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Carbon-Dioxide-Controlled Ventilation Study

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Summary

Pacific Northwest Laboratory (PNL) conducted this study for the U.S. Department of Energy In-House Energy Management (IHEM) Program. The purpose of the study was to review options for using carbon dioxide (CO₂)-based ventilation control at the Hanford Site and to make recommendations for implementing this control strategy. This study researched the energy savings potential associated with reducing outdoor-air ventilation provided by heating, ventilating, and air-conditioning (HVAC) systems in buildings.

Concerns that must be addressed prior to implementing CO₂-based ventilation control are its impact on both energy consumption and building occupant quality of life. Reduced outdoor-air ventilation can cause indoor-air quality (IAQ) to be inadequate to maintain a healthy, safe working environment, which may result in reduced productivity. Energy savings at the cost of reduced productivity are quickly lost through increased labor costs. Energy saving projects that improve the quality of the work environment achieve additional savings through improved work productivity.

Specific conclusions regarding the use of CO₂-based ventilation control are as follows.

- For buildings with a winter heating load, the load reduction resulting from avoiding over-ventilating will probably show a simple payback of less than one year. CO₂-based ventilation control should be used in these buildings.
- For buildings with sufficient internal loads (i.e., no winter heating load or heating loads met by terminal reheat), the reduction in cooling load during summer months will probably not be economically effective.

Acknowledgments

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1.0 Introduction

The In-House Energy Management (IHEM) Program has been established by the U.S. Department of Energy to provide funds to federal laboratories to conduct research on energy-efficient technology. The Energy Sciences Department of Pacific Northwest Laboratory (PNL) was tasked by IHEM to research the energy savings potential associated with reducing outdoor-air ventilation of buildings. By monitoring carbon dioxide (CO₂) levels in a building, outdoor air provided by the heating, ventilating, and air-conditioning (HVAC) system can be reduced to the percentage required to maintain satisfactory CO₂ levels rather than ventilating with a higher outdoor-air percentage based on an arbitrary minimum outdoor-air setting.

During summer months, warm outdoor air brought into a building for ventilation must be cooled to meet the appropriate cooling supply-air temperature, and during winter months, cold outdoor air must be heated. By minimizing the amount of hot or cold outdoor air brought into the HVAC system, the supply air requires less cooling or heating, saving energy and money. Additionally, the CO₂ levels in a building can be monitored to ensure that adequate outdoor air is supplied to a building to maintain air quality levels.

The two main considerations prior to implementing CO₂-based ventilation control are its impact on energy consumption and the adequacy of indoor air quality (IAQ) and occupant comfort. To address these considerations, six portable CO₂ monitors were placed in several Hanford Site buildings to estimate the adequacy of office/workspace ventilation. The monitors assessed the potential for reducing the flow of outdoor-air to the buildings. A candidate building was also identified to monitor various ventilation control strategies for use in developing a plan for implementing and assessing energy savings.

This report contains four sections and two appendixes. Section 2.0 reviews the methodology used in this study. Section 3.0 discusses the results. Section 4.0 makes specific conclusions regarding the use of CO₂-based ventilation control. Appendix A contains the results of a sample building modeled using the Building Loads Analysis and System Thermodynamics (BLAST) software (BLAST Support Office 1991). Results of a Building Life-Cycle Cost (BLCC) program (10 CFR 436) run are contained in Appendix B.

2.0 Methodology

The two main issues to consider prior to implementing CO₂-based ventilation control are how to save energy and money while ensuring adequate IAQ and occupant comfort. To address these considerations, this study was conducted in two major phases.

- *Phase 1* - Selected office spaces were monitored to determine the dependence of CO₂ and IAQ levels on zone occupancy. This determination was made to verify that CO₂ and IAQ levels are interdependent, allowing for the use of CO₂ monitoring to control modulating ventilation levels. Also, the performance of several different manufacturers' sensors were compared to determine positive or negative attributes that make one sensor preferable over others.
- *Phase 2* - Researchers identified a building with an appropriate control system, or one in which the air handler controls could be modified, to allow for application and monitoring of various ventilation control strategies.

Major tasks associated with these phases were

- to determine a strategy for CO₂ monitoring and control
- to model a representative office building to determine the expected level of savings
- to procure CO₂ sensors and a data logger for spot-monitoring
- to collect data on CO₂ levels from a representative office building to help select an appropriate sensor for the study
- to identify a building with an appropriate control system to adapt to CO₂-based ventilation control
- to establish a baseline energy consumption level, CO₂ levels, and an occupant satisfaction level
- to implement CO₂-based control and monitor occupant satisfaction and energy consumption
- to analyze the energy and occupant survey data and economics of the strategy implementation and savings, and develop recommendations for further implementation or discontinuation.

2.1 Strategy Development

The American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) published *ASHRAE Standard 62-1989* that identifies the issues of IAQ and occupant comfort (ASHRAE 1989). The outdoor-air requirements to ventilate commercial facilities vary from 15 to 60 ft³/min per person, depending on the use of the building space. A typical office space's ventilation requirement set by ASHRAE is 20 ft³/min per person.

ASHRAE Standard 62-1989 describes an alternative method for providing acceptable IAQ known as the Indoor Air Quality Procedure. This procedure states that a building must maintain the contaminant level of several common contaminants below a maximum limit; e.g., CO₂ (1000 parts per million [ppm]), chlordane (0.0003 ppm), and ozone (0.05 ppm).

The strategy employed in this study attempts to maintain acceptable IAQ in a building by maintaining CO₂ levels below the ASHRAE limit of 1000 ppm. This strategy assumes that CO₂ levels rise as people enter a building. The building ventilation rate can be controlled (increased and decreased) to supply the appropriate outdoor-air flow rate to maintain acceptable IAQ as occupants enter a space, as seen by a rise in CO₂. By measuring only CO₂, other contaminants in the building are not considered, such as volatile organics and formaldehyde -- two common contaminants associated with sick building syndrome.

2.2 Computer Modeling

To determine the amount of energy savings that can be expected with CO₂-based ventilation control, a sample building was modeled using the Building Loads Analysis and System Thermodynamics (BLAST) software (BLAST Support Office 1991). The modeled building was a 100 ft by 100 ft, single-story building with exterior walls that had 20% windows. Two air systems were modeled -- one with 20% outdoor air to simulate the base case and one with 5% outdoor air to simulate CO₂-based ventilation control. The base-case level of 20% outdoor air was chosen to represent a typical ventilation rate. With CO₂ ventilation control, 5% outdoor air was arbitrarily chosen to represent the potential decrease in CO₂ levels due to a decrease in occupancy. An economizer cycle was included in each model so the energy difference was shown only for periods when the economizer was not in effect. Results of the modeling are contained in Appendix A. The cost and savings values from the BLAST model were used as input data for a Building Life-Cycle Cost (BLCC) (10 CFR 436) program run. Cost assumptions used in the economic analysis were \$500 material cost per sensor and \$500 labor cost, for a total of \$1,000 per installed sensor. The results of that run are contained in Appendix B.

2.3 Representative CO₂ Levels

The next step was to determine if the response time of representative CO₂ levels was adequate for ventilation control. Sensors from several manufacturers were purchased to identify the most effective at

sensing CO₂ levels. Gaztech International Corporation- CO₂ Telaire Monitor 1053 and 1050, Staefa Control System Staefa FRA-Q1 Room Air Quality Sensor, and MSA Infrared gas monitor model 3630-01-01-02 were purchased.

Carbon dioxide levels were monitored at various PNL offices in the 2400 Stevens building using each sensor and a data logger. The data logger was located in occupied offices, unoccupied offices, and conference rooms for periods of one week in each place. Data was downloaded to a desktop computer once a week and analyzed to compare occupancy schedules and CO₂ levels. The Gaztech CO₂ monitor was used because of its sensitivity in detecting occupancy changes.

2.4 Equipment Installation

The next objective of the study was to locate a building best suited for CO₂-based ventilation control. Although the 2400 Stevens Building would have been ideal because it was the building from which CO₂ data had been collected and would have allowed for real-time monitoring of occupant comfort, the building's mechanical equipment consists of packaged rooftop units requiring extensive modifications. Outdoor air is brought into the building through manually adjusted dampers based on occupant complaints of stuffiness. Carbon dioxide-based control would have required retrofit of outdoor-air dampers and economizer cycle controls.

With guidance from Ron Underhill of PNL Facilities, the 337 Building in the 300 Area at the Hanford Site was identified as a prime location to study CO₂-based ventilation control effectiveness. Building 337 has a variable air volume/air handling system with economizer control and a Johnson Controls Metasys energy management and control system (EMCS). The Metasys system has an input channel for a CO₂ sensor with the capability for CO₂-based ventilation control. The Metasys system also has data-recording capabilities for its other control functions, such as outdoor-air, room-air, and duct-air temperatures and fan variable-speed commands. These Metasys system capabilities allowed for implementation and monitoring of CO₂-based ventilation control performance without costly building control modifications.

To collect data on baseline CO₂ levels in Building 337, the Telaire model 1053 was installed in the return-air plenum of air-handler no. 4 in the south wing of the building and connected to the EMCS.

Because CO₂ levels in the return-air plenum are a dilution of the return air for the entire wing, there was a concern that CO₂ buildup in frequently used areas in the building would go undetected. Therefore, a Telaire model 1050 CO₂ sensor and the Recordaire data logger were placed in the building's Mt. Baker conference room. Weekly seminars and training sessions are conducted in the Mt. Baker conference room. The CO₂ levels measured in the Mt. Baker room served as a comparison to the levels measured in the return-air plenum.

2.5 Baseline Data Collection and Energy Performance

Baseline data on temperatures, CO₂ levels, and cooling energy in Building 337 was collected to identify energy consumption and CO₂ levels during normal operation. The building is run at 20% minimum outdoor air, which is representative of most Hanford Site buildings with economizer systems. The following data was collected by the EMCS:

- outdoor-air temperature (°F)
- return-air temperature (°F)
- mixed-air temperature (°F)
- supply-air temperature (°F)
- return-air relative humidity (% RH)
- outdoor-air damper position (% open)
- supply- and return-fan command (% loaded)
- CO₂ levels (ppm).

Data was collected periodically from June 1993 to September 1993. Because the HVAC system in Building 337 has night and weekend temperature setback and the EMCS has limited memory space for data storage, priority was given to data collection during operating hours. During weekdays, data points, except for CO₂ levels, were collected each half hour from 5:30 a.m. to 6:00 p.m. The CO₂ levels were recorded every five minutes to account for small changes in CO₂ levels and changes in occupancy.

To calculate accurate cooling energy data based on airflows and temperatures, the airflow rates at various fan speeds were measured. The data for the fan speed versus airflow are shown in Table 2.1 and Figure 2.1.

A linear regression was performed on the above data. The regression showed the airflow rate to be a linear function of percentage load with a root mean square (R²) value of 99.8%. The root mean square value in a linear regression refers to how well the data sets a line, where R² = 100% denotes a perfect line. Therefore, the line's equation determined the air flows from the supply-fan speed (percent loaded).

The ventilation rate in f³/min is given in Equation (2.1).

$$\text{Ventilation} = 330 (\% \text{ loading of the fan}) + 599 \quad (2.1)$$

Table 2.1. Fan Speed Versus Airflow

Fan Speed (% loaded)	60%	70%	80%	90%
Airflow (ft ³ /min)	20,703	23,887	26,836	30,305

Figure 2.1. Fan Speed Versus Airflow

The above parameters collected by the EMCS and airflow rates were used to compute the cooling energy use of Building 337. The cooling energy was calculated from Equation (2.2):

$$\begin{aligned}
 E &= m \times C_p \times \Delta T \\
 &= \rho \times V \times C_p \times \Delta T
 \end{aligned}
 \tag{2.2}$$

where

- E = cooling energy (Btu/h)
- m = mass flow rate of air (lbm/h)
- ρ = density of air at 300K (lb/ft³)
- V = volumetric airflow rate (ft³/h)
- C_p = specific heat of air at 300K (lbm/°F)
- ΔT = temperature change across the coils (°F).

