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ANALYZING, EVALUATING, AND QUANTIFYING THE THERMAL ENERGY CONTRIBUTIONS OF THE PASSIVE SOLAR-HEATING ELEMENTS INCORPORATED IN THE DESIGN AND CONSTRUCTION OF THE PLUMBLEE RESIDENCE LOCATED IN ALAMANCE COUNTY, NC

Presented By

Mark A. Terrell Graduate Student

Under the Direction of

Dr. Michael L. Leming Associate Professor, Construction Engineering & Management

August 2004

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DEPARTMENT OF CIVIL ENGINEERING NORTH CAROLINA STATE UNIVERSITY

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ABSTRACT

Currently, nationwide efforts are being made to help policymakers, construction professionals and consumers become more aware of the benefits of incorporating sustainable energy principles in residential building design and construction (Miller 1996). Any success in applying these principles is the result of effective communication by design professionals to builders and homeowners in understanding cost benefit tradeoffs for using sustainable energies in homes. The Gordon and Janice Plumblee Residence, located on 1742 Routh Road in Burlington, NC, is an example of how passive solar-heating design elements, along with simple conventional construction techniques, have created a comfortable, affordable, and low-energy consumption home.

This report evaluates the passive solar and energy conservative elements incorporated in the Plumblee Home and quantifies the significance of each element energy contribution. A model of the thermal performance of the home is compared to the actual performance. The accuracy of the model is verified. The modeling software is used to perform a sensitivity study of the thermal performance. An analysis of the construction methods and materials used is presented.

ACKNOWLEDGMENTS

Sincere appreciation is extended to homeowner, Mr. Gordon Plumblee for his permission to use his home in this study. Mr. Plumblee, a former high school biology instructor, provided critical data on monthly electricity usage for his home over a period of eight years along with other information relating to the operational aspects of the home. Sincere gratitude is also extended to Dr. Herbert M. Eckerlin, PE and Professor of Mechanical & Aerospace Engineering for the technical review and assistance in analyzing the thermal performance of the home. Significant gratitude is also given to Mr. Rex S. Terrell, Contractor of Record, for providing construction details and cost estimates.

Special thanks are extended to Ms. Debra R. Coleman, AIA of Sun Plans Inc., Architect of Record, for the recommendation of which software program to use for modeling the home and to Ms. Dona Stankus, AIA of NC Solar Center for providing a copy of the software for the study.

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1. Introduction

Passive solar-heating elements used in residential home design and construction offer significant benefits in advancing to more sustainable energy usage nationwide. Capturing the free heat directly from the sun in a controlled environment of a passive solar home makes solar energy economically and environmentally more attractive (Chiras 2002). In addition, the natural sunlight brought in from large, south-facing windows brightens the interior. Passive solar features that utilize the benefits of sunlight aid in lower energy consumption of other nonrenewable energy sources and provide natural lighting as a delightful comfort for home occupants (Rucker 1992).

Passive solar design is based upon understanding the principles of heat transfer through various building surfaces. Residential homes experience heat gains or losses through elements such as windows, doors or chimneys, and through ceilings, walls, floors, and air infiltration. Determining whether the heat transfer is either a loss or a gain is a function of the seasonal changes in the motion of the earth around the sun. For the earth's northern hemisphere, the sun track is higher in the sky during the summer (cooling season) and lower during the winter (heating season). The seasonal location of the sun, combined with the construction details of the home, affect how much heat loss or solar gain is experienced. Designers understanding heat transfer concepts can incorporate passive solar-heating principles in the design of any style home (Chiras 2002).

The case study home in this report is the residence of Gordon and Janice Plumblee located in Alamance County, NC. The Plumblee Home is a "direct gain" passive solar home. This means that the house collects, stores, and distributes the solar heat throughout the house.

1.1. Professional Guidelines for Passive Solar Homes

Passive solar design applies energy-saving techniques using conventional design and construction practices as incorporated in the Plumblee Home. Debra Coleman, Architect for the Plumblee Home, prescribed the following passive solar design factors for creating a comfortable, low-energy consuming home (Rucker 1992):

1. Home orientation, shape, and floor plan.

The floor plan is oriented with the elongation in the east-west direction allowing the long exterior walls to face north and south. Heat generating rooms such as the kitchen and laundry are located on the colder northern side. Living areas intended for more frequent use share the common south-facing wall. A rectangular configuration without projections from the south wall is preferred in order to place south-facing windows to receive winter sun. Any protrusion to the south will shade adjacent windows (Rucker 1992).

2. Window placement and shading.

Passive solar homes benefit from receiving sunlight. The maximum recommended southfacing window area is 12% of the floor area. North, east, and west windows should not exceed 4% of the floor area (Chiras 2002). Special attention is required for designing roof overhangs including gutters. Overhang lengths without gutters vary from 3.5 feet in hot climates to only 12 inches for colder climates. The south eaves will shade the windows from high summer sun but allow low winter sun to penetrate deep into the home (Rucker 1993). Professional consultation is advised for specific situations.

3. Heat-absorbing materials.

In order to moderate inside temperature changes and to prevent overheating of the home, thermal masses or heat-absorbing materials are utilized to collect or store heat from solar

gains. Brick chimneys or concrete floors covered with stone, decorative tile, or brick pavers serve as heat-absorbing thermal mass adding additional comfort and aesthetics to the home.

4. Insulation and air infiltration control.

No additional insulation is required above current regulations. Prior to insulating all building-envelope surfaces, joints are carefully caulked around exterior walls and intersecting floors and ceilings. Exterior walls and ceiling receive a continuous vapor barrier sealed from any penetration or tear. Doors, windows, electrical boxes, and pipe penetrations are sealed and foamed around. Energy-efficient windows and inner doors separating entryways and main living spaces are recommended. These extra precautions minimize air infiltration (Rucker 1992).

5. Mechanical system.

Passive solar homes require less heating because of south-glazing solar gains in the winter and less cooling due to overhang shading in the summer. A heating, ventilation, and airconditioning (HVAC) system complementing these passive solar features is essential (Chiras 2002). Again, professional consultation is advised for specific situations.

6. Quality control of construction methods and materials.

Respect and understanding of energy-efficient design and concepts is necessary during the construction phase of a passive solar home. A comfortable, low-energy home is only achieved by abiding to the details provided in blueprints and energy-efficient specifications (Rucker 1992).

1.2. Limitations of Passive Solar Design

Optimal performance and desired comfort are best achieved when the basic principles of passive solar design are applied under professional supervision. The ratio of south-facing

windows to thermal storage mass directly affects the overall thermal performance of the home. The auxiliary heating system may require additional runtime during the winter if the amount of south-facing windows is less than optimal. Otherwise, undersized thermal mass can cause daytime overheating. Although some remediation can be performed after construction, the basic shape, cross-sectional construction, and orientation of the home cannot easily be changed later. Therefore, having the home's insulation details, air infiltration control, and major axis oriented east-west are essential fundamentals for an effective passive solar home (Chiras 2002).

1.3. Description of Plumblee Home



Figure 1 - Southeast View of Plumblee Residence (photo by Gordon Plumblee)

The Plumblee Home located in central North Carolina is secluded by surrounding farmland and natural landscaping overlooking a private lake. The exterior façade is cypress beveled siding covered on the north and east sides by a wrap-around porch. This single-story home has an abundance of south-facing windows with brick veneer covering the foundation and southwest corner along with the northwest garage wall.

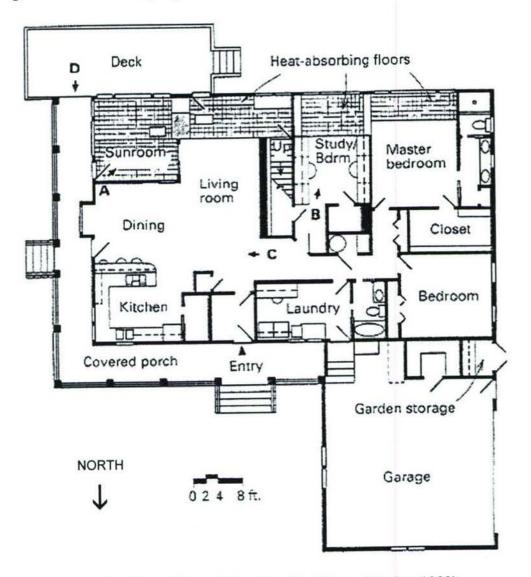


Figure 2 – Floor Plan of Plumblee Residence (Rucker 1993)

The 2160 square-feet home has its major axis oriented east-west to make the long southfacing wall available to the sun. Interior features include vaulted ceilings over kitchen and living space, hardwood floors, French doors, brick hearth, and brick pavers on the floor adjacent to the south-facing windows providing natural sunlight. The living room, study, master bedroom, and sunroom share the common south-facing exterior wall allowing the home occupants to experience the view and desirable comfort provided by the windows. The kitchen, laundry, and other heat generating rooms are located on the colder northern side.

1.4. Design and Construction Professionals Involved

The successful completion and high energy-efficient performance of the Plumblee Home is a direct result of effective communication and comprehensive understanding of the design details and construction aspects by all parties involved in the building of the home. Debra R. Coleman, AIA provided the design documents and drawings based on the homeowner's desired characteristics. Harry Boody, PE of Guaranteed Energy Efficient Systems, Inc. was responsible for the insulation, caulking, vapor barrier, and mechanical system installation. Rex S. Terrell, a homebuilder from Burlington, NC, provided the quality construction supervision, adhering to the energy-conserving and comfort details desired by the homeowner (Rucker 1992).

1.5. Overview of Energy-10 Software

Energy-10 is a creditable software analysis program for conceptual design of energy-efficient buildings produced by the U.S. Department of Energy (DOE) at the National Renewable Energy Laboratory (NREL). The program allows professional solar designers to predict the energy performance of a small-size facility to achieve optimal comfort, performance, and economy (Chiras 2002).

The selection of using Energy-10 was recommended by Ms. Debra R. Coleman, AIA of Sun Plans Inc. Ms. Coleman, knowing the popularity of the software among passive solar designers, felt the thermal simulation analysis by Energy-10 would provide insight in the effects of passive solar and energy conservative features incorporated in the Plumblee Home.

2. Research Significance

The various passive solar features of the Plumblee Home have created a comfortable, lowenergy use home (corresponding with the homeowner). The contributions of the various thermal energy features built into the home have not been fully quantified. This report provides an important addition to the body of knowledge of passive solar home performance and will be of significant value to the engineer, architect, planning commissions and other parties implementing effective passive solar and energy efficient home design. Unique, long term operating data on the energy consumption of the Plumblee Home is available from the homeowner. The completeness of this data makes the home an ideal candidate for further detailed analysis. Little information exists in the published literature which provides quantitative estimates of the effects of passive solar and energy conservative features incorporated into residential dwellings.

2.1. Research Objectives

- 1. Analyze and evaluate the actual thermal performance of the Plumblee Home.
- 2. Model the predicted thermal performance with a creditable energy efficiency software program for sustainable buildings.
- Compare the actual thermal performance with the modeled thermal performance and verify the software output for general conformance.
- Evaluate and quantify the thermal energy contributions of the various passive solar and energy conservative elements in the Plumblee Home.
- Identify the effect of the various passive solar energy conservative elements in terms of cost savings.
- 6. Identify ways to improve the thermal performance of the Plumblee Home.

3. Methods Used for Resolution

In order to quantify the impact of each feature, the actual total thermal energy use was compared with the total projected use simulated in the software modeling program. The various solar and energy conservative features were then incorporated into the model to determine their effect to the overall house performance. The thermal energy contribution of each feature was ranked and evaluated.

The following procedures established the database used in this study:

- 1. Gather and classify information to establish the database.
 - a. Collect actual energy use records from the homeowner and develop graphical representations suitable for analysis.
 - b. Collect historical weather and climatologic data from the National Oceanic and Atmospheric Administration (NOAA) for Burlington, NC.
- Select a creditable software analysis program which can simulate the thermal performance of a passive solar and energy conservative home.
- 3. Verify accuracy of the software modeling program for general conformance with actual data.
 - Model and estimate the projected annual thermal energy performance of the passive solar home using the software program.
 - b. Compare the actual annual energy use with the modeled annual energy use projected by the software program.
 - c. Verify that the modeled performance is acceptable as a reasonable projection of annual energy use for the Plumblee Home.
- 4. Use the software modeling program to conduct sensitivity analyses of the thermal performance of the home.

 a. Vary different passive solar and energy conservative features using the software program to quantify the significance of each element incorporated in the Plumblee Home.

4. Thermal Performance Derivations

The objective of obtaining a detailed energy use analysis of the Plumblee Home involves collecting the actual energy use consumed annually and modeling the projected annual energy use. The meticulous records kept by Mr. Gordon Plumblee, have provided critical information for modeling the thermal performance efficiency of the home. Monthly meter readings from separate meters for the total house electrical load and the HVAC system load were recorded by Mr. Plumblee for the first eight years of operation. Thus, the actual thermal performance was determined by simply separating the heating and cooling loads from the total house load.

However, modeling the thermal performance is not simple. Thermal performance modeling requires information on specific details of the home, as well as the living style of the home occupants, for input into the selected energy performance design software, Energy-10.

4.1. Summary of Data Entry for Energy-10

The Plumblee Home is a single-story dwelling of two occupants with 2160 square-feet of conditioned living space and 768 square-feet of unconditioned garage and storage. The home is heated and cooled with a heat pump based on an average electricity rate of \$0.069 per kilowatt-hour of usage for the period of 1991 to 1994. All climatology and weather data used in Energy-10 for this analysis is from historical data reported in Greensboro, NC, the nearest reporting weather station to the actual home site in Burlington, NC.

The home is oriented with the main surface area of glazing due south. The south-facing windows account for 206 square-feet of glazing bordered by cypress trim-siding. The north and east exterior walls are constructed with the standard 2 x 4 stud frames, R-13 batt-insulation, and polyisocyanurate foam board. A covered porch finished with cypress siding also extends along the north and east façade. The western portion of the exterior including the garage is covered with brick veneer. The north, east and west glazing areas are 33, 79, and 25 square-feet respectively.

Roof construction for the home consists of trusses with attic storage space. R-30 battinsulation is over the western portion of the home and R-30 blown-in insulation over the cathedral ceilings of the living room, dining room, and kitchen. The overhangs have 17 inches of eaves with a 4 inch gutter to provide adequate summer shading for this passive solar home. The covered porch extends 6 feet from the main house along the north entrance and east side of the house.

Floor construction is framed over a crawlspace block foundation. Basic floor construction is hardwood finish over plywood sub-flooring framed with 2x10 joists at 16 inches on-center spacing and R-19 batt-insulation. The laundry room and bathrooms are vinyl floors. Brick pavers cover 360 square-feet of floor space adjacent to the south-facing windows serving as thermal storage mass (along with the brick chimney and hearth). The floor construction under the brick pavers consists of 4 inches of concrete over 2x12 joists at 12 inches on-center spacing and R-19 batt-insulation.

The heat pump has a high coefficient of performance (COP) of 3.02 and a low COP of 2.14 for the heating season, with a seasonal energy efficiency ratio (SEER) of 10.1 for the cooling season. The air-handling unit and insulated ductwork for the heat pump are located in

the crawlspace. Thermostat comfort set-points are 68 degrees-Fahrenheit for the heating season and 77 degrees-Fahrenheit for the cooling season. The total conditioned house volume accounts for 18,653 cubic-feet of living space. The average air infiltration rate for the living space is 0.22 air-changes per hour (ACH), based on the blower door tests conducted by Duke Power Company in August 1993 (Plumblee 2004).

The internal gains affecting the overall thermal performance of the home are a function of the interior and exterior lighting loads, the occupancy schedule, the hot water usage, and other electrical loads from basic operating appliances. These loads given in peak watts per square-foot, with their associated hourly profiles and schedules, are listed in Appendix A along with a more detailed review of the building construction described above.

4.2. Modeling: Energy-10 Software Program

Energy-10 was validated using the BESTEST protocol. The BESTEST procedure was developed within the International Energy Agency Solar Heating and Cooling Program, and was adopted by DOE and the international community as the accepted basis for verifying the credibility of computer simulation programs. The procedure verified the simulation results of Energy-10 for two defined hypothetical buildings, a low-mass building and a high-mass building. The simulation is considered to be credible if the given results fall within or close to the range of results obtained using other simulation programs. Thermal simulations produced by Energy-10 were reported by the developers as performing "very well" in comparison to the BESTEST standards (Energy-10, Help Topics – Version 1.5, 2002).

The thermal performance model of Energy-10 incorporates heating energy, cooling energy, heat loss, and solar gain along with the effects of added thermal mass, shading design, glazing, building orientation, and air infiltration control. Simulated results involve calculating the home's

thermal performance relative to desired indoor temperature and overall heat transfer, including both losses and gains. The amount of useful solar energy provided to the home is dependent on solar radiation as well as conduction losses, air infiltration losses, and heat gains from internal loads. The auxiliary space heating or cooling required is the amount of the load not provided by solar energy or thermal storage.

