LEED™ Application Guide

Intelli-Hood®
Kitchen Ventilation Controls

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LEED Application Guide for Melink Intelli-Hood® Controls

Introduction

The Leadership in Energy and Environmental Design (LEED™) Green Building Rating System™ is the premier guide for the design, construction, and operation of green buildings. LEED™ promotes sustainable design by taking into account the performance of the whole-building in five areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

When applying for LEED™ Certification, credits are awarded in these categories, and the total determines the level of building certification. The categories are as follows: Certified, Silver, Gold, and Platinum. The LEED Application requires detailed documentation for each point-eligible building component.

This document is intended to serve as a guide for the design professional who is considering or pursuing LEED™ Certification at any level and wishes to evaluate the potential contributions of the Melink Intelli-Hood Controls towards that goal. This guide provides the explanations, energy analyses and charts to help you and your team obtain up to two credits.

It is important to remember that many products can contribute credits towards LEED™ Certification, but the building performance is a summary of all of the products involved, and therefore no one product can guarantee LEED™ credits.

The eligible credits for the Melink Intelli-Hood Controls are as follows:

Innovation and Design Processes
ID Credit 1 – Innovation in Design

Energy & Atmosphere
EA Credit 1 – Optimize Energy Performance

ID Credit 1 – Innovation in Design

According to the LEED Rating System, the Innovation in Design Credit 1 is intended to provide the opportunity for projects to earn points for innovative performance in a category not specifically addressed by LEED. Innovative performance credits are awarded for design strategies which result in measurable environmental benefits.

The Melink Intelli-Hood Controls are an innovative solution to the typical kitchen ventilation system that operates at full capacity all day and sometimes all night long. However, since the reviewers at the U.S. Green Building Council are not interested in awarding credits for specific manufacturers' products, but are interested in awarding credits for unique design approaches and technologies, the following text or a similar version is suggested in the LEED application:

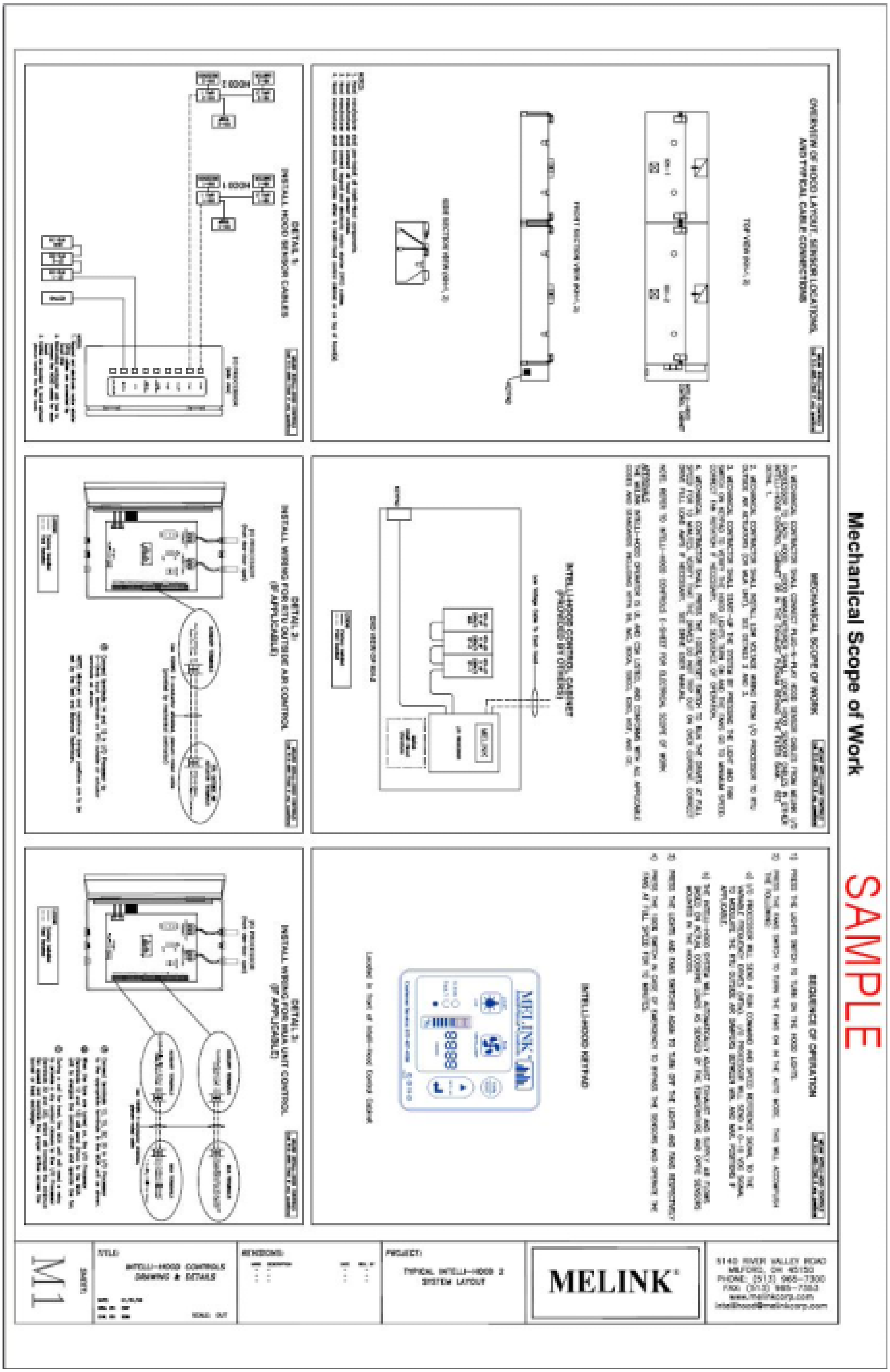
This project has a kitchen ventilation system and the typical sequence of operation for the vast majority of hoods across the U.S. and the world is to turn them on in the morning and let them operate at full capacity all day long. The long-held reasoning behind this all-or-nothing control strategy is 'you never know when someone is going to turn on a grill or fryer and do some cooking, and so you better leave the fans running all the time.'