2.6 Carbon-Dioxide-Based Control Implementation

After the baseline cooling energy consumption was calculated and baseline CO₂ levels in ppm were recorded, the CO₂-based ventilation control was implemented. The EMCS was programmed to reset the minimum outdoor air from 20% to 0%. Normally, outdoor air is set to a minimum value higher than 0% to make up for air lost through bathroom exhaust fans, leakage from doors and windows, and other building air losses. The outdoor air was set to 0% to make the energy effects of return air versus outdoor air easier to interpret. The EMCS was also programmed to control the outdoor-air dampers with both outdoor-air temperature (economizer cycle) and CO₂ levels. If either the outdoor-air temperature is below the return-air temperature or the CO₂ level exceeds the set point (1000 ppm), the outdoor-air damper is opened. If the outdoor-air temperature is above the return-air temperature, and the CO₂ level is below the set point, the outdoor-air damper is closed to minimize the required energy for cooling. The EMCS allows for parallel operation so the outdoor-air damper is controlled by either the outdoor-air temperature or the CO₂ level.

Data was again collected on the same parameters as the baseline data. Cooling energy for CO₂-based ventilation control was also calculated during this period.

The Hanford Technical Library (HTL) was investigated for CO₂-based ventilation control during November 1993. The HTL HVAC system is similar to the HVAC system in Building 337 with an economizer and an EMCS. The EMCS is also a Johnson Controls system, but it is an older system than the Metasys system found in Building 337. The HTL has a constant-volume air-handling system and outside air economizer with one main air-handler for the entire building.

Initially, the remote CO₂ sensor was placed in the return-air plenum where CO₂ levels were recorded on the data logger. Data was also collected from the EMCS on the same parameters as Building 337 as follows:

- outdoor-air temperature (°F)
- return-air temperature (°F)
- mixed-air temperature (°F)
- supply-air temperature (°F)
- return-air relative humidity (% RH)
- outdoor-air damper position (% open).

3.0 Results

Data collection and computer modeling results are provided below.

3.1 CO₂ Data Results

Data was collected on CO₂ levels in Building 337 in the return-air plenum of air-handler no. 4 in the south wing of the 337 Building. CO₂ data collected are shown in Figures 3.1 and 3.2. The CO₂ data collected in the Mt. Baker room of the 337 Building for comparison reasons are shown in Figures 3.3, 3.4, and 3.5. In addition, the CO₂ data collected from the Hanford Technical Library is shown in Figure 3.6.

3.1.1 Building 337 CO₂ Results

Figures 3.1 and 3.2 showed the CO₂ levels encountered in Building 337 during normal operations. As shown, at a 20% minimum outdoor-air damper setting the CO₂ levels do not reach objectionable levels. This result appears to indicate that the building is being over-ventilated and that the outdoor-air levels can be reduced without negatively affecting the quality of life inside the building. However, careful consideration should be taken when assuming a building has adequate indoor air quality. Data on the CO₂ levels in the Mt. Baker room were approaching 1000 ppm in some cases shown in Figures 3.3 through 3.5. Therefore, before full implementation of CO₂ ventilation control, adequate CO₂ levels must be ensured throughout the entire building without neglecting high-occupancy areas.

Figure 3.1. CO₂ Levels: Building 337 Return-Air Plenum, 7/29/93 to 8/5/93

Figure 3.2. CO₂ Levels: Building 337 Return-Air Plenum, 8/6/93 to 8/13/93

Figure 3.3. CO₂ Levels: Building 337 Mt. Baker Room, 7/29/93 to 8/5/93

3.1.2 Hanford Technical Library CO₂ Results

Figure 3.6 shows the CO₂ levels encountered in the HTL during normal operations. As shown, at a 20% minimum outdoor-air damper setting the CO₂ levels do not reach objectionable levels. This conclusion appears to indicate the building is being over-ventilated and the outdoor-air levels can be reduced without negatively affecting the quality of life inside the building.

Figure 3.4. CO₂ Levels: Building 337 Mt. Baker Room, 8/6/93 to 8/12/93

Figure 3.5. CO₂ Levels: Building 337 Mt. Baker Room, 8/13/93 to 8/20/93

3.2 Results from Computer Model

Building cooling and heating loads are affected by several major parameters such as building shape and use. Buildings with a high ratio of outside surface to total volume are much more affected by outdoor weather conditions (solar loads, wind effects, ambient temperatures) than block-shaped buildings with a low ratio of outside surface to total volume. Because large, block-shaped buildings may be

Figure 3.6. CO₂ Levels: Hanford Technical Library, 11/22/93 to 12/6/93

sufficiently insulated from the effects of weather, cooling year-round may be required to overcome the heat load of lights, office equipment, and staff. Internal heat loads, such as equipment-intensive laboratories or computer centers, can also overcome heating loads on a building to the point that cooling is required year-round. Buildings requiring cooling year-round can take advantage of cool, ambient weather in the winter to “free cool” the building with an HVAC economizer cycle that mixes cold outdoor air with warm return air from the cooled zones.

During economizer cycle operation, the outdoor air to the building is well above the minimum setting to provide free cooling (and ventilation is not a problem). Only during non-economizer periods does the outdoor air reset to the minimum position.

The BLAST run showed that CO₂-based ventilation control is applicable only for buildings with a winter heating load. The BLAST run’s energy results are shown in Figure 3.7. For buildings with a winter cooling load, the outdoor air is useful as an economizer to minimize cooling loads. Consequently, CO₂-based control does not reduce energy consumption because cooling energy is saved. For buildings with a heating load, however, the savings can be significant with a one-year simple payback.

The results of the BLCC program run, based on the BLAST results (included as Appendix B), show that CO₂-based ventilation control has a net 25-year life-cycle cost of \$10,000 less than the 20% ventilation, for a 4,442 ft³/min air-handling load.

For a building without a winter heating load, one in which the internal loads require cooling year-round (e.g., block-shaped office buildings), extrapolating the savings for the cooling load predicted by the BLAST model and analyzing the data with BLCC shows that a single air-handler will have to handle in excess of 91,000 ft³/min for the CO₂ sensor to pay for itself in 25 years. It is extremely unlikely that a candidate building will be found with an air-handling system of this size.

Figure 3.7. BLAST-Predicted HVAC Energy with 20% Minimum Outdoor Air and 5% Minimum Outdoor Air

3.2.1 Building 337 Computer Model Results

Data from Building 337 on energy consumption show that outdoor-air control must be approached on a case-by-case basis. When the outdoor air ventilation was changed from 20% to 0% minimum outdoor air, there was little change in energy consumption. This is depicted in Figure 3.8, showing the thermal load (change in temperature across the cooling coil) during both 20% minimum outdoor air and 0% outdoor air settings. As shown in Figure 3.8, there is little change in thermal load between the 20% and 0% outdoor air rates; therefore, no energy savings were realized for Building 337 during CO₂ ventilation control. This absence of energy savings was a result of problems with air balancing in the building, requiring the exhaust fan on air-handler no. 4 to be run at a greater volume than the supply fan. The airflow difference creates a positive pressure in the outdoor-air plenum whenever the return-air damper is open, causing the outdoor-air opening to function as an exhaust rather than a ventilation-air opening. CO₂-based control will work successfully at this site only after the air-balance problems are corrected.

Although the above situation should not be indicative of routinely encountered conditions, it does exemplify the fact that energy projects cannot overcome problems associated with the basic operating strategy used for a building. These types of problems must be corrected before the energy savings potential can be obtained.

Figure 3.8. Building 337 - Cooling Coil Thermal Load and Minimum Damper Position Versus Time

3.2.2 Hanford Technical Library Computer Model Results

After analyzing the data from the HTL by comparing the mixed-air temperature to the supply-air temperature, it was clear the HVAC system was operating in an economizer mode. The mixed-air temperature was approximately the same as the supply-air temperature. By mixing cold outdoor air with warm return air, no cooling was needed to meet the required supply-air temperature. Therefore, CO₂-based control was not appropriate with this system configuration during the study. Outdoor-air ventilation rates should not be minimized because cooling energy is reduced by utilizing the economizer. Buildings such as the HTL can take advantage of CO₂-based ventilation control only during the summer cooling season when outdoor air adds to the cooling load.

4.0 Conclusions

Based on economic analyses of the life-cycle cost to utilize CO₂-based ventilation control, the following conclusions are made:

- For buildings with a winter heating load, the load reduction resulting from avoiding over-ventilating will probably show a simple payback of less than one year. CO₂-based ventilation control should be used in these buildings.
- For buildings with sufficient internal loads (i.e., no winter heating load or heating loads met by terminal reheat), the reduction in cooling load during summer months that could be realized with CO₂ ventilation control will probably not be economically effective.

5.0 References

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE). 1989. *ASHRAE Standard 62-1989*, "Ventilation for Acceptable Indoor Air Quality." Atlanta, Georgia.

10 CFR 436. "Federal Energy Management and Planning Programs." *U.S. Code of Federal Regulations*.

BLAST Support Office. 1991. *BLAST Users Manual*. University of Illinois at Urbana-Champaign.

Appendix A

BLAST Output

1 BLAST -- BUILDING LOADS ANALYSIS AND SYSTEM THERMODYNAMICS

TRADEMARK

A.1

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A.2


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0 109 NORTH AXIS=0.00;
0 110 EXTERIOR WALLS :
0 111 STARTING AT(0.00, 0.00, 0.00)
0 112 FACING(180.00)
0 113 TILTED(90.00)
0 114 EXTERIOR (100.00 BY 10.00)
0 115 WITH WINDOWS OF TYPE
0 116 FENTS ( 99.0 BY 2.0)
0 117 REVEAL (0.00)
0 118 AT (0.01, 3.0),
0 119 STARTING AT(100.00, 0.00, 0.00)
0 120 FACING(90.00)
0 121 TILTED(90.00)
0 122 EXTERIOR (100.00 BY 10.00)
0 123 WITH WINDOWS OF TYPE
0 124 DFW ( 99.0 BY 2.0)
0 125 AT (0.01, 3.0),
0 126 STARTING AT(100.00, 100.00, 0.00)
0 127 FACING(0.00)
0 128 TILTED(90.00)
0 129 EXTERIOR (100.00 BY 10.00)
0 130 WITH WINDOWS OF TYPE
0 131 DFW ( 99.0 BY 2.0)
0 132 AT (0.01, 3.0),
0 133 STARTING AT(0.00, 100.00, 0.00)
0 134 FACING(270.00)
0 135 TILTED(90.00)
0 136 EXTERIOR (100.00 BY 10.00)
0 137 WITH WINDOWS OF TYPE
0 138 DFW ( 99 BY 2.0)
0 139 AT (0.01, 3.0);
0 140 SLAB ON GRADE FLOORS :
0 141 STARTING AT(0.00, 100.00, 0.00)
0 142 FACING(180.00)
0 143 TILTED(180.00)
0 144 SLAB FLOOR (100.00 BY 100.00);
0 145 ROOFS :
0 146 STARTING AT(0.00, 0.00, 10.00)
0 147 FACING(180.00)
0 148 TILTED(0.00)
0 149 ROOF31 (100.00 BY 100.00);
0 150 PEOPLE=150,OCCUPANCY ,
0 151 AT ACTIVITY LEVEL 0.2, 70.00 PERCENT RADIANT,
0 152 FROM 01JAN THRU 31DEC;
0 153 LIGHTS=56.30,LIGHTS ,
0 154 10.00 PERCENT RETURN AIR, 20.00 PERCENT RADIANT,
0 155 20.00 PERCENT VISIBLE, 0.00 PERCENT REPLACEABLE,
0 156 FROM 01JAN THRU 31DEC;
0 157 CONTROLS=DEAD BAND ,
0 158 3412000.0 HEATING, 3412000.0 COOLING,
0 159 0.00 PERCENT MRT,
0 160 FROM 01JAN THRU 31DEC;
0 161 END ZONE;
0 162 END BUILDING DESCRIPTION;