The rate of heat loss is determined by the resistance to heat flow (R-value) of various building elements for the walls, floors, ceilings, windows, doors, etc. The overall coefficient of heat transfer (U-value) is determined for each exterior building surface as the reciprocal of the sum of the R-values. The rate of conduction heat loss is the total surface area multiplied by the calculated U-value of the surface and the temperature difference. Ultimately, the total space heat loss is then the sum of the conduction losses and air infiltration losses through the various building surfaces (Mazria 1979).

Energy-10 is intended to be used during the conceptual design phase before construction documents are prepared. For this research, the actual energy performance of the Plumblee Home had already been monitored and recorded as monthly electric power usage. Therefore, the projected model desired from Energy-10 is calibrated by actual performance data. Furthermore, the modeling capability of Energy-10 allowed the contribution of each passive solar and energy conservative feature to be estimated. The individual significance of each feature was evaluated by either adding or subtracting each solar element from the input data of the model simulated in Energy-10.

4.3. Actual Performance: Meter Readings Recorded by Homeowner

The actual thermal performance of the Plumblee Home was derived from the metered electricity usage recorded monthly for the total house load and the HVAC system load. The

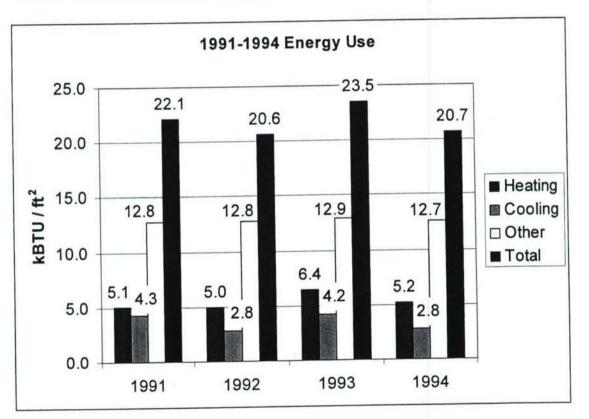
HVAC system load is subtracted from the total house load to provide the power usage for the auxiliary appliances, lights, and other internal gains. The power usage recorded in terms of kilowatt-hours (kWh) was converted to thermal energy use in terms of British-thermal-units (BTU) using the conversion factor of one kWh is equal to 3,415 BTU. Bar graphs of the annual energy use for the home are provided in Appendix B showing the monthly HVAC system load and total house load.

The modeled output report from Energy-10 displays the annual energy use generating a bar graph of the heating load, cooling load, lighting load, other house loads, and total load. The output is in terms of thousand British-thermal-units of energy per square-feet of conditioned living space (kBTU/ft²). In order to verify the modeled output for general conformance, the actual HVAC system load metered is divided into heating and cooling season loads for comparison to the model report. The homeowner reported that the thermostat was changed in October for the heating season and during April or May for the cooling season. Therefore, the heating season form the Plumblee Home runs from November to March and the cooling season from June to September. Climatology data from the National Climatic Data Center of the National Oceanic and Atmospheric Administration (NOAA) was retrieved online for the monthly annual heating degree days and cooling degree days and used as a guide for verifying the actual months of the heating and cooling seasons.

5. Discussion of Results

The results of the thermal analysis of the Plumblee Home, as modeled by Energy-10, correlated well with the actual thermal performance of the house. The effect of various passive solar and energy conservative measures on the performance of the home was evaluated. These measures were evaluated and ranked according to their heating contribution to the house.

5.1. Verification of Model



5.1.1. Data Evaluation and Analysis

Figure 3 – Actual Energy Use of Plumblee Home

Actual operating data for the years 1991 through 1994 were selected as a basis for determining how the House actually performs. The living patterns of the Plumblees were very consistent during these years. This explains why the heating, cooling, lighting and other costs

were so consistent during the 1991-1994 period. This fact was borne out in the very consistent energy-use data recorded for these years.

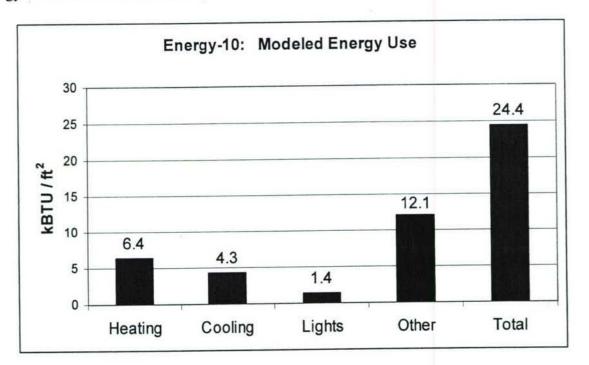


Figure 4 – Model of Energy Use (Energy-10)

Year	Heating	Cooling	Other	Total
1991	5.1	4.3	12.8	22.1
1992	5.0	2.8	12.8	20.6
1993	6.4	4.2	12.9	23.5
1994	5.2	2.8	12.7	20.7
Actual Average	5.4	3.5	12.8	21.7
Standard Deviation of Sample	0.68	0.80	0.10	1.39
Energy-10 Model Results	6.4	4.3	13.5	24.4
<u>Model – Actual Avg</u> Std Dev	1.43	0.96	6.83	1.92
% of Actual	118%	122%	106%	112%

Table 1 – Verification of Model (units = $kBTU/ft^2$)

There are three important findings from this analysis. First, the Energy 10 model predicts the actual energy use quite well. The model appears to be conservative in predicting actual energy usage and is within about 12 percent of the total house energy use. Second, the model is sufficiently accurate since the modeled energy use for heating and cooling is less than two standard deviations from the actual average energy use. For the "other" category, the correlation between the model and the actual is even better (see Table 1). Based on these results, Energy-10 was found to be an acceptable vehicle for evaluating the effectiveness of various solar and energy conservation measures on the performance of passive solar residential structures.

5.1.2. Research Limitation of Data Input Affecting Thermal Analysis

The actual date of change-over from seasonal operation of heating or cooling is unknown. Interpolations of the heating and cooling loads were calculated using the percent of heating or cooling degree days recorded in climatology data for the months of April, May, and October (NOAA). If the yearly turn-over between seasonal room temperature settings was known, then the conformance between the model and actual performance would likely be improved. Although the uncertainty exists, Energy-10 appears to be sufficiently accurate in the correlation between modeled and actual energy use.

5.2. Sensitivity Study of Passive Solar and Energy Conservative Features

5.2.1. Factors

Because of the excellent manner the Energy-10 model approximates the actual performance of the Plumblee House, it was decided that Energy-10 could effectively be used to evaluate the impact of various passive solar and energy conservation measures. The following heating performance measures were varied independently from the actual home construction to obtain predicted performance in order to identify those areas of design most critical to performance:

- House orientation rotated 15, 30, and 45 degrees east of true south.
- South-facing glazing surface area and type.
- Surface area of windows in east, west, and north walls.
- Roof-overhang lengths (including 4 inch gutter).
- Amount of thermal storage mass provided by brick pavers.
- Wall construction details; 2x4 to 2x6 exterior frames.
- Room temperature set-points.
- Air infiltration control.

5.2.2. Findings

(1) Orientation:

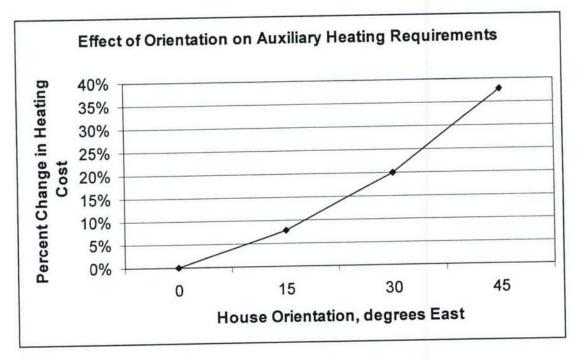


Figure 5 - Model of Orientation Effects (using Energy-10)

Additional heating is required when positioning the home orientation with the major axis in a direction other than east-west. A 15-degree east deviation from true south results into 7.3 percent of additional auxiliary heating required.

(2) Glazing:

Converting all south-facing windows from standard glass to Low-E glass provides a 6.5 percent cost savings in auxiliary heating required. Figures 6 and 7 below show the effect that increasing the south facing glazing has on (1) the "Auxiliary Heating Requirements" and (2) the "Cooling Requirements" of a house. As would be expected, an increase in glazing reduces the heating demand and increases the cooling load.

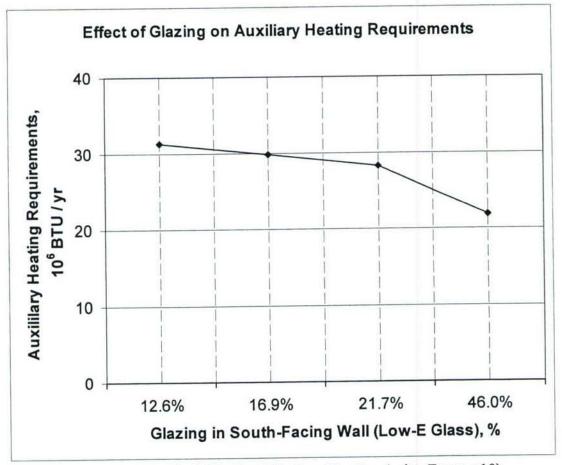


Figure 6 - Model of Glazing Effect on Heating (using Energy-10)

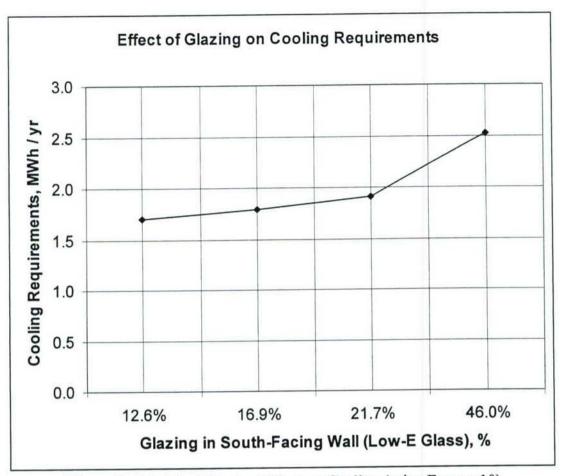


Figure 7 – Model of Glazing Effect on Cooling (using Energy-10)

(3) Roof Overhang:

The roof overhang length was varied from 24 to 12 inches of boxed eave with a 4 inch gutter. A reduction in overall overhang extension from 28 inches to 21 inches yields a 3.7 percent cost savings in auxiliary heating required.

(4) Thermal Mass Effects:

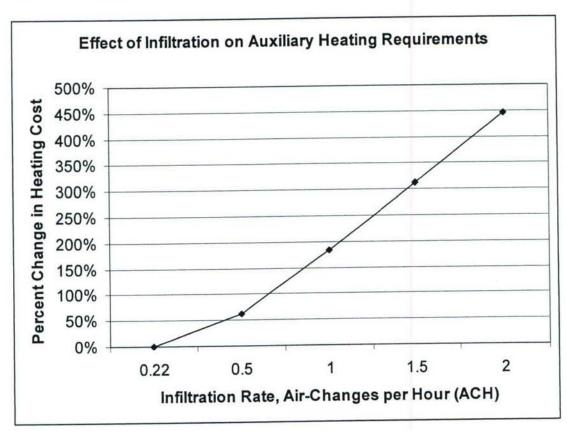
The additional thermal storage mass provided by the brick pavers and concrete in the floor area along the south-facing wall provides 5.2 percent of cost savings in auxiliary heating requirements. Any additional thermal mass may cause overheating during adverse weather.

(5) Wall Insulation:

Wall construction was varied in the thermal simulation by changing the 2x4 frame with R-13 batt-insulation to 2x6 with R-19 for the exterior walls. A 13.5 percent cost savings in auxiliary heating requirements is obtained by using 2x6 exterior walls.

(6) Temperature Set-point:

Setting back the thermostat comfort temperature from 70 degrees-Fahrenheit to 68°F in the heating season provides a 28.3 percent cost savings in auxiliary heating required.



(7) Air Infiltration Control:

Figure 8 - Model of Air Infiltration Control (using Energy-10)

The default value of air infiltration rate commonly used in design is 1.0 air-change per hour (ACH). In this part of the study, air infiltration rates were varied from 0.5 ACH to 2.0 ACH. A cost savings of 43 percent in auxiliary heating requirements is achieved when reducing air

infiltration from 1.0 ACH to 0.5 ACH. The Plumblee Home has an average air infiltration rate of 0.22 ACH. The extra precautions of providing a continuous vapor barrier and sealing off all openings and penetrations during construction has produced a considerably effective, "air-tight" home.

5.2.3. Implications of Sensitivity Analysis of Plumblee Home

Air infiltration and room temperature control are considered to have a reasonably significant effect on the heating performance of the Plumblee Home. The amount of heat loss through the seams or cracks of windows, doors, walls, and ceilings is minimal as the result of having an "airtight" home and a smaller temperature difference from outside to inside conditions.

Moderate changes in heating performance appear to be cost effective for changing 2x4 to 2x6 exterior wall construction and increasing the amount of Low-E glass in south-facing windows. The remaining features are considered to be marginal in the effect of heating performance and could be implemented in the "fine-tuning" of the conceptual design.

The following is a summary of the effectiveness of various passive solar and energy conservative features for improving the heating performance of the Plumblee passive solar-heated home:

Control Measure Implemented	Percent Cost Savings
• Make the house tighter. (i.e., reduce the infiltration from 1 ACH to 0.5 ACH)	43.0%
• Reduce room temperature by 2°F (e.g., from 70°F to 68°F).	28.3%
 Increase south-facing Low-E glazing by 10 percent. 	15.0%
• Change from 2x4 to 2x6 wall construction.	13.5%
• Reduce window area in east, west and north wall by 50%.	7.7%
• Orient the house 15° more toward true south.	7.3%

Convert south-facing glazing from standard glass to low-e glass.
Increase thermal mass (brick pavers) in floor from 0% to 17%.
Reduce roof overhang (from 28 in. to 21 in.).

Based on construction methods and material costs, the most efficient, energy conservative measures for improving heating performance in order of cost savings, are (1) controlling air infiltration by making the house tighter, (2) setting back room temperature, and (3) laying out the house in the beginning with the major axis in the east-west direction. Room temperature is controlled by the home occupants and little can be done by the professional to modify this parameter. House orientation can clearly be addressed early as part of the design cost, but lot or site constraints may limit options. The sensitivity analysis indicates that the additional time, materials, and labor for installing a vapor barrier and caulking cracks or seams around windows, doors, walls, and ceilings to minimize infiltration are clearly worthwhile and should be included in all residential construction. The sensitivity analysis suggests that the effect of air infiltration rate on energy use is sufficiently important. Changes in the building code which would result in the reduction of the air infiltration rate should be considered for all new construction. Although not included in this case study, a more thorough cost analysis of the thermal performance and energy conservative measures is recommended.

6. Conclusions and Recommendations

- Energy-10 provided a conservative model of the thermal performance of this particular passive solar-heated home and was considered to be valid for conceptual design of similar energy efficient buildings.
- Modeled thermal performance simulated by Energy-10 is a reasonably accurate projection of the actual thermal performance experienced by the Plumblee Home.
- Energy-10 appears to be sufficiently accurate in the correlation between modeled and actual energy use, considering the uncertainty of the actual date of change-over from seasonal operation of heating or cooling for the Plumblee Home is unknown.
- Energy-10 provided a reasonable prediction of the effectiveness of passive solar and energy conservative features incorporated in the Plumblee Home.
- Home orientation, window placement, insulation details, air infiltration control, room temperature setting, and quality construction are the considerably significant design factors for creating a comfortable, low-energy consuming passive solar-heated home.
- Air infiltration and room temperature control are considered to have a reasonably significant effect on the heating performance of the Plumblee Home.
- A thorough cost analysis of the thermal performance and energy conservative measures is recommended.
- Additional studies are recommended to compare other similar passive solar homes to the Plumblee Home.

REFERENCES

- Course Notes from MAE 421, "Design of Solar Heating Systems," Spring 2004. NC State University, Dr. Herbert M. Eckerlin, Professor.
- House specifications and design details provided by Gordon Plumblee, homeowner, March 2004.
- Rucker, Debra G. "A Sun-Inspired Home," *The Southface Journal*. Summer 1992.
 Rucker, Debra G. "A Sun Inspired Home," *Carolina Sun*. North Carolina Solar Energy Association (NCSEA), Volume 15 No. 2, Summer 1992.
- 4. Rucker, Debra G. "Practical Solar Design," Fine Homebuilding. October/November 1993.
- 5. Miller, Burke. "Passive Solar, Country-Style," Solar Today. July/August 1996.
- Chiras, Dan. "Build a Solar Home and Let the Sunshine In," Mother Earth News. August/September 2002.

http://www.motherearthnews.com/

- 7. Mazria, Edward. "The Passive Solar Book," Rodak Press, 1979.
- Rucker, Debra G. "Custom Residence for Barbara & Gordon Plumblee," Design Drawings. Energetic Design, Inc. March 1989.
- Energy-10 software program, "A Conceptual Design Tool for Energy Efficient Buildings." National Renewable Energy Laboratory (NREL) under the U.S. Department of Energy, Version 1.5 Release June 2002.
- Balcomb, J. Douglas. "Mastering Energy-10." National Renewable Energy Laboratory (NREL), July 2002.
- 11. National Oceanic and Atmospheric Administration (NOAA), Online. http://www.noaa.gov/

 National Climatic Data Center – National Environmental Satellite, Data, and Information Service, NOAA; Online.

http://www.ncdc.noaa.gov/oa/ncdc.html

APPENDICES

APPENDIX A

{Energy-10: Program Input}

Energy Efficient Case

Input reflects actual construction details and conditions experienced at the Plumblee Home.

