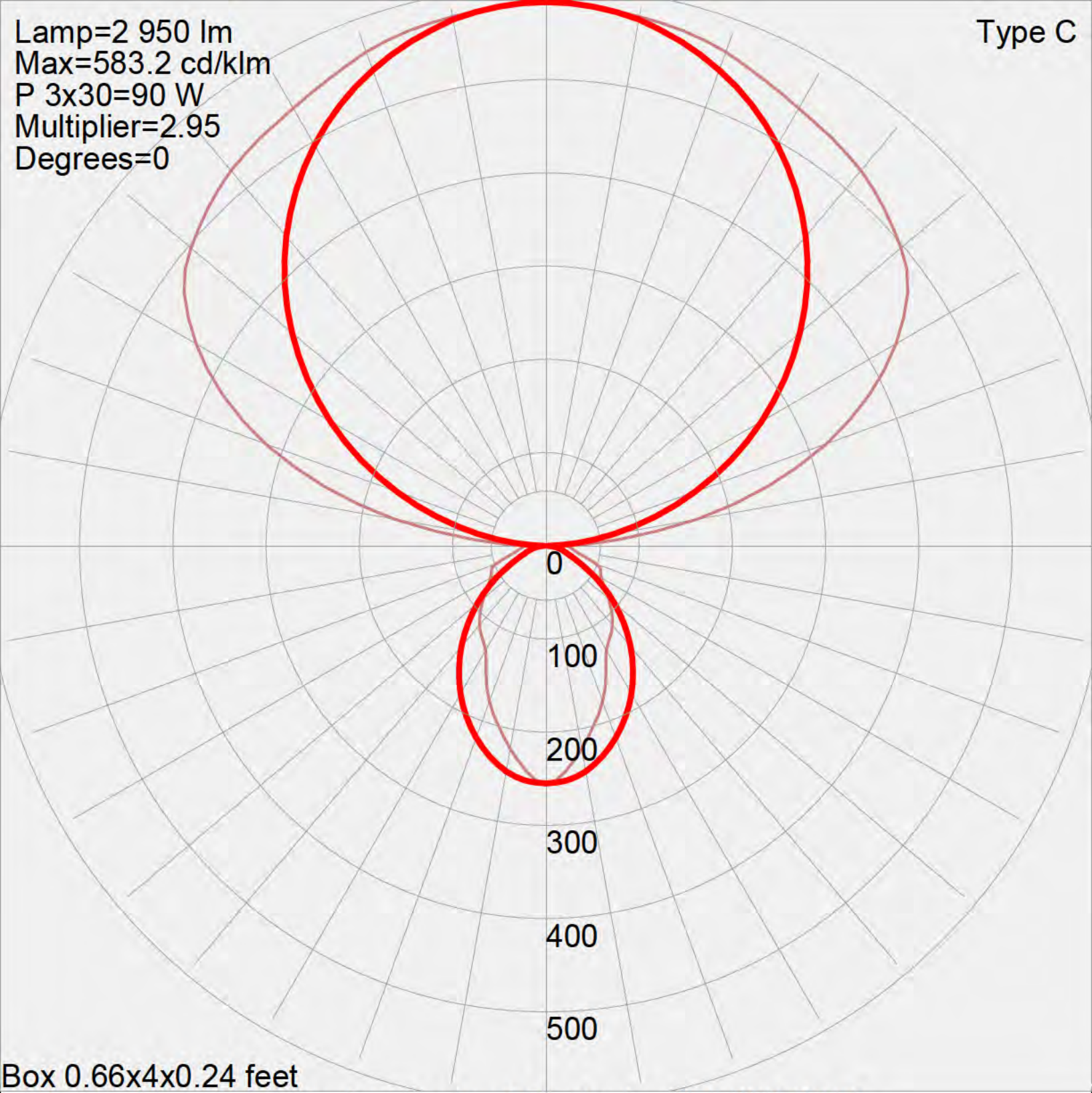
WET LOCATION: Neoprene gaskets	W
LONGLIFE WIRING: Incandescent lamps only	LL
EXTERNAL WIRING: “J” box for feed through	J
277 VOLT FLUORESCENT: 277V ballast	277V
TAMPER RESISTANT SCREWS	TP
ALTERNATE FACE FINISHES:	
Silver Powder coat	SPC
White Powder coat	WPC
Dark bronze powder coat	DBPC

Add suffix to catalog number.

Please note: Lightech reserves the right to make changes without notice.

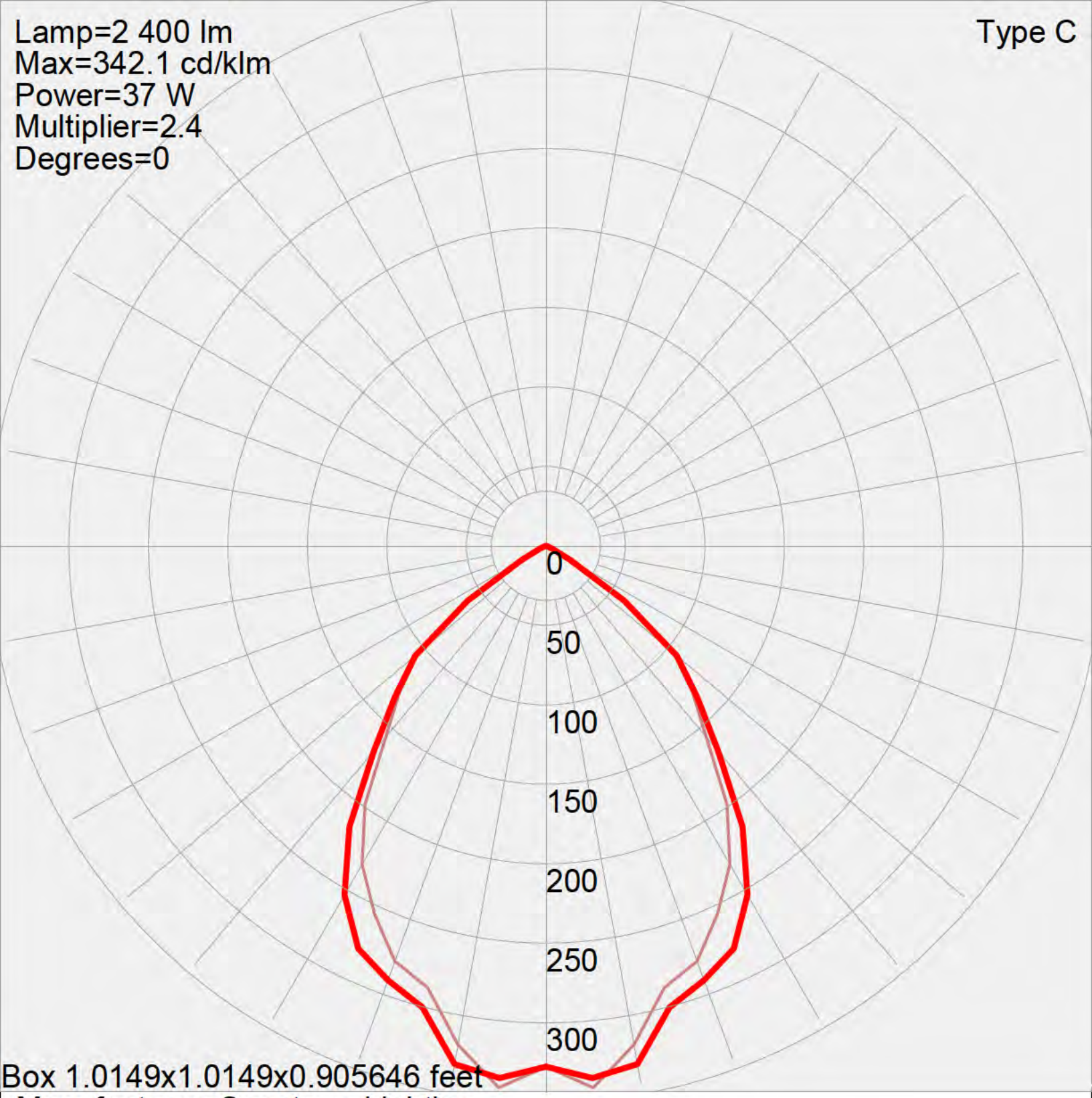


Manufacturer: COOPER LIGHTING - PORTFOLIO
Luminaire catalog: C6142E-6180LI1
Luminaire: PORTFOLIO 6 IN RECESSED FLUORESCENT DOWNLIGHT
Lamp catalog: CFL42W/U/4P 42 WATTS
Lamp: 4 PIN TTT COMPACT FLUORESCENT LAMP



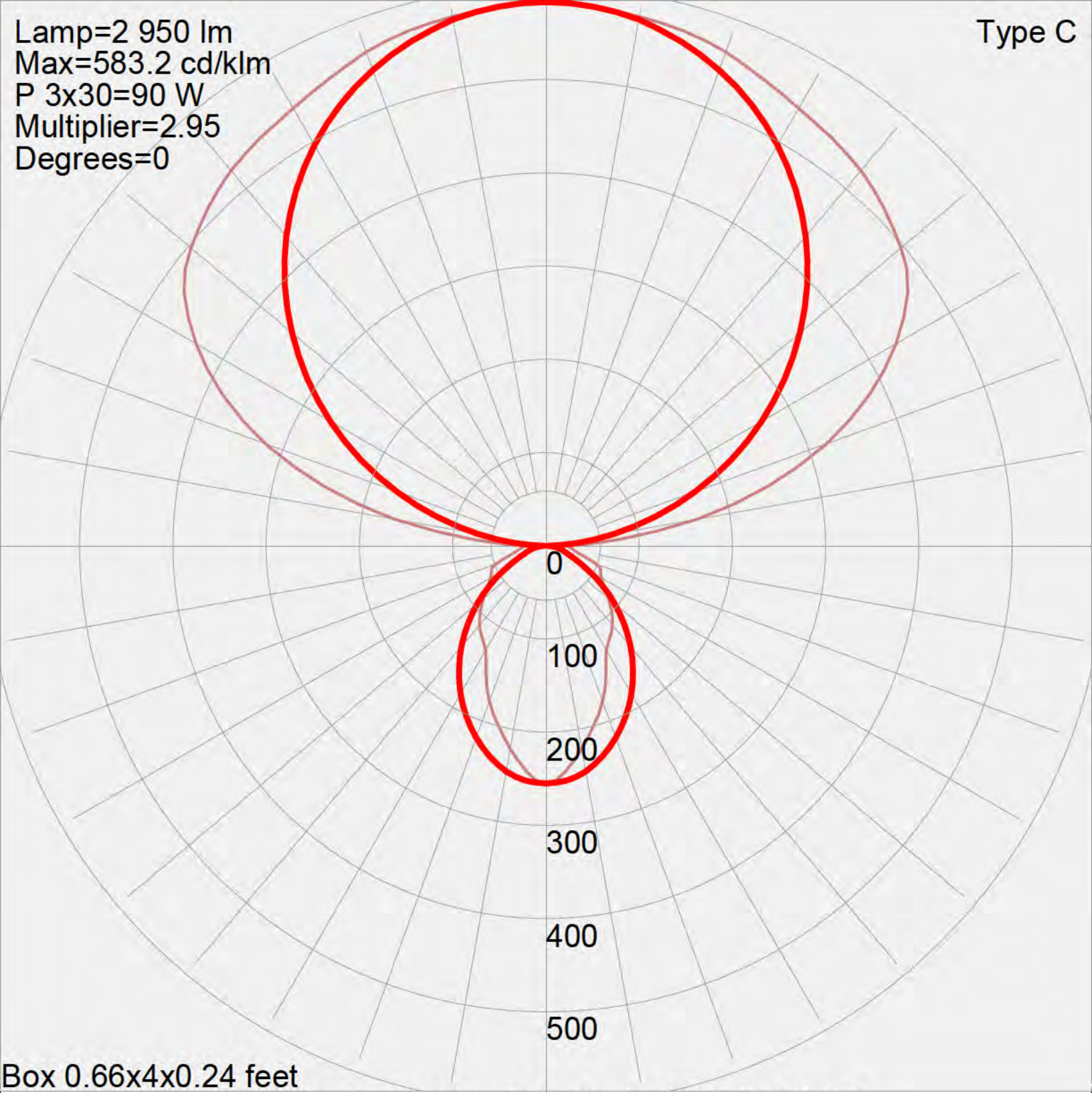
Box 0.66x4x0.24 feet

Manufacturer: Ledalite Architectural Products 604-888-6811
Luminaire catalog: 9506T03CN-RN
Luminaire: Centris
Lamp: F32T8



