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IOWA  
ASSOCIATION OF MUNICIPAL  
UTILITIES



# ***Water & Wastewater Treatment Energy Use Self-Audit Tool***

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Developed By

Iowa Association of Municipal Utilities

&

The Energy Group, Inc.

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## **Install Instructions**

1. Load CD into the CD Drive.
2. CD should open automatically; however if nothing happens open CD.
3. Double Click iamu.msi
4. Click OK.
5. Follow Install instructions on screen.
6. To open program, Select Start.
7. Select Programs.
8. Click WW-ESAT and program will open.
9. There will also be an icon on your desktop to open the program.

## **WW-ESAT Disclaimer:**

By using any of the information, materials or functions from the following software, you agree to and understand the following DISCLAIMER:

This software tool provides estimates of energy and cost savings for water and wastewater treatment facilities upgrades. While IAMU has attempted to make the information, materials and functions in this software current, IAMU cannot represent nor endorse the accuracy or reliability of any of the results, due to the inherent nature of estimates that are based on general assumptions rather than specific site conditions.

This software and information which is made available, is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability, fitness for a particular purpose, or non-infringement.

IAMU shall not be liable for any special, direct, indirect, incidental, or consequential damages, including, without limitation, loss of revenues, profits or data, whether in an action in contract, negligence, or other tortuous action, which may result from the use of this software or the materials and information contained herein.

## **Cooling Equipment**

The Cooling Equipment Upgrade calculator will determine the annual savings from replacing the existing cooling equipment. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following definitions and recommendations if you are unsure of anything.

Capacity- Tons x 12,000 Btu

EER- See Appendix Cooling Equipment

Full Load Cooling Hours- annual cooling hours will vary. See Page 13

Cost- Installed Cost

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

## **Heating Equipment**

The Heating Equipment Upgrade calculator will determine the annual savings from replacing the existing Heating equipment. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following definitions and recommendations if you are unsure of anything.

Annual Therm, CCF, or Gallons of Gas Usage- Located on Utility Bills

Existing Heating Equipment Efficiency- See Page 12

Proposed Heating Equipment Efficiency- See Manufacturer of Dealer

Annual Heating Hours- annual heating hours will vary by region. See Page 13

Cost- Installed Cost

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

## **Peak/Off Peak Equipment Scheduling**

The Peak/Off Peak Equipment Scheduling calculator will show the demand savings from rescheduling equipment to run during off peak hours. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following definitions and recommendations if you are unsure of anything.

HorsePower- Motor HorsePower

Efficiency- Motor Efficiency

Winter Peak/Off Peak Demand Rate \$/kW- Winter Price per kW, Located on Utility Bill

Summer Peak/Off Peak Demand Rate \$/kW- Summer Price per kW, Located on Utility Bill

\*If your facility does not have an off peak demand rate, use a price \$0.00.

\*\*This calculator assumes a motor load factor of 0.80.

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

## **Night Setback**

The Night Setback calculator will determine the annual savings from reducing the building temperature when the building is unoccupied. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following recommendations if you are unsure of anything.

Annual Therm, CCF, or Gallons of Gas Usage- Located on Utility Bills

Occupied Temperature- Building Temperature when building is occupied.

Unoccupied Temperature- Building Temperature when building is unoccupied.

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

## Windows

The Window Upgrade calculator will determine the annual savings from replacing the existing windows. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following recommendations if you are unsure of anything.

Shading Co-Efficient- Can be found on window label. If you unsure of the shading co-efficient of the existing window, use 0.89.

U-Value- the recipricol of the R-Value ( $1/R$ -Value). It is the insulation level of the window. If you are unsure of the U-Value of the existing window, use 0.60.

Annual Heating Hours- annual heating hours will vary by region. See Page 13

Full Load Cooling Hours- annual cooling hours will vary. See Page 13

Equipment Efficiency- See Page 12

kW/Ton- See Page 10.

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

## Doors

The Door Upgrade calculator will determine the annual savings from replacing the existing Door. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following recommendations if you are unsure of anything.

U-Value- the recipricol of the R-Value ( $1/R$ -Value). It is the insulation level of the window. If you are unsure of the U-Value of the existing window, use 0.30.