Appendix A

New Project Information		212
Location Weather Eile Grnsboro.et1 ▼ City GREENSBORO State NORTH CAROLINA Zone 1	▼ Building L p/ER Back ▼ HVAC System Floor Area	\$/kW \$/Therm if applicable) Use :
Zone 1 Zone 2	Aspect Ratio: 1.667 ibrary to use ARCHIVELIB	Inspect Building Use Defaults

New Project Information Dialog Box

Ceiling Area: 2160 Ite Help Construction : Area: Building Rotation degrees clockwise : 0 Wall Construction : 2 x 4 frame Construction 0	Gross Dimensions : -	Le	ength - ft	Heig	ght - ft				эк	
E ast, West Facades: 35.9964 × 8 = 287.97 ft ² Ceiling Area: 2160 ft ² Help Construction : attic, r-30 Image: Building Rotation degrees clockwise : 0 Wall Construction : 2 × 4 frame Image: Construction : 0 Eloor Construction : 2 × 10 frame Image: Construction : 0	North, South Facade	s: 6	0.006	× 8		480.05	ft²	C	ncel	
Ceiling Area: 2160 It ^e Construction : Building Rotation degrees clockwise : 0 Wall Construction : 2 x 4 frame ✓ 0 Eloor Construction : 2 x 10 frame ✓ Cucts Ducts Inside	East, West Facades	3	5.9964	× 8		287.97	ft	All and a state of	and a state	
Boof Construction : attic, r-30 Image: Construction degrees O Wall Construction : 2 x 4 frame Image: Construction degrees O Eloor Construction : 2 x 10 frame Image: Construction degrees O	Ceiling <u>A</u> rea:	2	160	ft²				Hel	Р	
Boof Construction : attic, r-30 Image: Clockwise : Image: Duckside Wall Construction : 2 x 4 frame Image: Clockwise : Image: Duckside Eloor Construction : 2 x 10 frame Image: Clockwise : Image: Duckside	Construction :									
Wall Construction : 2 x 4 frame C Ducts Dutside Floor Construction : 2 x 10 frame Ducts Inside	Roof Construction :	attic, I	-30	1111-242	-			degrees 0		
	And the state of the second		the second s		Ī	C Ducts Dutside				
Windows (Number & Type) :	Eloor Construction :	2 × 10	frame	l in the second	-	c	Ducts Insid	ie		
	Windows (Number 8	Type):								
North: 5 East: 7 4060 double, wood 💌	North: 5	East :	7	-	4060 d	ouble, wood	E			
South: 12 West: 4	South : 12	West :	4	-	The second			To a series		
	Cccupancy :		141. 4 141. 4					ting <u>c</u> ooling		
Occupancy:		2	0 <u>O</u> pen	7	days	Setpo	int : 68	77	۴F	
Occupancy: heating cooling	# of People :									

Provisional Data Dialog Box

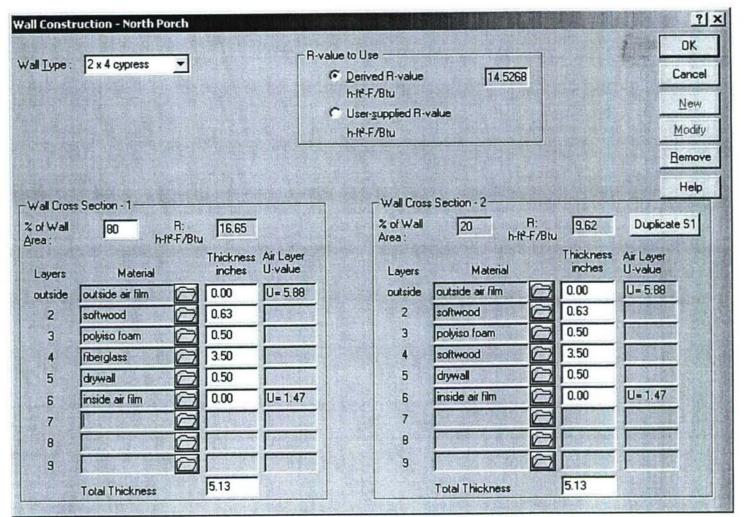
	completed the AutoBuild process, w rectangular building descriptions.
The text on the	screen shows summary information the two buildings.
NEXT STEPS:	
1. Click DK	OK
	n'' button on the toolbar (it running person).
	oject name and project file ne Save As screen.
4. Click DK in I	he simulate screen.
17 Line and a contract test back to the first test	mulations are finished, ults using the options in the
"AutoBuild	'Informational Dialog Box

	Area //*	Volume ft ²	UA Btu/h-F	HVAC Class	Cancel
216	00	10052.0	-	and the second se	
	~	18653.0	362.37	Residential	Help
0	Je Je		0		
Dest	1	. 1	Deutiliane	I Inflication	
	<u>R</u> oofs	<u>R</u> oofs <u>F</u> la	<u>R</u> oofs <u>F</u> loors	<u>R</u> oofs <u>F</u> loors <u>P</u> artitions	<u>R</u> oofs <u>F</u> loors <u>Partitions</u> <u>Infiltration</u>

Building Zones Dialog Box

¥alls - Zone Name	Wall Type	Gross Area ft	R-value h-ft ⁻ F/Btu	UA Btu/h-F	Solar Abs	Orient	Tik	?)> Windows / Doors
North Porch	2 x 4 cypress	275.58	14.53	14.61	0	0	90	5/1
East Porch	2 x 4 cypress	287.97	14.53	11.96	0	90	90	7/1
South	2 x 4 cypress	480.05	14.53	15.44	0.5	180	90	13/0
West	2 x 4 brick	287.97	13.18	19.30	0.1	270	90	4/0
North Garag	2 x 4 garage	204.92	10.39	19.72	0	0	90	0/0
	See See - S		0	0.0	0	0	0	6
		B p	0	0.0	0	0	0	
[0	0	0.0	0	0	0	
		Sum : 1536.49		81.0		эк	Cance	Help

Walls Dialog Box



Wall Construction Dialog Box - Cypress Siding

all Const	ruction - West	in zadi					A HEAT THE	S. MALLER		?
	Dudhich	_		L B	-value to Use		-		New Constant	DK
Wall <u>T</u> ype :	2 x 4 brick	-			Derived R-value	13.1	802			Cance
				ALL DE	h-ft ^e -F/Btu	新教教教				New
					C User-supplied R- h-ft ² -F/Btu	value		(Fig. 1)		Modify
					THETTOLU					The Party of the
										Bemov
-Wall Cros	s Section - 1 —					s Section - 2	Sec. 19			Help
% of Wall Area :	80	R: h-ft ^e -F/Btu	15.4		% of Wall Area :	20	R: h-ft ^e -F/Btu	8.36	Duplic	ate S1
Layers	Materia		Thickness inches	Air Layer U-value	Layers	Material		Thickness inches	Air Laye U-value	r
outside	outside air film	0	0.00	U= 5.88	outside	outside air film	0	0.00	U= 5.88	3
2	builder brick	0	3.75	· 影响的	2	builder brick	0	3.75	STAR STAR	
3	dead air film	6	1.00	U= 1.50	3	dead air film	0	1.00	U= 1,50	
4	sheathing	0	0.50	The second	4	sheathing	0	0.50	a realization	陸高島
5	fiberglass	6	3.50	1.2000年	5	softwood	0	3.50		
6	drywall	0	0.50	Contraction of the	6	drywall	0	0.50		
7	inside air film	0	0.00	U= 1.47	7	inside air film		0.00	U= 1.47	7
8		0	Page 1	- Salar	8	1000分钟的空	0			
				Contraction in the	9	I SH SHOW	0	THE RUNAWER	S PORTAN	Tot Chines
9		Ø	1 - Alter	San Lange	State State	A State of the sta		A CONTRACTOR	is due los	

Wall Construction Dialog Box - Brick Veneer

Wall Const	ruction - North Gara	ige	The second second				all see all		?
		-	⊏ B-	value to Use					OK
Wall Lype :	2 x 4 garage	1	and so the	Derived R-value	10.3894			C	Cancel
				h-ft ² -F/Btu				144	New
				C User-supplied R- h-ft ² -F/Btu	value				Modify
	E. Market		Sa AR	IFIC-F7DIG				A DE CONTRACTOR	emove
							Series 1	<u></u>	emove
- Wall Cros	s Section · 1	A Star Alla			s Section - 2		1122.00		Help
% of Wall Area :	80 R	: /Btu 12.89		% of Wall Area :	20 h-ft ^e	R: -F/Btu	5.85	Duplicate	s1
Layers	Material	Thickness inches	Air Layer U-value	Layers	Material		Thickness inches	Air Layer U-value	
outside	garage air space	0.00	U= 5.00	outside	garage air space	0	0.00	U= 5.00	
2	drywall	0.50	和学校	2	drywali	0	0.50	AND ADDRESS	
3	fiberglass	3.50	and Second	3	softwood	0	3.50	Rei Satis	
4	drywall	0.50	a service	4	drywall	Ø	0.50		
5	inside air film	0.00	U= 1.47	5	inside air film	0	0.00	U= 1.47	
6		3	State 2	6		0			
7				7	的原始建設的	0		10.12	Fig-
8				8		Ø	13.49		
9		3	TRANSPORT	9		0	The second	Real Property of	Y de
	Total Thickness	4.5			Total Thickness		4.5		

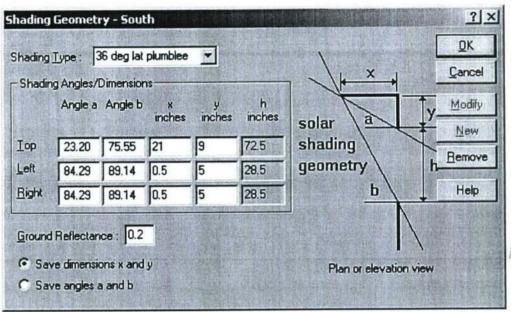
Wall Construction Dialog Box – Living Space to Garage

Windows Type	1	Num	UA	Orie	nt Tilt	Shading	OK
A STATE OF THE OWNER			Btu/h-F				Cance
2058 double, wo	0	6	40.98	180	90	36 deg lat plumbl	Help
2048 double, wo	0	2	11.33	180	90	36 deg lat plumbl	
5858 double, wo	0	2	35.33	180	90	36 deg lat plumbl	6
4858 double, wo	0	1	14.71	180	90	36 deg lat plumbl	6
3858 double, wo	0	1	11.77	180	90	36 deg lat plumbl	6
2668 double, wo	0	1	8.54	180	90	36 deg lat plumbl	0
Doors - No Glazin	g						
Sa a Martin State	0	0	0.00				The Part of
	0	0	0.00	ALC: NO			
	P	0	0.00				

Windows & Doors Dialog Box - South-Facing

Window Type :	U-value] <u>0</u> K
2058 double, wood	Use derived U-value 0.476 Btu/hr-ft ² -F	Cancel
Glazing Name : double	C Use supplied U-value 0.5 Btu/hr-ft²-F	Modify
Frame	Rough Frame Opening Size	New
Name: wood	Width Height Area	Remove
PFD Area ft ^e : 2.27 Length inches: 191	28.5 × 72.5 = 14.349	Help
PFD Width		
Etame the	ermal effect	
frame glass extends t	o here	

Windows Construction Dialog Box - South-Facing



Shading Geometry Dialog Box - South-Facing

Roofs - Zone Name	Roof Type	Gross Area ft	R-value h-ft ² -F/Btu	UA Btu/h-F	Solar Abs	Orient	Tik	<u>?</u>]× Windows
North Roof	shingle, attic, r	1080.00	30.50	35.41	0.15	0	27	00
South Roof	shingle, attic, r	1080.00	30.50	35.41	0.5	180	27	0
I	L. Stadlers		0	0.0	0	0	0	
	PATRIAN STATE	0	0	0.0	0	Q	0	
	Skiller and		0	0.0	0	0	0	
		0	0	0.0	0	0	0	
	HO BOOK		0	0.0	0	0	0	
[The second second	0	0	0.0	0	0	0	
		Sum : 2160.00		70.8		ок	Cance	Help

Roofs Dialog Box

	A HOLE AS		- B-v	alue to Use	C. C. Barris	2018		OK
loof Type :	shingle, attic, r-30			C Derived R-value	29.04	17		Cance
				h-ft ² -F/Btu				
				User-supplied R-v	value 30.5			New
				h-ft ² -F/Btu				Modif
								Bemov
								Help
Roof Cros	ss Section - 1			Roof Cros	s Section · 2			Theip
% of Roof Area :	81 R h-ft ² -F	: /Btu 36.02		% of Roof Area :	19 h-	R: ft²-F/Btu	15.91	Duplicate S1
Layers	Material	Thickness inches	Air Layer U-value	Layers	Material		Thickness inches	Air Layer U-value
outside	outside air film	3 0.00	U= 5.88	outside	outside air film	0	0.00	U= 5.88
2	softwood	0.50	1 Alternation	2	softwood	0	0.50	States of the
3	ceiling air space	0.00	U= 1.00	3	ceiling air space	0	0.00	U= 1.00
4	fiberglass	10.00	THE REAL PROPERTY IN	4	softwood	0	10.00	Calendary Cale
5	drywall	0.50	The sector of	5	drywall		0.50	
6	inside air film	0.00	U= 1.47	Б	inside air film	0	0.00	U= 1.47
7		3 I		7	A CHELK LAND	0	Adda to have	Leating and
		3		8			1 All the second	Carlana ave
8	R and a state of the state of t		The loss of	9		0	10%的资源	
8 9			STREET STREET STREET	the second s	the structure of the statement of a structure of the		The subscreen and a second	Contraction of the second seco

Roof Construction Dialog Box

Name	Floor Construction	Area ft ²	R h-ft ^e -F/Bt	UA u Btu/ł		Perimeter It	f Factor Btu/h-F-ft
Hardwoods	2 x 10 hardwo	1800	19.87	11.06	Crawl Space	▼ 125.995	0.1
Brick Pavers	2 x 12 pavers	360	20.9718	4.82	Crawl Space	▼ 66.995	0.1
	Contract and	D	0		- AND - COMPANY	- 0	0
	T WARRAND		0	Tallon		- 0	0
	Sector Provent	D D	0	12.20	NEW YORK	- 0	D
	TRANS - LONG		0	19. 8		• 0	0
			0		The Station of the	• 0	0
and the second second	No. of Lot of Lo		0	1100	NAME OF TAXABLE PARTY.	- 0	0
A MARKEN SA		Sum : 2160.0	The second	15.88		OK Cancel	Help

Floors Dialog Box

			r-B-	value to Use		- Del		DK
or Lype :	2 x 10 hardwood 💌			Derived R-value	19.86	52		Cance
			California and	h-ft ² -F/Btu	10000000000000000			New
				C User-supplied R-v	alue			
				h-ft ^e -F/Btu				Modify
					A STATE OF			Bemov
							1950	Help
loor Cros	s Section - 1		and the second second	Floor Cross	s Section - 2			the second
of Floor	80 R: h-ft²-F/	Btu 22.03		% of Floor Area :	20 h	R: ft²-F/Btu	14.26	Duplicate S1
	The state of the state of		Air Layer	· 这些一个自己遭越大爆			Thickness inches	Air Layer
Layers	Material	inches	U-value	Layers	Material		Constants Mail	U-value
outside	dead air film		U= 1.50		dead air film		0.00	U= 1.50
2	fiberglass			2	softwood		9.25	
3	softwood	0.63		3	softwood		0.63	
4	hardwood	0.75	州市中国政治	4	hardwood	0	0.75	A CONTRACTOR OF THE
5		3		5	。這個意識 中方	0	WE WARD	
6	E	3	and the state	6		0	THE PARTY	
7	C			7		G		The State of state
	E		Mar Alle	В			100 Mar 18	A CONTRACTOR
8	A DESCRIPTION OF A DESC	5	A GLOBERS OF	9	Carlos Carlos	0	Real Street,	1. 日本語語
8 9	E	2	A DIMENTIAL STREET	and the second	And the state of the second state of the secon	and the second sec	and the second second second	THE CONTRACTOR OF A CONTRACTOR OF A CONTRACT

Floor Construction Dialog Box - Hardwood

	0.10			⊢B	-value to Use		-	OK
or Lype :	2 x 12 pavers	-			Derived R-value	20.9718		Cance
					h-ft²-F/Btu	trees we have		New
					← User- <u>s</u> upplied R- h-ft ² -F/Btu	value		Modify
					THEFTOLU			
								<u>Remov</u>
They Cros	s Section - 1	APRIL A			- Floor Cros	is Section - 2	and the second	Help
of Floor		R: F-F/Btu	22.05		% of Floor Area :		R: [16.93	Duplicate S1
Layers	Material		Thickness inches	Air Layer U-value	Layers	Material	Thickne inches	
outside	dead air film	0	0.00	U= 1.50	outside	dead air film	0.00	U= 1.50
2	fiberglass	Ø	6.00	Sale and	2	softwood	11.25	
3	softwood	0	0.75		3	softwood	0.75	A LANDERS AND
4	concrete	0	4.00	100.05		concrete	4.00	
5	paver brick	0	0.50	2010年1月1日	5	paver brick	0.50	
	A VERSUS STRANGER	Ø	1.2884年	TANKAS	6	A STREET STREET		
6	the state of the second st		1.100	A Second	7			
6 7		0	A REAL PROPERTY AND ADDRESS OF			El manufactura el a manager		second second state and state and
		00			B	and the second second		
7		000			9	(manual states and st		

Floor Construction Dialog Box – Brick Pavers

Name	Wall Type		Total Area			
Furniture	furniture	-0	300			
Walls (interior)	2 x 4 partition	6	110			
Brick Hearth	brick chimney	6	43.3			
1			0			
[0			
			0			
		0	0			
		0	0			
		Sum	453.30			
	OK O	ancel	Help			

Interior Partitions Dialog Box

Ifective Leakage Area	(ELA)		OK
ELA:	0.0	irr²	Cancel
Shielding Class:	5	and the second	A STREET
Number of Stories:	1		Help
Constant Air Change Ra	te		
Air Changes per Hour:	0.22		
		And Andrews (



AC System - Z		THE REAL PROPERTY OF				?
VAC System :	Air Source H	leat Pump/E	R Backup	*		OK
Heating: Heat Pump/ER	Backup	Out	put:	39012	Btu/h	Cancel
Cooling:		Ser	sible Output :*	25129	Btu/h	Help
Direct Expansion	n Compressor	VI	al Output :*	33506	Btu/h	Cost
Fan/Air Distributi	on:	Airl	Flow :	1320		
Forced Air		Min Min	imum Occupied side Air (MODA):	D	cfm	
Autosizing:						
Oversizing Facto	r for Autosize:	1.312	Autosize Dn Autosize Df	Autosia	ze Now	
		*Outputs at	ARI Rated Conditi	ons.		