Unfortunately this practice is very energy wasteful during idle, non-cooking periods. Not only is exhaust and make-up air fan energy wasted, but more importantly conditioned air is wasted. This is akin to heating or air conditioning one's home with the windows wide open – and moreover mounting fans on the window sills to push cold/hot air into and out of the home. The furnace or A/C unit would have to run continuously to try and keep the thermostat satisfied and it would also be very uncomfortable. Yet this is standard practice in the commercial kitchen ventilation industry.

In order to address this problem, the hoods on this project have been designed with variable-speed controls that reduce fan speed during idle, non-cooking periods. This is accomplished with temperature and optic sensors to detect the heat and smoke load inside the hoods, a micro-processor to adjust various parameters for the specific application, and variable-frequency drives to vary the speed of the exhaust and make-up fans.

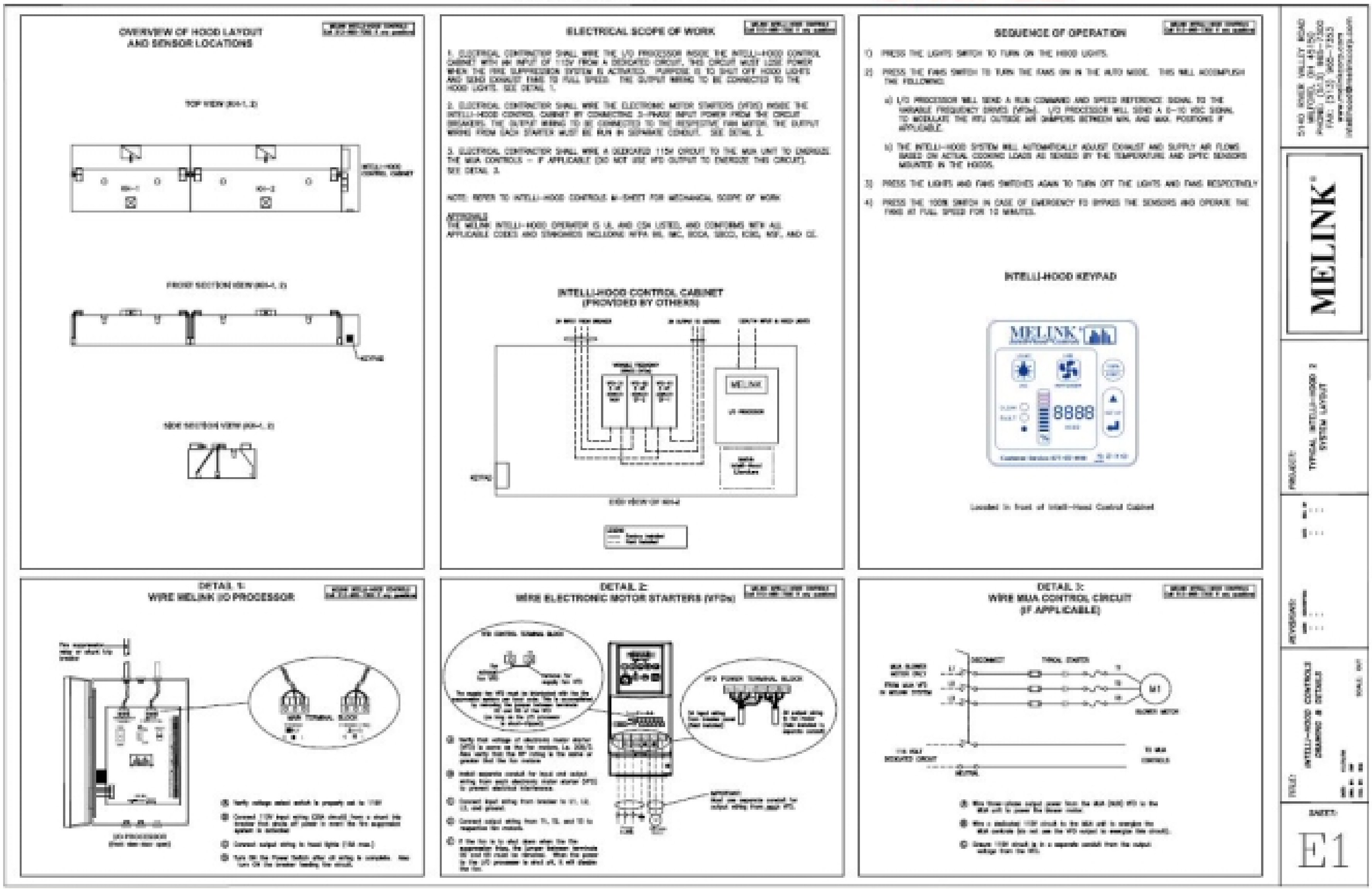
The micro-processor allows numerous intelligent algorithms to be utilized including: 1) Auto on/off – which automatically turns the hoods on when the exhaust temperature reaches a programmed set-point, and off when the temperature drops a predetermined amount; 2) Auto temp span – which automatically hones into the optimal temperature range for controlling the minimum and maximum fan speeds; and 3) Remote access- which allows one to monitor hood performance and energy savings over time from a remote location.

The net result is the energy efficiency of the kitchen ventilation system will be improved up to 50%. The actual calculated savings are included in the Energy & Atmosphere section of this application. The mechanical and electrical detailed drawings are included in this section.