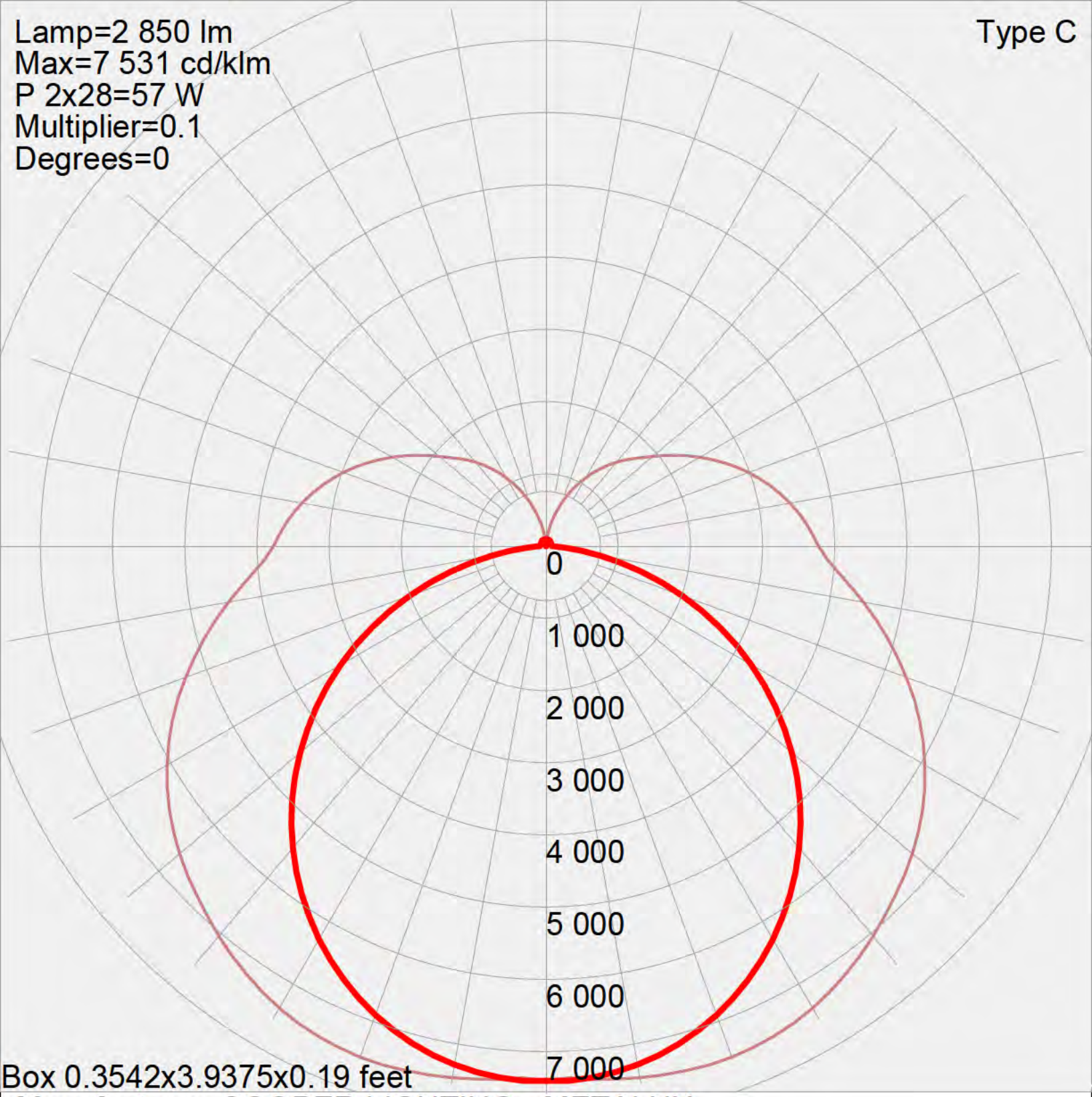
Box 1.0149x1.0149x0.905646 feet

Manufacturer: Spectrum Lighting
Luminaire catalog: SP6VF132EX/6410SG- lower position
Lamp catalog: CF32DT/E/841
Lamp: Fluor. 32W DULUX triple tube

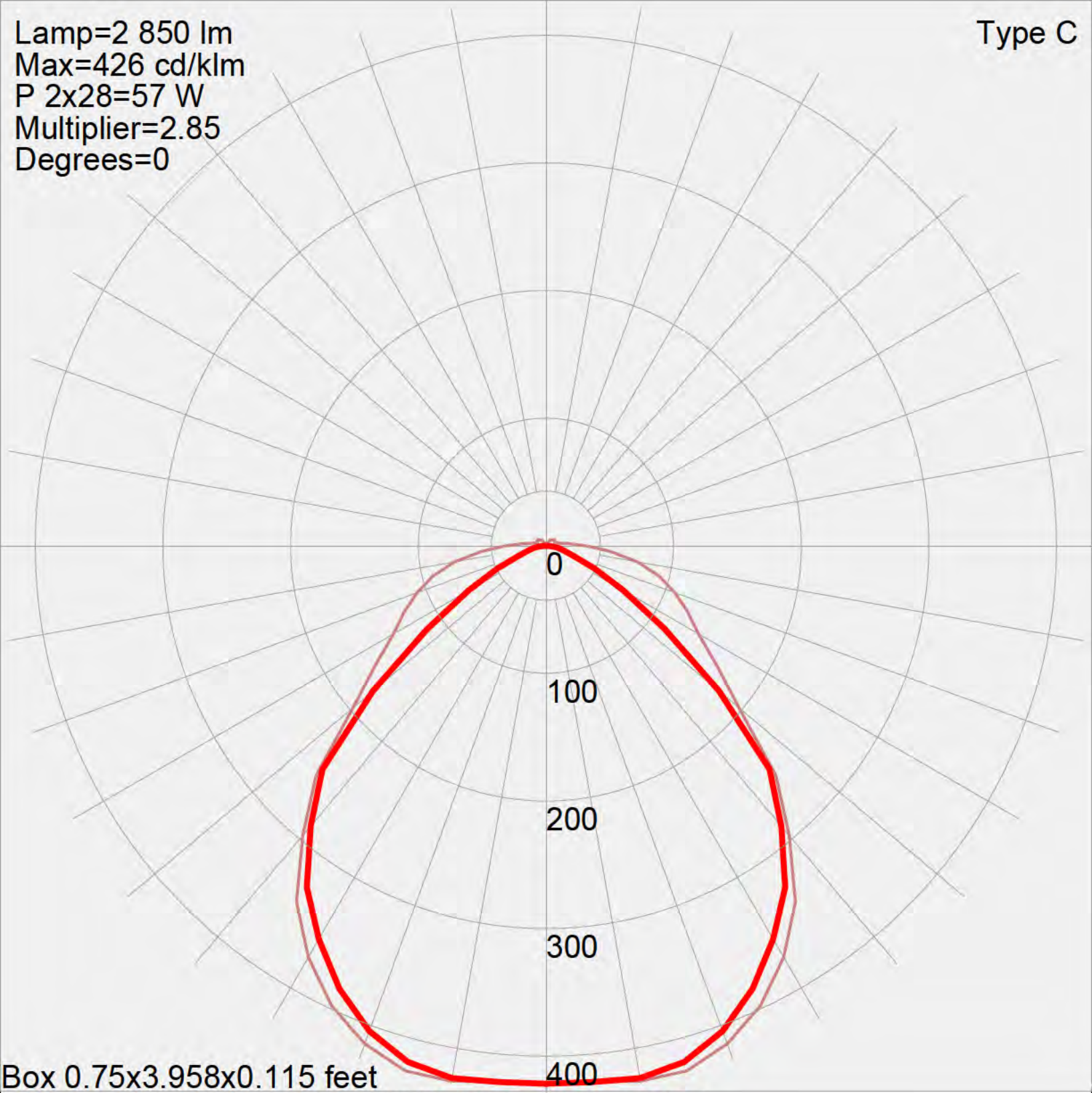


Box 0.66x4x0.24 feet

Manufacturer: Ledalite Architectural Products 604-888-6811
Luminaire catalog: 9506T03CN-RN
Luminaire: Centris
Lamp: F32T8



Box 0.3542x3.9375x0.19 feet
Manufacturer: COOPER LIGHTING - METALUX
Luminaire catalog: BC-232A
Luminaire: Wall Bracket with white translucent lens.
Lamp: Two-F32T8/35K - 2850 Lumens ea. - 32 Watts ea.



Manufacturer: COOPER LIGHTING - FAIL-SAFE
Luminaire catalog: FWS 232-120-EB81
Luminaire: 2/32W T8 4'SURFACE MNT LUMINAIRE w/WHITE BODY REFL
Lamp catalog: F32T8/735/RS

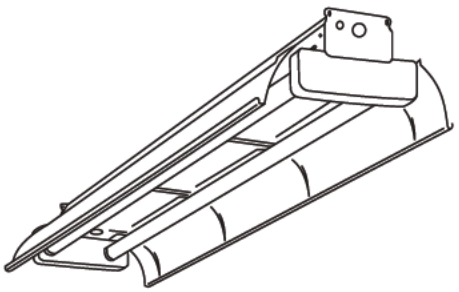
LITHONIA LIGHTING®

Catalog Number	
Notes	Type

FEATURES & SPECIFICATIONS

Heavy-Duty Turret Industrial

AF



Rapid Start
4' or 8' lengths
1, 2, 3 or 4 lamps

INTENDED USE

For applications that require medium to high light levels such as manufacturing, warehousing, storage, retail or task lighting. Ideal for mounting heights up to 25'.

ATTRIBUTES

Heavy-duty design for demanding industrial environments. Pressure-lock lampholders enclosed in snap-in turret housing. Available in 4' or 8' lengths. 6" lamp spacing of 2-lamp models, 3" lamp spacing on 3-lamp models. Solid top, 10% or 20% uplight reflectors available, painted after fabrication.

CONSTRUCTION

Die-embossed reflector constructed of heavy gauge cold-rolled steel. White enamel reflector finish standard, porcelain finish optional.

FINISH

Five-stage iron-phosphate pretreatment ensures superior paint adhesion and rust resistance. Finish is high-gloss baked white enamel.

ELECTRICAL SYSTEM

Thermally protected, resetting, Class P, HPF, UL listed, CSA Certified ballast is standard. Energy saving and electronic ballasts are sound rated A.

Fixture is suitable for damp locations. AWM, TFN or THHN wire used throughout, rated for required temperatures.

INSTALLATION

For surface or suspended mounting, unit or row installation.

LISTING

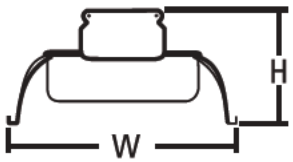
120V, 277V and MVOLT are UL Listed and CSA Certified (standard). 347V is CSA Certified (see Options). NOM Certified (see Options).

WARRANTY

Guaranteed for one year against mechanical defects in manufacture.

Specifications

Length: 49-13/16 (1265) or 99-5/8 (2530)
Width: 13-3/8 (340)
Height: 6-5/8 (168)



All dimensions are inches (millimeters).
Specifications subject to change without notice.

ORDERING INFORMATION

For shortest lead times, configure product using **standard options (shown in bold).**
Example: AF 3 32 277 1/3 GEB10IS

Series	Lamps	Lamp type	Voltage	Options
AFST Solid reflector	1	**32 32W T8 (48")**	**120**	Shipped installed in fixture
AF10 10% uplight apertured reflector	**2**		**277**	1/3 One 3-lamp ballast (32 watt electronic ballast only)
AF 20% uplight apertured reflector	**3**		347	1/4 One 4-lamp ballast (32 watt electronic ballast only)
For tandem double-length unit, add prefix T. Example: TAF10	4 Not included.		**MVOLT**[2]	GEB T8 electronic ballast, ≤20% THD
				GEB10IS T8 electronic ballast, ≤10% THD, instant start[1]
				GEB10RS T8 electronic ballasts, 10% THD, rapid start
				EL Emergency battery pack (nominal 300 lumens), see Life Safety Section
				GLR Internal fast-blow fusing (add X for external)
				GMF Internal slow-blow fusing (add X for external)
				PLF_ Plug-in wiring, Specify 1, 2 or 3 branch circuits & hot wires (A = black, B = red, C = blue, AB or AC)
				TILW Tandem in-line wiring
				PO White porcelain reflector finish
				CSA CSA Certified (347V only)
				NOM NOM Certified
				BDP Ballast disconnect[3]

Accessories

Order as separate catalog number.

ACEP	Full-depth endplates (1 pair)
HRUN	Hooker® T-bar hanger for 5" channel (flush to ceiling)
HRUN1	Hooker® T-bar hanger for 5" channel (1-1/2" from ceiling)
SQ_	Swivel stem hanger (specify length in 2" increments)
1B	Ceiling spacer (1-1/2" to 2-1/2" from ceiling)
HC36	Chain hangers (1 pair, 36" long)
THUN	Tong hanger for 5" channel
WGAFPV	Wireguard, 4' white (order 2 for 8' fixtures)[4]
DLAF ME	4' 30° x 30° metal eggcrate louver[4]
DLAF A12	4' framed acrylic prismatic lens[4]

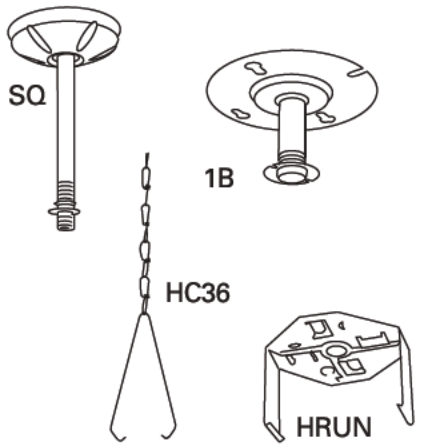
NOTES:
1 Available only with 32 lamp type.
2 Electronic ballast 120 through 277 volt only. Available with 32 watt T8 only. MVOLT must specify GEB10IS.
3 Meets codes that require in fixture disconnect.
4 Order 2 for 8' fixtures.