HVAC System Dialog Box

leating System - Z	one 1		?
Type: Heat Pu	mp/ER Backup		OK
Supply <u>A</u> ir Temperatu	re ; 95.0	•F	Cancel
			Help
- Autosizing:			La Mars
Outdoor Design Ter	mperature :	20.0 *F	
		Personal States	
Heat Pump:	at 47.0 *F	at 17.0 *F	
COP:	3.02	2.14	
Capacity, Btu/h	33506	16753	
Electrical Resistance	e, Btu/h	39012	
			2. 金子子
V	lues apply at Ra	ted Conditions	

Heating System Dialog Box

oling System - Zone 1			2
Type : Direct Expansion D	ompressor	-	OK
			Cancel
Efficiency :	10.1	EER	Help
Supply Air Termperature :	56.0	F	
Autosizing:			
Outdoor Design Temperature :	91.0	*F (2.5 Percentile)	
Sensible <u>R</u> atio :	0.75		
Design Day Month:	July	✓ Hottest Month: Ju	ly .
Account for previous Dayli	ghting results	during Autosize	

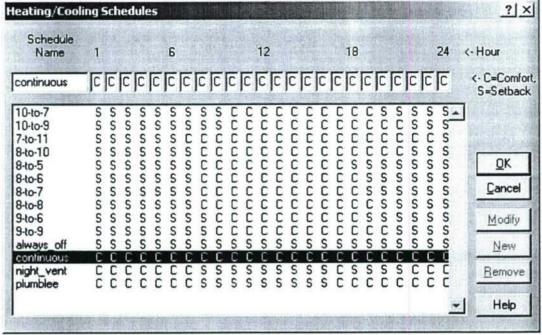
Cooling System Dialog Box

Air Distribution Type : Forced /	OK		
Supply:			Cancel
Static Pressure :	0.2	inches of water	Help
Fan Efficiency :	15	~ %	
Duct Leakage to Dutdoors :	3	*	
Duct Leakage to Indoors :	5	*	
Duct Conduction to Outdoor :	5	z	
Return:			
Duct Leakage from Dutdoors :	3	*	
Duct Conduction from Dutdoors :	5	*	
Exhaust Air Heat Recovery Efficiency :	Ī	- %	

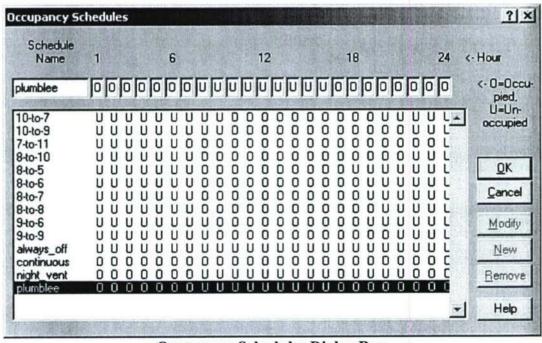
Air Distribution System Dialog Box

Heating & Cooling :	Workday		Non-workd	· 法法	Course
	Iconanuous	0	continuous	0	Cance
Occupancy :	plumblee	0	continuous	0	Help
Setpoints			Caller		
Heating:	Comfort 68.0	*F	Setback/Se	••up •F	
Cooling :	KW	۴F	77.0	TF	
Outside Air Damper Interlock : Fan Startup: Fixe	C Supply Fan	0	Cocupancy S	Schedule	
	C No C				

HVAC Controls Dialog Box



Heating/Cooling Schedules Dialog Box



Occupancy Schedules Dialog Box

<u>Note</u>: The above Occupancy Schedule is only used for Temperature Set-backs. See Internal Gains for actual Occupancy Profiles.

Internal Gains -	Zone 1		?×
	Profiles	Peaks	<u>O</u> K
	Work Nonwork Day Day	Typical Autosize Work Day	Cancel
Internal Lights, W/fit		0.20 0.20	Work Week
External Lights, W/ff	plumble 🕜 plumble 🕥	0.04 0.04	Help
People, number	plumble 🕥 plumble 🕥	2.00 2.00	
Hot Water, W/ff	plumble 🕜 plumble 🕥	2.08 2.08	
<u>D</u> ther, W/ft ^e	plumble 🕜 plumble 🔇	0.25 0.25	

Internal Gains Dialog Box

Internal Lights External Lights People Hot Water Other Work Day Profile plumbleelt plumbleeolt plumblee plumbleehw plumbleeot Nonwork Day Profile plumbleelt plumbleeolt plumbleenw plumbleehw plumbleeot

oad Profile	1000		00055	2010	1110	100		1055	1000			-	111												23
Profile Name	1					6						12					-	8					2	24	<- Hour
plumblee	P	P	P٢	P	P	P [0 F	ōſ		σΓ					P	P	P [P [P	P [P	P	<- Relative value, integ
ofinwk	1	1	1	1	1	1	1	4	8	8	8	8	8	8	8	8	8	6	4	3	2	1	1	1	0 - 9, and P for Peak
ofotnw	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	-	T TOTT CO
ofotwk	4	4	4	4	4	4	Б	8	P	P	P	Ρ	Ρ	Ρ	Ρ	Ρ	Ρ	8	6	4	4	4	4	1	
ofpenw	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	L or
ofpewk	0	0	0	0	0	0	2	6	8	Ρ	Ρ	Ρ	Ρ	Ρ	Ρ	Ρ	8	6	4	2	0	0	0	C	DK
plumblee	P	P	P	P	F	P	0	0	0	0	0	0	0	0	0	0	P	P	P	P	P	P	F		Cancel
plumbleehw	0	0	0	0	0	5	P	5	D	0	0	0	0	0	0	0	0	5	P	5	U	U	U	L	Lance
plumbleelt	0	D	0	0	Ρ	6	0	0	D	0	0	0	0	0	0	Ū	6	6	P	P	P	U	U	12	
plumbleenw		Ρ	Ρ	P	P	P	В	6	5	5	5	5	5	5	5	5	Б	R	2	P	P	2	P	F.	Modify
plumbleeolt	0	0	0	0	0	0	0	0	U	U	U	U	U	U	U	U	U	U	U 0	U	1	4	4	18	
plumbleeot	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	6	4	4	1	4	4	-188	1 New
reexnw	1	1	1	1	1	1	U	U	U	U	U	U	ŭ	U	U	U	0	U	h	h	L	P	6	-	
reexwk	2	2	2	2	2	2	U	U	U	U	U	U	U	U	U	0	0	0	2	5	2	2	2	-	<u>Remov</u>
rehwnw	2	2	2	2	2	2	2	2	2	2	4	2	2	4	4	4	Ę	4	2	2	2	6	5	-	
rehwwk	2	2	2	2	2	3	-	2	9	8	4	b	5	4	4	4	1	1	1	1	1	1	1	1.	Help
reinnw	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	<u> </u>	Burning and

Load Profile Dialog Box

Lighting Zones		國和國國的		
Name	Floor Area ft ^e	Lighting \w/ft ^e	Details EL DL	Close
Zone 1	2160.0	0.20	No No	国际管理
				Add
				Delete
				Modify
Total Floor A Percent Building Z	the second se			Help

Lighting Zones Dialog Box

Note: Daylighting Dialog Boxes not used in this case study of the Plumblee Home. {Typical Daylighting Controls are only used in non-residential applications.}

Gas Furnace Case

Equivalent Heating Case using Gas Furnace in lieu of Heat Pump with Electric Heating.

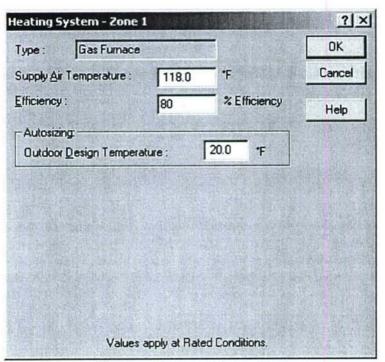
Note:

The Gas Furnace Case input is the base for all other varied cases.

VAC System : DX Cooling v Heating:	with Gas Furnace		and a state of the	ОК
Gas Furnace	Dutput:	37775	Btu/h	Cancel
Cooling:				Help
Direct Expansion Compressor	Sensible Output :*	24580	Btu/h	
Tensor Enhancion Completion	Total Output :*	32774	Btu/h	Cost
Fan/Air Distribution:				
	Air Flow :	1210	cfm	
Forced Air	Minimum Occupied Dutside Air (MODA):	0	cfm	
Autosizing:				
Oversizing Factor for Autosize:	1.312 C Autosize On C Autosize Off	Autosiz	e Now	

{Only Dialog Boxes with Changed Input Presented}

HVAC System Dialog Box



Heating System Dialog Box

oling System - Zone 1	相關是在南部		?
ype : Direct Expansion	Compressor	- A State Hele	OK
			Cancel
Ificiency :	10.1	EER	Help
Supply <u>A</u> ir Termperature :	56.0	۴F	
Autosizing:			
Dutdoor Design Temperature	91.0	*F (2.5 Perce	entile)
Sensible <u>R</u> atio :	0.75		
Design Day Month:	July	Hottest Mon	th: July
Account for previous Day	lighting results	during Autosize	
Values a	pply at ARI Ra	ted Conditions.	

Cooling System Dialog Box

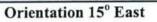
Air Distribution Type : Forced	Air		OK
A STATE OF STATE	The Party of the P	State State	Cancel
Supply: Static Pressure :	0.2	inches of water	Help
an Efficiency:	15	*	A REAL PROPERTY AND
Ouct Leakage to Outdoors :	3	x	and the second
Ouct Leakage to Indoors :	5	*	
Duct Conduction to Outdoor:	5	*	
Return:			
Ouct Leakage from Outdoors :	3	*	
Ouct Conduction from Outdoors :	5	*	
Exhaust Air Heat Recovery Ifficiency :	İ	- *	

Air Distribution System Dialog Box

I

Orientation Cases

Bldg Title :	Drientation 15 East Case							
	Rotate	Area ft²	Volume ft ^a	UA Btu/h-F	HVAC Class	Cancel		
C Zone 1	345	2160.0	18653.0	362.37	Residential	Help		
C Zone <u>2</u>	0	D	0	0				
₩alls	Boo	ts	Floors	Partitions	Infiltration			



uilding Zon	es - Bldg-2	e contra	nn la entere			?]
Bldg Title :	Orientation :	30 East Cas	8			OK
	Rotate	Area It ^e	Volume ft ⁹	UA Btu/h-F	HVAC Class	Cancel
• Zone 1	330	2160.0	18653.0	362.37	Residential	Help
C Zone 2	0	0	0	0		
<u>₩</u> alls	<u><u> </u></u>	fs	Floors	Partitions	Infiltration	
HVAC Syst	em HV	AC Controls	Intern	al <u>G</u> ains	Lighting Zones	

Orientation 30° East

Bldg Title :	Drientation	45 East Cas	e			DK
	Rotate	Area ft ²	Volume ft ^p	UA Btu/h-F	HVAC Class	Cancel
• Zone 1	315	2160.0	18653.0	362.37	Residential	Help
C Zone 2	0	0	0	0		
<u>₩</u> alls	Boo	fs	Eloors	Partitions	Infiltration	

Orientation 45° East

Window Placement Cases

Case 1 - All south-facing windows changed to Low-E glass.

Туре	Num	UA Btu/h-F	Orien	nt Tilt	Shading	DK Cance
2058 double, wo	6	24.28	180	90	36 deg lat plumbl	Help
2048 double, wo	2	6.87	180	90	36 deg lat plumbl	C. SHOW NO
5858 double, wo	2	19.64	180	90	36 deg lat plumbl	
4858 double, wo	01	8.22	180	90	36 deg lat plumbl	
3858 double, wo		6.67	180	90	36 deg lat plumbl	
2668 double, wo		4.96	180	90	36 deg lat plumbl	
COMPANY OF SCHOOL STOCK SCHOOL SCHOOL		4.96	-	-	A DESCRIPTION OF THE OWNER OWNER OF THE OWNER OWNER OF THE OWNER O	
		0.00				
		0.00				
(1) 在12 12 12 12 12 12 12 12 12 12 12 12 12 1	00	0.00			小是一日不可能的	

For South-Facing Windows - Low-E

Window Type :	U-value	<u>o</u> k
2058 double, wood	C Use derived U-value 0.282 Btu/hr-ft-F	Cancel
Glazing Name: double low-e	C Use supplied U-value 0.5 Btu/hr-ft ² -F	Modify
Frame	Rough Frame Opening Size	New
Name: wood	Width Height Area inches inches It ²	<u>R</u> emove
PFD Area ft ² : 2.27 Length inches: 191	28.5 × 72.5 = 14.349	Help
PFD Width		
frame glass extends to	nal effect here	

Change Glazing Name to "Double Low-E"

Glazing System	U Btu/hr-ft ² -F	Shading Coefficient	SHGC	Visible Transmittan	Glazing ce Type		<u>Q</u> K Cance
double low-e	0.260	0.65	0.56	0.75	2613	•	-commenters
double	0.49	0.89	0.77	0.81	2003	-	Modify
double bronze	0.49	0.72	0.62	0.62	2203 2613		New
double low-e guad low-e 88	0.26	0.65	0.56	0.75	4651		
r1000	0.00	0.65	0.56	0.75	2613		<u>R</u> emov
r1000 sc0	0.00	0.00	0.00	0.00	2613		Open William
scO	0.26	0.00	0.00	0.00	2613		Help
single	1.11	1.00	0.86	0.90	1000		
six layered	0.15	0.63	0.54	0.55	4651		
triple	0.32	0.79	0.68	0.74	3001 3641		
triple low-e 88	0.23	0.67	0.58	0.71	3641	-	

Glazing Library Dialog Box - Double, Low-E

Case 2-Used 8 south-facing, Low-E windows.

Туре	Num	UA Btu/h-F	Drien	t Tilt	Shading	OK Cance
2058 double, wo	6	24.28	180	90	36 deg lat plumbl	Help
2048 double, wo	2	6.87	180	90	36 deg lat plumbl	R. Harris
5858 double, wo	0	0.00	180	90	36 deg lat plumbl	
4858 double, wo	0	0.00	180	90	36 deg lat plumbl	
3858 double, wo	0	0.00	180	90	36 deg lat plumbl	
2668 double, wo		4.96	180	90	36 deg lat plumbl	
Doors - No Glazin	g			and the second		
	0	0.00	Continues in			
		0.00				
	00	0.00	A THE ARE			

"Large Rectangular Windows Deleted"

Case 3 - Used 6 south-facing, Low-E windows.

Туре	Num	UA Btu/h-F	Drie	nt Tilt	Shading	OK Cancel
2058 double, wo	@4	16.19	180	90	36 deg lat plumbl	Help
2048 double, wo	2	6.87	180	90	36 deg lat plumbl	Selection of the
5858 double, wo	0	0.00	180	90	36 deg lat plumbl	
4858 double, wo	0	0.00	180	90	36 deg lat plumbl 🦳	
3858 double, wo	0	0.00	180	90	36 deg lat plumbl	
2668 double, wo	01	4.96	180	90	36 deg lat plumbl	a state
Doors - No Glazin	g					
	0	0.00				
	0	0.00	-Allana		A State of the state of	
CARLES AND PORT	00	0.00	Tele P			

Case 4 - Used 4 south-facing, Low-E windows.