Mechanical Scope of Work
SAMPLE
INTELLI-HOOD CONTROLS DRAWING & DETAILS
TYPICAL INTELLI-HOOD 3 SYSTEM LAYOUT
MELINK
M1

Electrical Scope of Work

SAMPLE



EA Credit 1 – Optimize Energy Performance

Intelli-Hood Design Considerations

To ensure that the savings garnered from the Intelli-Hood controls are maximized, it is necessary to discuss some recommendations for an energy efficient commercial kitchen ventilation design. The Intelli-Hood controls are designed to modulate the exhaust fans and any make up air units based on the cooking loads. A temperature sensor mounted in the exhaust collar of the hood will modulate the fans based on the heat load and an optic sensor set will send the fans to full speed upon detection of smoke. To ensure the most energy efficient design, we strongly recommend an exhaust fan for each hood. This will allow the Intelli-Hood controls to modulate the fans independently thus maximizing the energy savings. Please contact a Melink representative to ensure proper design and performance for each application.

As is mentioned above, the Intelli-Hood controls also modulate the MUA fans. Typically this is done one of two ways. The first scenario would be to modulate the motor on a dedicated MUA unit for the hoods. This is typically a heat only unit and supplies roughly 80% of the exhaust air for the kitchen hoods. It must be noted, if a dedicated MUA unit is specified for the job, it must be a variable volume compatible unit. The second scenario would be to modulate the outside air damper on the RTUs, thus eliminating the dedicated MUA unit. For this to be effective, the ratio of total building exhaust to tonnage should not exceed 160 cfm per ton.