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0 163 BEGIN FAN SYSTEM DESCRIPTION;
0 164 SINGLE ZONE DRAW THRU SYSTEM 1
0 165 "20% " SERVING ZONES
0 166 1;
0 167 FOR ZONE 1:
0 168 SUPPLY AIR VOLUME=27500;
0 169 EXHAUST AIR VOLUME=0;
0 170 BASEBOARD HEAT CAPACITY=0.0;
0 171 BASEBOARD HEAT ENERGY SUPPLY=HOT WATER;
0 172 ZONE MULTIPLIER=1;
0 173 END ZONE;
0 174 OTHER SYSTEM PARAMETERS:
0 175 SUPPLY FAN PRESSURE=2.48914;
0 176 SUPPLY FAN EFFICIENCY=0.7;
0 177 RETURN FAN PRESSURE=0.0;
0 178 RETURN FAN EFFICIENCY=0.7;
0 179 EXHAUST FAN PRESSURE=1.00396;
0 180 EXHAUST FAN EFFICIENCY=0.7;
0 181 HEATING COIL ENERGY SUPPLY=HOT WATER;
0 182 HEATING COIL CAPACITY=3412000;
0 183 MIXED AIR CONTROL=RETURN AIR ECONOMY CYCLE;
0 184 DESIRED MIXED AIR TEMPERATURE=COLD DECK TEMPERATURE;
0 185 OUTDOOR AIR VOLUME=0.0;
0 186 PREHEAT COIL LOCATION=NONE;
0 187 PREHEAT TEMPERATURE=46.4;
0 188 PREHEAT ENERGY SUPPLY=HOT WATER;
0 189 PREHEAT COIL CAPACITY=0;
0 190 GAS BURNER EFFICIENCY=0.8;
0 191 HUMIDIFIER TYPE=NONE;
0 192 HUMIDISTAT LOCATION=1;
0 193 HUMIDISTAT SET POINT=50;
0 194 SYSTEM ELECTRICAL DEMAND=0.0;
0 195 END OTHER SYSTEM PARAMETERS;
0 196 ** BLOCK USED FOR DESIGN SYSTEM ONLY **
0 197 OTHER SYSTEM PARAMETERS:
0 198 COOLING SAT DIFFERENCE=20.0;
0 199 HEATING SAT DIFFERENCE=70.0;
0 200 AIR VOLUME COEFFICIENT=1.0;
0 201 END OTHER SYSTEM PARAMETERS;
0 202 ** BLOCK USED FOR DESIGN SYSTEM ONLY **
0 203 COOLING COIL DESIGN PARAMETERS:
0 204 COIL TYPE=CHILLED WATER;
0 205 END COOLING COIL DESIGN PARAMETERS;
0 206 EQUIPMENT SCHEDULES:
0 207 SYSTEM OPERATION=ON, FROM 01JAN THRU 31DEC;
0 208 EXHAUST FAN OPERATION=ON, FROM 01JAN THRU 31DEC;
0 209 PREHEAT COIL OPERATION=ON, FROM 01JAN THRU 31DEC;
0 210 HEATING COIL OPERATION=ON, FROM 01JAN THRU 31DEC;
0 211 COOLING COIL OPERATION=ON, FROM 01JAN THRU 31DEC;
0 212 HUMIDIFIER OPERATION=ON, FROM 01JAN THRU 31DEC;
0 213 TSTAT BASEBOARD HEAT OPERATION=ON, FROM 01JAN THRU 31DEC;
0 214 HEAT RECOVERY OPERATION=OFF, FROM 01JAN THRU 31DEC;
0 215 MINIMUM VENTILATION SCHEDULE=MINVENT, FROM 01JAN THRU 31DEC;
0 216 MAXIMUM VENTILATION SCHEDULE=MAXOA, FROM 01JAN THRU 31DEC;

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0 217 SYSTEM ELECTRICAL DEMAND SCHEDULE=ON, FROM 01JAN THRU 31DEC;
0 218 END EQUIPMENT SCHEDULES;
0 219 END SYSTEM;
0 220 SINGLE ZONE DRAW THRU SYSTEM 2
0 221 "54 " SERVING ZONES
0 222 1;
0 223 FOR ZONE 1:
0 224 SUPPLY AIR VOLUME=27500;
0 225 EXHAUST AIR VOLUME=0;
0 226 BASEBOARD HEAT CAPACITY=0.0;
0 227 BASEBOARD HEAT ENERGY SUPPLY=HOT WATER;
0 228 ZONE MULTIPLIER=1;
0 229 END ZONE;
0 230 OTHER SYSTEM PARAMETERS:
0 231 SUPPLY FAN PRESSURE=2.48914;
0 232 SUPPLY FAN EFFICIENCY=0.7;
0 233 RETURN FAN PRESSURE=0.0;
0 234 RETURN FAN EFFICIENCY=0.7;
0 235 EXHAUST FAN PRESSURE=1.00396;
0 236 EXHAUST FAN EFFICIENCY=0.7;
0 237 HEATING COIL ENERGY SUPPLY=HOT WATER;
0 238 HEATING COIL CAPACITY=3412000;
0 239 MIXED AIR CONTROL=RETURN AIR ECONOMY CYCLE;
0 240 DESIRED MIXED AIR TEMPERATURE=COLD DECK TEMPERATURE;
0 241 OUTDOOR AIR VOLUME=0.0;
0 242 PREHEAT COIL LOCATION=NONE;
0 243 PREHEAT TEMPERATURE=46.4;
0 244 PREHEAT ENERGY SUPPLY=HOT WATER;
0 245 PREHEAT COIL CAPACITY=0;
0 246 GAS BURNER EFFICIENCY=0.8;
0 247 HUMIDIFIER TYPE=NONE;
0 248 HUMIDISTAT LOCATION=1;
0 249 HUMIDISTAT SET POINT=50;
0 250 SYSTEM ELECTRICAL DEMAND=0.0;
0 251 END OTHER SYSTEM PARAMETERS;
0 252 ** BLOCK USED FOR DESIGN SYSTEM ONLY **
0 253 OTHER SYSTEM PARAMETERS:
0 254 COOLING SAT DIFFERENCE=20.0;
0 255 HEATING SAT DIFFERENCE=70.0;
0 256 AIR VOLUME COEFFICIENT=1.0;
0 257 END OTHER SYSTEM PARAMETERS;
0 258 ** BLOCK USED FOR DESIGN SYSTEM ONLY **
0 259 COOLING COIL DESIGN PARAMETERS:
0 260 COIL TYPE=CHILLED WATER;
0 261 END COOLING COIL DESIGN PARAMETERS;
0 262 EQUIPMENT SCHEDULES:
0 263 SYSTEM OPERATION=ON, FROM 01JAN THRU 31DEC;
0 264 EXHAUST FAN OPERATION=ON, FROM 01JAN THRU 31DEC;
0 265 PREHEAT COIL OPERATION=ON, FROM 01JAN THRU 31DEC;
0 266 HEATING COIL OPERATION=ON, FROM 01JAN THRU 31DEC;
0 267 COOLING COIL OPERATION=ON, FROM 01JAN THRU 31DEC;
0 268 HUMIDIFIER OPERATION=ON, FROM 01JAN THRU 31DEC;
0 269 TSTAT BASEBOARD HEAT OPERATION=ON, FROM 01JAN THRU 31DEC;
0 270 HEAT RECOVERY OPERATION=OFF, FROM 01JAN THRU 31DEC;
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0 271 MINIMUM VENTILATION SCHEDULE=MINVENT2, FROM 01JAN THRU 31DEC;
0 272 MAXIMUM VENTILATION SCHEDULE=MAXOA, FROM 01JAN THRU 31DEC;
0 273 SYSTEM ELECTRICAL DEMAND SCHEDULE=ON, FROM 01JAN THRU 31DEC;
0 274 END EQUIPMENT SCHEDULES;
0 275 END SYSTEM;
0 276 END FAN SYSTEM DESCRIPTION;
0 277 END INPUT;

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0 REPORTING WILL BE DONE IN UNITS ENGLISH
0 SIMULATIONS WILL BE ALLOWED FOR TYPES* ZONES      SYSTEMS      PLANTS

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1 BUILDING SIMULATIONS WILL BE ATTEMPTED

SIMULATIONS WILL BE ATTEMPTED FOR 1 ZONES

SIMULATIONS WILL BE ATTEMPTED FOR 2 SYSTEMS

SIMULATIONS WILL BE ATTEMPTED FOR 0 PLANTS

0 NEW BLDL AND AHLDFL FILES WILL BE CREATED

FROM USER INPUT, AS NECESSARY

0 LOCATION TAKEN FROM ATTACHED WTHRFL

TITLE= YAKIMA WA- TMY

LAT= 46.500 LONG= 120.500 TIME ZONE= 8.0

0 * * * * *

BLDFL FOR

NONE SPECIFIED

LOCATION YAKIMA WA- TMY

LAT= 46.500 LONG= 120.500 TIME ZONE= 8.0

DATE OF FILE CREATE/UPDATE 1 JAN 99 NUMBER OF ENVIRONMENTS 3

NUMBER OF ZONES 1 WITH ZONE NUMBERS

1

0 * * * * *

AHLDFL FOR

NONE SPECIFIED

LOCATION YAKIMA WA- TMY

LAT= 46.500 LONG= 120.500 TIME ZONE= 8.0

DATE OF FILE CREATE/UPDATE 1 JAN 99 NUMBER OF ENVIRONMENTS 3

NUMBER OF SYSTEMS 2 WITH SYSTEM NUMBERS

1 2

0 ENVIRONMENT NUMBER 1 FOR BLDL TITLE IS SUMMER

DESIGN DAY 21 JUL WITH GROUND TEMPERATURE 64.000 MAKE UP WATER TEMPERATURE 55.004

0 ENVIRONMENT NUMBER 1 FOR AHLDFL TITLE IS SUMMER

DESIGN DAY 21 JUL WITH GROUND TEMPERATURE 64.000 MAKE UP WATER TEMPERATURE 55.004

0 ENVIRONMENT NUMBER 2 FOR BLDL TITLE IS SUMMER

DESIGN DAY 21 JUL WITH GROUND TEMPERATURE 64.000 MAKE UP WATER TEMPERATURE 55.004

0 ENVIRONMENT NUMBER 2 FOR AHLDFL TITLE IS SUMMER
DESIGN DAY 21 JUL WITH GROUND TEMPERATURE 64.000 MAKE UP WATER TEMPERATURE 55.004

***** SIMULATION PERIOD 1 JAN 1954 THRU 31 DEC 1954

0 ENVIRONMENT NUMBER 3 FOR BLDFL TITLE IS YAKIMA WA- TMY
WEATHER STATION 24243 START DATE OF 1 JAN 1954 NO. OF DAYS 365
WITH GROUND TEMPERATURES JAN =58.00 FEB =57.00 MAR =57.00 APR =59.00 MAY =61.00 JUN =62.00
JUL =64.00 AUG =65.00 SEP =65.00 OCT =64.00 NOV =63.00 DEC =60.00
WITH MAKE UP WATER TEMPERATURES JAN =55.00 FEB =55.00 MAR =55.00 APR =55.00 MAY =55.00 JUN =55.00
JUL =55.00 AUG =55.00 SEP =55.00 OCT =55.00 NOV =55.00 DEC =55.00