Туре	Num	UA Btu/h-F	Orie	nt Tilt	Shading	OK Cance
2058 double, wo	3	12.14	180	90	36 deg lat plumbl	Help
2048 double, wo		3.44	180	90	36 deg lat plumbl	THE ME
5858 double, wo	0	0.00	180	90	36 deg lat plumbl	
4858 double, wo	0	0.00	180	90	36 deg lat plumbl	
3858 double, wo	0	0.00	180	90	36 deg lat plumbl	
2668 double, wo	1	4.96	180	90	36 deg lat plumbl	
Doors - No Glazin	9					
	00	0.00				4
ALL PARTY	0	0.00				
STATE AND ST	00	0.00		ALC: NO		

Case 5 - Used minimal glazing on North, East, and West exterior walls.

Туре	Num	UA Btu/h-F	Drie	ent Tilt	Shadir	DQ.	OK Cance
2028 double low-	24	8.78	0	90	fully shaded	0	Help
2058 double low-		4.05	0	90	fully shaded	0	all a
	0	0.00	0	90			
	0	0.00	0	90	NSTRATES IN		
Antesis Astronom	00	0.00	0	90			
State of the second		0.00	0	90			
Doors - No Glazin	9			ND SI SI			
wood	01	9.40					
	0	0.00					
	0	0.00	A STATE				

Energy-Efficient (Base) Case

Windows-	NL		UA	Driv	ent Tilt	Shadir	-	OK
Туре	Nu	*	Btu/h-F	UIR	314 114	JINGLI		Cancel
2028 double low-	2		4.39	0	90	fully shaded	0	Help
2058 double low-	0		0.00	0	90	fully shaded	0	C. P. S.
	0	Re-sur	0.00	0	90	Rev Contraction		
and the second s	0		0.00	0	90			
	0		0.00	0	90			
	0		0.00	0	90			
Doors - No Glazin	g	-du						
wood	01		9.40					
	0	1	0.00					
	Ø)	0.00					

Minimal Glazing Case

THE STATE OF A STATE O		1
States - Al	0	0.00
	LIA Sum :	39.72
	Ene	rgy-F

indows & Doors	- East Por	ch		(注)]]			<u>? </u> >
Windows					Charte		OK
Туре	Num	UA Btu/h-F		ent Tilt	Shadin	9	Cancel
2028 double low-		2.20	90	90	fully shaded	0	Help
2058 double low-		4.05	90	90	fully shaded	Ø	- Children
2032 double low-	2	5.01	90	90	fully shaded	Ø	
2668 double, wo		0.00	90	90	fully shaded	Ø	
3858 double low-	00	0.00	90	90	<none></none>	Ø	
3816 dble low-e,	0	0.00	90	90	<none></none>	0	
Doors - No Glazing						No. State	
wood	$\bigcirc 1$	9.40					
utility in the second		0.00					
国际集合 。""你们	0	0.00					
	UA Sun	20.66	1				

Windows				0.	. T.b.	Chadre		OK
Туре		lum	UA Btu/h-F	Orie	ent Tilt	Shadin	9	Cancel
2028 double low-	0	2	4.39	90	90	fully shaded	0	Help
4838 double low-	0	1	5.62	90	90	fully shaded	Ø	a prives
2038 double low-	0	1	2.81	90	90	fully shaded	0	
2668 double, wo	Ø	1	8.54	90	90	fully shaded	0	
3858 double low-	Ø	1	6.67	90	90	<none></none>	0	
3816 dble low-e,	0	1	2.29	90	90	<none></none>	0	
Doors - No Glazin	g							
wood	0	1	9.40					
243种2010月1日	0	0	0.00				The second	
	P	0	0.00				Service 1	Lenk have

Efficient (Base) Case gy

Minimal Glazing Case

Windows & Doors	s - West						? ×
-Windows Type	Num	UA	Orie	nt Tilt	Shad	lina	OK
, ypc		Btu/h-F					Cancel
2032 double low-	@4	10.03	270	90	<none></none>	0	Help
ab as delas	0	0.00	270	90			-The second second
	0	0.00	270	90		G	
	0	0.00	270	90	No. of Concession, Name		
Rock Rock Providence	0	0.00	270	90			
		0.00	270	90	Standard .		
Doors - No Glazin	9						
- CAREARA SALITA DA	0	0.00					
Real Part of Mary	0	0.00				R. See	
	0	0.00					
	UA Sum	10.03		8			A STREET

Energy-Efficient (Base) Case

Windows Type	Num	UA Btu/h-F	Orier	nt Tilt	Shac	ling	OK Cance
2032 double low-	2	5.01	270	90	<none></none>	0	Help
	0	0.00	270	90			SUM
	0	0.00	270	90			
	0	0.00	270	90			
· · · · · · · · · · · · · · · · · · ·	00	0.00	270	90			
		0.00	270	90			
Doors - No Glazin	9	Silver California					
	0	0.00	A STATE	11		a transfer	
	0	0.00		La Parti			
学校 化学校	0	0.00					

Minimal Glazing Case

Shading Cases

Case 1 - Overhang Design: 12 inch eave with 4 inch gutter.

Туре	Num	UA Btu/h-F	Orier	nt Tilt	Shading	DK Cancel
2058 double, wo	6	40.98	180	90	12 inch overhan	Help
2048 double, wo	2	11.33	180	90	12 inch overhan	- MPS dents
5858 double, wo	2	35.33	180	90	12 inch overhan	
4858 double, wo	01	14.71	180	90	12 inch overhan	20
3858 double, wo	01	11.77	180	90	12 inch overhan	
2668 double, wo		8.54	180	90	12 inch overhan	
Doors - No Glazin	9		194		A CONTRACTOR	
	0	0.00			有 网络小麦西兰和小小麦	APPLIE DE
- and a state	0	0.00			1. 化 在地方	
	PIO	0.00				

	<u>T</u> ype: 1 ng Angles/[2 inch ov	ant see a			x x	Cance
		Angle b	x inches	y inches	h inches	solar a	y <u>M</u> odify New
[op	29.36	78.89	16	9	72.5	shading	Bemov
eft	84.29	89.14	0.5	5	28.5	geometry	h
Right	84.29	89.14	0.5	5	28.5	b	Help
	l Reflectan ve dimensio	and the second	E FILLS			Plan or elevation view	~

I

Case 2 - Overhang Design: 24 inch eave with 4 inch gutter.

Windows Type	N	lum	UA	Drie	nt Tilt	Shi	ading		OK
			Btu/h-F						Cancel
2058 double, wo	0	6	40.98	180	90	24 inch ove	rhan [/	\geq	Help
2048 double, wo	Ø	2	11.33	180	90	24 inch ove	erhan [3	A STREET
5858 double, wo	0	2	35.33	180	90	24 inch ove	erhan (
4858 double, wo	0	1	14.71	180	90	24 inch ove	erhan (\geq	
3858 double, wo	Ø	1	11.77	180	90	24 inch ove	erhan [3	
2668 double, wo		1	8.54	180	90	24 inch ove	erhan	B	
Doors - No Glazin	g	E Rote i Rot							
	0	0	0.00						
A AND INTROM	Ø	0	0.00						
	P	0	0.00						

100	Iype: 2	4 inch ov	RINESSE				Cance
		Angle b	x inches	y inches	h inches	solar a	y <u>M</u> odif
ор	17.82	71.04	28	9	72.5	shading	
eft	84.29	89.14	0.5	5	28.5	geometry	h_ <u>Bemov</u>
light	84.29	89.14	0.5	5	28.5	b	Help
• Sa	l Reflectan ve dimensio ve angles a	ons x and				Plan or elevation vi	.

Heat Absorbing Material Case



Name	Floor Construction	Area ft ²	R h-ft ^e -F/Bta	UA u Btu/I		Perimeter It	f Factor Btu/h-F-ft
Hardwoods	2 x 10 hardwo	1800	19.87	11.06	Crawl Space	▼ 125.995	0.1
Brick Pavers	2 x 12 pavers	360	20.9718	4.82	Crawl Space	▼ 66.995	0.1
an a	Cherry Constant		0	multi-ac	State Lat. States	- 0	0
			0	No.	A CONTRACTOR OF THE	- [0	0
	Teste set	D	0	121.34	Alexandra Section	- 0	0
	RUARA		0	Star .	I SERVICE STATE	• 0	0
	Desister and		0	No. of the local division of the local divis		• 0	0
Colline Control Control Inco	MARTINE BARK		0	CHICKEN THE		• 0	0
	the second	Sum : 2160.0	5	15.88		DK Cancel	Help

Energy Efficient (Base) Case

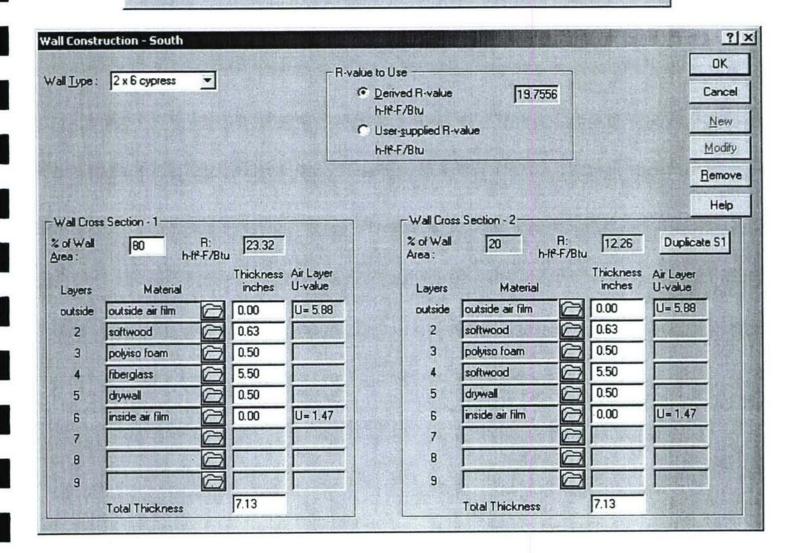
Floors - Zone	e 1			(111-18) H.				?×
Name	Floor Construction	Area ft ²	R h-ft ^e -F/B	UA Itu Btu/I			Perimeter ft	f Factor Btu/h-F-ft
Hardwoods	2 x 10 hardwo	2160	19.87	16.32	Crawl Space	-	192	0.1
	Marries Site		0	A STATE	The start of the	•	0	0
			0	Contraction of the		•	a	0
í -	建物的组织的	D O	0	12 法不		•	٥	0
-			0	1 Carl		•	0	0
í	The second		0	- STAR	The art is a feat of the	•	0	0
-	Call Age of Links	0	0		The state	+	0	0
	120-DEPOP		0		A Street of	•	0	0
		6um : 2160.0	<u>ז</u>	16.32		OK	Cancel	Help

No Brick Pavers Case

Insulation Case



Name	Wall Type	Gross Area ft ²	R-value h-ft ² -F/Btu	UA Btu/h-F	Solar Abs	Drient	Tik	Windo Doc	
North Porch	2 x 6 cypress	275.58	19.76	10.75	0	0	90	5/1	6
East Porch	2 x 6 cypress	287.97	19.76	8.79	0	90	90	7/1	6
South	2 x 6 cypress	480.05	19.76	11.35	0.5	180	90	13/0	6
West	2 x 6 brick	287.97	18.38	13.84	0.1	270	90	4/0	6
North Garag	2 x 6 garage	204.92	15.51	13.21	0	0	90	0/0	6
			0	0.0	0	0	0	Parine	
		6	0	0.0	0	0	0	1 Maria	
	Distanting		0	0.0	0	0	0		6
		Sum : 1536.49		57.9		ж	Cance	¥] - H	lelp



Air Infiltration Control Cases

Case 1 - Used 0.5 Air-Changes per Hour (ACH).

ffective Leakage Area	[ELA]		OK
ELA:	0.0	int	Cancel
Shielding Class:	5		
Number of Stories:	1		Help
Constant Air Change Ra Air Changes per Hour:	te	_	

Case 2 – Used 1.0 Air-Change per Hour (ACH).

ffective Leakage Area	(ELA)		OK
ELA:	0.0	int	Cancel
Shielding Class:	5		STRUCTURE LAN
Number of Stories:]1		Help
Constant Air Change Ra	te		
Air Changes per Hour:	1		
	No.		

Case 3 – Used 1.5 Air-Changes per Hour (ACH).

Ifective Leakage Area	(ELA)		DK
ELA:	0.0	irf	Cancel
Shielding Class:	5		
Number of Stories:]1		Help
Constant Air Change Ra	ste		
Air Changes per Hour:	1.5		

Case 4 - Used 2.0 Air-Changes per Hour (ACH).

ffective Leakage Area	(ELA)		OK
ELA:	0.0	iri²	Cancel
Shielding Class:	5		
Number of Stories:	1		Help
Constant Air Change Ra	te		
Air Changes per Hour:	2		

Indoor Air Temperature Control Cases

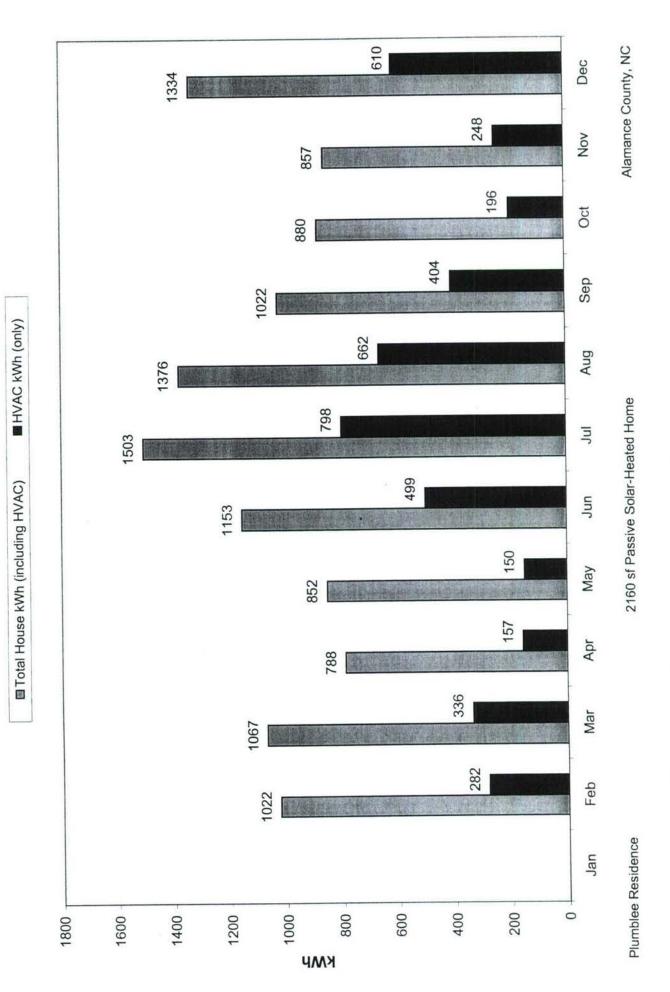
Case 1 – Winter Comfort Set-point: 72 °F

Summer	Comfort	Set-point:	73	F	
--------	---------	------------	----	---	--

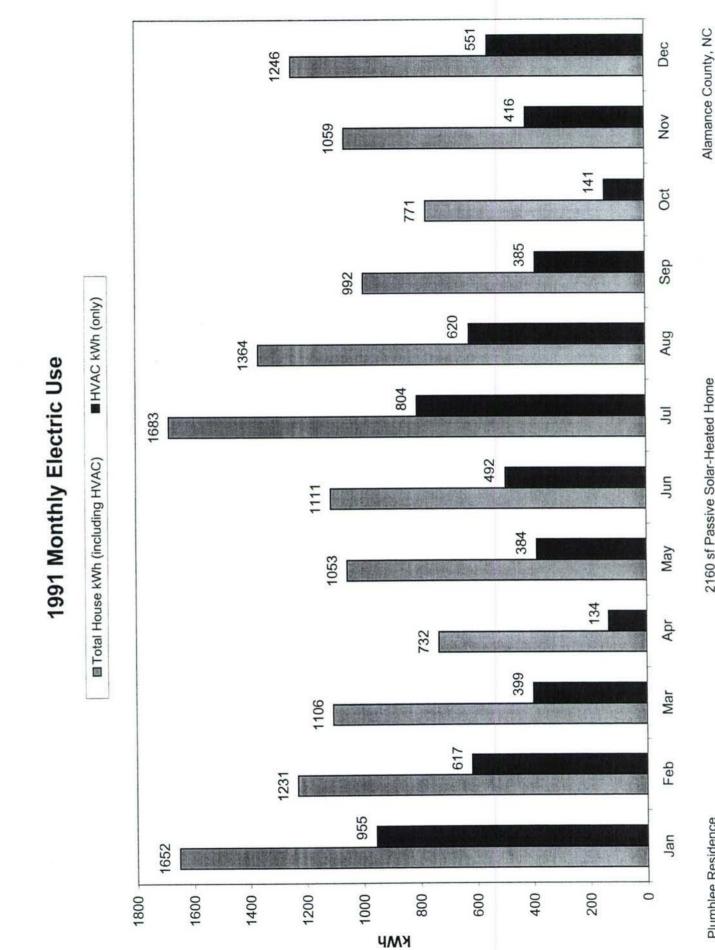
Schedules	Workday	7	Non-workd	lay	OK
Heating & Cooling :	continuous	0	continuous	0	Cancel
Occupancy :	plumblee	0	continuous	0	Help
Setpoints			Cathaol /Se	then a local statements	To puel a
Heating:	Comfort 72.0	۴F	Setback/Se 72.0	•F	
Cooling :	73.0	*F	73.0	T†F	
Outside Air Damper Interlock :	Supply Fa	n (Occupancy	Schedule	
Fan Startup: F	ixed Start Period:	4	hrs		