EA Credit 1 – Optimize Energy Performance

Intelli-Hood Energy Savings

To assist in the energy calculations, a program was written by the Food Service Technology Center called the Outdoor Airload Calculator. This program can be found at www.fishnick.com. In conjunction with an excel spreadsheet from Melink Corporation, this information will determine the energy savings for a particular project. It is strongly recommended that a design professional from Melink Corporation assist in the design and layout of the Intelli-Hood controls and the calculation of the energy savings.

To have an accurate calculation of the energy savings, it is necessary to have the following information.

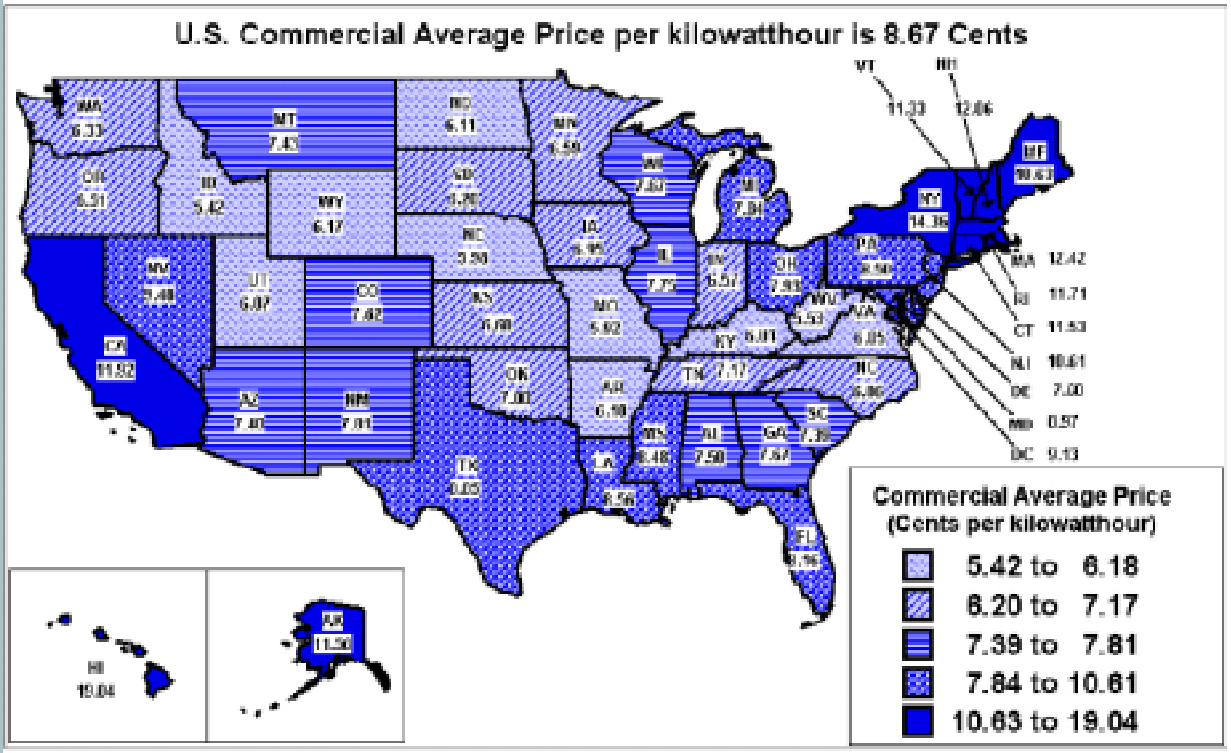
- The total horsepower of the exhaust and MUA units (assuming the fan blower motor is being controlled and not a damper).
- The total exhaust cfm and MUA cfm.
- The number of hours the hoods will run each day.
- The local gas and electric rates for the project.
- How many days and weeks the hoods operate each year.
- What type of MUA unit (gas, steam, electric, etc).

Example:

A hotel located in Boston, MA with a four hood kitchen design with an exhaust fan for each hood totaling 10hp, with a 7.5hp MUA unit. The kitchen has 10,000cfm of exhaust and 8,000cfm of heated MUA. The fans run 20 hours a day 365 days per year. Using table 1 for the electric rate and table 2 for the gas rate, the motor operating savings is shown in table 3, the heating savings in table 4 and the cooling savings in table 5. Table six shows the actual Outdoor Air Load Calculator. Based on this data, the savings are 3237 kW hours and 295987k BTUs.