MOUNTING DATA

For unit or row installation. Surface or stem mounting.[1]

UNIT INSTALLATION — Minimum of two hangers required.

ROW INSTALLATION — One hanger per fixture plus one per row required.



DIMENSIONS

A = 1/4 x 1/2 (64 x 13) Oval Hole

C = 7/8 (22) Dia.K.O.

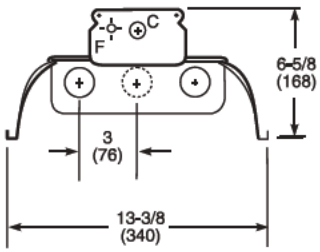
D = 11/16 (17) Dia. K.O.

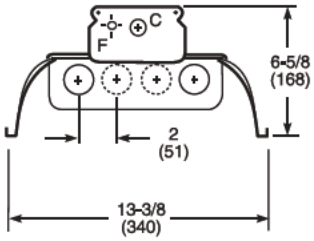
E = 2 (51) Dia. K.O.

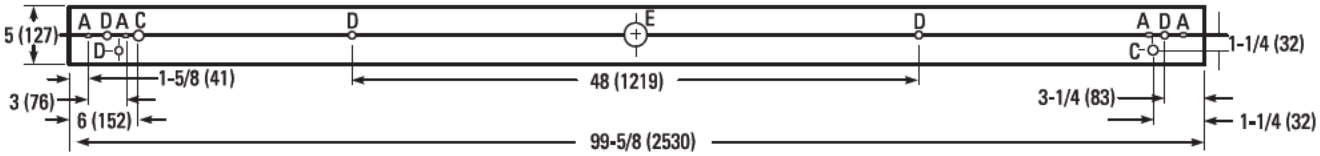
F = 7/16 (111) Dia. K.O.

All dimensions are inches (millimeters).

Specifications subject to change without notice.



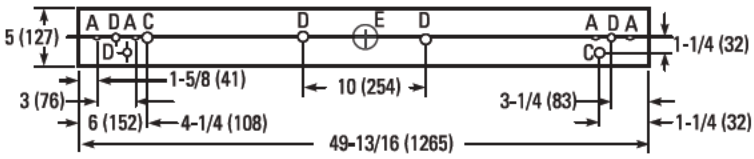




Energy (Calculated in accordance with NEMA standard LE-5)

LER.FW	ANNUAL ENERGY COST*	LAMP DESCRIPTION	LAMP LUMENS	BALLAST FACTOR	WATTS
74	$3.24	(2) F32T8	2800	.88	60

*Calculated in accordance with NEMA Standards LE-5.



PHOTOMETRICS

Calculated using the zonal cavity method in accordance with IESNA LM41 procedure. Floor reflectances are 20%. Lamp configurations shown are typical. All data based on 25°C. Full photometric data on these and other configurations available upon request.

AF 2 32

Report ITL 5711

S/MH 1.4

Coefficient of Utilization

Ceiling	80%			70%			50%		
Wall	70%	50%	30%	70%	50%	30%	50%	30%	10%
1	94	90	86	90	86	83	79	76	74
2	86	79	73	82	75	70	69	65	61
3	78	69	62	74	66	60	61	56	52
4	72	61	54	68	59	52	54	48	44
5	65	54	46	62	52	44	48	41	37
10	43	31	24	41	30	23	28	22	18

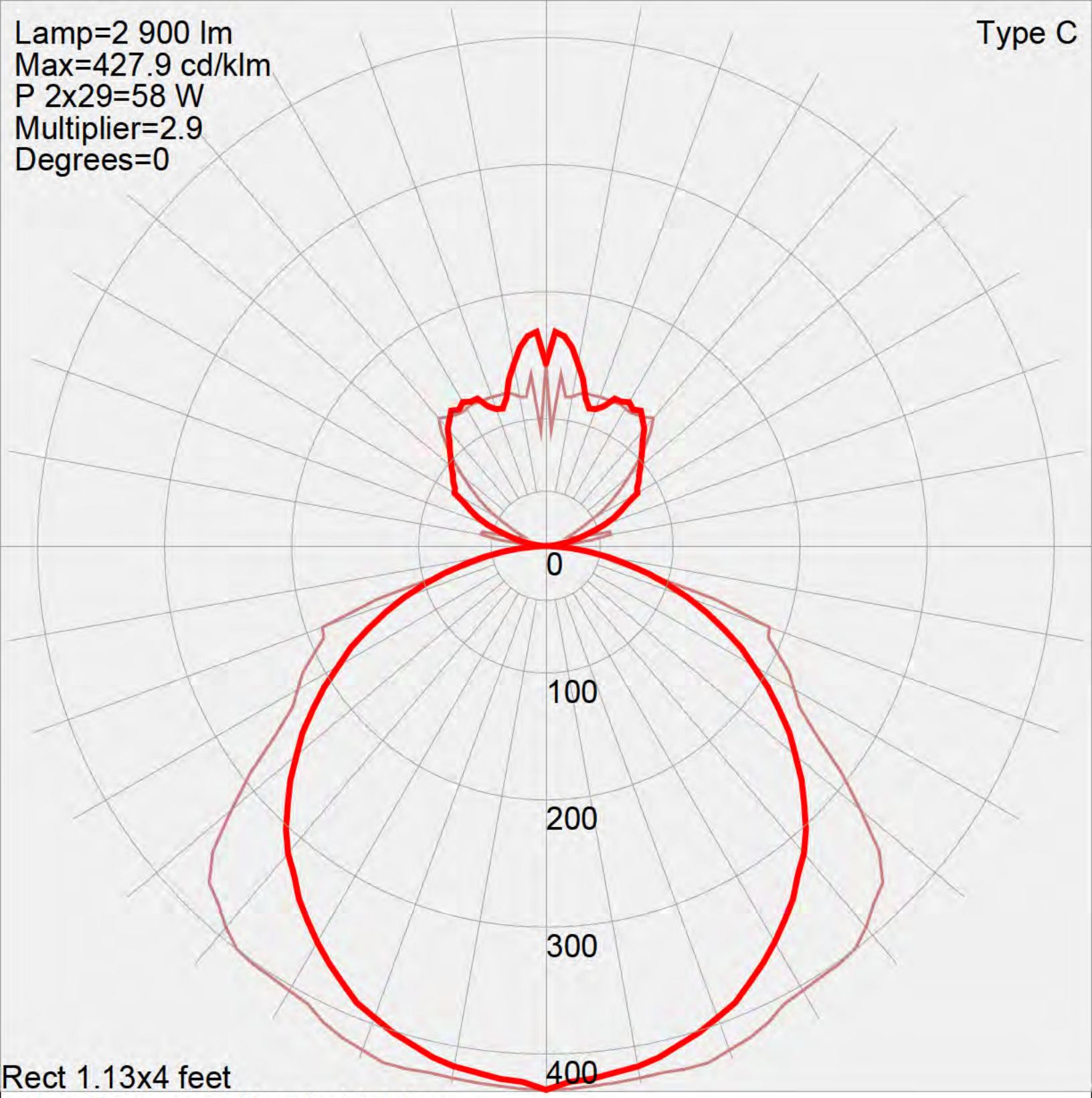
Zonal Lumens Summary

Zone	Lumens	%Lamp	%Fixture
0-30	998	17.2	19.0
0-40	1677	28.9	31.9
0-60	3126	53.9	59.6
0-90	4074	70.2	77.6
90-180	1175	20.3	22.4
0-180	5249	90.5	100.0

LITHONIA LIGHTING®

An AcuityBrands Company

Lithonia Lighting
Industrial
One Lithonia Way, Conyers, GA 30012
Phone: 770-922-9000 Fax: 770-981-8141
www.lithonia.com



Manufacturer: Lithonia Lighting
Luminaire catalog: AF 2 32 MVOLT GEB10IS
Luminaire: HEAVY DUTY TURRET INDUSTRIAL 20% UPLIGHT 50" X 4' 2 L
Lamp: TWO 32-WATT T8 LINEAR FLUORESCENT.

PORTFOLIO™

DESCRIPTION

Round wall mount lens downlight with 6 inch aperture for vertical ED17 medium base quartz or ceramic metal halide lamp. Medium beam distribution with 45° cutoff to lamp produces even illumination with good efficiency. Available in white, black or bronze finish and can be used to blend with or accent varying architectural styles.

Catalog #		Type
Project		
Comments		Date
Prepared by		

SPECIFICATION FEATURES

Housing
Fabricated 0.062 thick aluminum housing and integral 0.125 thick extruded aluminum arm is available in various painted finishes.

Mounting Plate
Die formed 0.060 thick pre-galvanized steel mounting plate attached directly to wall mounted junction box. Housing attached to mounting plate and drawn tight to mounting surface with two Philips drive screws.

Reflector
Spun 0.050" thick aluminum reflector provides medium beam distribution. Available in all Portfolio Alzak® finishes. Also available with seamless grooved black baffle.

Shielding
Tempered glass lens provides lamp containment.

Trim Retention
Keyholes align reflector to preinstalled machine screws that pull flange tight to the housing.

Socket
Pulse rated E26 medium base porcelain socket with nickel plated brass screw shell.

Ballast
Magnetic core and coil 120/277V or 347V ballast. Quick connector plugs into housing for tool-less ballast installation / replacement.

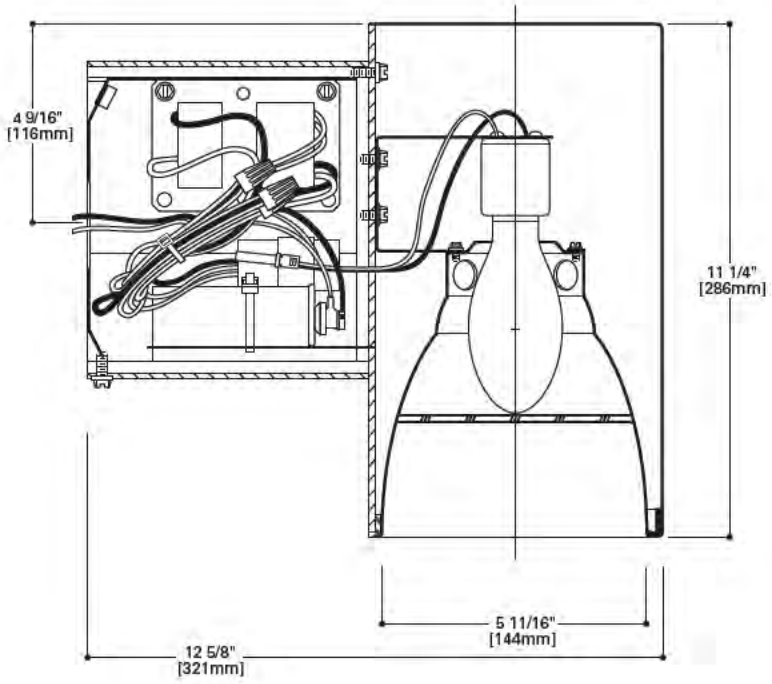
Code Compliance
UL listed, CSA certified for standard wet locations. Exempt from EISA ballast efficiency standards.

M8605727
M8605737
M8605747

44600

50/70/100W
ED17
Metal Halide

6 Inch
Round Wall Mount Cylinder



Energy Data		
50W		
120V Input Power: 72	277V Input Power: 72	347V Input Power: 67
120V Input Current: 1.0	277V Input Current: .5	347V Input Current: .48
70W		
120V Input Power: 90	277V Input Power: 90	347V Input Power: 90
120V Input Current: 1.9	277V Input Current: .8	347V Input Current: .7
100W		
120V Input Power: 129	277V Input Power: 129	347V Input Power: 129
120V Input Current: 2.3	277V Input Current: 1	347V Input Current: 1
Minimum Starting Temp: -20°F, -30°C		

ORDERING INFORMATION

Sample Number: M8605737P = 6" wall mount round cylinder, white with 120/277V ballast for a 70W ED17 MH lamp (Order housing and trim separately.)

Housing
M8605 = 6" Round MH Wall Mount Cylinder

Ballast
727 = 50W M148/M110 120/277V 60Hz magnetic
7267 = 50W M148/M110 347V 50/60Hz magnetic
737 = 70W M143/M98 120/277V 60Hz magnetic
7376 = 70W M143/M98 347V 50/60Hz magnetic
747 = 100W M140/M90 120/277V 60Hz magnetic
7476 = 100W M140/M90 347V 50/60Hz magnetic

Housing Finish
P = White
BZ = Bronze
MB = Black

Options
F = Time delay fuse

Trim
44600 = 6" Medium beam reflector

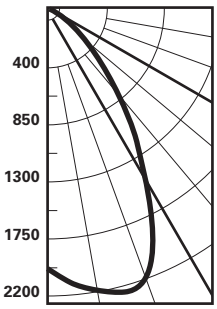
Finish (Alzak ® Finishes)
LI = Specular Clear, low iridescent
H = Semi-specular clear
WMH = Warm Haze
G = Gold
WH = Wheat
GP = Graphite
GPH = Graphite Haze
K = Cognac
KH = Cognac Haze
B = Black
(Omit finish code for black baffle option)

Options
BA = Black Baffle

Accessories
(None)

PHOTOMETRICS

Candlepower Distribution



Test No. E428-428
M8605P-737-44600LI
Lamp=M100C
Lumens=8000
Spacing Criteria=1.1
Efficiency=38.5%

Candlepower

Deg.	CD
0	1988
5	2003
15	2217
25	1974
35	1117
45	542
55	191
65	60
75	8
85	0
90	0

Average Luminance

Deg.	CD/SQ M
45	46706
55	20291
65	8651
75	1883
85	0

Cone of Light

Distance to Illuminated Plane	Initial Nadir Footcandles	Beam Diameter
5'6"	66	6'6"
6'6"	47	7'6"
8'0"	31	9'0"
10'0"	20	11'6"
12'0"	14	13'6"
14'0"	10	16'0"

Beam diameter is to 50% of maximum footcandles, rounded to the nearest half-foot.