APPENDIX B

{Plumblee Home: Annual Monthly Energy Use}



1990 Monthly Electric Use



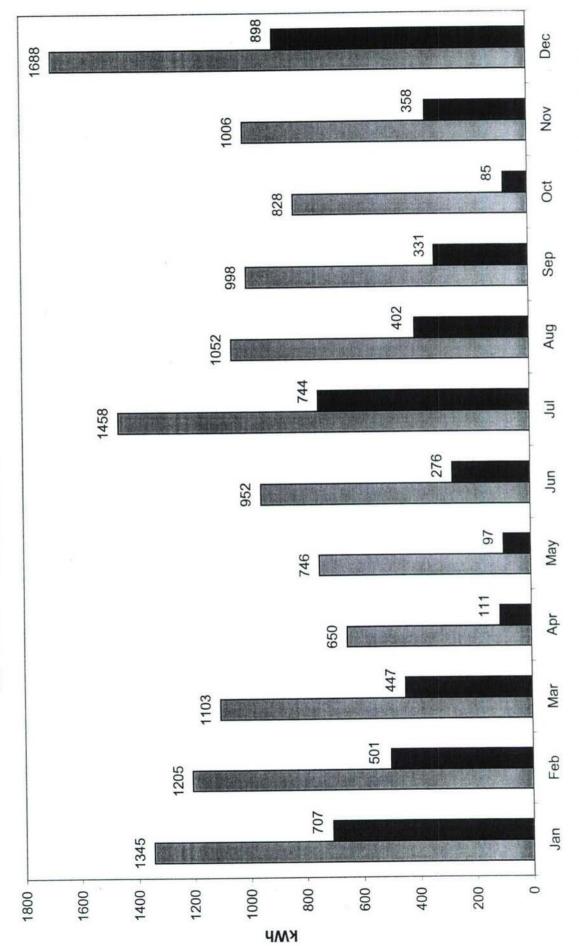
2160 sf Passive Solar-Heated Home

Plumblee Residence



HVAC kWh (only)

Total House kWh (including HVAC)

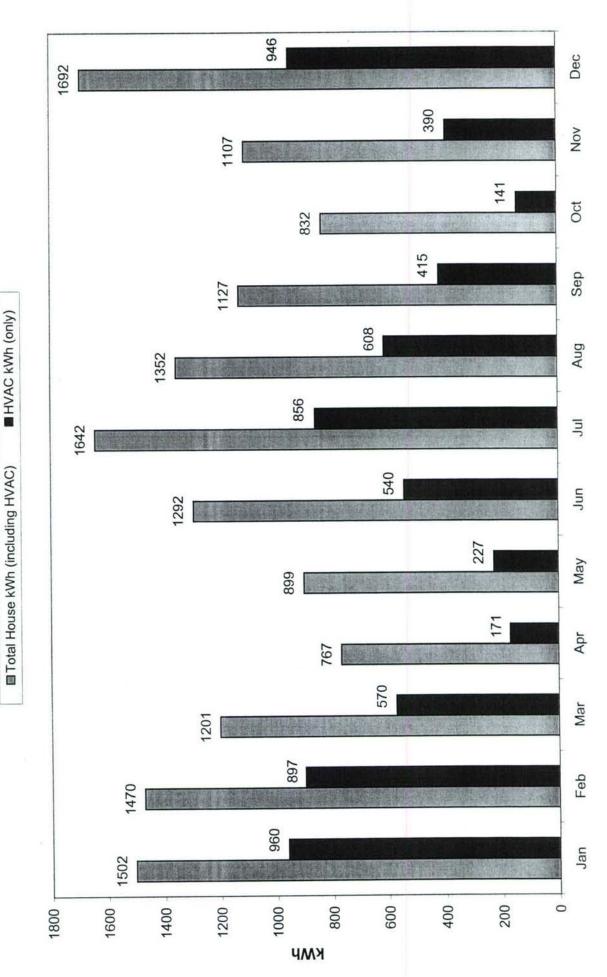


Plumblee Residence

Alamance County, NC

2160 sf Passive Solar-Heated Home

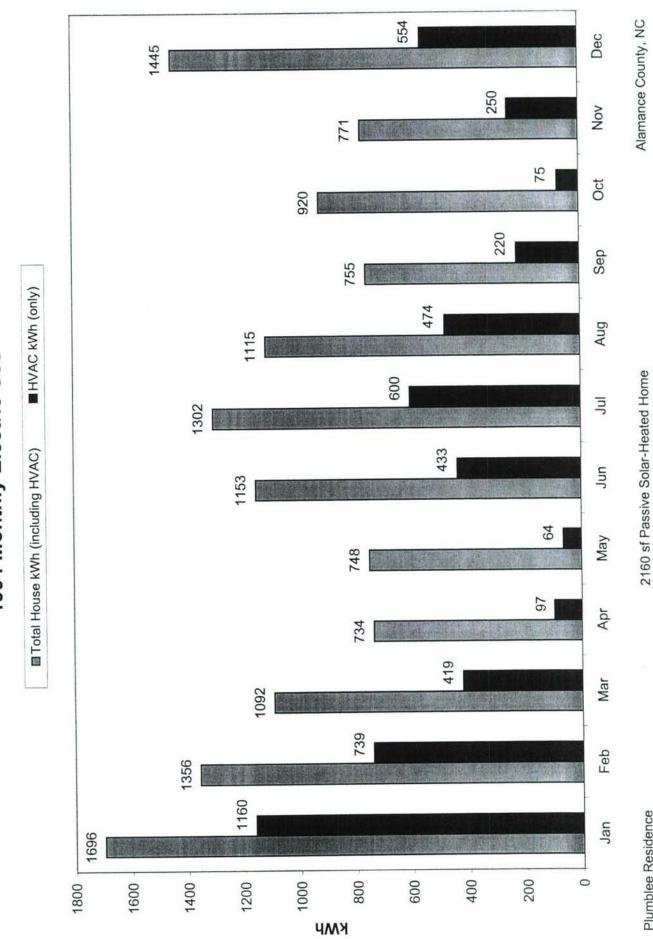




Plumblee Residence

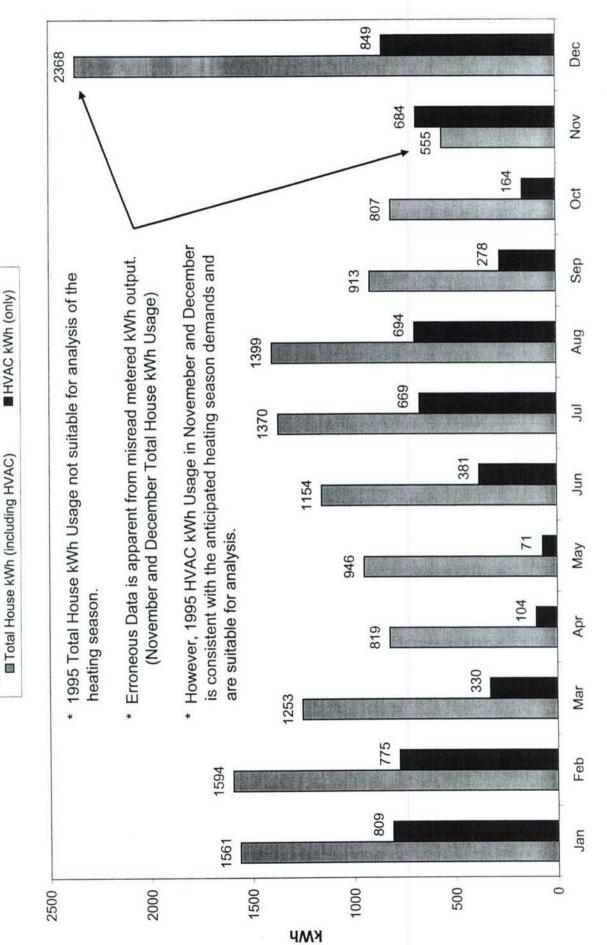
Alamance County, NC

Alaman



1994 Monthly Electric Use

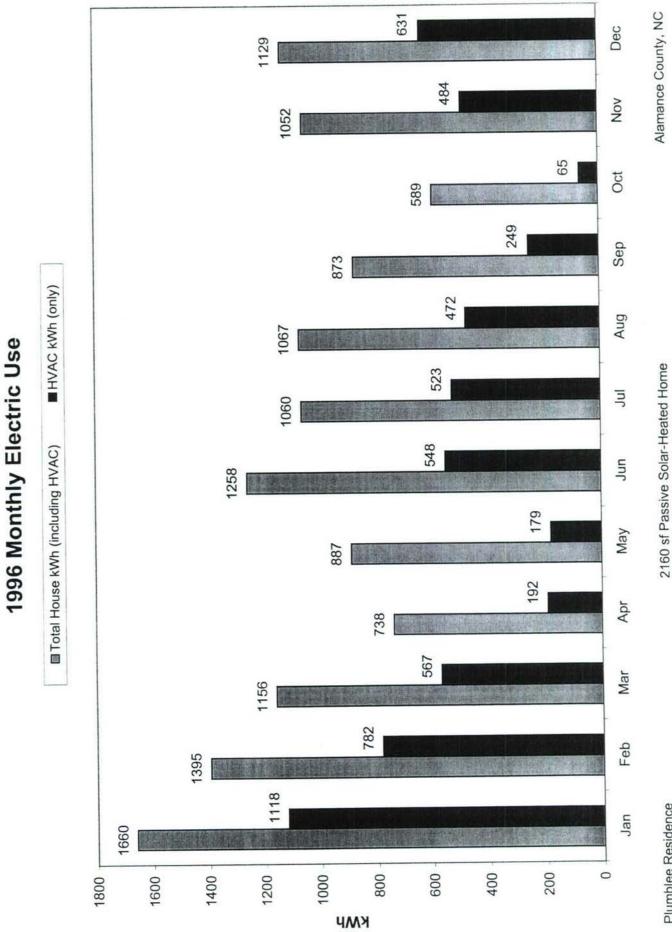


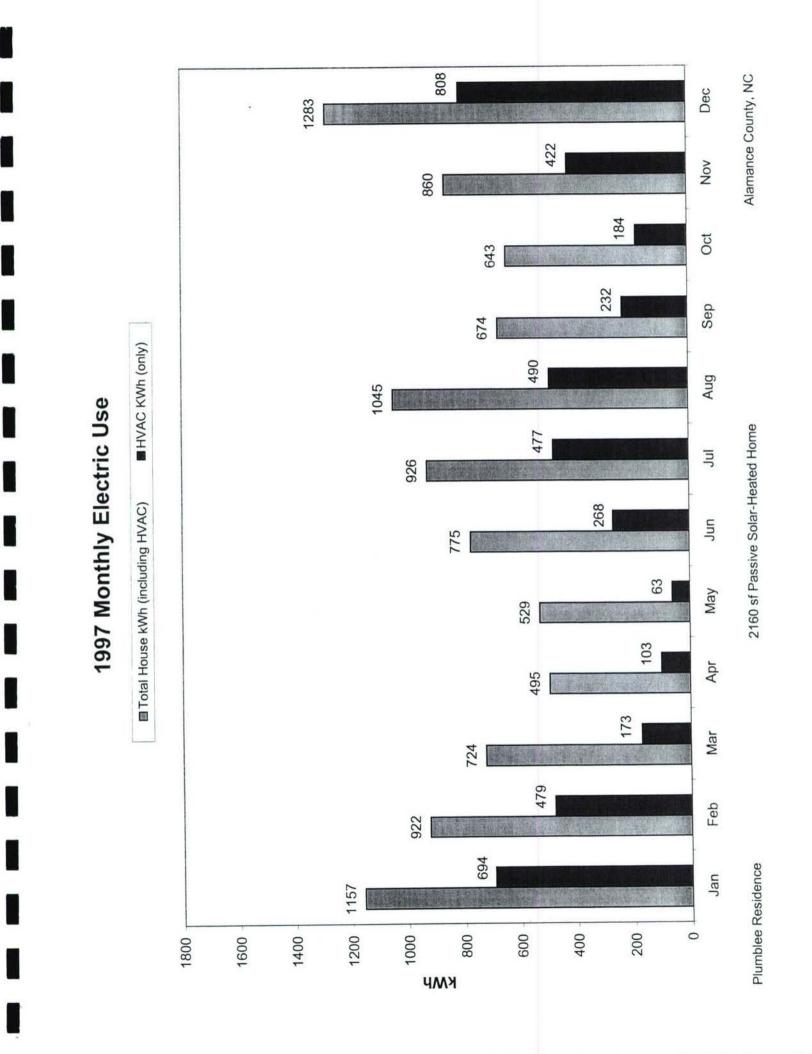


Plumblee Residence

2160 sf Passive Solar-Heated Home

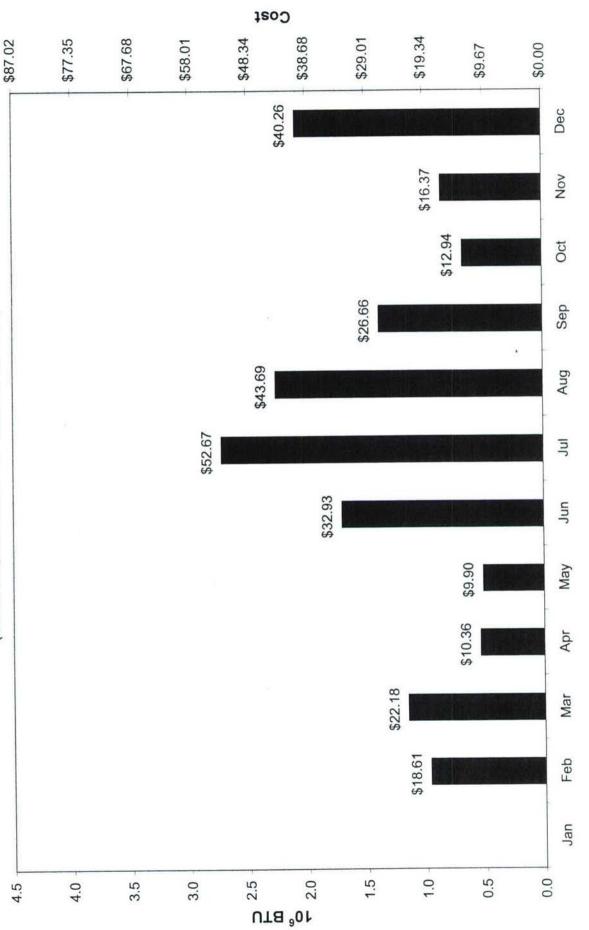
Alamance County, NC





1990 Monthly HVAC Energy Use / Cost (based on \$.066 / kWh or \$19.34 / 10⁶ BTU)

.