0 ENVIRONMENT NUMBER 3 FOR AHLDFL TITLE IS YAKIMA WA- TMY
WEATHER STATION 24243 START DATE OF 1 JAN 1954 NO. OF DAYS 365
WITH GROUND TEMPERATURES JAN =58.00 FEB =57.00 MAR =57.00 APR =59.00 MAY =61.00 JUN =62.00
JUL =64.00 AUG =65.00 SEP =65.00 OCT =64.00 NOV =63.00 DEC =60.00
WITH MAKE UP WATER TEMPERATURES JAN =55.00 FEB =55.00 MAR =55.00 APR =55.00 MAY =55.00 JUN =55.00
JUL =55.00 AUG =55.00 SEP =55.00 OCT =55.00 NOV =55.00 DEC =55.00

ZONE GROUP LOADS FOR SUMMER

DATE 21 JUL (MONDAY)

NUMBER		NAME		MULTIPLIER				
1	1	20%				1		
ZONE	TOTAL CONVECTIVE HEATER LOAD	TOTAL RADIANT HEATER LOAD	TOTAL SENSIBLE COOLING LOAD	PEAK CONVECTIVE HEATER LOAD	PEAK RADIANT HEATER LOAD	PEAK SENSIBLE COOLING LOAD	MAX TEMP	MIN TEMP
	1000BTU	1000BTU	1000BTU	1000BTU/HR	1000BTU/HR	1000BTU/HR	DEG. F	DEG. F
1	0.000E+00	0.000E+00	1.251E+03	0.000E+00	0.000E+00	9.545E+01	78.00	78.00
OGROUP:	0.000E+00	0.000E+00	1.251E+03	0.000E+00	0.000E+00	9.545E+01	78.00	78.00
OPEAK DATES (MO/DY/HR):				7/21/ 1	7/21/ 1	7/21/17	7/21/24	7/21/ 1
OTOTAL ITERATIONS =	191							
DID NOT CONVERGE =	0							

ZONE GROUP LOADS FOR SUMMER

DATE 21 JUL (SUNDAY)

NUMBER	NAME		MULTIPLIER				MAX TEMP	MIN TEMP
1	1	20%	1					
ZONE	TOTAL CONVECTIVE HEATER LOAD	TOTAL RADIANT HEATER LOAD	TOTAL SENSIBLE COOLING LOAD	PEAK CONVECTIVE HEATER LOAD	PEAK RADIANT HEATER LOAD	PEAK SENSIBLE COOLING LOAD	DEG. F	DEG. F
	1000BTU	1000BTU	1000BTU	1000BTU/HR	1000BTU/HR	1000BTU/HR		
1	0.000E+00	0.000E+00	7.125E+02	0.000E+00	0.000E+00	4.919E+01	78.00	78.00
OGROUP:	0.000E+00	0.000E+00	7.125E+02	0.000E+00	0.000E+00	4.919E+01	78.00	78.00
OPEAK DATES (MO/DY/HR):				7/21/ 1	7/21/ 1	7/21/18	7/21/24	7/21/ 1
OTOTAL ITERATIONS =	266							
DID NOT CONVERGE =	0							

ZONE GROUP LOADS FOR YAKIMA WA- TMY

SIMULATION PERIOD 1 JAN 1954 THRU 31 DEC 1954

NUMBER	NAME	MULTIPLIER						
1	1 20%	1						
ZONE	TOTAL CONVECTIVE HEATER LOAD	TOTAL RADIANT HEATER LOAD	TOTAL SENSIBLE COOLING LOAD	PEAK CONVECTIVE HEATER LOAD	PEAK RADIANT HEATER LOAD	PEAK SENSIBLE COOLING LOAD	MAX TEMP	MIN TEMP
	1000BTU	1000BTU	1000BTU	1000BTU/HR	1000BTU/HR	1000BTU/HR	DEG. F	DEG. F
1	1.173E+05	0.000E+00	7.496E+04	1.153E+02	0.000E+00	9.768E+01	78.00	68.02
OGROUP:	1.173E+05	0.000E+00	7.496E+04	1.153E+02	0.000E+00	9.768E+01	78.00	68.02
OPEAK DATES (MO/DY/HR):				1/20/ 6	1/ 1/ 1	7/29/17	10/20/17	12/31/24
OTOTAL ITERATIONS =	16518							
DID NOT CONVERGE =	0							

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*****
**                                **
**      SYSTEM DESIGN REPORT SUMMARY      **
**                                **
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PROJECT NONE SPECIFIED

SYSTEM NUMBER 1 SYSTEM TITLE 20%

SYSTEM TYPE SINGLE ZN DRAW THRU

USER INPUT PARAMETERS

DESIGN DELTA TEMPERATURE DEG.		DESIGN AIR VOLUME
HEATING	COOLING	COEFFICIENT
-----	-----	-----
70.00	20.00	1.00

ZONE NO	ZONE MULTIPLIER	DESIGN AIR QUANTITY FT**3/MIN	DESIGN ZONE SENSIBLE LOAD COOLING 1000BTU/HR	DESIGN ZONE SENSIBLE LOAD HEATING 1000BTU/HR	LOAD TYPE FOR DESIGN AIR QUANTITY
----	-----	-----	-----	-----	-----
1	1.0	4.4425E+03	9.5451E+01	0.0000E+00	COOLING

NOTE ***

USE OF THE DESIGN SYSTEM AND DESIGN PLANT FEATURES CAUSE A SIMULATION BASED ON THE USER SUPPLIED PARAMETERS (I.E., SUPPLY AIR TEMPERATURE DIFFERENCES, COIL CONTROL TYPE, CONTROLLER THROTTLING RANGES, ETC.). WHEN MAKING ALTERNATIVE STUDIES WITH THIS OPTION COMPARISON OF LIFE CYCLE COSTS MAY BE ERRONEOUS DUE TO DIFFERENT CAPITAL COSTS ASSOCIATED WITH SIZING OF CENTRAL PLANT COMPONENTS. WHEN SIMULATING THE PERFORMANCE OF EXISTING BUILDINGS ACTUAL CONDITIONS SHOULD BE ENTERED, AND ALTERNATIVE STUDIES SHOULD BE BASED ON INTENDED ALTERATIONS.

 **
 ** AIR HANDLING SYSTEM ENERGY USE SUMMARY **
 **

SYSTEM NUMBER=
 DESIGN DAY SUMMER

1, 204

SIMULATION DATE 21JUL1999 (MONDAY)

0 0	HOUR	E L E C T R I C I T Y							
		BUILDING ELECTRIC		SYSTEM EQUIPMENT		ELECTRIC HEATING		TOTAL USE	
		CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)
	1	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	2	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	3	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	4	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	5	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	6	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	7	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	8	1.689E+04	1.689E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	2.323E+04	2.323E+04
	9	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	10	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	11	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	12	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	13	4.504E+04	4.504E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.138E+04	5.138E+04
	14	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	15	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	16	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	17	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	18	2.815E+04	2.815E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	3.449E+04	3.449E+04
	19	1.689E+04	1.689E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	2.323E+04	2.323E+04
	20	1.689E+04	1.689E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	2.323E+04	2.323E+04
	21	1.126E+04	1.126E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.760E+04	1.760E+04
	22	1.126E+04	1.126E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.760E+04	1.760E+04
	23	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	24	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
0		-----	-----	-----	-----	-----	-----	-----	-----
0	TOT	5.574E+05	5.067E+04	1.522E+05	6.341E+03	0.000E+00	0.000E+00	7.095E+05	5.701E+04

A.13

A.14

0	0	HOUR	GAS		STEAM		HOT WATER		COOLING COIL DEMAND (CW)	
			TOTAL USE		TOTAL USE		TOTAL USE		TOTAL USE	
			CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)
		1	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
		2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
		3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
		4	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
		5	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
		6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
		7	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
		8	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
		9	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.106E+04	4.106E+04
		10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.530E+04	7.530E+04
		11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.555E+04	8.555E+04
		12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.807E+04	8.807E+04
		13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.243E+04	9.243E+04
		14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.102E+05	1.102E+05
		15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.174E+05	1.174E+05
		16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.217E+05	1.217E+05
		17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.225E+05	1.225E+05
		18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.075E+05	1.075E+05
		19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.816E+04	8.816E+04
		20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.659E+04	7.659E+04
		21	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.537E+04	6.537E+04
		22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.766E+04	4.766E+04
		23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.534E+04	2.534E+04
		24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.083E+04	1.083E+04
0			-----	-----	-----	-----	-----	-----	-----	-----
0		TOT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.276E+06	1.225E+05

 **
 ** AIR HANDLING SYSTEM COMPONENT LOAD SUMMARY **
 **

	SYSTEM NUMBER=	1, 20*				
	DESIGN DAY SUMMER					
0	MONTH	CONSUMPTION	PEAK DEMAND	HRS CNSMPTN	PK CAP EXCD	HRS CAP EXCD
		(BTU)	(BTU/HR)	(HOURS)	(BTU/HR)	(HOURS)
0 HEATING COIL LOADS	JUL	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	ANN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0 COOLING COIL LOADS	JUL	1.276E+06	1.225E+05	1.600E+01	0.000E+00	0.000E+00
	ANN	1.276E+06	1.225E+05	1.600E+01	0.000E+00	0.000E+00

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*****
**
**  AIR HANDLING SYSTEM LOAD SUMMARY  **
**
*****

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SYSTEM NUMBER= 1, 20%
DESIGN DAY SUMMER

SIMULATION DATE 21JUL1999 (MONDAY)
0 TOTAL DEMAND PEAK DEMAND TIME OF PEAK
1000BTU 1000BTU/HR MO/DY/HR
OSUM OF ZONE SENSIBLE
HEATING LOADS 0.00000E+00 0.00000E+00 0/ 0/ 0
OTOTAL HEATING PROVIDED
BY SYSTEM 0.00000E+00 0.00000E+00 0/ 0/ 0

SUM OF ZONE SENSIBLE
COOLING LOADS 1.25071E+03 9.54511E+01 7/21/17
OSENSIBLE COOLING
PROVIDED BY SYSTEM 1.25153E+03 1.20163E+02 7/21/17
OLATENT COOLING
PROVIDED BY SYSTEM 2.41080E+01 2.31467E+00 7/21/17
OTOTAL COOLING PROVIDED
BY SYSTEM 1.27564E+03 1.22478E+02 7/21/17

TOTAL ENERGY CONSUMED BY SYSTEM AND ZONES - 1.98518E+03 1000BTU
OTOTAL FLOOR AREA SERVED BY FAN SYSTEM - 1.00000E+04 FT**2

OENERGY BUDGET (TOTAL ENERGY/FLOOR AREA) - 1.98518E-01 1000BTU /FT**2

NOTE: THIS ENERGY BUDGET DOES NOT INCLUDE ANY LOADS NOT MET
OR ANY ENERGY FOR DOMESTIC HOT WATER. IT ALSO DOES NOT
INCLUDE THE EFFECT OF THE PLANT ON ENERGY CONSUMPTION.

FRACTION OF OUTDOOR AIR	MAX [%]	AVG [%]	MIN [%]	HRS SYSTEM OPERATED	TOTAL HRS OF SIMULATION
MX/MN DATES	100.00	47.45	20.00	24	24
(MO/DY/HR):	7/21/ 9		7/21/10		

FRACTION OF OUTDOOR AIR VALUES ARE BASED ON SYSTEM OPERATING HOURS ONLY!