Footcandle values are initial, apply appropriate light loss factors where necessary.

Cone Color Multiplier
Gold x 0.90

Lamp Wattage Multiplier
70W x 0.625

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Luminaire
0-30	1713	21.4	55.7
0-40	2413	30.2	78.4
0-60	3012	37.6	97.9
0-90	3076	38.5	100.0
90-180	0	0.0	0.0
0-180	3076	38.5	100.0

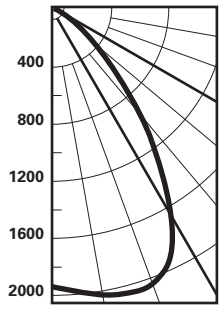
Coefficient of Utilization

rc	80%				70%			50%		30%		10%		0%
rw	70	50	30	10	50	30	10	50	10	50	10	50	10	0
RCR														
0	46	46	46	46	45	45	45	43	43	41	41	39	39	38
1	44	43	42	41	42	41	40	40	39	39	38	37	37	36
2	41	40	38	37	39	38	36	38	36	37	35	35	34	33
3	39	37	35	33	36	35	33	35	33	34	32	34	32	31
4	37	34	32	31	34	32	30	33	30	32	30	32	29	29
5	35	32	30	28	32	30	28	31	28	30	27	30	27	27
6	33	30	28	26	30	27	26	29	26	28	25	28	25	25
7	31	28	25	24	27	25	24	27	23	27	23	26	23	23
8	30	26	23	22	26	23	22	25	22	25	22	24	21	21
9	28	24	22	20	24	22	20	23	20	23	20	23	20	19
10	26	22	20	18	22	20	18	22	18	22	18	21	18	18

rc=Ceiling reflectance, rw=Wall reflectance, RCR=Room cavity ratio
CU Data Based on 20% Effective Floor Cavity Reflectance.

PHOTOMETRICS

Candlepower Distribution



Test No. E428-429
M8605P-737-44600BA
Lamp=M100C
Lumens=8000
Spacing Criteria=1.0
Efficiency=35.0%

Candlepower

Deg.	CD
0	1918
5	1980
15	2154
25	1902
35	1017
45	438
55	143
65	29
75	2
85	0
90	0

Average Luminance

Deg.	CD/SQ M
45	36960
55	14876
65	4094
75	461
85	0

Cone of Light

Distance to Illuminated Plane	Initial Nadir Footcandles	Beam Diameter
5'6"	64	6'0"
6'6"	46	7'6"
8'0"	30	9'0"
10'0"	19	11'0"
12'0"	13	13'6"
14'0"	10	16'0"

Beam diameter is to 50% of maximum footcandles, rounded to the nearest half-foot.

Footcandle values are initial, apply appropriate light loss factors where necessary.

Lamp Wattage Multiplier
70W x 0.625

Zonal Lumen Summary

Zone	Lumens	%Lamp	%Luminaire
0-30	1656	20.7	59.1
0-40	2296	28.7	81.9
0-60	2769	34.6	98.8
0-90	2804	35.0	100.0
90-180	0	0.0	0.0
0-180	2804	35.0	100.0

Coefficient of Utilization

rc	80%				70%			50%		30%		10%		0%
rw	70	50	30	10	50	30	10	50	10	50	10	50	10	0
RCR														
0	42	42	42	42	41	41	41	39	39	37	37	36	36	35
1	40	39	38	37	38	37	37	37	36	35	34	34	33	33
2	38	36	35	34	36	35	33	35	33	34	32	33	31	31
3	36	34	32	31	34	32	31	33	30	32	30	31	29	29
4	34	32	30	29	31	30	28	31	28	30	28	29	27	27
5	33	30	28	26	29	28	26	29	26	28	26	28	25	25
6	31	28	26	24	28	26	24	27	24	27	24	26	24	23
7	29	26	24	22	26	24	22	25	22	25	22	24	22	21
8	28	24	22	21	24	22	21	24	21	23	21	23	20	20
9	26	23	21	19	22	20	19	22	19	22	19	22	19	18
10	25	21	19	18	21	19	18	21	18	21	18	20	18	17

rc=Ceiling reflectance, rw=Wall reflectance, RCR=Room cavity ratio

CU Data Based on 20% Effective Floor Cavity Reflectance.

LITHONIA LIGHTING®

Catalog Number	
Notes	Type

FEATURES & SPECIFICATIONS

INTENDED USE

Specification premium, high performance static T8 luminaires provide general illumination for recessed applications; ideal for schools, hospitals and other applications where fixture depth is a requirement.

ATTRIBUTES

Designed exclusively for use with T8 lamps, electronic ballasts and sockets.

CONSTRUCTION

Smooth hemmed fixture sides and ends for easy handling. Integral T-bar clips secure fixture to T-bar system. Housing formed from cold-rolled steel. Acrylic shielding material 100% UV stabilized.

Steel door frame has superior structural integrity with premium extruded appearance and precision flush mitered corners. Steel door allows easy lens replacement without frame disassembly (for lenses up to .156" thick). Door frame assemblies hinge or latch from either side of fixture. Powder-painted steel latches provide easy, secure door closure. Spring-loaded cam latch es standard.

No asbestos is used in this product.

FINISH

Five-stage iron-phosphate pre-treatment ensures superior paint adhesion. Painted parts finished with high-gloss, baked white enamel.

OPTICAL

Broad range of lens options available to meet specific performance requirements.

ELECTRICAL SYSTEM

Thermally-protected, resetting, Class P, HPF, non-PCB, UL Listed, CSA certified ballast is standard. Energy-saving and electronic ballasts sound rated A.

Luminaire is suitable for damp locations. AWM, TFN or THHN wire used throughout, rated for required temperatures.

LISTING

UL Listed (standard). Optional: Canada CSA or C-UL. Mexico NOM.

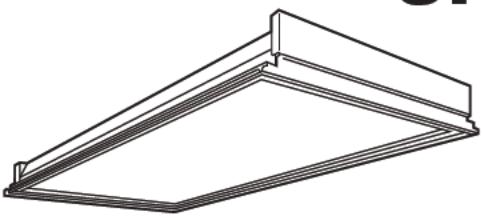
WARRANTY

Guaranteed for one year against mechanical defects in manufacture.

NOTE: Specifications subject to change without notice.

Specification Premium T8 Troffer

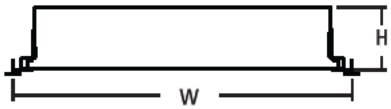
SP 2'X4'



2, 3 or 4 Lamps

Specifications

Length: 48 (1219)
Width: 24 (610)
Depth: 4-1/2 (114)
Weight: 23 lbs.



All dimensions are inches (millimeters).

ORDERING INFORMATION

For shortest lead times, configure product using **standard options (shown in bold).**
Example: 2SP G 3 32 RW A12125 MVOLT 1/3 GEB10IS

2SP

Series
2SP 2' wide

Trim type
G Grid
F Overlapping flanged
MT Modular fit-in

Number of lamps
2
3
4
6 Not included.

32

Lamp type
32 32W T8 (48")

32

Door frame
(blank) **Flush steel, white**
FN Flush aluminum, natural
FM Flush aluminum, matte black
FW Flush aluminum, white
RN Regressed aluminum, natural
RM Regressed aluminum, matte black
RW Regressed aluminum, white

Diffuser type
A12 #12 pattern acrylic
A12125 #12 pattern acrylic, 0.125" thick
A19 #19 pattern acrylic, 0.156" thick
A15 #15 pattern acrylic, 0.200" thick
PC1S 1/2" x 1/2" x 1/2" plastic cube silver louver
PC2S 1-1/2" x 1-1/2" x 1" plastic cube silver louver
PC3S 3/4" x 3/4" x 1/2" plastic cube silver louver

Voltage[1]
120
277
347
MVOLT
Others available.

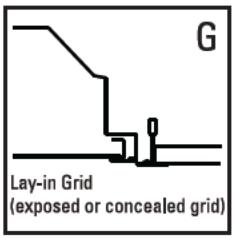
Options
1/4 One 4-lamp ballast
1/3 One 3-lamp ballast
2/3 Two 3-lamp ballasts[3]
GEB10IS Electronic ballast, ≤10% THD, Instant Start
GEB10RS Electronic ballast, ≤10% THD, Rapid Start
EL Emergency battery pack (nominal 300 lumens)
EL14 Emergency battery pack (nominal 1400 lumes)
GLR Internal fast-blow fuse[2]
GMF Internal slow-blow fuse[2]
LST Tandem-wired fixture pairs (shared ballasts)
PWS1836 6' prewire, 3/8" dia., 18-gauge, 1 circuit
LP735 Lamped; 700-series, 3500K
LP__ Lamped, specify lamp type and color
PAF Painted after fabrication (white enamel)
LASC LA school safety cable
JP Job pack without individual cartons, G trim only
CSA CSA Certified
NOM NOM Certified

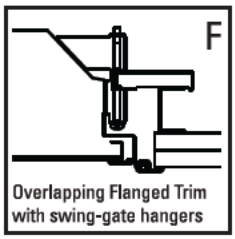
NOTES:
1 MVOLT standard for 120V and 277V applications. Some options require voltage specified.
2 Must specify voltage.
3 Six-lamp configuration only.

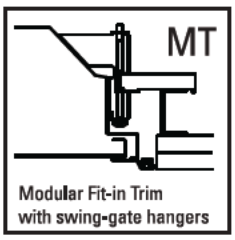
SP 2'x4' Static T8 Troffer

MOUNTING DATA

Continuous row mounting of flanged units requires CRE and CRM trim options (see Options).





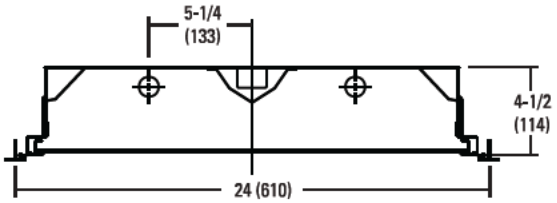


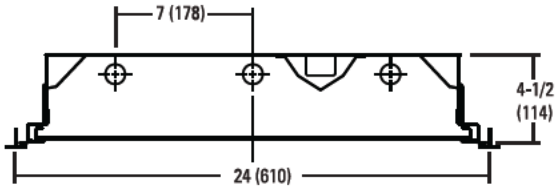
NOTES:

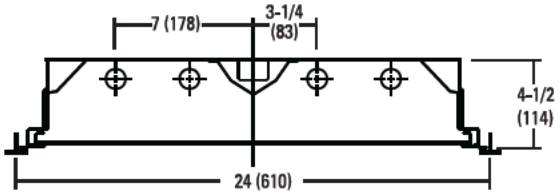
1 Recommended rough-in dimensions for F trim fixtures 24" x 48" (Tolerance is +1/4", -0"). Swing-gate range 1-5/8" to 3-3/4". Swing-gate span 23-3/8" to 26-11/16".

DIMENSIONS

All dimensions are inches (millimeters). Specifications subject to change without notice.







PHOTOMETRICS

Calculated using the zonal cavity method in accordance with IESNA LM41 procedure. Floor reflectances are 20%. Lamp configurations shown are typical. Full photometric data on these and other configurations available upon request.