You can use this example and these tables as a basis for your project estimations.

Table 1



Note: Data is displayed as 5 groups of 10 States and the District of Columbia.

Source: Energy Information Administration, Form EIA-861, "Annual Electric Power Industry Report."

Table 2

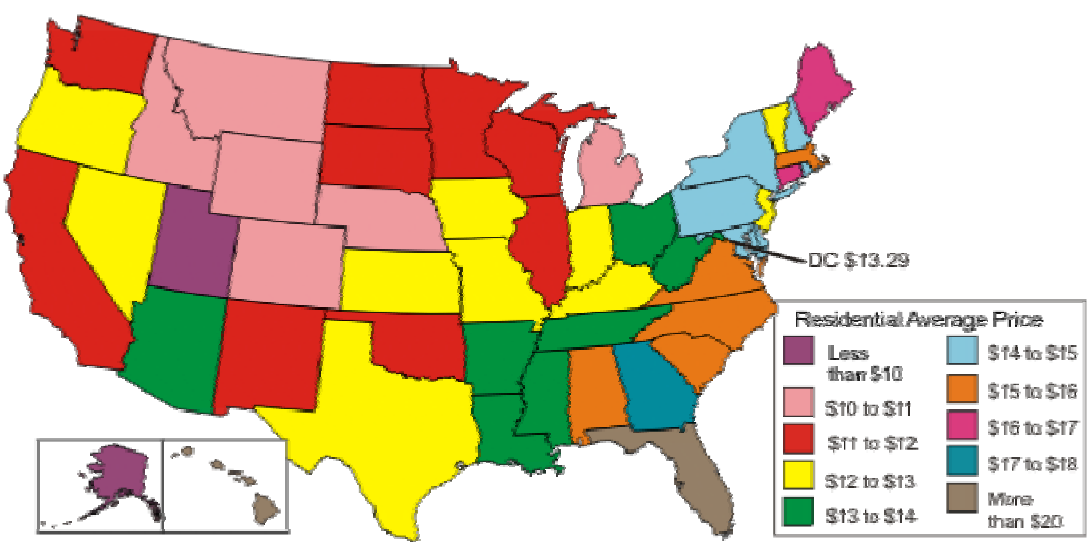


Table 3

FAN ENERGY SAVINGS

INPUT DATA:

A Operating Hours Per Day	20	HRS/DAY
B Operating Days Per Week	7	DAYS/WK
C Operating Weeks Per Year	52	WKS/YR
D Horsepower of Fan Motor(s)	17.5	HP
E Load Factor of Fan Motor(s)	0.9	
F Cost Per Kilowatt Hour	0.1168	$/KWHR

CONSTANT EXHAUST VOLUME ANALYSIS:

G Total Time (A x B x C)	7280	HRS/YR
H Total KWHR/HP/YR (0.746/0.9 x G)	6034.3	KWHR/HP/YR

VARIABLE EXHAUST VOLUME ANALYSIS:

% Rated RPM H	% Run Time I	Time HRS/YR J=FxI	Output KW/HP K	System Effic. L	Input KW/HP M=K/L	KWHR/ HP/YR N=JxM
100	25	1820	0.746	0.9	0.829	1508.6
90	5	364	0.544	0.9	0.604	220.0
80	10	728	0.382	0.9	0.424	309.0
70	15	1092	0.256	0.9	0.284	310.6
60	20	1456	0.161	0.9	0.179	260.5
50	25	1820	0.093	0.9	0.103	188.1
40	0	0	0.048	0.9	0.053	0.0
30	0	0	0.020	0.9	0.022	0.0
20	0	0	0.015	0.9	0.017	0.0
10	0	0	0.010	0.90	0.011	0.0

O Total KWH/HP/YR (Total of Column N) 2796.7

CALCULATION: (H - O) x D x E x F

SAVINGS = $5,956 /YEAR

Table 4

HEATING SAVINGS

INPUT DATA:

A	Previous Net Exhaust Volume	8000	CFM
B	New Net Exhaust Volume (1)	5800	CFM
C	Winter Building Temperature	70	F
D	Previous Net Heat Load (2)	1076316	kBTU
E	New Net Heat Load (2)	780329	kBTU
F	Operating Hours Per Day	20	HRS/DAY
G	Operating Days Per Week	7	DAYS/WK
-	Heating Fuel Type	Natural Gas	
H	Cost Per Fuel Unit (3)	1.3	$/UNIT
J	BTU Per Fuel Unit (4)	100	kBTU/UNIT
K	System Efficiency (4)	0.8	
L	Supply Air Heating Multiplier (5)	1.00	

CALCULATION: (D-E) x L x H / (J x K)

SAVINGS: $4,810 /YEAR

NOTES:

(1) Determine the New Exhaust Volume by completing TABLE 1. The New Exhaust Volume equals the AVG % RPM x the Previous Exhaust Volume.

(2) Using design weather data via the Outdoor Airload Calculator and multiplied by days/year ratio.

(3) Using local energy costs.

(4) Using typical system efficiency.

(5) Estimation Factor

TABLE 1

% Rated RPM (F)	% Rated RPM (F)	% Run Time (I)	F x I
100	100	25	25
90	90	5	5
80	80	10	8
70	70	15	11
60	60	20	12
50	50	25	13
40	40	0	0
30	30	0	0
20	20	0	0
10	10	0	0
	AVG % RPM =		73%

Table 5

COOLING SAVINGS

INPUT DATA:

A Previous Net Exhaust Volume	8000 CFM
B New Net Exhaust Volume (1)	5800 CFM
C Previous Net Cooling Load (2)	33041 kBTU
D New Net Cooling Load (2)	23955 kBTU
E AC Correction Factor (3)	1
F Cost Per Fuel Unit (5)	0.1168 $/kWH
G COP (6)	3
H Supply Air Cooling Multiplier (7)	0.50

CALCULATION: (C - D) x H x E x F / (3.413 x G)

SAVINGS = $52 /YEAR

NOTES:

(1) Using New Exhaust Volume from CONDITIONED MAKE-UP AIR SAVINGS - HEATING on page 2. See Note 1.

(2) Obtained from Outdoor Airload Calculator

(3) Using design weather data.

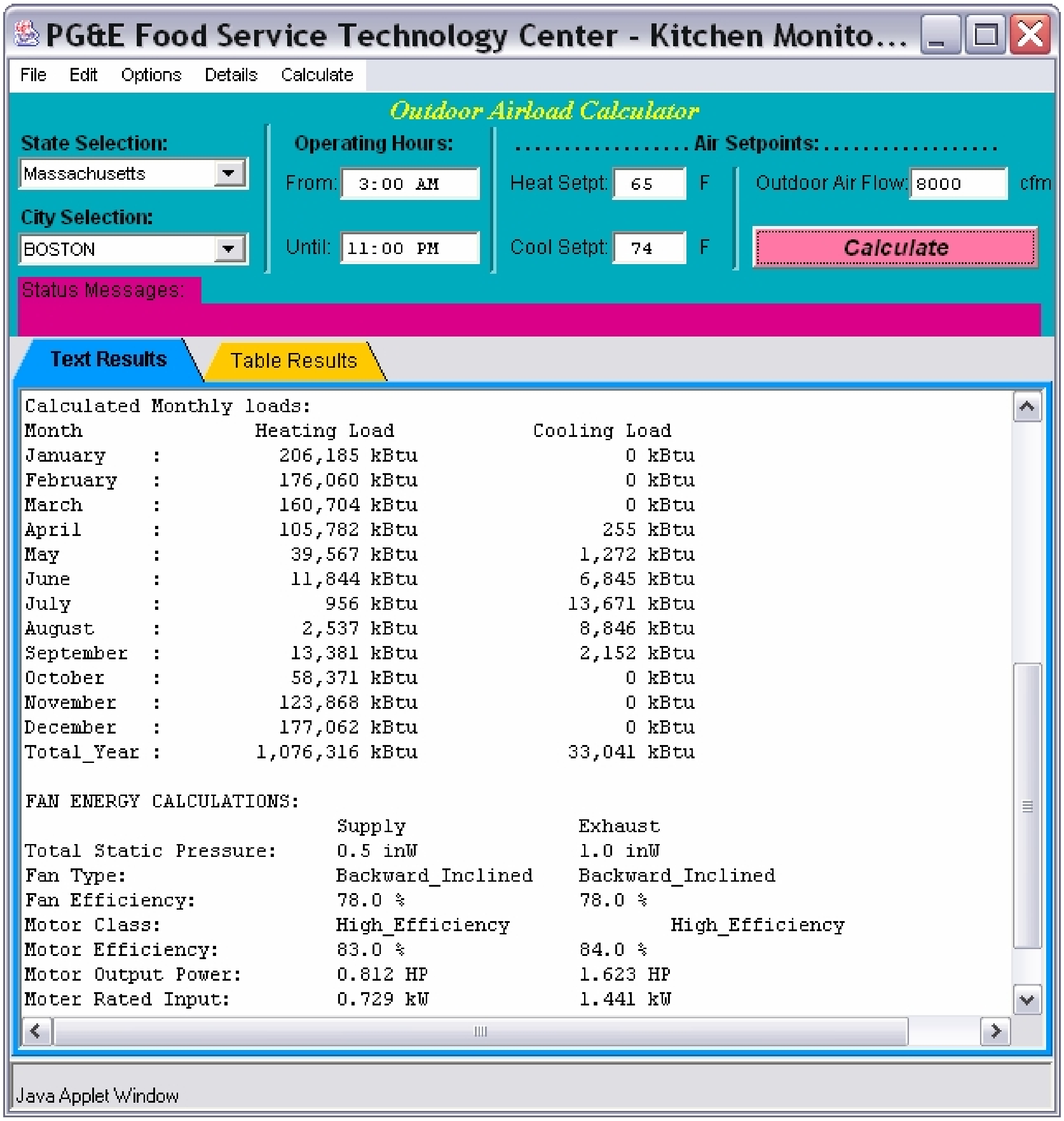
(4) The multiplier corrects for actual % outside air.