Alamance County, NC

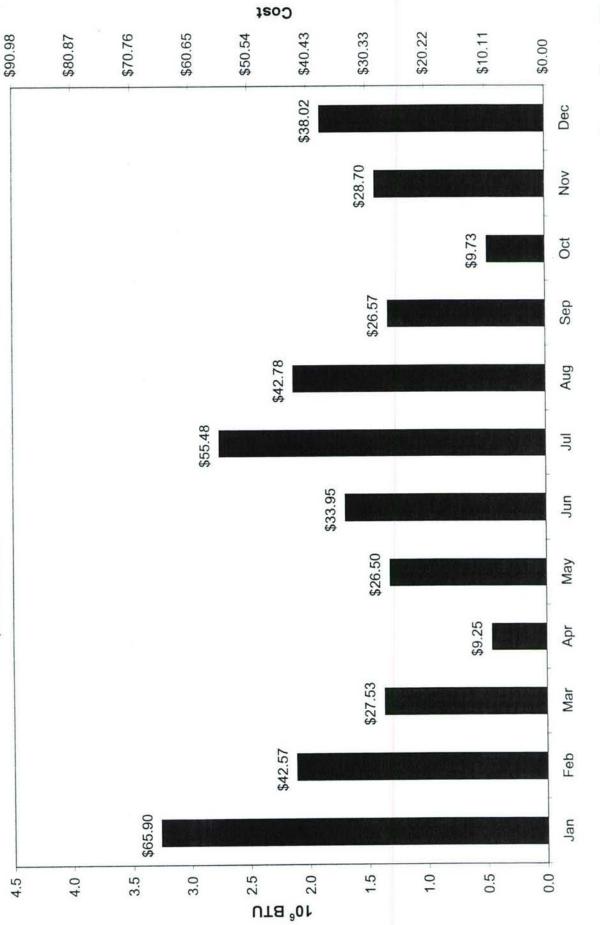
2160 sf Passive Solar-Heated Home



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1991 Monthly HVAC Energy Use / Cost

(based on \$.069 / kWh or \$20.22 / 10⁶ BTU)

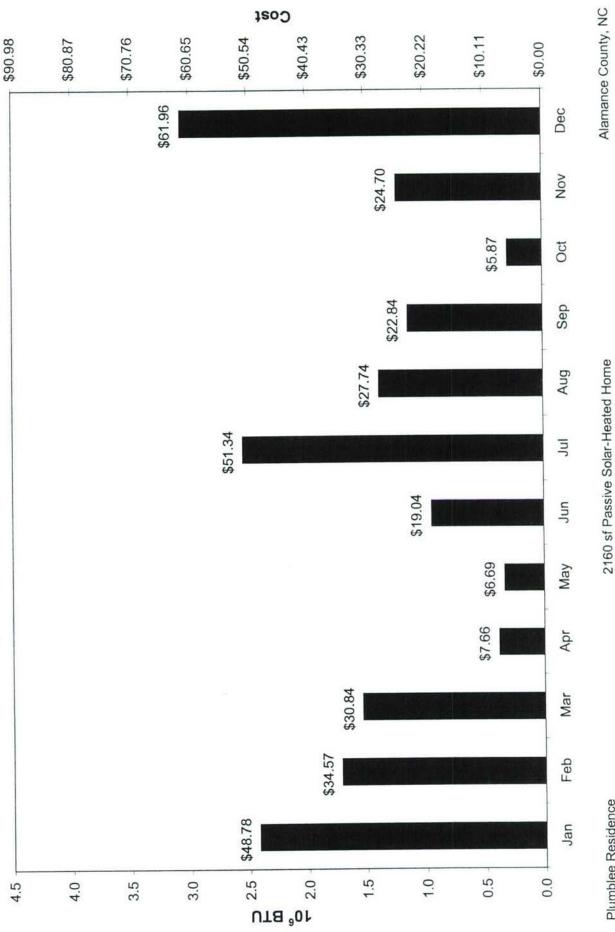


Plumblee Residence

Alamance County, NC



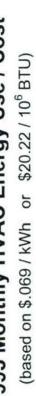
(based on \$.069 / kWh or \$20.22 / 10⁶ BTU)

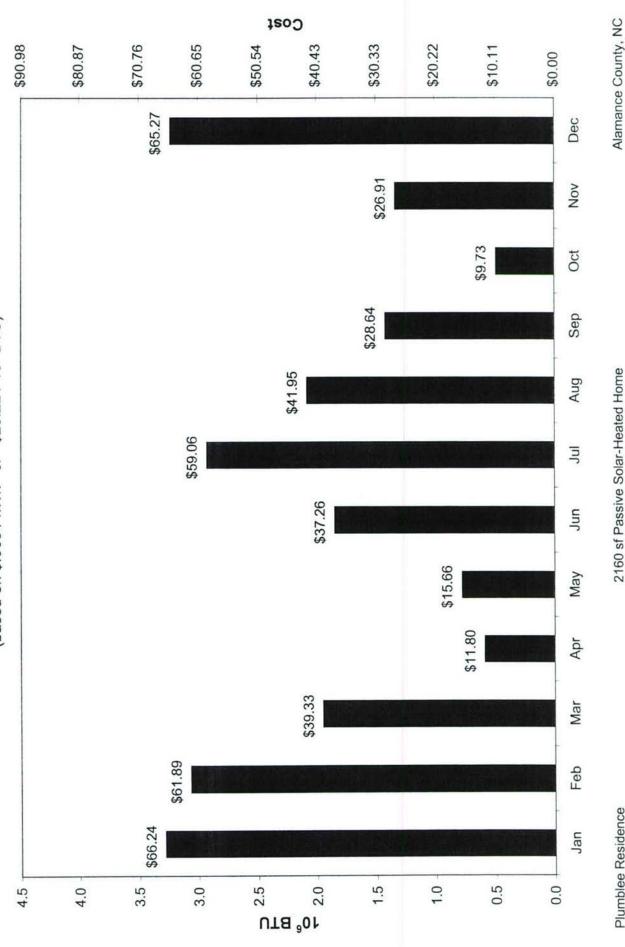


Plumblee Residence

Alamance County, NC

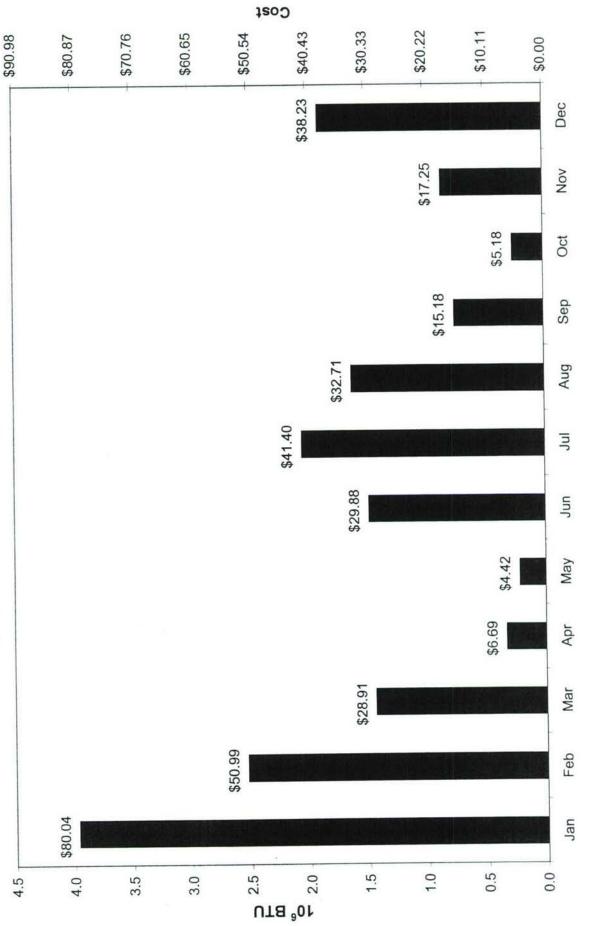






Alamance County, NC

1994 Monthly HVAC Energy Use / Cost (based on \$.069 / kWh or \$20.22 / 10⁶ BTU)



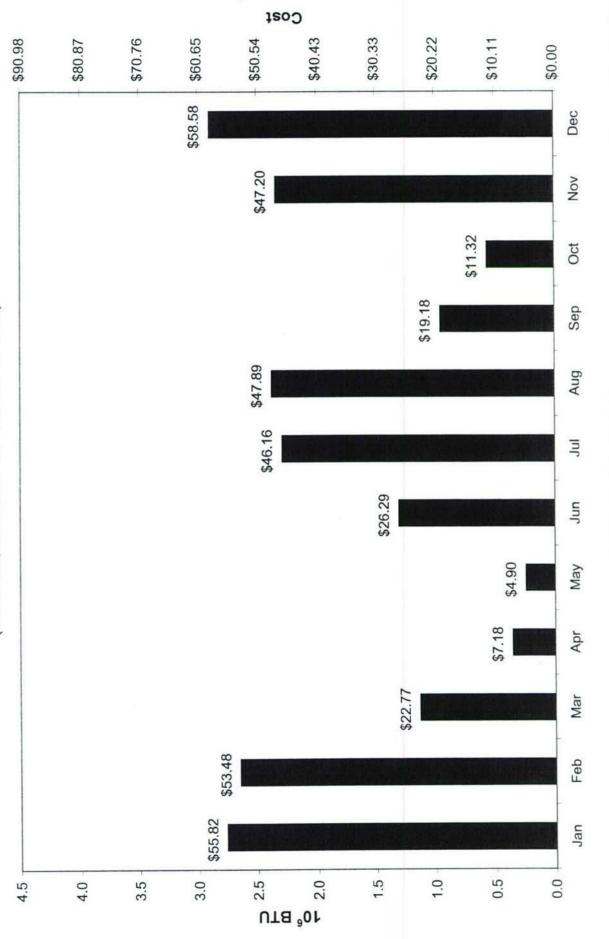
Alamance County, NC

2160 sf Passive Solar-Heated Home



1995 Monthly HVAC Energy Use / Cost

(based on \$.069 / kWh or \$20.22 / 10⁶ BTU)

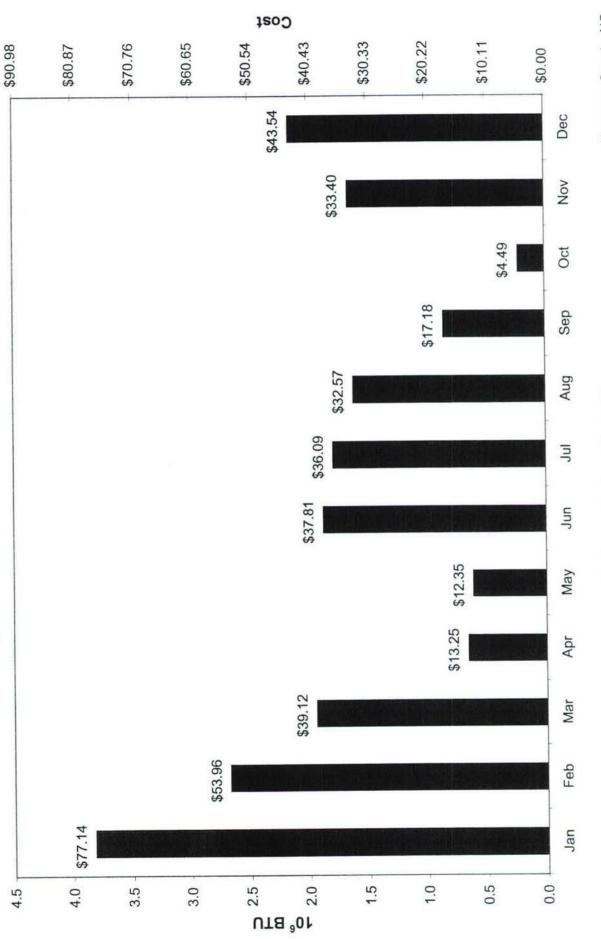


Plumblee Residence

Alamance County, NC



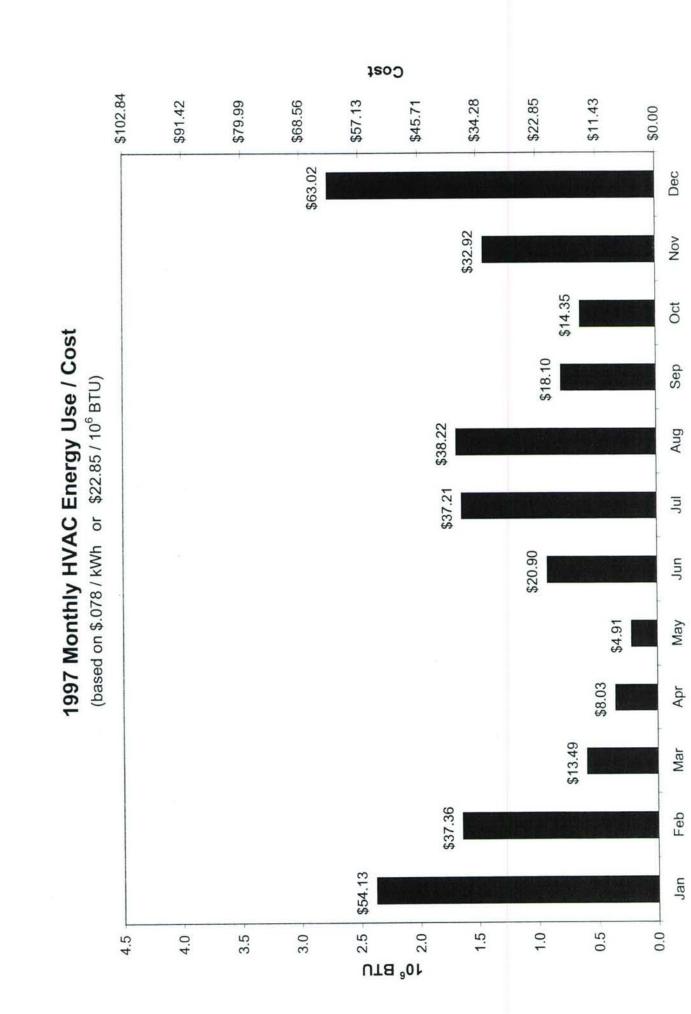




Plumblee Residence

2160 sf Passive Solar-Heated Home

Alamance County, NC



Alamance County, NC

2160 sf Passive Solar-Heated Home

APPENDIX C

{Annual Climatology Data for Plumblee Home}

Flev. 660 ft. above sea level PTeor 660 ft. above sea level PTeor 660 ft. above sea level PTeor 70 33 DT90 DX32 DT32 DT00 TPCP DPNP EMXP Number of Days Min Depart for above sea level Proc TD32 DT00 TPCP DPNP EMXP TSNW I Number of Days Min Dapa (132 DT90 0.17 0.3 DAP Dapa (132 DT90 17 0.3 CP Dapa (132 Dapa (132 DT90 17.0 DAPN DAPN Dapa (132 DT90 17.0 DAPN	I I I I I I I I I I I I I I I I I I I			deoline a		National Oceanic & Autospirate Autimustication	5			СГ	MM	I	DLO	DO E	OGICAL (1990)	MATOLOGICAL SUMMARY (1990)	MU	MA	RY			A	sheville	151 Patton Avenue Asheville, North Carolina 28801	151 Patton Avenue orth Carolina 28801	Avenu 3 2880
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)ate						amper	ature	ĺ₽°)						\vdash			Prec	cipitat	ion (i	nch	es)			
Mean Mean Depart. Depart. Mean	Mean Mean <t< td=""><td>-mal</td><td>TXMM</td><td>-</td><td></td><td></td><td>HTDD</td><td>CLDD</td><td>EMXT</td><td></td><td>EMNP</td><td></td><td>DT90 [</td><td>DX32 D</td><td>T32 D1</td><td></td><td></td><td>PNP</td><td>EMXP</td><td></td><td>TSNW</td><td>MXSD</td><td></td><td>DP01</td><td>DP05</td><td>DP1</td></t<>	-mal	TXMM	-			HTDD	CLDD	EMXT		EMNP		DT90 [DX32 D	T32 D1			PNP	EMXP		TSNW	MXSD		DP01	DP05	DP1
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		Annua										Feb		0	65		.28X	Σ	2.80	Oct	0.0		0	8		
													1													

Notes

(blank) Not reported.

- + Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence. Used through December 1983 only.
 - A Accumulated amount. This value is a total that may include data from a previous month or months or year (for annual value).
 - B Adjusted Total. Monthly value totals based on proportional available data across the entire month.

 - E An estimated monthly or annual total.

- X Monthly means or totals based on incomplete time series. 1 to 9 days are missing. Annual means or totals include one or more months which had 1 to 9 days that were missing.
 - M Used to indicate data element missing.
- T Trace of precipitation, snowfall, or snowdepth. The precipitation data value will = zero.
 - Elem- Element Types are included to provide cross-reference for users of the
 - > NCDC CDO System.
 - Station Station is identified by: CoopID/WBAN, Station Name, State
- the total accumulated amount appears in a subsequent monthly value. If TPCP = "M" accumulation began. The element TPCP accumulated amount value appears in a Example: Days 1-20 had 1.35 inches of S Precipitation amount is continuing to be accumulated. Total will be included in a during the month. Flag is set to "S" and there was no precipitation measured subsequent monthly or yearly value. would then be 00135S and the total precipitation, then a period of

Dynamically generated Wed Jun 16 17:18:19 EDT 2004 via http://cdo.ncdc.noaa.gov/ancsum/ACS Additional documentation can be found at http://www5.ncdc.noaa.gov/cdo/3220doc.txt Data provided from the NCDC CDO System

http://cdo.ncdc.noaa.gov/ancsum/ACS

Page 1 of 1

Federal Building

National Climatic Data Center

Annual Climatological Summary: 311239/99999, BURLINGTON FIRE STN #5, North Carolina

Administration U.S. Department of Commerce

ANNUAL

subsequent monthly value.