 **
 ** AIR HANDLING SYSTEM ENERGY USE SUMMARY **
 **

SYSTEM NUMBER= 1, 20%
 DESIGN DAY SUMMER

SIMULATION DATE 21JUL1999 (SUNDAY)

0 0	HOUR	E L E C T R I C I T Y							
		BUILDING ELECTRIC		SYSTEM EQUIPMENT		ELECTRIC HEATING		TOTAL USE	
		CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)
	1	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	2	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	3	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	4	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	5	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	6	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	7	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	8	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	9	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	10	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	11	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	12	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	13	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	14	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	15	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	16	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	17	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	18	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	19	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	20	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	21	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	22	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	23	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	24	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
0		-----	-----	-----	-----	-----	-----	-----	-----
0	TOT	1.351E+05	5.630E+03	1.522E+05	6.341E+03	0.000E+00	0.000E+00	2.873E+05	1.197E+04

A.17

A.18

0 0	HOUR	GAS		STEAM		HOT WATER		COOLING COIL DEMAND (CW)	
		TOTAL USE		TOTAL USE		TOTAL USE		TOTAL USE	
		CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)
	1	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	4	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	5	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	7	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	8	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	9	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.317E+03	9.317E+03
	10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.010E+04	3.010E+04
	11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.835E+04	3.835E+04
	12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.621E+04	4.621E+04
	13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.350E+04	5.350E+04
	14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.105E+04	6.105E+04
	15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.701E+04	6.701E+04
	16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.017E+04	7.017E+04
	17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.076E+04	7.076E+04
	18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.845E+04	6.845E+04
	19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.381E+04	6.381E+04
	20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.506E+04	5.506E+04
	21	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.822E+04	4.822E+04
	22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.180E+04	3.180E+04
	23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.639E+04	1.639E+04
	24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.934E+03	3.934E+03
0		-----	-----	-----	-----	-----	-----	-----	-----
0	TOT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.341E+05	7.076E+04

 **
 ** AIR HANDLING SYSTEM COMPONENT LOAD SUMMARY **
 **

SYSTEM NUMBER=		1, 20%				
DESIGN DAY SUMMER		SIMULATION DATE 21JUL1999 (SUNDAY)				
0	MONTH	CONSUMPTION	PEAK DEMAND	HRS CNSMPTN	PK CAP EXCD	HRS CAP EXCD
		(BTU)	(BTU/HR)	(HOURS)	(BTU/HR)	(HOURS)
0 HEATING COIL LOADS						
	JUL	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	ANN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0 COOLING COIL LOADS						
	JUL	7.341E+05	7.076E+04	1.600E+01	0.000E+00	0.000E+00
	ANN	7.341E+05	7.076E+04	1.600E+01	0.000E+00	0.000E+00

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**
**  AIR  HANDLING  SYSTEM  LOAD  SUMMARY  **
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SYSTEM NUMBER= 1, 20
DESIGN DAY SUMMER

SIMULATION DATE 21JUL1999 (SUNDAY)			
	TOTAL DEMAND 1000BTU	PEAK DEMAND 1000BTU/HR	TIME OF PEAK MO/DY/HR
OSUM OF ZONE SENSIBLE HEATING LOADS	0.00000E+00	0.00000E+00	0/ 0/ 0
OTOTAL HEATING PROVIDED BY SYSTEM	0.00000E+00	0.00000E+00	0/ 0/ 0
SUM OF ZONE SENSIBLE COOLING LOADS	7.12539E+02	4.91927E+01	7/21/18
0SENSIBLE COOLING PROVIDED BY SYSTEM	7.20247E+02	6.94225E+01	7/21/17
0LATENT COOLING PROVIDED BY SYSTEM	1.38740E+01	1.33725E+00	7/21/17
OTOTAL COOLING PROVIDED BY SYSTEM	7.34121E+02	7.07598E+01	7/21/17

TOTAL ENERGY CONSUMED BY SYSTEM AND ZONES = 1.02142E+03 1000BTU

FRACTION OF OUTDOOR AIR MX/MN DATES (MO/DY/HR):	MAX [%] 100.00 7/21/ 9	AVG [%] 43.78	MIN [%] 20.00 7/21/10	HRS SYSTEM OPERATED 24	TOTAL HRS OF SIMULATION 24
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FRACTION OF OUTDOOR AIR VALUES ARE BASED ON SYSTEM OPERATING HOURS ONLY!

A.20

 **
 ** AIR HANDLING SYSTEM ENERGY USE SUMMARY **
 **

SYSTEM NUMBER= 1, 20%
 SYSTEM LOCATION = 24243 YAKIMA WA- TMY SIMULATION PERIOD 1JAN1954 - 31DEC1954

A.21

0	0	MONTH	E L E C T R I C I T Y							
			BUILDING ELECTRIC		SYSTEM EQUIPMENT		ELECTRIC HEATING		TOTAL USE	
			CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND
			(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)
0		JAN	1.256E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.728E+07	5.701E+04
0		FEB	1.175E+07	5.067E+04	4.261E+06	6.341E+03	0.000E+00	0.000E+00	1.601E+07	5.701E+04
0		MAR	1.384E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.856E+07	5.701E+04
0		APR	1.329E+07	5.067E+04	4.565E+06	6.341E+03	0.000E+00	0.000E+00	1.785E+07	5.701E+04
0		MAY	1.256E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.728E+07	5.701E+04
0		JUN	1.329E+07	5.067E+04	4.565E+06	6.341E+03	0.000E+00	0.000E+00	1.785E+07	5.701E+04
0		JUL	1.299E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.770E+07	5.701E+04
0		AUG	1.342E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.814E+07	5.701E+04
0		SEP	1.286E+07	5.067E+04	4.565E+06	6.341E+03	0.000E+00	0.000E+00	1.743E+07	5.701E+04
0		OCT	1.256E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.728E+07	5.701E+04
0		NOV	1.244E+07	5.067E+04	4.565E+06	6.341E+03	0.000E+00	0.000E+00	1.701E+07	5.701E+04
0		DEC	1.300E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.772E+07	5.701E+04
0			-----	-----	-----	-----	-----	-----	-----	-----
0		TOT	1.546E+08	5.067E+04	5.554E+07	6.341E+03	0.000E+00	0.000E+00	2.101E+08	5.701E+04

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0	0	MONTH	GAS		STEAM		HOT WATER		COOLING COIL DEMAND (CW)	
			TOTAL USE		TOTAL USE		TOTAL USE		TOTAL USE	
			CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND
			(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)
0		JAN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.753E+07	1.901E+05	0.000E+00	0.000E+00
0		FEB	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.361E+07	1.020E+05	0.000E+00	0.000E+00
0		MAR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.719E+07	9.209E+04	0.000E+00	0.000E+00
0		APR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.292E+07	7.641E+04	9.728E+04	2.118E+04
0		MAY	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.593E+06	3.839E+04	3.448E+06	1.000E+05
0		JUN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.290E+06	2.932E+04	9.286E+06	1.070E+05
0		JUL	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.918E+06	2.465E+04	2.173E+07	1.249E+05
0		AUG	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.625E+06	2.463E+04	1.873E+07	1.233E+05
0		SEP	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.438E+06	3.112E+04	6.256E+06	9.990E+04
0		OCT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.225E+07	7.318E+04	7.643E+05	7.211E+04
0		NOV	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.896E+07	1.095E+05	0.000E+00	0.000E+00
0		DEC	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.066E+07	1.233E+05	0.000E+00	0.000E+00
0			-----	-----	-----	-----	-----	-----	-----	-----
0		TOT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.440E+08	1.901E+05	6.032E+07	1.249E+05

 **
 ** AIR HANDLING SYSTEM COMPONENT LOAD SUMMARY **
 **

SYSTEM NUMBER= 1, 20%
 SYSTEM LOCATION = 24243 YAKIMA WA- TMY

0	MONTH	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	SIMULATION PERIOD 1JAN1954 - 31DEC1954 HRS CNSMPTN (HOURS)	PK CAP EXCD (BTU/HR)	HRS CAP EXCD (HOURS)
0 HEATING COIL LOADS						
	JAN	5.753E+07	1.901E+05	7.440E+02	0.000E+00	0.000E+00
	FEB	3.361E+07	1.020E+05	6.720E+02	0.000E+00	0.000E+00
	MAR	2.719E+07	9.209E+04	7.440E+02	0.000E+00	0.000E+00
	APR	1.292E+07	7.641E+04	6.540E+02	0.000E+00	0.000E+00
	MAY	6.593E+06	3.839E+04	4.740E+02	0.000E+00	0.000E+00
	JUN	3.290E+06	2.932E+04	3.000E+02	0.000E+00	0.000E+00
	JUL	1.918E+06	2.465E+04	1.720E+02	0.000E+00	0.000E+00
	AUG	2.625E+06	2.463E+04	2.160E+02	0.000E+00	0.000E+00
	SEP	6.438E+06	3.112E+04	4.200E+02	0.000E+00	0.000E+00
	OCT	1.225E+07	7.318E+04	6.520E+02	0.000E+00	0.000E+00
	NOV	2.896E+07	1.095E+05	7.130E+02	0.000E+00	0.000E+00
	DEC	5.066E+07	1.233E+05	7.440E+02	0.000E+00	0.000E+00
	ANN	2.440E+08	1.901E+05	6.505E+03	0.000E+00	0.000E+00
0 COOLING COIL LOADS						
	JAN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	FEB	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	MAR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	APR	9.728E+04	2.118E+04	1.100E+01	0.000E+00	0.000E+00
	MAY	3.448E+06	1.000E+05	1.060E+02	0.000E+00	0.000E+00
	JUN	9.286E+06	1.070E+05	2.170E+02	0.000E+00	0.000E+00
	JUL	2.173E+07	1.249E+05	3.710E+02	0.000E+00	0.000E+00
	AUG	1.873E+07	1.233E+05	3.420E+02	0.000E+00	0.000E+00
	SEP	6.256E+06	9.990E+04	1.540E+02	0.000E+00	0.000E+00
	OCT	7.643E+05	7.211E+04	2.500E+01	0.000E+00	0.000E+00
	NOV	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	DEC	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	ANN	6.032E+07	1.249E+05	1.226E+03	0.000E+00	0.000E+00

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**
** AIR HANDLING SYSTEM LOAD SUMMARY
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SYSTEM NUMBER= 1, 20%
SYSTEM LOCATION = 24243 YAKIMA WA- TMY

	SIMULATION PERIOD 1JAN1954 - 31DEC1954	TOTAL DEMAND 1000BTU	PEAK DEMAND 1000BTU/HR	TIME OF PEAK MO/DY/HR
0				
OSUM OF ZONE SENSIBLE HEATING LOADS	1.17268E+05	1.15307E+02	1/20/ 6	
OTOTAL HEATING PROVIDED BY SYSTEM	2.43990E+05	1.90078E+02	1/20/ 6	
SUM OF ZONE SENSIBLE COOLING LOADS	7.49622E+04	9.76806E+01	7/29/17	
OSENSIBLE COOLING PROVIDED BY SYSTEM	5.92615E+04	1.22755E+02	7/29/17	
OLATENT COOLING PROVIDED BY SYSTEM	1.05376E+03	8.92051E+00	8/11/16	
OTOTAL COOLING PROVIDED BY SYSTEM	6.03152E+04	1.24862E+02	7/29/17	

TOTAL ENERGY CONSUMED BY SYSTEM AND ZONES = 5.14393E+05 1000BTU

FRACTION OF OUTDOOR AIR MX/MN DATES (MO/DY/HR):	MAX [%] 100.00 4/25/18	AVG [%] 28.62	MIN [%] 20.00 1/ 1/ 1	HRS SYSTEM OPERATED 8760	TOTAL HRS OF SIMULATION 8760

FRACTION OF OUTDOOR AIR VALUES ARE BASED ON SYSTEM OPERATING HOURS ONLY!