2SP 3 32 A12125
Report: **LTL13408**
LUMENS PER LAMP:**2850**
Luminaire Efficiency: 81.5%

Coefficients of Utilization

pf		20%							
pc		80%			50%			30%	
	pw	70%	50%	30%	50%	30%	10%	50%	30%	10%
RCR	0	97	97	97	91	91	91	87	87	87
	1	89	86	83	80	78	76	77	75	74
	2	82	76	71	71	67	64	69	65	63
	3	75	67	61	64	59	55	61	57	54
	4	69	60	53	57	52	47	55	50	47
	5	64	54	47	51	46	41	50	45	41
	6	59	49	42	47	41	37	45	40	36
	7	55	45	38	43	37	33	42	36	32
	8	51	41	34	39	33	29	38	33	29
	9	48	37	31	36	30	26	35	30	26
	10	45	35	28	33	28	24	33	28	24

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	2217	25.9	31.8
0° - 40°	3626	42.4	52.0
0° - 60°	5947	69.6	85.4
0° - 90°	6968	81.5	100.0
90° - 180°	0	0.0	0.0
0° - 180°	6968	81.5	100.0

2SP 3 32 A12
Report: **LTL13410**
LUMENS PER LAMP:**2850**
Luminaire Efficiency: 81.9%

Coefficients of Utilization

pf		20%							
pc		80%			50%			30%	
	pw	70%	50%	30%	50%	30%	10%	50%	30%	10%
RCR	0	98	98	98	91	91	91	87	87	87
	1	90	86	83	81	78	76	78	76	74
	2	82	76	71	72	68	64	69	66	63
	3	76	67	61	64	59	55	62	57	54
	4	70	60	53	57	52	47	55	51	47
	5	64	54	47	52	46	41	50	45	41
	6	59	49	42	47	41	37	45	40	36
	7	55	45	38	43	37	33	42	36	32
	8	52	41	34	39	33	29	38	33	29
	9	48	38	31	36	30	26	35	30	26
	10	45	35	28	33	28	24	33	28	24

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	2219	25.9	31.7
0° - 40°	3621	42.3	51.7
0° - 60°	5944	69.5	84.9
0° - 90°	7005	81.9	100.0
90° - 180°	0	0.0	0.0
0° - 180°	7005	81.9	100.0

2SP 3 32 A19
Report: **LTL13472**
LUMENS PER LAMP:**2850**
Luminaire Efficiency: 76.9%

Coefficients of Utilization

pf		20%							
pc		80%			50%			30%	
	pw	70%	50%	30%	50%	30%	10%	50%	30%	10%
RCR	0	92	92	92	85	85	85	82	82	82
	1	85	82	79	77	75	73	74	73	71
	2	79	73	69	69	66	63	67	64	62
	3	73	66	61	63	58	55	60	57	54
	4	67	59	54	57	52	48	55	51	47
	5	63	54	48	51	46	43	50	46	42
	6	58	49	43	47	42	38	46	41	38
	7	54	45	39	43	38	34	42	37	34
	8	51	41	35	40	34	31	39	34	31
	9	47	38	32	37	32	28	36	31	28
	10	45	35	29	34	29	26	33	29	25

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	2413	28.2	36.7
0° - 40°	3949	46.2	60.0
0° - 60°	5947	69.6	90.4
0° - 90°	6578	76.9	100.0
90° - 180°	0	0.0	0.0
0° - 180°	6578	76.9	100.0

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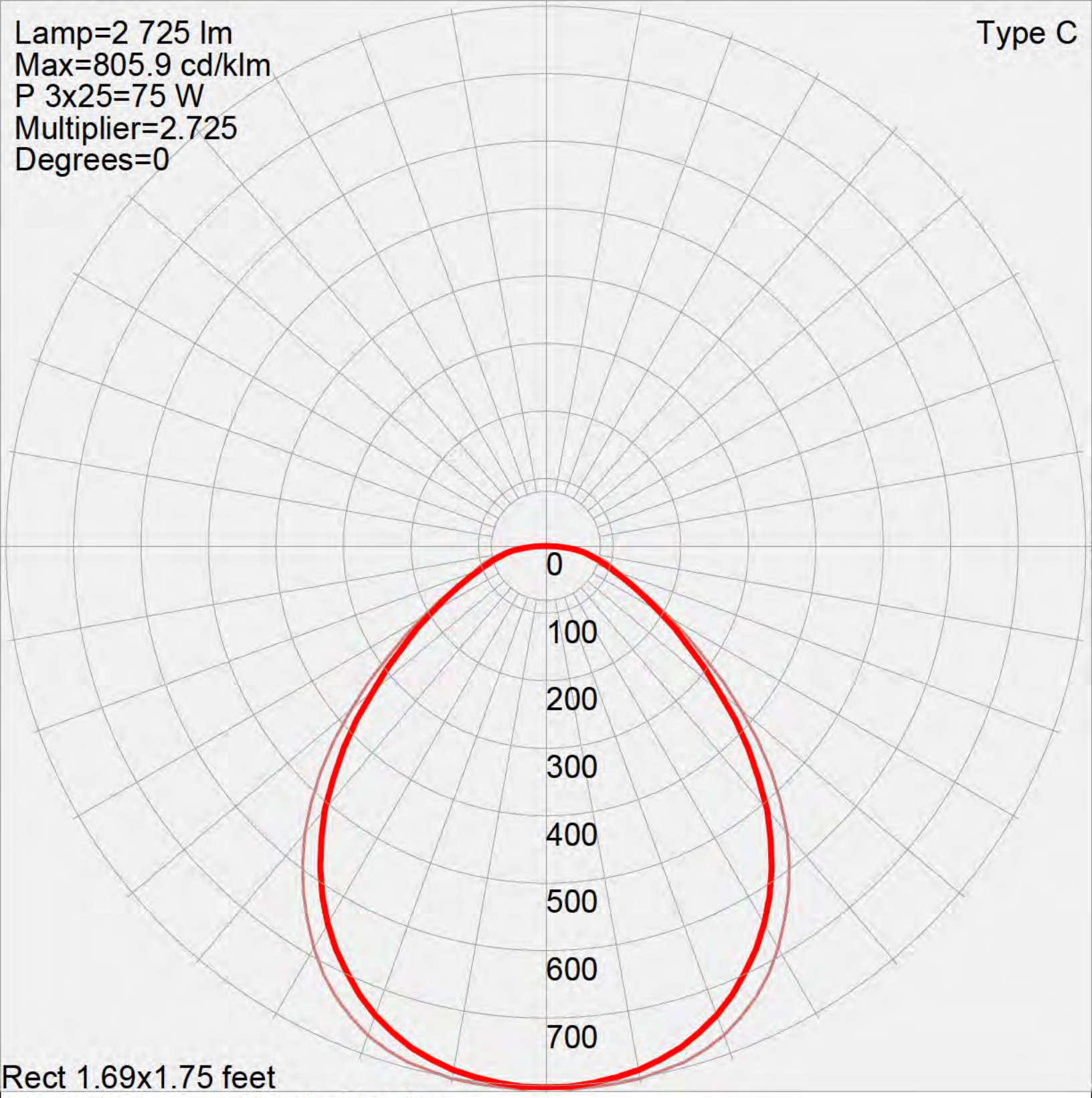
An AcuityBrands Company

Lithonia Lighting
Fluorescent
One Lithonia Way, Conyers, GA 30012
Phone: 800-858-7763
www.lithonia.com



Manufacturer: Lithonia Lighting
Luminaire catalog: 2SP G B 3U31 A12 1/3 GEB
Luminaire: Specification Premium Troffer Air Handling, 2'x4', 3 Lamp, T8 U, F
Lamp catalog: FBO31/835
Lamp: THREE (3) U-BENT T8 32 W NON-LINEAR LAMPS

LITHONIA LIGHTING®

Catalog Number	
Notes	Type

FEATURES & SPECIFICATIONS

INTENDED USE — The Avante 2x4 is a general lighting luminaire for large spaces including open offices, circulation areas, classrooms, libraries, cafeterias, airport ticketing and wait areas, and numerous other commercial applications. Static or air functions available. **Certain airborne contaminants can diminish integrity of acrylic.** Click here for Acrylic Environmental Compatibility table for suitable uses.

CONSTRUCTION — Housing is gloss white enamel on cold rolled steel. All edges hemmed or rounded.

All shieldings pivot on light traps and swing down for easy lamp access.

Molded light traps prevent light leaks between shielding and endplates.

All air and screw slot units supplied with screw-on tee bar clips. Ballast access is from below.

OPTICS — Twin matte white polyester powder paint finished reflectors provide uniform light distribution. Optional low brightness diffuse aluminum stepped reflectors available.

All diffusers control direct light distribution and glare by shielding lamps from direct view.

Metal diffuser staggered round holes (MDR) 52% open perforated metal with .075" diameter holes backed with white acrylic diffuser.

Straight blade louver (SBL) sides of perforated metal with staggered round holes and solid blade louvered center. Sides and louver backed with white acrylic diffuser.

Metal diffuser aligned mini slots (MDM) 46% open perforated metal backed with white acrylic diffuser.

Acrylic diffuser prismatic lens (ADP) extruded acrylic lens backed with white acrylic diffuser.

Metal diffuser with center slots (MDC). 52% open metal, .075" diameter holes with 1" wide solid center. Slotted with 1/2"x2" open slots. Diffuser is backed with white acrylic overlay.

ELECTRICAL — All ballasts supplied are class P, thermally protected, resetting, HPF, non-PCB, UL Listed, CSA Certified. Ballasts are sound rated A. Standard combinations conform to UL 935.

INSTALLATION — Trims available for standard 1" and 9/16" tee bar or screw slot grids. Fixtures can be row mounted end-to-end.

Drywall ceiling adapters available.

LISTINGS — UL Listed to US and Canadian safety standards. Chicago Plenum approved and NYC approved (see Options).

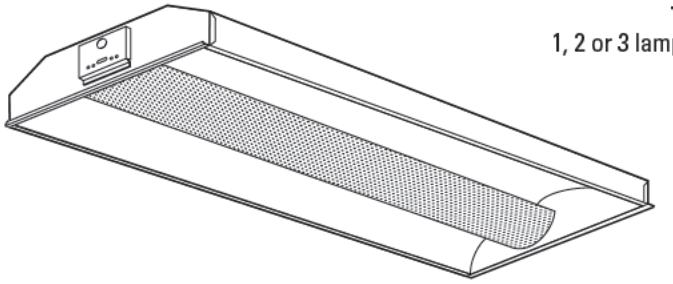
Avante is covered by one or more of the following patents: 5,988,829; 399,586; 411,641; 413,402; 2,212,513; 87,513.

NOTE: Specifications are subject to change without notice.

Avante®
Direct/Indirect Lighting

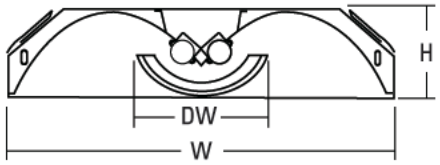
2AV 2'x4'

Linear Fluorescent
T8
1, 2 or 3 lamps



Specifications

Length: 48" (1219)
Width: 24" (602)
Diffuser Width: 8" (203)
Depth: 5-1/2" (140)



All dimensions are inches (millimeters).

ORDERING INFORMATION

For shortest lead times, configure product using **standard options (shown in bold).**
Example: 2AV G 2 32 MDR MVOLT GEB10IS

2AV — Series
2AV 2' wide

Trim type
G Grid trim
ST Screw slot

32 — Number of lamps
1
2
3
Not included.

Air function
(blank) **Static (no air function)**
A Air return/supply

32 — Lamp type
32 32W T8 (48")

Diffuser
MDR Metal diffuser, round holes
SBL Straight blade louver, round holes
MDM Metal diffuser, mini slots
ADP Acrylic diffuser, linear prismatic lens
MDC Metal diffuser, round holes with large center slots[1]
Others available.

Voltage
MVOLT[2]
347
Others available.

Options
GEB10IS Electronic ballast, ≤ 10% THD, instant start
GEB10RS Electronic ballast, ≤ 10% THD, rapid start
S5100 1.0 ballast factor, SIMPLY5™ system[4]
ALG Acrylic litter guard[1]
EL14 Emergency battery pack (nominal 1400 lumens, see Life Safety section)
GLR Internal fast-blow fuse[3]
HW Hardwire for SIMPLY5™ system; replaces RELOC® wiring
PWS1836 6' prewire, 3/8" dia., 18-gauge, 3 wires
NY3 New York City approved
CP Chicago Plenum approved
APB Air pattern control blades[1]

Reflector option
ASR Aluminum stepped reflector

Accessories

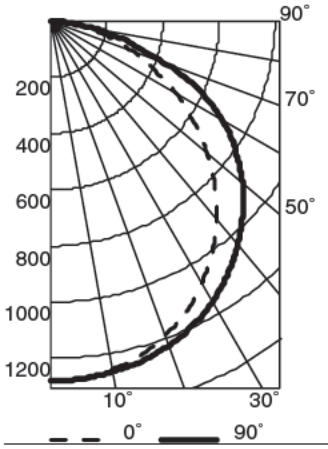
Order as separate catalog number.

DGA24 Drywall ceiling adapter, unit installation. Use G trim plus DGA accessory for fixture trim flange and fixture support in plaster or plasterboard ceilings.

NOTES:
1 Refer to options and accessories section for more detailed information.
2 MVOLT (120 - 277 volt).
3 Must specify voltage, 120 or 277.
4 SIMPLY5 system includes 13' S5SSC RELOC wiring system. Specify voltage unless HW (hardwire) or PWS1836 is ordered.