Annual Heating Hours- annual heating hours will vary by region. See Page 13

Full Load Cooling Hours- annual cooling hours will vary. See Page 13

Equipment Efficiency- See Page 12

kW/Ton- See Page 10

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

## **Roof**

The Roof Upgrade calculator will determine the annual savings from replacing the existing roof or adding additional insulation to the roof. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following recommendations if you unsure of anything.

R-Value- See Appendix Insulation

Annual Heating Hours- annual heating hours will vary by region. See Page 13

Full Load Cooling Hours- annual cooling hours will vary. See Page 13

Equipment Efficiency- See Page 12

kW/Ton- See Page 10

Inside Ceiling Height- Space floor to Ceiling in feet.

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

## **Walls**

The Walls Upgrade calculator will determine the annual savings from adding additional insulation to the wall. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following recommendations if you unsure of anything.

R-Value- See Page 12

Annual Heating Hours- annual heating hours will vary by region. See Page 13

Full Load Cooling Hours- annual cooling hours will vary. See Page 13

Equipment Efficiency- See Page 12

kW/Ton- See Page 10

\*To get the most accurate results please input the sq/ft. of glass in the correct direction is faces. The savings will be impacted accordingly.

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

## **Variable Speed Drives**

The Variable Speed Drives calculator will determine the annual savings from adding a variable speed drive to an existing motor. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following recommendations if you unsure of anything.

Annual Operating Hours- motor operating hours per year.

Horsepower- Motor Horsepower

100% Flow/Volume- Percent of time the motor operates at 100% Capacity

90% Flow/Volume- Percent of time the motor operates at 90% Capacity

80% Flow/Volume- Percent of time the motor operates at 80% Capacity

70% Flow/Volume- Percent of time the motor operates at 70% Capacity

60% Flow/Volume- Percent of time the motor operates at 60% Capacity

50% Flow/Volume- Percent of time the motor operates at 50% Capacity

40% Flow/Volume- Percent of time the motor operates at 40% Capacity

30% Flow/Volume- Percent of time the motor operates at 30% Capacity

Motor Efficiency- Efficiency of existing motor.

\*This calculator assumes a motor load factor of 0.80.

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

## **Motors**

The Motors Upgrade calculator will determine the annual savings from replacing an existing motor with a more efficient motor. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following recommendations if you unsure of anything.

Annual Operating Hours- motor operating hours per year.

Horsepower- Motor Horsepower

Efficiency- Motor Efficiency

\*This calculator assumes a motor load factor of 0.80.

## **Lighting Equipment**

The Lighting Equipment Upgrade calculator will determine the annual savings from replacing existing lighting with a more efficient lighting. The form will need to be completely filled out to determine the energy savings. An error will occur if the form is not accurately filled out. Please use the following recommendations if you unsure of anything.

Number of Fixtures- Total Number of Fixture not Individual Lamps.

Usage Hours- operating hours per year.

Lighting Category- Type of Lighting

Lamp- Lamp Type

Fixture Wattage- Total Wattage of Fixture not Individual Lamps.

\*User must select Lighting Category before Lamp.

Form Use:

1. Fill out form as Accurately as possible.
2. Click Calculate.
3. Click Add to report if you wish to do another calculation.
4. Click reset to clear the form.
5. Click print if you wish to print the results.

**Cooling Equipment Efficiency Rating**

<b>SEER</b>	<b>EER</b>	<b>kW/Ton</b>
7.0	6.0	2.00
7.5	6.5	1.85
8.0	7.0	1.72
8.5	7.5	1.60
9.0	8.0	1.50
9.5	8.5	1.41
10.0	9.0	1.33
10.5	9.5	1.26
11.0	10.0	1.20
11.5	10.5	1.14
12.0	11.0	1.09
12.5	11.5	1.04
13.0	12.0	1.00
13.5	12.5	0.96
14.0	13.0	0.92
14.5	13.5	0.89
15.0	14.0	0.86
15.5	14.5	0.83
16.0	15.0	0.80
16.5	15.5	0.77
17.0	16.0	0.75
17.5	16.5	0.73
18.0	17.0	0.71
18.5	17.5	0.69
19.0	18.0	0.67
19.5	18.5	0.65
20.0	19.0	0.63
20.5	19.5	0.62
21.0	20.0	0.60