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**                                **
**  SYSTEM DESIGN REPORT SUMMARY  **
**                                **
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PROJECT NONE SPECIFIED

SYSTEM NUMBER 2 SYSTEM TITLE 5%

SYSTEM TYPE SINGLE ZN DRAW THRU

USER INPUT PARAMETERS

DESIGN DELTA TEMPERATURE DEG.		DESIGN AIR VOLUME
HEATING	COOLING	COEFFICIENT
70.00	20.00	1.00

ZONE NO	ZONE MULTIPLIER	DESIGN AIR QUANTITY FT**3/MIN	DESIGN ZONE SENSIBLE LOAD COOLING 1000BTU/HR	DESIGN ZONE SENSIBLE LOAD HEATING 1000BTU/HR	LOAD TYPE FOR DESIGN AIR QUANTITY
1	1.0	4.4425E+03	9.5451E+01	0.0000E+00	COOLING

NOTE ***
 USE OF THE DESIGN SYSTEM AND DESIGN PLANT FEATURES CAUSE A SIMULATION BASED
 ON THE USER SUPPLIED PARAMETERS (I.E., SUPPLY AIR TEMPERATURE DIFFERENCES,
 COIL CONTROL TYPE, CONTROLLER THROTTLING RANGES, ETC.). WHEN MAKING
 ALTERNATIVE STUDIES WITH THIS OPTION COMPARISON OF LIFE CYCLE COSTS MAY BE
 ERRONEOUS DUE TO DIFFERENT CAPITAL COSTS ASSOCIATED WITH SIZING OF CENTRAL
 PLANT COMPONENTS. WHEN SIMULATING THE PERFORMANCE OF EXISTING BUILDINGS
 ACTUAL CONDITIONS SHOULD BE ENTERED, AND ALTERNATIVE STUDIES SHOULD BE BASED
 ON INTENDED ALTERATIONS.

 **
 ** AIR HANDLING SYSTEM ENERGY USE SUMMARY **
 **

SYSTEM NUMBER= 2, 5%
 DESIGN DAY SUMMER

SIMULATION DATE 21JUL1999 (MONDAY)

0 0	HOUR	E L E C T R I C I T Y							
		BUILDING ELECTRIC		SYSTEM EQUIPMENT		ELECTRIC HEATING		TOTAL USE	
		CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND
		(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)
	1	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	2	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	3	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	4	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	5	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	6	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	7	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	8	1.689E+04	1.689E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	2.323E+04	2.323E+04
	9	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	10	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	11	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	12	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	13	4.504E+04	4.504E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.138E+04	5.138E+04
	14	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	15	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	16	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	17	5.067E+04	5.067E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	5.701E+04	5.701E+04
	18	2.815E+04	2.815E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	3.449E+04	3.449E+04
	19	1.689E+04	1.689E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	2.323E+04	2.323E+04
	20	1.689E+04	1.689E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	2.323E+04	2.323E+04
	21	1.126E+04	1.126E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.760E+04	1.760E+04
	22	1.126E+04	1.126E+04	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.760E+04	1.760E+04
	23	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
	24	0.000E+00	0.000E+00	6.341E+03	6.341E+03	0.000E+00	0.000E+00	6.341E+03	6.341E+03
0		-----	-----	-----	-----	-----	-----	-----	-----
0	TOT	5.574E+05	5.067E+04	1.522E+05	6.341E+03	0.000E+00	0.000E+00	7.095E+05	5.701E+04

A.25

0 0	HOUR	GAS		STEAM		HOT WATER		COOLING COIL DEMAND (CW)	
		TOTAL USE		TOTAL USE		TOTAL USE		TOTAL USE	
		CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)
	1	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	4	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	5	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	7	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	8	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	9	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.106E+04	4.106E+04
	10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.520E+04	7.520E+04
	11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.173E+04	8.173E+04
	12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.075E+04	8.075E+04
	13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.239E+04	8.239E+04
	14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.851E+04	9.851E+04
	15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.051E+05	1.051E+05
	16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.100E+05	1.100E+05
	17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.123E+05	1.123E+05
	18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.934E+04	9.934E+04
	19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.092E+04	8.092E+04
	20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.314E+04	7.314E+04
	21	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.502E+04	6.502E+04
	22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.766E+04	4.766E+04
	23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.534E+04	2.534E+04
	24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.083E+04	1.083E+04
0		-----	-----	-----	-----	-----	-----	-----	-----
0	TOT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.189E+06	1.123E+05

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**      A I R   H A N D L I N G   S Y S T E M   C O M P O N E N T   L O A D   S U M M A R Y
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SYSTEM NUMBER=		2, 5%				
DESIGN DAY SUMMER		SIMULATION DATE 21JUL1999 (MONDAY)				
0	MONTH	CONSUMPTION	PEAK DEMAND	HRS CNSMPTN	PK CAP EXCD	HRS CAP EXCD
		(BTU)	(BTU/HR)	(HOURS)	(BTU/HR)	(HOURS)
0 HEATING COIL LOADS						
	JUL	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	ANN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0 COOLING COIL LOADS						
	JUL	1.189E+06	1.123E+05	1.600E+01	0.000E+00	0.000E+00
	ANN	1.189E+06	1.123E+05	1.600E+01	0.000E+00	0.000E+00

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**
**  AIR  HANDLING  SYSTEM  LOAD  SUMMARY
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SYSTEM NUMBER= 2, 5%
DESIGN DAY SUMMER

SIMULATION DATE 21JUL1999 (MONDAY)
0 TOTAL DEMAND PEAK DEMAND TIME OF PEAK
1000BTU 1000BTU/HR MO/DY/HR
OSUM OF ZONE SENSIBLE
HEATING LOADS 0.00000E+00 0.00000E+00 0/ 0/ 0
OTOTAL HEATING PROVIDED
BY SYSTEM 0.00000E+00 0.00000E+00 0/ 0/ 0

SUM OF ZONE SENSIBLE
COOLING LOADS 1.25071E+03 9.54511E+01 7/21/17
OSENSIBLE COOLING
PROVIDED BY SYSTEM 1.16679E+03 1.10185E+02 7/21/17
OLATENT COOLING
PROVIDED BY SYSTEM 2.24755E+01 2.12250E+00 7/21/17
OTOTAL COOLING PROVIDED
BY SYSTEM 1.18926E+03 1.12307E+02 7/21/17

TOTAL ENERGY CONSUMED BY SYSTEM AND ZONES - 1.89881E+03 1000BTU
OTOTAL FLOOR AREA SERVED BY FAN SYSTEM - 1.00000E+04 FT**2

OENERGY BUDGET (TOTAL ENERGY/FLOOR AREA) - 1.89881E-01 1000BTU /FT**2

NOTE% THIS ENERGY BUDGET DOES NOT INCLUDE ANY LOADS NOT MET
OR ANY ENERGY FOR DOMESTIC HOT WATER. IT ALSO DOES NOT
INCLUDE THE EFFECT OF THE PLANT ON ENERGY CONSUMPTION.

FRACTION OF OUTDOOR AIR	MAX [%]	AVG [%]	MIN [%]	HRS SYSTEM OPERATED	TOTAL HRS OF SIMULATION
MX/MN DATES	100.00	39.33	0.00	24	24
(MO/DY/HR):	7/21/ 9		7/21/19		

FRACTION OF OUTDOOR AIR VALUES ARE BASED ON SYSTEM OPERATING HOURS ONLY!

 **
 ** AIR HANDLING SYSTEM ENERGY USE SUMMARY **
 **

SYSTEM NUMBER= 2, 54
 DESIGN DAY SUMMER

SIMULATION DATE 21JUL1999 (SUNDAY)

0 0	HOUR	E L E C T R I C I T Y							
		BUILDING ELECTRIC		SYSTEM EQUIPMENT		ELECTRIC HEATING		TOTAL USE	
		CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND
		(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)
	1	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	2	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	3	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	4	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	5	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	6	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	7	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	8	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	9	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	10	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	11	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	12	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	13	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	14	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	15	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	16	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	17	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	18	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	19	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	20	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	21	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	22	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	23	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
	24	5.630E+03	5.630E+03	6.341E+03	6.341E+03	0.000E+00	0.000E+00	1.197E+04	1.197E+04
0		-----	-----	-----	-----	-----	-----	-----	-----
0	TOT	1.351E+05	5.630E+03	1.522E+05	6.341E+03	0.000E+00	0.000E+00	2.873E+05	1.197E+04

A.30

0 0	HOUR	GAS		STEAM		HOT WATER		COOLING COIL DEMAND (CW)	
		TOTAL USE		TOTAL USE		TOTAL USE		TOTAL USE	
		CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)
	1	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	4	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	5	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	7	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	8	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	9	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.317E+03	9.317E+03
	10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.904E+04	2.904E+04
	11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.234E+04	3.234E+04
	12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.552E+04	3.552E+04
	13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.931E+04	3.931E+04
	14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.453E+04	4.453E+04
	15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.961E+04	4.961E+04
	16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.364E+04	5.364E+04
	17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.628E+04	5.628E+04
	18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.718E+04	5.718E+04
	19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.633E+04	5.633E+04
	20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.138E+04	5.138E+04
	21	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.775E+04	4.775E+04
	22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.180E+04	3.180E+04
	23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.639E+04	1.639E+04
	24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.934E+03	3.934E+03
0 0	TOT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.144E+05	5.718E+04

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**
**      A I R   H A N D L I N G   S Y S T E M   C O M P O N E N T   L O A D   S U M M A R Y
**
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SYSTEM NUMBER=		2, 5%		SIMULATION DATE 21JUL1999 (SUNDAY)		
DESIGN DAY SUMMER						
0	MONTH	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	HRS CNSMPTN (HOURS)	PK CAP EXCD (BTU/HR)	HRS CAP EXCD (HOURS)
0 HEATING COIL LOADS						
	JUL	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	ANN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
0 COOLING COIL LOADS						
	JUL	6.144E+05	5.718E+04	1.600E+01	0.000E+00	0.000E+00
	ANN	6.144E+05	5.718E+04	1.600E+01	0.000E+00	0.000E+00

 **
 ** AIR HANDLING SYSTEM LOAD SUMMARY **
 **

SYSTEM NUMBER= 2, 5%
 DESIGN DAY SUMMER

0 SIMULATION DATE 21JUL1999 (SUNDAY)

	TOTAL DEMAND 1000BTU	PEAK DEMAND 1000BTU/HR	TIME OF PEAK MO/DY/HR
OSUM OF ZONE SENSIBLE HEATING LOADS	0.00000E+00	0.00000E+00	0/ 0/ 0
OTOTAL HEATING PROVIDED BY SYSTEM	0.00000E+00	0.00000E+00	0/ 0/ 0
SUM OF ZONE SENSIBLE COOLING LOADS	7.12539E+02	4.91927E+01	7/21/18
OSENSIBLE COOLING PROVIDED BY SYSTEM	6.02762E+02	5.60964E+01	7/21/18
OLATENT COOLING PROVIDED BY SYSTEM	1.16108E+01	1.08056E+00	7/21/18
OTOTAL COOLING PROVIDED BY SYSTEM	6.14373E+02	5.71770E+01	7/21/18

TOTAL ENERGY CONSUMED BY SYSTEM AND ZONES = 9.01669E+02 1000BTU

FRACTION OF OUTDOOR AIR MX/MN DATES (MO/DY/HR):	MAX [%] 100.00 7/21/ 9	AVG [%] 33.78	MIN [%] 0.00 7/21/10	HRS SYSTEM OPERATED 24	TOTAL HRS OF SIMULATION 24
---	------------------------------	------------------	----------------------------	---------------------------	-------------------------------

FRACTION OF OUTDOOR AIR VALUES ARE BASED ON SYSTEM OPERATING HOURS ONLY!