2AV 2x4 Direct/Indirect Lighting

2AV G 2 32 MDR, (2) 32W T8 lamps, 2850 lumens per lamp, s/m 1.2 (along) 1.3 (across), test no. LTL 10121



Coefficients of Utilization

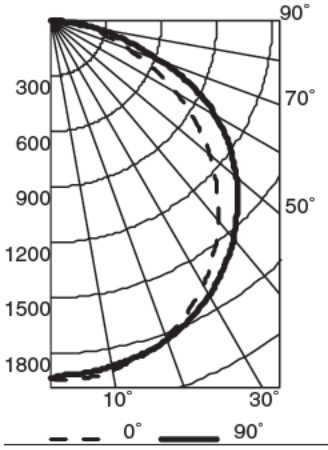
CP Summary 0°	CP Summary 90	RCR	pf 80% 70%	pf 80% 50%	pf 80% 30%	pc 70% 50%	pc 70% 30%	pc 70% 10%	20% 50% 50%	20% 50% 30%	20% 50% 10%
0° 1280	1280	0	81	81	81	79	79	79	76	76	76
5° 1279	1277	1	74	71	68	69	66	64	66	64	62
15° 1233	1253	2	67	61	57	60	56	52	58	54	51
25° 1141	1194	3	61	54	48	53	47	43	50	46	42
35° 1005	1101	4	56	47	41	46	41	36	45	40	36
45° 828	969	5	51	42	36	41	36	31	40	35	31
55° 623	806	6	47	38	32	37	31	27	36	31	27
65° 406	590	7	44	34	28	34	28	24	33	27	24
75° 211	291	8	41	31	25	31	25	21	30	25	21
85° 46	64	9	38	29	23	28	23	19	27	22	19
90 0	0	10	36	26	21	26	21	17	25	21	17

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1010	17.7	26.0
0° - 40°	1669	29.3	43.0
0° - 60°	3015	52.9	77.7
0° - 90°	3882	68.1	100.0
90° - 180°	0	0.0	0.0
0° - 180°	3882	68.1	100.0

Efficiency: 68.1%

2AV G 3 32 MDR, (3) 32W T8 lamps, 2850 lumens per lamp, s/m 1.3 (along) 1.3 (across), test no. LTL 10155



Coefficients of Utilization

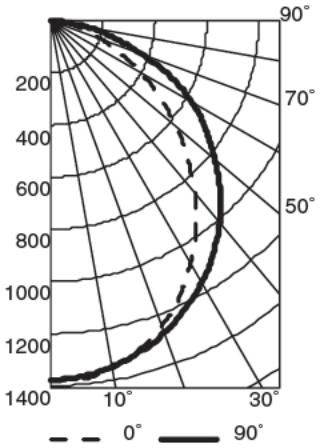
CP Summary 0°	CP Summary 90	RCR	pf 80% 70%	pf 80% 50%	pf 80% 30%	pc 70% 50%	pc 70% 30%	pc 70% 10%	20% 50% 50%	20% 50% 30%	20% 50% 10%
0° 1934	1934	0	81	81	81	79	79	79	76	76	76
5° 1941	1913	1	74	71	68	69	67	64	66	64	62
15° 1880	1871	2	67	62	57	60	56	52	58	54	51
25° 1747	1781	3	61	54	48	53	47	43	51	46	42
35° 1539	1632	4	56	48	41	47	41	37	45	40	36
45° 1275	1435	5	51	42	36	42	36	31	40	35	31
55° 956	1179	6	47	38	32	37	32	27	36	31	27
65° 611	849	7	44	34	28	34	28	24	33	28	24
75° 298	431	8	41	31	26	31	25	21	30	25	21
85° 66	90	9	38	29	23	28	23	19	28	23	19
90 0	0	10	36	27	21	26	21	17	26	21	17

Zonal Lumen Summary

Zone	Lumens	% Lamp	% Fixture
0° - 30°	1529	17.9	26.2
0° - 40°	2527	29.6	43.3
0° - 60°	4552	53.2	78.0
0° - 90°	5837	68.3	100.0
90° - 180°	0	0.0	0.0
0° - 180°	5837	68.3	100.0

Efficiency: 68.3%

2AV G 3 32 MDR ASR, (3) 32W T8 lamps, 2850 lumens per lamp, s/m 1.2 (along) 1.3 (across), test no. LTL 10120



Coefficients of Utilization

CP Summary 0°	CP Summary 90	RCR	pf 80% 70%	pf 80% 50%	pf 80% 30%	pc 70% 50%	pc 70% 30%	pc 70% 10%	20% 50% 50%	20% 50% 30%	20% 50% 10%
0° 1377	1377	0	50	50	50	49	49	49	47	47	47
5° 1380	1370	1	46	44	42	43	41	40	41	40	39
15° 1309	1317	2	42	39	36	38	35	33	36	34	32
25° 1171	1223	3	38	34	31	33	30	28	32	29	27
35° 974	1090	4	35	30	26	30	26	24	29	26	23
45° 745	920	5	32	27	23	26	23	20	26	23	20
55° 511	728	6	30	24	21	24	20	18	23	20	18
65° 297	514	7	28	22	18	22	18	16	21	18	16
75° 134	254	8	26	20	17	20	17	14	19	16	14
85° 33	54	9	24	19	15	18	15	13	18	15	13
90 0	0	10	23	17	14	17	14	12	16	14	12

Zonal Lumen Summary

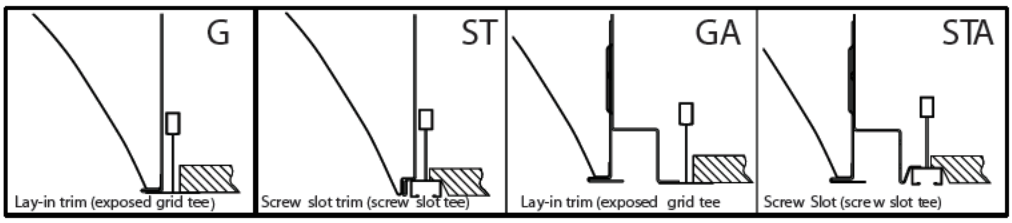
Zone	Lumens	% Lamp	% Fixture
0° - 30°	1051	12.3	29.2
0° - 40°	1697	19.9	47.1
0° - 60°	2907	34.0	80.6
0° - 90°	3606	42.2	100.0
90° - 180°	0	0.0	0.0
0° - 180°	3606	42.2	100.0

Efficiency: 42.2%

For additional photometric information, visit our website at 'lithonia.com'.

MOUNTING DATA

Ceiling Type	Appropriate Trim Type
Exposed grid tee (1' and 9/16")	G
Concealed grid tee	G
Screw slot	ST
Plaster or plasterboard	G*

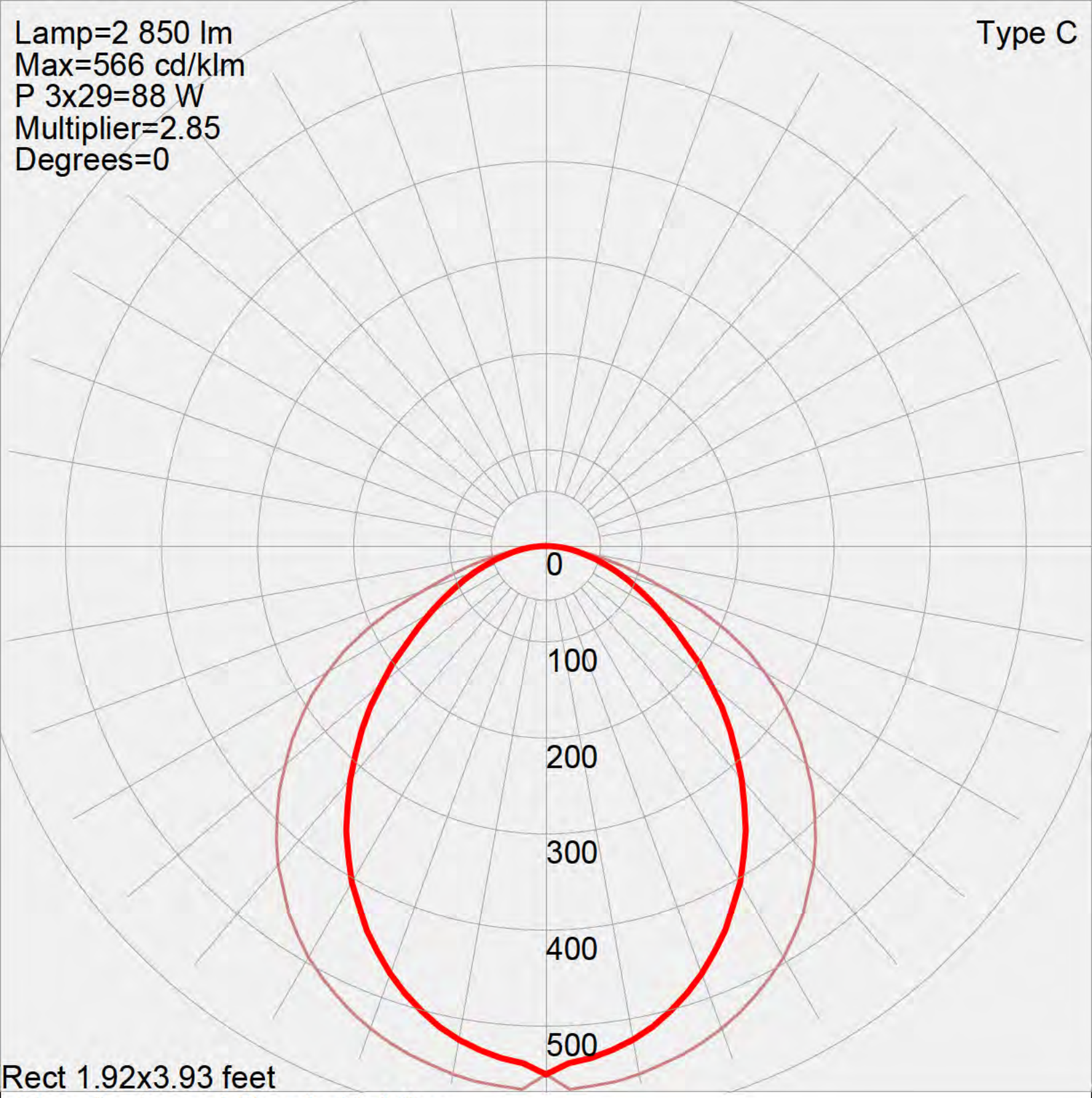


*DGA accessory available to provide ceiling trim flange and fixture support for plaster or plasterboard ceiling. Recommended rough-in dimensions for DGA installation is 24-3/4" x 48-3/4" (Tolerance is +1/8", -0").

LITHONIA LIGHTING®
An AcuityBrands Company

Lithonia Lighting
Fluorescent
One Lithonia Way, Conyers, GA 30012
Phone: 800-858-7763 Fax: 770-929-8789
www.lithonia.com

Sheet #: 2AV 2X4 T8



Manufacturer: Lithonia Lighting
Luminaire catalog: 2AV G 3 32 SBL 1/3 ASR
Luminaire: 2X4 AVante, recessed, 3 lamp T8 32 watt, Straight Blade Louver
Lamp catalog: F32T8
Lamp: THREE 32-WATT T8 LINEAR FLUORESCENT.

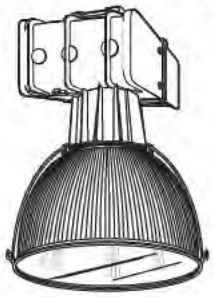
LITHONIA LIGHTING®

Catalog Number	
Notes	Type

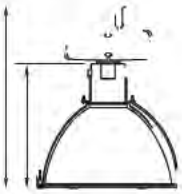
DURA BAY

Enclosed Glass High Bay Industrial Lighting

TPGE PG21GLE



Metal Halide
350W - 1000W
High Pressure Sodium
400W - 1000W



Specifications

Height: 28-1/2 (72.4)*
Reflector Height: 19-1/2 (49.5)
Width: 22 (55.9)
Weight: 55 lbs (25 kg)

All dimensions are inches (centimeters) unless otherwise specified.

FEATURES & SPECIFICATIONS

INTENDED USE — Use in high mounting heights that require high efficiencies, horizontal illumination, premium contrast control, total enclosure of lamp, and higher thermal performance. Ideal for manufacturing, warehousing, gymnasiums (with wireguard) and retail areas.

ATTRIBUTES — Completely enclosed borosilicate glass reflector inhibits entrance of dust and air-borne particulate while providing maximum durability and cleanability. Designed for optimum efficiencies and a balance of uplight and downward distributions. Electrical components are horizontally opposed in ballast housing to create a cooler running fixture.

CONSTRUCTION — Housing – Vertically seamed, heavy-duty, die-cast aluminum. Ballast and electrical components are heat-sinked and horizontally opposed. Integral splice box mounting flange ensures structural integrity.

FINISH — Electrostatically applied white polyester powder paint.

OPTICAL SYSTEM — 21" diameter heat-resistant borosilicate glass reflector/refractor. Three plated steel support retain the glass reflector/refractor between a cast aluminum upper enclosure and a corrosion-resistant steel flange. Clear tempered glass lens is fully gasketed to inhibit the entrance of ambient contaminants. Lens assembly is hinged and latched to allow easy maintenance. Meets UL lamp rupture containment specifications.

ELECTRICAL SYSTEM — Ballast: All ballasts are 100% factory tested. HPS: Constant wattage autotransformer; MH: Super CWA Pulse Start ballasts, 88% efficient and EISA legislation compliant, are required for 250-450W (must order SCWA option) for US shipments only. CSA, NOM or INTL required for probe start shipments outside the US. 1000W is Constant Wattage Autotransformer.

Socket – Porcelain, vertically oriented, mogul-base socket with copper alloy, nickel-plated screw shell and center contact. UL listed 1500W, 600V and 5KV pulse rated.

INSTALLATION — Ballast Housing – Removable cast aluminum pendant splice box slides on integral die-cast aluminum housing mounting flange and mounts to 3/4" pendant conduit prior to ballast housing installation. Matching wire access cover accepts RELOC® modular wiring. Complete assembly meets or exceeds UL 50-pound pull test.