(5) Using local energy costs.

(6) Using typical system efficiency.

(7) Using cooling supply air factor.

Table 6


PG&E Food Service Technology Center - Kitchen Monito...
File Edit Options Details Calculate
Outdoor Airload Calculator
State Selection:
Massachusetts
City Selection:
BOSTON
Operating Hours:
From: 3:00 AM
Until: 11:00 PM
Air Setpoints:
Heat Setpt 65 F
Cool Setpt 74 F
Outdoor Air Flow 8000 cfm
Calculate
Status Messages:
Text Results
Table Results
Calculated Monthly loads:
Month Heating Load Cooling Load
January : 206,185 kBtu 0 kBtu
February : 176,060 kBtu 0 kBtu
March : 160,704 kBtu 0 kBtu
April : 105,782 kBtu 255 kBtu
May : 39,567 kBtu 1,272 kBtu
June : 11,844 kBtu 6,845 kBtu
July : 956 kBtu 13,671 kBtu
August : 2,537 kBtu 8,846 kBtu
September : 13,381 kBtu 2,152 kBtu
October : 58,371 kBtu 0 kBtu
November : 123,868 kBtu 0 kBtu
December : 177,062 kBtu 0 kBtu
Total_Year : 1,076,316 kBtu 33,041 kBtu
FAN ENERGY CALCULATIONS:
Supply Exhaust
Total Static Pressure: 0.5 inW 1.0 inW
Fan Type: Backward_Inclined Backward_Inclined
Fan Efficiency: 78.0 % 78.0 %
Motor Class: High_Efficiency High_Efficiency
Motor Efficiency: 83.0 % 84.0 %
Motor Output Power: 0.812 HP 1.623 HP
Moter Rated Input: 0.729 kW 1.441 kW
Java Applet Window

Summary

Most commercial kitchen hoods operate at 100% capacity all day, even during idle non-cooking periods. This costs the U.S. food service industry over $2 billion in wasted energy every year.

The Melink Intelli-Hood controls are the only proven solution to this problem. Using a microprocessor and sensors, they reduce fan speed during idle periods to save both fan energy and conditioned air.

In accordance with the principles and guidelines of LEED, the Intelli-Hood controls complement the efforts of green design and building. This application guide is designed for your use in your strategic planning.

Additional Resources:

U.S. Green Building Council
www.usgbc.org
(202) 828-7422

Food Service Technology Center
www.fishnick.com
(925) 866-5616

For more information on this application guide, or the Intelli-Hood controls, please contact Melink Corporation at 513-965-7300 or mail@melinkcorp.com.

You can also visit our website at www.melinkcorp.com for more information about Melink Corporation's LEED-Gold Certified headquarters and leadership in the green building movement.