## Lighting Chart

### Fluorescent

Current		Replacement	
1- Lamp F34-T12	43 Watts	1- Lamp F32T8	39 Watts
2- Lamp F34-T12	82 Watts	2- Lamp F32T8	58 Watts
3- Lamp F34-T12	125 Watts	3- Lamp F32T8	85 Watts
4- Lamp F34-T12	164 Watts	4- Lamp F32T8	106 Watts
1- Lamp F96-T12	62 Watts	1- Lamp F96T8	57 Watts
2- Lamp F96-T12	123 Watts	2- Lamp F96T8	116 Watts
1- Lamp F40-T12U	44 Watts	1- Lamp F32T8U	39 Watts
2- Lamp F40-T12U	74 Watts	2- Lamp F32T8U	62 Watts

### Incandescent

25 Watt Incan. Lamp	25 Watts	Compact Fluorescent	9 Watts
40 Watt Incan. Lamp	40 Watts	Compact Fluorescent	11 Watts
60 Watt Incan. Lamp	60 Watts	Compact Fluorescent	13 Watts
75 Watt Incan. Lamp	75 Watts	Compact Fluorescent	18 Watts
100 Watt Incan. Lamp	100 Watts	Compact Fluorescent	26 Watts
150 Watt Incan. Lamp	150 Watts	Compact Fluorescent	39 Watts
150 Watt Outdoor Lamp	150 Watts	35 Watt H.P.S	55 Watts

### Exit Signs

15 Watt Incan. Lamp	15 Watts	LED Sign	2 Watts
20 Watt Incan. Lamp	20 Watts	LED Sign	2 Watts

### High Intensity Discharge (HID)

400 Watt Metal Halide	150 Watts	High Bay Fixture	220 Watts
1000 Watt Metal Halide	1,070 Watts	High Bay Fixture	460 Watts

### Insulation R-Values

<b>Type of Insulation</b>	<b>R-Value/Inch</b>
Fiberglass Batt	3.14
Fiberglass Blown Attic	2.20
Fiberglass Blown Wall	3.20
Rock Wool Batt	3.14
Rock Wool Blown Attic	3.10
Rock Wool Blown Wall	3.03
Cellulose Blown Attic	3.13
Cellulose Blown Wall	3.70
Vermiculite	2.13
Autoclaved Aerated Concrete	3.90
Rigid Fiberglass	4.00
Expanded Polystyrene	4.00
Extruded Polystyrene	5.00
Polyurethane	6.25
Polyisocyanurate	7.20

### Heating System

<b>Heating System Type</b>	<b>Efficiency</b>
30 Years +	50% - 60%
15-30 Years +	60% - 65%
10-15 Years +	65% - 70%
New Boiler	75% - 80%
New Induce Draft Furnace	78% - 82%
New High Efficiency Boiler	85% - 87%
New High Efficiency Furnace	90% - 97%
Electric Baseboard	100%
Electric Furnace	100%
Electric Ceiling Radiant	100%

### **Full Load Cooling Hours**

\*The full load cooling hours for Iowa range from 450 in North Central Iowa to 750 in Southern Iowa. Use the chart below to adjust the hours.

<b>Adjustment</b>	<b>Full Load Cooling Hours</b>
Air Condition is on all Summer	Add 200
Lots of West Facing Glass	Add 300
Well Shaded Building	Subtract 100
No West Facing Glass	Subtract 100

### **Annual Heating Hours**

Annual Heating Hours will vary by region. Use the following calculation to find your annual heating hours.

$$\text{Week of Winter} \times 7/\text{Days a Week} \times 24/\text{Hours a Day}$$

The chart below lists the average weeks of Winter per year for Iowa Locations.

<b>Location</b>	<b>Weeks of Winter</b>
Des Moines	28.0
Mason City	29.8
Sioux City	31.2
Council Bluffs	32.1
Davenport	33.5