Optical Mounting – Six 8-32 zinc-plated, tri-lobular, thread-rolling screws are arranged concentrically around the lamp socket. Cast upper enclosure is gasketed and provided with matching keyhole slot pattern for vibration-resistant mounting.

LISTING — UL Listed -30°C to 55°C ambient operations and damp locations. 750W, 875W and 1000W pulse start -30°C to 40°C. UL Listed to US and Canadian safety standards (see Options). NOM Certified (see Options).

ORDERING INFORMATION

Example: **TPGE 1000M PG21GLE C21 120**

Choose the boldface catalog nomenclature that best suits your needs and write it on the appropriate line.
Order accessories as separate catalog numbers (shipped separately).

TPGE **PG21GLE** **C21** **120**

Series

TPGE

Wattage/lamp

High pressure sodium

400S **1000S**

Metal halide

350M **450M** **875M**
400M **750M** **1000M**

Metal halide - Title 20[13]

750M **875M** **1000M**

Reflector

PG21GLE

Distribution

C21 Concentrating (400S, 1000S and 1000M)
N21 Narrow (350M to 875M only)

Voltage

120
208[1,2]
240[1,2,3]
277
347
480[1,2]
TB[4]

Ballast[6]

Pulse Start

NOTE: For shipments to U.S. Territories, **SCWA** must be specified to comply with EISA.

SCWA Super constant wattage autotransformer
RLB Regulated lag ballast
SCWI Isolated SCWA[5]
(blank) Standard magnetic ballast[5]
CWI Constant wattage isolated[5]
MRB Magnetic regulator ballast

Options

Shipped installed in fixture

SF Single fuse (120, 277, 347V)[7]
DF Double fuse (208, 240, 480V)[7]
EC Emergency circuit[8,9]
QRS Quartz restrike system[8,9]
QRSTD QRS time delay[8,9]
HA 65°C ambient operation[14]
CR Corrosion-resistant finish
TOB Through-wire outlet box
LCPP Loop, cord, plug requires TPH, PPH[7]
LC3P Loop, 3' cord, 15A NEMA twistlock plug[7,10]
HC3P Hook, 3' cord, 15A NEMA twistlock plug[7,10]
LOCS Loop, 5' white cord, RELOC OCS[7,11]
HOCS Hook, 5' white cord, RELOC OCS[7,11]
LOCU Loop, 5' white cord, RELOC OCU[6,7,10,11,12]
HOCU Hook, 5' white cord, RELOC OCU[6,7,10,11,12]
TR Remote ballast
RC3NP TR with prewired 3' cord[7]
ENC Encapsulated CWA ballast (120, 277, 347V)
KW1 KiloWatch 120V control relay[6]
KW4 KiloWatch 277V control relay[6]
KW150 KiloWatch 120V control relay-50% light output[6]
KW450 KiloWatch 277V control relay-50% light output[6]
KW1S KiloWatch II with integral sensor
CSA Listed and labeled to comply with Canadian Standards
NOM NOM Certified (Consult factory)

Accessories

Order as separate catalog numbers.

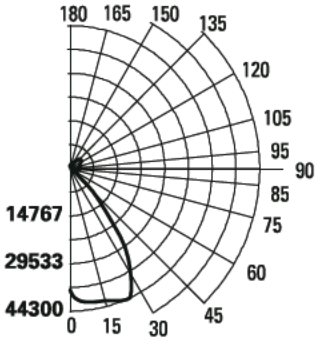
HKF Fixture hook female
LPF Fixture loop female
SCK 60" safety chain kit
TMB Twin mounting bar (consult factory)
HKM Fixture hook male
HKMG Grommeted fixture hook male
LPM Fixture loop male
LPMG Grommeted fixture loop male
TPH Throughwire power hook
TPHKR Through-wire power hook for KiloWatch System
PPH Pendant power hook

NOTES:

1 Requires CWI or RLB option in Canada for MH. Available for 175-450W.
2 Requires CWI or MRB option in Canada for HPS. Available for 70-400W.
3 220V and 240V 50Hz and 60Hz ballasts available for use with U.S. metal halide lamps.
4 Optional multi-tap ballast (120, 208, 240, 277V). For voltage specific options specify tap position (TB1=120V, TB2=208V, TB3=240V, TB4=277V).
5 Available for shipments outside of U.S. only.
6 For specific ordering information, see Product Selection Guide.
7 Must specify voltage or tap position.
8 Lamp not included.
9 See Product Selection Guide (QRS Lamp Wattage Table) for maximum lamp wattage.
10 20A standard 480V.
11 May be ordered with 10', 15', and 20' cords. For black cord, specify **BK** (i.e. **HOCSBK**).
12 When using RELOC with KiloWatch, LOCU or HOCU option must be used with TAP1KW, TAP3KW or TAP13KW. Consult factory for 208, 240, 480V.
13 These wattages comply with California Title 20.
14 Not available with 750M, 875M or 1000M pulse start.

TPGE Metal Halide, High Pressure Sodium, Enclosed Glass High Bay

TPGE 1000M PG21GLE C21 (concentrating), 1000W clear Metal Halide lamp, 1.3 s/mh, 110000 rated lumens, test no. 98120504



Coefficient of utilization

ρf		80%			20%			30%		10%			
ρc					50%								
ρw	70%	50%	30%	10%	30%	10%	50%	30%	10%	50%	30%	10%	0%
0	97	97	97	97	84	84	84	77	77	77	70	70	70	67
1	89	86	82	80	75	73	71	69	67	65	63	62	60	57
2	83	77	72	68	68	65	62	63	60	58	58	56	54	51
3	77	70	64	60	62	58	55	57	54	51	53	51	48	46
4	72	63	57	53	57	52	49	53	49	46	49	46	44	42
5	67	58	52	47	52	48	44	49	45	42	46	42	40	38
6	63	53	47	42	48	43	40	45	41	38	42	39	36	34
7	59	49	43	38	45	40	36	42	38	35	39	36	33	32
8	55	45	39	35	41	37	33	39	35	32	37	33	31	29
9	52	42	36	32	39	34	30	36	32	29	34	31	28	27
10	49	39	33	29	36	31	28	34	30	27	32	29	26	25

Average luminance data

Angle	Footlamberts
55	3858
65	3876
75	5127
85	7151

Output data

Zone	Lumens	%lamp
0 - 30	36479	33.2
0 - 40	55266	50.2
0 - 60	65283	59.3
0 - 90	73737	67.0
90 - 180	20220	18.4
0 - 180	93957	*85.4

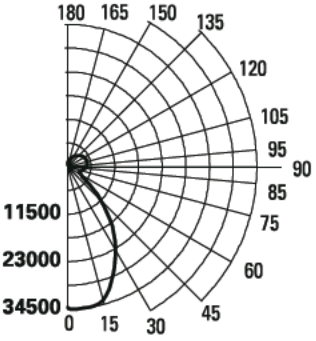
*** Fixture efficiency**

Distribution data

Angle	cp.	Lumens
0	37761	0
5	41395	3951
15	42469	12039
25	44265	20489
35	29906	18787
45	10236	7927
55	2330	2090
65	2185	2169
75	2630	2782
85	3210	3502
90	3372	0
95	3340	3644
105	3211	3397
115	3564	3538
125	4387	3936
135	3963	3069
145	2443	1535
155	1437	665
165	1318	374
175	663	63
180	336	0

Spacing criterion: 1.2
Spacing to mounting height: 1.3

TPGE 1000M PG21GLE C21 (concentrating), 1000W coated Metal Halide lamp, 1.1 s/mh, 107000 rated lumens, test no. 98120505



Coefficient of utilization

ρf		80%			20%			30%		10%			
ρc					50%								
ρw	70%	50%	30%	10%	30%	10%	50%	30%	10%	50%	30%	10%	0%
0	92	92	92	92	78	78	78	70	70	70	62	62	62	58
1	84	80	76	73	68	65	63	60	58	57	54	52	51	48
2	77	70	65	61	60	56	53	54	51	49	48	46	44	41
3	71	63	57	52	54	50	46	49	45	42	44	41	39	36
4	66	57	50	45	49	44	41	44	41	38	40	37	35	32
5	61	51	45	40	45	40	36	41	37	34	37	34	31	29
6	57	47	40	35	41	36	32	37	33	30	34	31	28	26
7	53	43	36	32	38	33	29	34	30	27	32	28	26	24
8	49	39	33	29	35	30	26	32	28	25	29	26	23	22
9	46	36	30	26	32	27	24	30	26	23	27	24	21	20
10	43	34	28	24	30	25	22	28	24	21	26	22	20	18

Average luminance data

Angle	Footlamberts
55	7943
65	5622
75	7339
85	9777

Output data

Zone	Lumens	%lamp
0 - 30	25289	23.6
0 - 40	37693	35.2
0 - 60	50805	47.5
0 - 90	62722	58.6
90 - 180	25686	24.0
0 - 180	88408	*82.6

*** Fixture efficiency**

Distribution data

Angle	cp.	Lumens
0	34154	0
5	34532	3296
15	33523	9503
25	26984	12490
35	19745	12404
45	11374	8809
55	4797	4304
65	3169	3146
75	3765	3983
85	4389	4789
90	4600	0
95	4770	5204
105	4910	5194
115	4766	4731
125	4421	3966
135	3853	2984
145	3136	1970
155	2377	1100
165	1617	458
175	811	77
180	409	0

Spacing criterion: 1.1
Spacing to mounting height: 1.1

Electrical Characteristics

1000 CWA-HPF wattage/ballast, 1000 input watts 90+ power factor, ±10% =±10% regulation line V=lamp wattage.

Wattage/ballast	Primary voltage	Line current (amps) start/operating	Primary dropout voltage	Input watts	Power factor (%)	Regulation Line V = Lamp watts
	120	5.70/9.20	80			
	208	3.40/5.30	140			
1000 CWA	240	2.90/4.60	160	1080	90+	±10% = ±10%
Peak-lead	277	2.50/4.00	160			
	480	1.50/2.30	320			

Tested to current IES and NEMA standards under stabilized laboratory conditions. Various operating factors can cause differences between laboratory data and actual field measurements. Dimensions and specifications on this sheet are based on the most current available data and are subject to change without notice.

Mounting Height Correction Factor

(Multiply the fc level by the correction factor)

25 ft.= 1.44
35 ft.= .73
40 ft.= .56

$$\left(\frac{\text{Existing Mounting Height}}{\text{New Mounting Height}}\right)^2 = \text{Correction Factor}$$

Energy (Calculated in accordance with NEMA Standard LE-5)

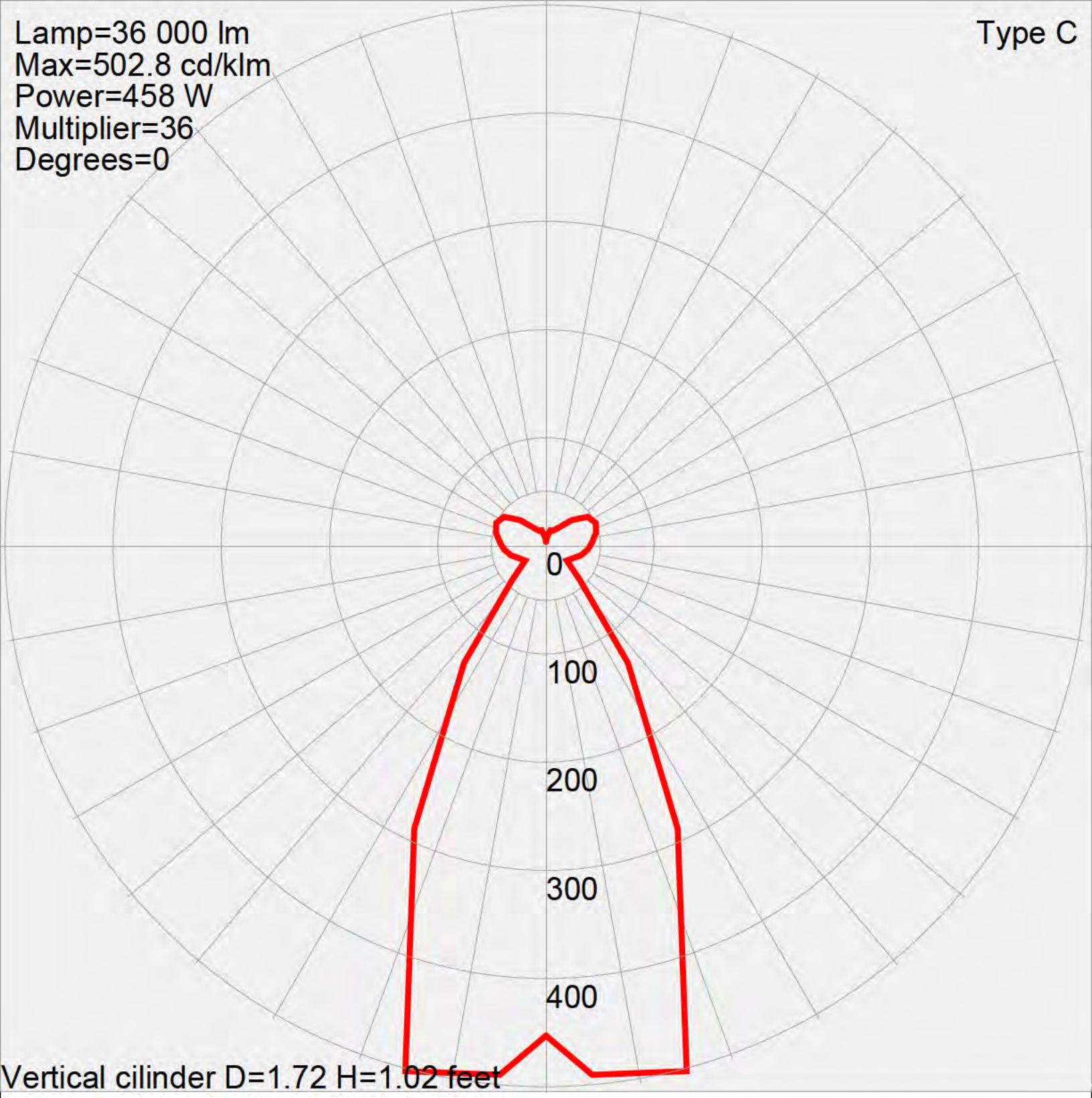
LERHID	ANNUAL* ENERGY COST	LAMP DESCRIPTION	LAMP LUMENS	BALLAST FACTOR	WATTS
87	$2.76	M1000/U	110,000	1	1080

* comparative yearly lighting energy cost per 1000 lumens.