A.32

 **
 ** AIR HANDLING SYSTEM ENERGY USE SUMMARY **
 **

SYSTEM NUMBER= 2, 5%
 SYSTEM LOCATION = 24243 YAKIMA WA- TMY

SIMULATION PERIOD 1JAN1954 - 31DEC1954

A.33

0	0	MONTH	E L E C T R I C I T Y							
			BUILDING ELECTRIC		SYSTEM EQUIPMENT		ELECTRIC HEATING		TOTAL USE	
			CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND
			(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)
0		JAN	1.256E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.728E+07	5.701E+04
0		FEB	1.175E+07	5.067E+04	4.261E+06	6.341E+03	0.000E+00	0.000E+00	1.601E+07	5.701E+04
0		MAR	1.384E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.856E+07	5.701E+04
0		APR	1.329E+07	5.067E+04	4.565E+06	6.341E+03	0.000E+00	0.000E+00	1.785E+07	5.701E+04
0		MAY	1.256E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.728E+07	5.701E+04
0		JUN	1.329E+07	5.067E+04	4.565E+06	6.341E+03	0.000E+00	0.000E+00	1.785E+07	5.701E+04
0		JUL	1.299E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.770E+07	5.701E+04
0		AUG	1.342E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.814E+07	5.701E+04
0		SEP	1.286E+07	5.067E+04	4.565E+06	6.341E+03	0.000E+00	0.000E+00	1.743E+07	5.701E+04
0		OCT	1.256E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.728E+07	5.701E+04
0		NOV	1.244E+07	5.067E+04	4.565E+06	6.341E+03	0.000E+00	0.000E+00	1.701E+07	5.701E+04
0		DEC	1.300E+07	5.067E+04	4.717E+06	6.341E+03	0.000E+00	0.000E+00	1.772E+07	5.701E+04
0		TOT	1.546E+08	5.067E+04	5.554E+07	6.341E+03	0.000E+00	0.000E+00	2.101E+08	5.701E+04

1 US ARMY CORPS OF ENGINEERS -- BLAST VERSION 3.0 (ANSI FORTRAN 77)

LEVEL 215-08 1 JAN 99

06.09.06

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0	0	MONTH	GAS		STEAM		HOT WATER		COOLING COIL DEMAND (CW)	
			CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND	CONSUMPTION	PEAK DEMAND
			(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)	(BTU)	(BTU/HR)
0		JAN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.217E+07	1.284E+05	0.000E+00	0.000E+00
0		FEB	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.592E+07	6.607E+04	0.000E+00	0.000E+00
0		MAR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.057E+07	6.007E+04	0.000E+00	0.000E+00
0		APR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.892E+06	4.351E+04	8.267E+04	2.118E+04
0		MAY	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.104E+04	3.987E+03	3.315E+06	8.933E+04
0		JUN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.074E+06	1.008E+05
0		JUL	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.029E+07	1.146E+05
0		AUG	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.766E+07	1.133E+05
0		SEP	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.581E+04	2.301E+03	6.010E+06	9.341E+04
0		OCT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.827E+06	3.651E+04	7.530E+05	7.211E+04
0		NOV	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.248E+07	7.129E+04	0.000E+00	0.000E+00
0		DEC	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.680E+07	8.228E+04	0.000E+00	0.000E+00
0		TOT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.017E+08	1.284E+05	5.718E+07	1.146E+05

 **
 ** AIR HANDLING SYSTEM COMPONENT LOAD SUMMARY **
 **

SYSTEM NUMBER= 2, 5						
SYSTEM LOCATION = 24243 YAKIMA WA- TMY						
0	MONTH	CONSUMPTION (BTU)	PEAK DEMAND (BTU/HR)	HRS CNSMPTN (HOURS)	PK CAP EXCD (BTU/HR)	HRS CAP EXCD (HOURS)
SIMULATION PERIOD 1JAN1954 - 31DEC1954						
0 HEATING COIL LOADS						
	JAN	3.217E+07	1.284E+05	6.790E+02	0.000E+00	0.000E+00
	FEB	1.592E+07	6.607E+04	5.280E+02	0.000E+00	0.000E+00
	MAR	1.057E+07	6.007E+04	4.220E+02	0.000E+00	0.000E+00
	APR	1.892E+06	4.351E+04	1.320E+02	0.000E+00	0.000E+00
	MAY	1.104E+04	3.987E+03	5.000E+00	0.000E+00	0.000E+00
	JUN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	JUL	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	AUG	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	SEP	1.581E+04	2.301E+03	1.900E+01	0.000E+00	0.000E+00
	OCT	1.827E+06	3.651E+04	1.370E+02	0.000E+00	0.000E+00
	NOV	1.248E+07	7.129E+04	5.080E+02	0.000E+00	0.000E+00
	DEC	2.680E+07	8.228E+04	6.820E+02	0.000E+00	0.000E+00
	ANN	1.017E+08	1.284E+05	3.112E+03	0.000E+00	0.000E+00
0 COOLING COIL LOADS						
	JAN	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	FEB	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	MAR	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	APR	8.267E+04	2.118E+04	1.100E+01	0.000E+00	0.000E+00
	MAY	3.315E+06	8.933E+04	1.060E+02	0.000E+00	0.000E+00
	JUN	9.074E+06	1.008E+05	2.170E+02	0.000E+00	0.000E+00
	JUL	2.029E+07	1.146E+05	3.710E+02	0.000E+00	0.000E+00
	AUG	1.766E+07	1.133E+05	3.420E+02	0.000E+00	0.000E+00
	SEP	6.010E+06	9.341E+04	1.540E+02	0.000E+00	0.000E+00
	OCT	7.530E+05	7.211E+04	2.500E+01	0.000E+00	0.000E+00
	NOV	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	DEC	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	ANN	5.718E+07	1.146E+05	1.226E+03	0.000E+00	0.000E+00

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*****
**
**   A I R   H A N D L I N G   S Y S T E M   L O A D   S U M M A R Y
**
*****

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SYSTEM NUMBER= 2, 58
SYSTEM LOCATION = 24243 YAKIMA WA- TMY

SIMULATION PERIOD 1JAN1954 - 31DEC1954			
	TOTAL DEMAND 1000BTU	PEAK DEMAND 1000BTU/HR	TIME OF PEAK MO/DY/HR
OSUM OF ZONE SENSIBLE HEATING LOADS	1.17268E+05	1.15307E+02	1/20/ 6
OTOTAL HEATING PROVIDED BY SYSTEM	1.01684E+05	1.28377E+02	1/20/ 7
SUM OF ZONE SENSIBLE COOLING LOADS	7.49622E+04	9.76806E+01	7/29/17
OSENSIBLE COOLING PROVIDED BY SYSTEM	5.61334E+04	1.12505E+02	7/29/17
OLATENT COOLING PROVIDED BY SYSTEM	1.04817E+03	1.23285E+01	8/13/14
OTOTAL COOLING PROVIDED BY SYSTEM	5.71815E+04	1.14555E+02	7/29/17

TOTAL ENERGY CONSUMED BY SYSTEM AND ZONES = 3.68957E+05 1000BTU

FRACTION OF OUTDOOR AIR MX/MN DATES (MO/DY/HR):	MAX [%] 100.00 4/25/18	AVG [%] 16.43	MIN [%] 0.00 1/ 1/ 1	HRS SYSTEM OPERATED 8760	TOTAL HRS OF SIMULATION 8760
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FRACTION OF OUTDOOR AIR VALUES ARE BASED ON SYSTEM OPERATING HOURS ONLY!

```

*****
**
**          REVIEW SUMMARY REPORT          **
**
*****
1 BUILDING WITH 1 ZONE
2 SYSTEMS
0 PLANTS
OUTPUT UNITS IN ENGLISH
58,57,57,59,61,62,64,65,65,64,63,60
PROJECT = NONE SPECIFIED

SIMULATION PERIOD = 1 JAN 1954 - 31 DEC 1954
LOCATION = YAKIMA WA- TMY
HEATING DEGREE DAYS = 5896.7
COOLING DEGREE DAYS = 445.0
GROUND TEMPS =

```

```

** SEVERE    ** CATCODE does not exist
USER SUPPLIED CATEGORY CODE WAS 00000

```

```

FOR ZONE 1 "20%
CEILING HEIGHT 10.0 FT
", FLOOR AREA 10000.00 FT**2
APPROXIMATED VOLUME 99995. FT**3

```

 *** PLAN VIEW OF BUILDING SURFACES ***

MIN X = 0.00 FT
 MAX X = 100.00 FT
 MIN Y = 0.00 FT
 MAX Y = 100.00 FT
 SOLAR DISTRIBUTION = -1

* = BUILDING SURFACE, + = SHADOWING SURFACE

Y+	N
1	1
-X---+---X	W---+---E
1	1
-Y	S

BUILDING TITLE - NONE

 *** BUILDING ENVELOPE DATA ***

NOTE ** SURFACES IN ZONES DESIGNATED AS ATTIC OR CRAWLSPACE ARE NOT INCLUDED

A.38

	AREA (FT**2)	U (B/H*F**2*R)	AZIMUTH* (DEGREES)	TILT (DEGREES)	PER CENT GLAZING	*NORTH= 0. EAST= 90.0
ROOF	10000.00	0.125	*****	0.0	0.0	
ROOF31	10000.00	0.125	*****	0.0		
EXTERIOR WALL	1000.00	0.171	180.0	90.0	19.8	
EXTERIOR	802.00	0.104	180.0	90.0		
FENTS	198.00	0.444	180.0	90.0		
EXTERIOR WALL	1000.00	0.193	90.0	90.0	19.8	
EXTERIOR	802.00	0.104	90.0	90.0		
DOUBLE PANE WINDOW	198.00	0.553	90.0	90.0		
EXTERIOR WALL	1000.00	0.193	0.0	90.0	19.8	
EXTERIOR	802.00	0.104	0.0	90.0		
DOUBLE PANE WINDOW	198.00	0.553	0.0	90.0		
EXTERIOR WALL	1000.00	0.193	270.0	90.0	19.8	
EXTERIOR	802.00	0.104	270.0	90.0		
DOUBLE PANE WINDOW	198.00	0.553	270.0	90.0		
SLAB ON GRADE FLOOR	10000.00	0.091	*****	180.0	0.0	
SLAB FLOOR	10000.00	0.091	*****	180.0		
	=====	=====			=====	
AREA	24000.00	0.187	(OVERALL WALL AVERAGE)		19.8	PERCENT OF TOTAL WALL
AREA		0.121	(BUILDING OVERALL AVERAGE)		7.9	PERCENT OF TOTAL FLOOR
FLOOR AREA OF BUILDING	=	10000.00	FT**2			
APPROX EXTERIOR SURFACE AREA	=	24000.00	FT**2			
APPROXIMATE VOLUME	=	99995.12	FT**3			
APPROX VOLUME / FLOOR AREA	=	10.0	FT (APPROXIMATE BUILDING WALL HEIGHT)			

 *** SURFACE CONSTRUCTIONS ***

U
 WITHOUT FILM COEFF
 (B/H*F**2*R)

A.39

EXTERIOR	0.114	
A2 - 4 IN DENSE FACE BRICK		2.162
B3 - 2 IN INSULATION		0.150
C2 - 4 IN LW CONCRETE BLOCK		0.661
E1 - 3 / 4 IN PLASTER OR GYP BOARD		6.720
FENTS	0.714	
GLSS		0.714
DOUBLE PANE WINDOW	1.045	
GLASS - CLEAR SHEET 1 / 8 IN		42.373
B1 - AIRSPACE RESISTANCE		1.099
GLASS - CLEAR SHEET 1 / 8 IN		42.373
SLAB FLOOR	0.097	
DIRT 12 IN		0.100
CONCRETE - SAND AND GRAVEL 4 IN		3.003
ROOF31	0.139	
E2 - 1 / 2 IN SLAG OR STONE		19.904
E3 - 3 / 8 IN FELT AND MEMBRANE		3.514
B6 - 2 IN DENSE INSULATION		0.150
C12 - 2 IN HW CONCRETE		5.988