LITHONIA LIGHTING®
An AcuityBrands Company

Sheet #: TPGE-PG21GLE

Lithonia Lighting
Industrial
One Lithonia Way, Conyers, GA 30012
Phone: 770-922-9000 Fax: 770-602-1531
www.lithonia.com



Manufacturer: Lithonia Lighting
Luminaire catalog: TPGE 400M PG21GLE N (COATED) (SC=0.9)
Luminaire: ENCLOSED GLASS OPTICAL, 400 MH W/ NARROW DISTRIBU
Lamp catalog: MH400/C/U
Lamp: ONE 400-WATT COATED BT-37 METAL HALIDE, VERTICAL BASE-

COOPER LIGHTING - LUMARK®

DESCRIPTION

The MPACT Quarter Sphere cutoff wa um na re makes an dea comp ement to s te des gn U L L sted and CSA Ce t f ed for wet ocat ons n down mount app cat ons and damp ocat ons n up mounted app cat ons

Rugged construct on and fu cutoff c ass f ed opt cs prov de facade and secur ty ght ng for ght restr cted zones surround ng schoo s, off ce comp exes, apartments, and recreat ona fac t es

Catalog #		Type
Project		
Comments		Date
Prepared by		

SPECIFICATION FEATURES

A ... Housing
The hous ng s a two p ece des gn of d e cast a um num for prec se contro of to erances and repeatab ty

B ... Mounting
Gasketed and z nc p ated r g d stee mount ng attachment f ts d rect y to 4 J Box or wa w th Hook N Lock mechan sm for qu ck nsta at on Secured w th two (2) capt ve corros on res stant b ack ox de coated a en head set screws concea ed but access b e from bottom

C ... Optical Modules
A opt ca modu es ut ze h gh performance 95% ref ect ve sheet Strong Type opt ca modu e s standard

D ... Ballast
H D um na res supp ed w th h gh power factor ba ast w th C ass H nsu at on M n mum start ng temperatures are 40°C (40°F) for HPS and 30°C (22°F) for MH Compact F uorescent um na res feature e ectron c un versa 120 277V h gh eff c ent 50/60Hz ba ast w th 18°C (0°F) m n mum start ng

E ... Door
D e cast door features, 1/8 heat and mpact res stant c ear tempered g ass ens mounted w th nterna p ated stee c ps and sea ed w th EPDM gasket ng H nged door secured n p ace v a two (2) capt ve fasteners

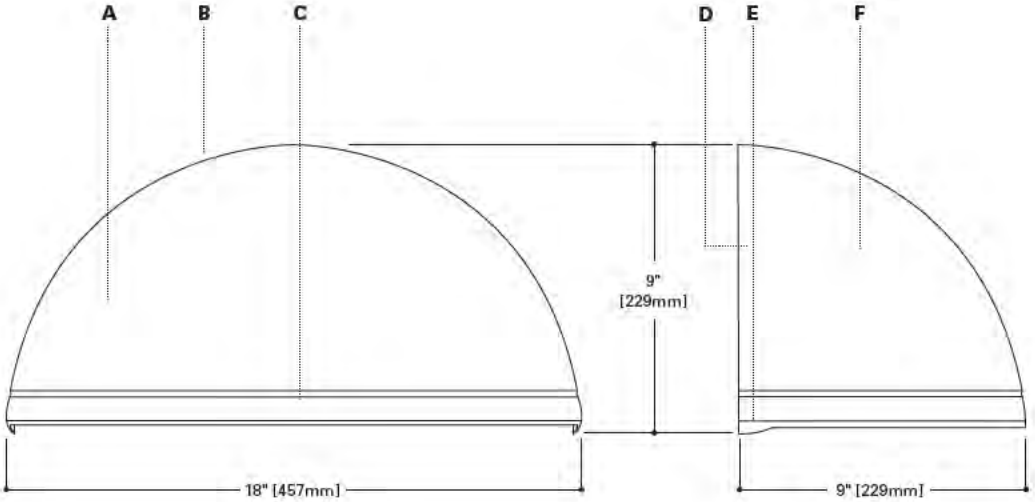
F ... Finish
Durab e po yester powder coat f n sh Standard co or s bronze Opt ona wh te and b ack co ors ava ab e Other f n sh co ors ava ab e Consu t your Cooper L ght ng Representat ve concern ng spec a co or requ rements

IP
IMPACT
QUARTER SPHERE

50 - 175W
High Pressure Sodium
Metal Halide
26 - 52W
Compact Fluorescent

FULL CUTOFF
WALL MOUNT LUMINAIRE

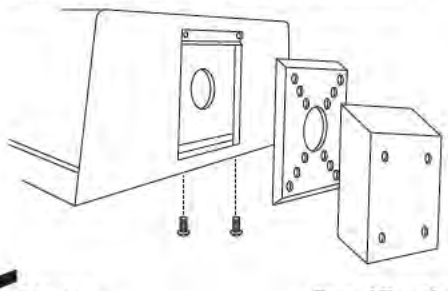
iMPACT™
Cutoff Wall Luminaires



DARK SKY COMPLIANT FCO Full Cutoff
In downlight applications only.

HOOK-N-LOCK MOUNTING

(Mounting attachment included. J-Box not included.)



TECHNICAL DATA

25°C Maximum Ambient Temperature
External Supply Wiring 90°C Minimum
Down Mounted—Wet Location
Up Mounted—Damp Location

ENERGY DATA

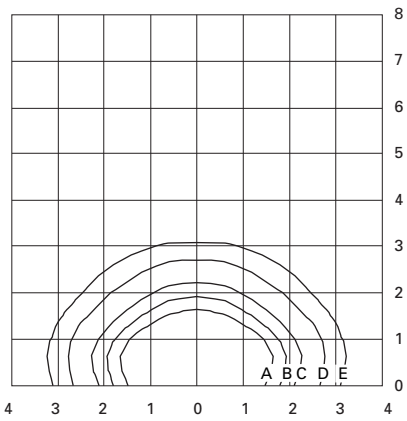
High Reactance Ballast Input Watts
50W HPS HPF (66 Watts)
50W MH HPF (72 Watts)
70W HPS HPF (91 Watts)
70W MH HPF (90 Watts)
100W HPS HPF (130 Watts)
100W MH HPF (129 Watts)
150W HPS HPF (190 Watts)
150W MH HPF (185 Watts)

CWA Ballast Input Watts
175W MH HPF (210 Watts)

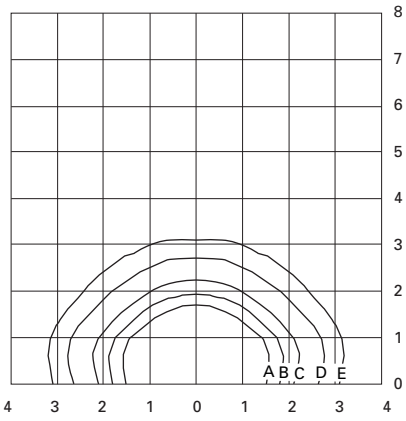
Electronic Ballast Input Watts
26W PL HPF (29 Watts)
32W PL HPF (36 Watts)
42W PL HPF (46 Watts)
52W PL HPF (55 Watts)

SHIPPING DATA

Approximate Net Weight:
18 lbs. (8 kgs.)



MHIP-S-175-MT-LL
175-Watt MH
14,000-Lumen Clear Lamp



HPIP-S-150-MT-LL
150-Watt HPS
16,000-Lumen Clear Lamp

Footcandle Table

Select mounting height and read across for footcandle values of each isofootcandle line. Distance in units of mounting height.

Mounting Height	Footcandle Values for Isofootcandle Lines				
	A	B	C	D	E
10'	4.50	2.25	1.13	0.45	0.23
15'	2.00	1.00	0.50	0.20	0.10
20'	1.12	0.56	0.28	0.11	0.06

ORDERING INFORMATION

Sample Number: MHIP-S-150-MT-LL

Lamp Type
HP= High Pressure Sodium
MH= Metal Halide
PL= Compact Fluorescent

Series
IP= IMPACT

Fixture Shape
S= Quarter Sphere

Lamp Wattage
HID [1]
50= 50W[2]
70= 70W[3]
100= 100W
150= 150W
175= 175W[4]
Compact Fluorescent [5]
26/32/42= 26, 32, or 42W
52= (2) 26W
64= (2) 32W
84= (2) 42W

Voltage [6]
120V= 120V
208V= 208V
240V= 240V
277V= 277V
347V= 347V
480V= 480V
DT= Dual-Tap[7]
MT= Multi-Tap, [8] wired 277V
TT= Triple-Tap, [9] wired 347V
E= Electronic (200-277V) [10]

Options [11]
Q= Quartz Restrike T4 Lamp[12, 13, 14, 15]
EM= Emergency Quartz Restrike T4 Lamp w/ Time Delay Relay[12, 13, 14, 15]
EMI40-XXX= CFL Cold Weather Emergency Battery Pack (Must Specify 120V or 277V)[16, 17]
CF/EM-XXX= Emergency Battery Pack (Must Specify 120V or 277V)[16, 18]
QMR= Quartz Restrike MR16 Lamp[14, 15, 19]
EMMR= Emergency Quartz Restrike MR16 Lamp w/ Time Delay Relay[14, 15, 19]
EM/SC= Emergency Separate Circuit T4 Lamp[13, 15, 20]
EM/SC/MR= Emergency Separate Circuit MR16 Lamp[21, 19, 20]
EM/SC/12V= Emergency Separate Circuit (12V)[21, 22]
F1= Single Fuse (120, 277 or 347V only)
F2= Double Fuse (208, 240 or 480V only)
LL= Lamp Included (Must Specify Wattage on PL)[23]
TR= Tamper Resistant Screw (Door and Mounting Plate)
PE= Internal Photocontrol (Specify Voltage)

Standard Color
__= Bronze (Standard)
WH= White
BK= Black

Notes:
1. All HID lamps are medium base.
2. Available in 120V, 277V and Dual Tap.
3. Not available in 480V.
4. Metal Halide only.
5. 52W is (2) 26W quad tube lamps.32,42,64, 84W use compact triple tube CF lamps.
6. Products also available in non US voltages and 50HZ for international markets.
7. Dual Tap ballast is 120/277V wired 277V.
8. Multi Tap ballast 120/208/240/277V wired 277V.
9. Triple Tap ballast 120/277/347V wired 347V.
10. Supplied with 120V through 277V 50/60Hz for Compact Fluorescent.
11. Add as suffix in the order shown.
12. The power might need to cycle and allow HID lamp to cool in warm climates. Available up to 175W HID.
13. For use with T4 double contact bayonet base, 100W maximum, 120V halogen lamp by others.
14. Lamps wired to quartz restrike relay.
15. Not available with CFL.
16. Battery pack will operate up to 42W CFL lamp for 90 minutes.
17. CF lamps only, rated for minimum temperature of 0°F (18°C), (1) 42W CFL maximum, heater rated for 300W with thermostat control.
18. CF lamps only, rated for minimum temperature of 32°F (0°C), (1) 42W CFL maximum.
19. For use with MR16, GU10 base, 50W maximum, 120V halogen lamp by others.
20. Leads run out back for connection to auxiliary 120V circuit.
21. Not Available with 52, 64, 84 CFL.
22. Supplied with 12V Bi pin socket for connection to emergency battery pack (supplied by others). For use with MR16, GU5.3 base, 35W maximum, 12V halogen lamp by others.
23. Lamp is shipped separate from luminaire. Lamp is Cooper designated product based on luminaire requirements. Specified lamps must be ordered as a separate line item.

STOCK SAMPLE NUMBER (Lamp Included)

SAMPLE NUMBER: MHIS17

MH	IS	
Lamp Type **MH**=Metal Halide	**Fixture Type** * **IS**=IMPACT Quarter Sphere	**Lamp Wattage** **10**=100W **17**=175W

NOTES: Options not available with stock products. Order Accessories as separate items for field installation. Refer to standard ordering information to add options and accessories.
* Painted bronze. Supplied with lamp and Multi-Tap HPF ballast wired 277V.