 *** FAN SYSTEM DATA ***

SYSTEM 1 SINGLE ZN DRAW THRU 20%

SERVING ZONES: 1

MIXED AIR CONTROL = RETURN AIR ECN CYCLE
 COLD DECK CONTROL = FIXED SET POINT
 HOT DECK CONTROL = FIXED SET POINT

DESIRED MIXED AIR TEMP = COLD DECK TEMP
 COLD DECK FIXED TEMP = 55 DEG. F
 HOT DECK FIXED TEMP = 140 DEG. F

SYSTEM OPERATION = ON, 1JAN THRU 31DEC
 PREHEAT COIL OPERATION = ON, 1JAN THRU 31DEC
 COOLING COIL OPERATION = ON, 1JAN THRU 31DEC
 REHEAT COIL OPERATION = ON, 01JAN THRU 31DEC
 HEAT RECOVERY OPERATION = OFF, 1JAN THRU 31DEC
 MINIMUM VENTILATION SCHEDULE = MINVENT, 1JAN THRU 31DEC
 MAXIMUM VENTILATION SCHEDULE = ON, 1JAN THRU 31DEC
 SYSTEM ELECTRICAL DEMAND SCHEDULE = ON, 1JAN THRU 31DEC
 EVAPORATIVE COOLER OPERATION = ON, 01JAN THRU 31DEC
 HEAT PUMP COOLING OPERATION = ON, 01JAN THRU 31DEC
 WLHPS STORAGE TANK OPERATION = ON, 01JAN THRU 31DEC
 WLHPS VENTILATION SYSTEM OPERATIO = ON, 01JAN THRU 31DEC
 WLHPS LOOP CONTROL SCHEDULE = ON, 01JAN THRU 31DEC
 VAV MINIMUM AIR FRACTION SCHEDULE = ON, 01JAN THRU 31DEC

EXHAUST FAN OPERATION = ON, 1JAN THRU 31DEC
 HEATING COIL OPERATION = ON, 1JAN THRU 31DEC
 HUMIDIFIER OPERATION = ON, 1JAN THRU 31DEC
 TSTAT BASEBOARD HEAT OPERATION = ON, 1JAN THRU 31DEC

HEAT PUMP BACKUP HEAT OPERATION = ON, 01JAN THRU 31DEC
 HEAT PUMP HEATING OPERATION = ON, 01JAN THRU 31DEC

A.40

ZONE	SUPPLY AIR VOLUME FT**3/MIN	MINIMUM AIR FRACTION	EXHAUST AIR VOLUME FT**3/MIN	REHEAT CAPACITY	BASEBOARD HEAT CAPACITY	RECOOL CAPACITY	ZONE MULTIPLIER
1	*****	0.00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1

***** BECAUSE "DESIGN SYSTEMS" WAS INVOKED BY THE USER, ZONE SUPPLY AIR VOLUME USED IN THE SIMULATION CANNOT BE REPORTED.

 *** FAN SYSTEM DATA ***

SYSTEM 2 SINGLE ZN DRAW THRU 5%

SERVING ZONES: 1

MIXED AIR CONTROL = RETURN AIR ECN CYCLE
 COLD DECK CONTROL = FIXED SET POINT
 HOT DECK CONTROL = FIXED SET POINT

DESIRED MIXED AIR TEMP = COLD DECK TEMP
 COLD DECK FIXED TEMP = 55 DEG. F
 HOT DECK FIXED TEMP = 140 DEG. F

SYSTEM OPERATION = ON, 1JAN THRU 31DEC
 PREHEAT COIL OPERATION = ON, 1JAN THRU 31DEC
 COOLING COIL OPERATION = ON, 1JAN THRU 31DEC
 REHEAT COIL OPERATION = ON, 01JAN THRU 31DEC
 HEAT RECOVERY OPERATION = OFF, 1JAN THRU 31DEC
 MINIMUM VENTILATION SCHEDULE = MINVENT2, 1JAN THRU 31DEC
 MAXIMUM VENTILATION SCHEDULE = ON, 1JAN THRU 31DEC
 SYSTEM ELECTRICAL DEMAND SCHEDULE = ON, 1JAN THRU 31DEC
 EVAPORATIVE COOLER OPERATION = ON, 01JAN THRU 31DEC
 HEAT PUMP COOLING OPERATION = ON, 01JAN THRU 31DEC
 WLHPS STORAGE TANK OPERATION = ON, 01JAN THRU 31DEC
 WLHPS VENTILATION SYSTEM OPERATION = ON, 01JAN THRU 31DEC
 WLHPS LOOP CONTROL SCHEDULE = ON, 01JAN THRU 31DEC
 VAV MINIMUM AIR FRACTION SCHEDULE = ON, 01JAN THRU 31DEC

EXHAUST FAN OPERATION = ON, 1JAN THRU 31DEC
 HEATING COIL OPERATION = ON, 1JAN THRU 31DEC
 HUMIDIFIER OPERATION = ON, 1JAN THRU 31DEC
 TSTAT BASEBOARD HEAT OPERATION = ON, 1JAN THRU 31DEC

HEAT PUMP BACKUP HEAT OPERATION = ON, 01JAN THRU 31DEC
 HEAT PUMP HEATING OPERATION = ON, 01JAN THRU 31DEC

A.41

ZONE	SUPPLY AIR VOLUME FT**3/MIN	MINIMUM AIR FRACTION	EXHAUST AIR VOLUME FT**3/MIN	REHEAT CAPACITY	BASEBOARD HEAT CAPACITY	RECOOL CAPACITY	ZONE MULTIPLIER
1	*****	0.00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1

***** BECAUSE "DESIGN SYSTEMS" WAS INVOKED BY THE USER, ZONE SUPPLY AIR VOLUME USED IN THE SIMULATION CANNOT BE REPORTED.

***** NO PLANTS WERE SIMULATED *****

 *** SCHEDULED LOADS ***

ZONE NUMBER SCHEDULED	FROM	THRU	SCHEDULE	DESIGN PEAK LOAD		DESIGN PEAK LOAD PER FT**2	# HOURS PER WEEK	AVERAGE LOAD WHEN LOAD
PEOPLE: 1	1JAN	31DEC	OCCUPANCY	150.	PEOPLE	1.500E-02	92.0	7.329E+01
PEOPLE								
LIGHTS: 1	1JAN	31DEC	LIGHTS	56.3	1000BTU	5.630E-03	115.	2.646E+01
1000BTU								

NO ELECT EQUIP:
 NO GAS EQUIP:
 NO OTHER EQUIP LOADS:

 *** INFILTRATION AND VENTILATION ***

NUMBER PEAK FLOW	FROM	THRU	OCCUPIED MAX	MIN	UNOCCUPIED MAX	MIN	SPECIFIED
---------------------	------	------	-----------------	-----	-------------------	-----	-----------

NO INFILTRATION:
 NO NATURAL VENTILATION:

 *** MECHANICAL VENTILATION ***

NUMBER	FROM	THRU	OCCUPIED MAX	MIN	UNOCCUPIED MAX	MIN	PEAK FLOW
OUTDOOR AIR:							
SYS 1	1JAN	THRU 31DEC, ON	FT**3/MIN	*****	*****	4.4E+03	8.9E+02
			MO/DA/HR	*****	*****	4/25/18	1/ 1/ 1
							4.4E+03

 *** MECHANICAL VENTILATION ***

NUMBER	FROM	THRU	OCCUPIED MAX	MIN	UNOCCUPIED MAX	MIN	PEAK FLOW
OUTDOOR AIR:							
SYS 2	1JAN	THRU 31DEC, ON	FT**3/MIN	*****	4.4E+03	0.0E+00	4.4E+03
			MO/DA/HR	*****	4/25/18	1/ 1/ 1	

 *** SPACE TEMPERATURES DEG. F ***

ZONE NUMBER	CONTROLS	HEATING				COOLING				NO HEATING OR	
COOLING		OCCUPIED		UNOCCUPIED		OCCUPIED		UNOCCUPIED		OCCUPIED	
		MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
UNOCCUPIED											
MIN											
1	DEAD BAND	68.02	68.02	68.02	68.02	78.00	78.00	78.00	78.00	78.00	68.02
68.02											

A.43

 *** ZONES ENERGY BUDGET ***

CATEGORY CODE - 00000
 1954
 FACILITY CATEGORY - UNKNOWN BUILDING CATEGORY
 LOCATION - YAKIMA WA- TMY
 PROJECT TITLE - NONE SPECIFIED

SIMULATION PERIOD - 1 JAN 1954 - 31 DEC

BUDGET REGION - 2
 HEATING DEGREE DAYS - 5896.7
 COOLING DEGREE DAYS - 445.0
 REQUIRED ENERGY BUDGET= ???

ZONE LOAD

NUMBER	TOTAL HEAT 1000BTU	TOTAL COOL 1000BTU	TOTAL ELECT 1000BTU	TOTAL GAS 1000BTU	INFIL LOSS 1000BTU	INFIL GAIN 1000BTU	TOTAL AREA FT**2	ENERGY BUDGET 1000BTU /
FT**2								
1	1.173E+05	7.496E+04	1.546E+05	0.000E+00	0.000E+00	0.000E+00	1.000E+04	3.468E+01
	=====	=====	=====	=====	=====	=====	=====	
TOTAL	1.173E+05	7.496E+04	1.546E+05	0.000E+00	0.000E+00	0.000E+00	1.000E+04	

ENERGY BUDGET FOR ALL ZONES - 3.468E+01 1000BTU / FT**2

*** ZONE ENERGY BUDGETS DO NOT INCLUDE FAN SYSTEMS OR EQUIPMENT INEFFICIENCIES

 *** SYSTEMS ENERGY BUDGET ***

CATEGORY CODE = 00000
 1954
 FACILITY CATEGORY = UNKNOWN BUILDING CATEGORY
 LOCATION = YAKIMA WA- TMY
 PROJECT TITLE = NONE SPECIFIED

SIMULATION PERIOD = 1 JAN 1954 - 31 DEC

BUDGET REGION = 2
 HEATING DEGREE DAYS = 5896.7
 COOLING DEGREE DAYS = 445.0
 REQUIRED ENERGY BUDGET= ???

SYSTEM LOADS

A.45

NUMBER	UNDER HEAT 1000BTU	HOURS	UNDER COOL 1000BTU	HOURS	OVER HEAT 1000BTU	HOURS	OVER COOL 1000BTU	HOURS	HEAT W/O DMD 1000BTU	HOURS	COOL W/O DMD 1000BTU	HOURS
1	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)
2	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)
TOTAL	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)	0.000E+00	(0)

NUMBER	TOTAL HEAT 1000BTU	TOTAL COOL 1000BTU	TOTAL ELECT 1000BTU	TOTAL GAS 1000BTU	TOTAL AREA FT**2	ENERGY BUDGET 1000BTU / FT**2
1	2.440E+05	6.032E+04	2.101E+05	0.000E+00	0.000E+00	0.000E+00
2	1.017E+05	5.718E+04	2.101E+05	0.000E+00	0.000E+00	0.000E+00
TOTAL	3.457E+05	1.175E+05	4.202E+05	0.000E+00	0.000E+00	

ENERGY BUDGET FOR ALL SYSTEMS = 0.000E+00 1000BTU / FT**2

*** ENERGY BUDGET DOES NOT INCLUDE UNDER/OVER/W.O. DEMAND HEATING/COOLING ITEMS

***** NO PLANT INFORMATION AVAILABLE *****

Appendix B

Building Life Cycle Cost Quick Input Program

Appendix B

Building Life Cycle Cost Quick Input Program

Analysis type = Federal Analysis--Energy Conservation Projects

Project name = CO2-BASED VENTILATION

Base date of study = 1994

Service date = 1994

Study Period = 25 years

Discount rate = 3.1%

Annually recurring costs and energy costs discounted from end of year

Number of alternatives in file = 2

Number of groups in file = 1

Present-Value Costs

<u>Alternative Name</u>	<u>Investment Costs*</u>	<u>OM&R and Energy Costs</u>	<u>Total Life- Cycle Costs</u>
20% VENTILAT	\$0	\$60527	\$60527
5% VENTILAT	\$3771	\$46858	\$50629<--MIN LCC

Comparative measures are only calculated for the alternative with lowest LCC relative to alternative with the lowest present-value investment cost:

Comparative economic measures for 5% VENTILAT relative to 20% VENTILAT:

NET SAVINGS = \$9898.078; SIR = 3.62; AIRR = 8.55%

* In Federal LCC analysis, investment costs include capital replacements and residual value, if any.

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