6/16/2004

Introduction: 311239/99999, BURLINGTON FIRE STN #5, North Carolina Elev. 660 ft. above sea level Lat. 36°04'N. Lon. 79°27'N. Station: 311239/99999, BURLINGTON FIRE STN #5, North Carolina Elev. 660 ft. above sea level Lat. 36°04'N. Lon. 79°27'N. Date Terecipitation (inches) Martine monti monoil Terecipitation (inches) Number of 2013 Precipitation (inches) Precipitation (inches) Number of 2014 Mart Mart <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>CLIN</th> <th>MA</th> <th>10</th> <th>LO</th> <th>GI 19</th> <th>3ICAI</th> <th>S</th> <th>AATOLOGICAL SUMMARY (1991)</th> <th>AAR</th> <th>×</th> <th></th> <th></th> <th></th> <th></th> <th>Asheville, North Carolina 2000</th> <th>lina 288</th>								CLIN	MA	10	LO	GI 19	3ICAI	S	AATOLOGICAL SUMMARY (1991)	AAR	×					Asheville, North Carolina 2000	lina 288
Particip Part Part Part Part Part Part Part Part	1239/9	66666	BUR	LINGT	ON FIR	E STN	#5, Nor	th Ca	Irolina			Elev	. 660 1	ft. abo	ve sea	level				Lat. 36	°04'N,	Lon. 7	79°27
MMINT MINT <					Ter	mpera	ature	(9 °)									Prec	ipitat	ion (ii	nches			
				DPNT	нтрр	CLDD	EMXT	H	EMNP		T90 D	X32 D	T32 DT	1.1		-	AXP .	1	TSNW	MXSD	PD .	01 DP	05 DP
5 27.8 39.7 0.5 777 0.0 66 17 8 26 0 12 0.0 12 0.0 0 10 5 31.4 44.5 2.8 568 0 75 5 10 16 0 133 -1.68 0.45 18 0.0 0 0 5 3 39.2 52.3 2.9 398 13 85 23 27 12 0 133 -1.68 0.45 18 0.0 0 0 133 -1.68 0.45 18 0.0 0 0 17 0 0 0 2.63 16.1 10 2.63 13 42 13 12 13 0.0 0 0 2.64 13 2.7 14 16 10 10 10 10 7 63.7 76.2 1.56 1.56 1.56 1.56 13 0.65 13 0.6				-		Cooling Degree Days			est		ax M =90° <=	ax Mi =32° <=	Days n Mir 32° <=(-	-		atest Up	Date	Total Fall	Max Mi Depth Da	II A	10 >=.	50 >=1
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32.5 45.6 3.9 595 0 76 3 17 20 0 0 17 0 3.03 -0.37 1.16 29 0.0 0 68 47.9 60.7 1.4 3243 1776 99 Jul 8 Jan 73 0 77 0 40.15X M 3.40 Jul 0.0 0 68	62.1	35.3	48.7	-1.4	481	2	17	17	21	28	0	0	9			2.43	0.21	23	0.0	5	+	7 0	
47.9 60.7 1.4 3243 1776 99 Jul 8 Jan 73 0 77 0 40.15X M 3.40 Jul 0.0 0 1 68	58.7	32.5	45.6	3.9		0	76	3	17	20	0	0	17			0.37	1.16	29	0.0	0	┥	Σ	- 6
	73.4	47.9	60.7	1.4	3243	1776	66	Jul	80	Jan	73	0	17	1.11	15X	¥	3.40	Inc	0.0	-	-	68	23
	reported. urred on (Date field	one or n is the la	nore pre	vious dat	tes during ance. Used	the month I through [The date	,E	X W to T	onthly n ssing. / 9 days	Annual I that we	r totals means re miss	based (or totals ing.	on incon include	nplete time one or me	e series. 1 ore month	I to 9 days is which h	ad 1	S Precip accurr subse Examp	itation am ulated. To quent mor ble: Days	ount is c btal will t thly or y 1-20 had	continuin be includ yearly va d 1.35 in	ig to be led in a liue. ches of
(blank) Not reported. (blank) Not reported. + Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence. Used through December M Ised to indicate data element missing.	1983 only.		This us	to jo of	m tert leter	include	e data fror	5	T Tr	ice of t	recipita	ation. Sr	nowfall, c	Dr snow	T Trace of precipitation, snowfall, or snowfepth. The precipitation data value	a precipita	tion data	value	precip	precipitation, then a period of accumulation began. The element TPCP	en a pen	iod of e eleme	nt TPC

- previous month or months or year (for annual value).
- B Adjusted Total. Monthly value totals based on proportional available data across the entire month.
 - E An estimated monthly or annual total.

- will = zero.
 - Elem- Element Types are included to provide cross-reference for users of the > NCDC CDO System.
 - Station Station is identified by: CoopID/WBAN, Station Name, State.

there was no precipitation measured during the month. Flag is set to "S" and the total accumulated amount appears in a accumulated amount value appears in a subsequent monthly value. If TPCP = "M" would then be 00135S and the total

subsequent monthly value.

Dynamically generated Wed Jun 16 17:20:22 EDT 2004 via http://cdo.ncdc.noaa.gov/ancsum/ACS Additional documentation can be found at http://www5.ncdc.noaa.gov/cdo/3220doc.txt Data provided from the NCDC CDO System

http://cdo.ncdc.noaa.gov/ancsum/ACS

Page of 1 National Climatic Data Center

Annual Climatological Summary: 51123979999, DORLINGTON TIKE STR#5, Forth Caroma

I I I I I I I I I I I I I I I I I I I	ational Oct	National Oceanic & Atmospheric Administration	National Oceanic & Atmospheri	ric Adm	inistration				CL	MA	DL	2	OGICAL (1992)	SICA	L S	N N	MATOLOGICAL SUMMARY	RY			Ash	eville, N	151 Patton Avenue Asheville, North Carolina 28801	151 Patton Avenue orth Carolina 28801
EMNP DT90 DX32 DT32 DT00 TPO EMNP Image: Second Sec	station: 3	11239/	66666	BUR	T ONIT	ON FIR	E STN	#5. Nor	th Ca	rolina			Elev	. 660	ft. abo	ove se	a level				Lat. 36	5°04'N	Lat. 36°04'N, Lon. 79°27'W	79°2
MMXT MMNT MTH DEPART EMXP TTOD EMXP TTOD FMXP FMXP FMXP TTOD FMXP TTDD FMXP TTOD <t< th=""><th>Data</th><th>1007</th><th>2000</th><th></th><th></th><th>Te</th><th>mper</th><th>ature</th><th>É.</th><th></th><th></th><th></th><th></th><th></th><th>┢</th><th></th><th></th><th>Pre</th><th>cipita</th><th>tion (</th><th>inche</th><th>s)</th><th></th><th></th></t<>	Data	1007	2000			Te	mper	ature	É.						┢			Pre	cipita	tion (inche	s)		
MINI MINI <th< th=""><th></th><th></th><th></th><th>ANT AN</th><th>TINOU</th><th>UTDO</th><th>CLDD</th><th>FMXT</th><th></th><th></th><th></th><th>DT90</th><th>X32 D</th><th>T32 D</th><th></th><th></th><th>ANP</th><th>EMXP</th><th></th><th>TSNW</th><th>MXSD</th><th></th><th>DP01 D</th><th>DP05 DP10</th></th<>				ANT AN	TINOU	UTDO	CLDD	FMXT				DT90	X32 D	T32 D			ANP	EMXP		TSNW	MXSD		DP01 D	DP05 DP10
Mean Max. <		_	_	WINN			CLUG		T		T	Z	mber of	Days	+	č	-	Sreatest Ob	served	Sn	Snow, Sleet		Numbe	Number of Days
max max <thmax< th=""> <thmax< th=""> <thmax< th=""></thmax<></thmax<></thmax<>				Mean	from Normal	Heating Degree Davs	Cooling Degree Davs	Highest	High Date	Lowest	Low Date	Max N	Aax N c=32° <	=32° <			om	Day	Date	Total Fall	Max N Depth	Max Date >=	>=.10 >=	>=.50 >=1.0
57.6 3.2.7 4.49 3.2 57.5 0 7 2.2 1 0 0 15 0 5.16 1.63 1.63 2.6 62.7 36.2 49.2 -0.2 484 0 83 4 24 17 0 0 13 0 2.90 -1.17 1.28 7 72.5 45.0 58.8 -1.2 239 60 83 25 2 7 0 0 1 0 2.65 17 1.28 7 74.8 46.8 60.9 7.1 152 31 91 25 35 0 0 0 3.8 0 0.71 1.40 16 30 74.8 60.9 72 219 92 94 22 33 0 0 0 0 1.40 16 16 216 216 216 216 216 216 216 1.40 16 <t< td=""><td>1 MOHI</td><td>a</td><td>+-</td><td>415</td><td>23</td><td></td><td>0</td><td>65</td><td>22</td><td>19</td><td>17</td><td>0</td><td>-</td><td>22</td><td></td><td>3.70</td><td>0.05</td><td>2.20</td><td>4</td><td>0.0</td><td>0</td><td></td><td>5</td><td>2</td></t<>	1 MOHI	a	+-	415	23		0	65	22	19	17	0	-	22		3.70	0.05	2.20	4	0.0	0		5	2
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72.5 45.0 58.8 -1.2 239 60 88 25 27 3 0 0 3 0 16 0.16 2.05 220 74.8 46.8 60.8 -7.1 152 31 91 25 35 5 2 0 0 6 338 0.50 0.70 30 83.0 60.9 72.0 -2.7 5 219 92 9 49 22 3 0 0 0 6 5 2.68 1.40 16 83.0 60.9 72.0 -3.5 0 0 0 0 2.49 1.90 0.76 2.3 91.8 67.7 79.8 -1.5 0 0 0 0 2.4 0.9 0.76 0.76 2.3 81.6 57.2 69.4 -1.0 7 2.4 0 0 0 0 1.91 2.0 0.71 2.04	1 6	62.2	36.2	49.2	-0.2			83	4	24	17	0	0	13		2.90	-1.17	1.28	7	0.0	0	+	9	~
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83.0 60.9 72.0 -2.7 5 219 92 94 22 3 0 0 6.75 2.58 1.40 16 91.8 67.7 79.8 1.5 0 464 100 14 62 13 24 0 0 2.49 -1.90 0.76 23 85.1 63.4 -1.6 33 172 90 10 43 30 2 0 0 0 3.57 -0.97 1.14 27 81.6 57.2 69.4 -1.6 33 172 90 10 43 30 2 0 0 0 1.97 -0.97 1.14 27 81.6 57.2 69.4 -1.6 33 16 28 20 0 0 0 0 1 1 20 1 4 27 2.56 2.56 2.56 2.56 2.56 2.56 2.56 2.56 2.56<	5	74.8	46.8	60.8	-7.1			91	25	35	5	2	0	0		3.38	-0.50	0.70	30	0.0	0	┫	0	2
91.8 67.7 79.8 1.5 0 464 100 14 62 13 24 0 0 2.49 -1.90 0.76 23 85.1 62.6 73.9 -3.5 0 24 0 0 0 3.57 -0.97 1.14 27 85.1 63.4 -1.6 33 172 90 10 43 30 2 0 0 0 3.57 -0.97 1.14 27 81.6 57.2 69.4 -1.6 33 16 28 20 0 0 0 1.97 -2.04 0.43 20 71.2 40.6 55.9 -3.9 273 0 81 0 0 1 0 4 27 20 60.6 38.7 49.7 -0.4 458 2 7 0 0 4 0 1 0 4 26 550 1.40 1 <	9	83.0	60.9	72.0	-2.7				6	49	22	3	0	0		6.75	2.58	1.40	16	0.0	0	+	11	9
85.1 62.6 73.9 -3.5 0 28 1 9 0 0 3.57 -0.97 1.14 27 81.6 57.2 69.4 -1.6 33 172 90 10 43 30 2 0 0 0 1.97 -2.04 0.43 20 71.2 40.6 55.9 -3.9 273 0 83 16 28 20 0 0 0 1.97 -2.04 0.43 20 71.2 40.6 55.9 -3.9 273 0 83 16 28 20 0 0 0 1.97 2.04 0.43 20 60.6 38.7 49.7 -0.4 458 20 140 0 41 0 0 1 0 1 0 1 0 1 1 0 1 0 1 0 1 1 0 1 0 1	7	91.8	67.7	79.8				100	14	62	13	24	0	0		2.49	-1.90	0.76	23	0.0	0	+	2	-
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71.2 40.6 55.9 -3.9 273 0 83 16 28 20 0 4 0 5.42 2.25 2.50 5 60.6 38.7 49.7 -0.4 458 2 76 4 25 18 0 0 10 0 4.88 2.05 1.40 4 51.7 28.9 40.3 -1.4 759 0 66 30 19 7 0 0 23 0 3.01 -0.39 1.10 11 70.5 45.5 58.0 -1.3 3699 1228 100 Jul 19 Dec 40 1 91 0 44.33 -0.71 2.50 Oct 0ct 70.5 45.5 58.0 -1.3 3699 1228 100 Jul 19 Dec 40 1 91 0 71 2.50 Oct 0ct 0ct 11 0ct 10 10 10 10 10 10 0ct 0ct 0ct 0ct 0ct	6	81.6	57.2	69.4	-1.6					43	30	2	0	0	0	1.97	-2.04	0.43	20	0.0	0	+	2	-
60.6 38.7 49.7 -0.4 458 2 76 4 25 18 0 10 0 4.88 2.05 1.40 4 51.7 28.9 40.3 -1.4 759 0 66 30 19 7 0 0 23 0 3.01 -0.39 1.10 11 70.5 45.5 58.0 -1.3 3699 1228 100 Jul 19 Dec 40 1 91 0 44.33 -0.71 2.50 Oct	10	712	40.6	55.9				83		28	20	0	0	4		5.42	2.25	2.50	5	0.0	0	1	9	6
51.7 28.9 40.3 -1.4 759 0 66 30 19 7 0 0 23 0 3.01 -0.39 1.10 11 70.5 45.5 58.0 -1.3 3699 1228 100 Jul 19 Dec 40 1 91 0 44.33 -0.71 2.50 Oct	11	60.6	38.7	49.7				76	4	25	18	0	0	10		4.88	2.05	1.40	4	0.0	0	+	6	e 1
70.5 45.5 58.0 -1.3 3699 1228 100 Jul 19 Dec 40 1 91 0 44.33 -0.71 2.50 Oct	12	51.7	28.9	40.3						19	7	0	0	23	_	3.01	-0.39	1.10	1	0.0	0	1	4	2
Notes	Annual	70.5	45.5	58.0						19		40	-	91	_	4.33	-0.71	2.50	Oct	0.0	0		83	26
												Ž	tec											
													201											

- Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence. Used through December 1983 only.
- A Accumulated amount. This value is a total that may include data from a previous month or months or year (for annual value)
 - B Adjusted Total. Monthly value totals based on proportional available data across the entire month.

 - E An estimated monthly or annual total.

- to 9 days that were missing.
 - M Used to indicate data element missing.
- T Trace of precipitation, snowfall, or snowdepth. The precipitation data value
 - will = zero.
 - Elem- Element Types are included to provide cross-reference for users of the > NCDC CDO System.

 - Station Station is identified by: CoopID/WBAN, Station Name, State.
- during the month. Flag is set to "S" and the total accumulated amount appears in a subsequent monthly or yearly value. Example: Days 1-20 had 1.35 inches of precipitation, then a period of accumulation began. The element TPCP would then be 00135S and the total subsequent monthly value. If TPCP = "M" accumulated amount value appears in a there was no precipitation measured subsequent monthly value.

Dynamically generated Wed Jun 16 17:22:12 EDT 2004 via http://cdo.ncdc.noaa.gov/ancsum/ACS Additional documentation can be found at http://www5.ncdc.noaa.gov/cdo/3220doc.txt Data provided from the NCDC CDO System

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Annual Climatological Summary: 311239/99999, BURLINGTON FIRE STN #5, North Carolina

National Climatic Data Center

6/16/2004

Annual Climatological Summary: 31 123979999, BURLING	Clima	tologic	cal Sur	nmary	: 31123	6666/6	9, 80	SLIN		Ĕ	E S1	IN #5,	ION	FON TIKE STIV#5, North Caronna	omia							P;	Page	of 1
U.S. Department of Commerce National Oceanic & Atmospheric Administration	irtment of ceanic &	Commer	ce Jeric Adr	inistration	F			CL	MA	TO	LO A	ANNUAI OGICAL (1993)			IMU	ANNUAL CLIMATOLOGICAL SUMMARY (1993)	~			Ashe	sville, h	National Climatic Data Center Federal Building 151 Patton Avenue Asheville, North Carolina 28801	limatic Data Center Federal Building 151 Patton Avenue orth Carolina 28801	enter ilding enue 8801
Station.	31123	6666/6	9. BUF	LINGT	Station: 311239/99999, BURLINGTON FIRE STN #5, North Carolina	E STN	#5, Nor	th Ca	Irolina			Elev.	6601	ft. abo	Elev. 660 ft. above sea level	level				Lat. 36°04'N, Lon. 79°27'W	°04'	N, Lon	. 79°2	M.L
Date					Te	Temperature	ature	(H °)								-	reci	pitati	ion (il	Precipitation (inches	-			
Laid	TVMAT	TIMMAN	MNITM	DPNT	НТОВ	CLDD	EMXT		EMNP	Ē	DT90 D	DX32 D	DT32 DT00	TPCP	CP DPNP	VP EMXP	4	F	TSNW MXSD	MXSD	-	DP01 DP05 DP10	1 204C	DP10
LIGT-7	Moon	INIMIM			Heating	Cooling Dearee		High			Max M		of Days Min Min				st Obs		Snov	(1)	_	Mumb		ys
Month	Max.	Min.	Mean	Normal	Days	Days	Highest	Date	Lowest			_		-	Ŷ	Day	20	Date	Fall	Depth D	Uate >	~ 10 >	< 00.=<	1.1
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e				-1.8	5 529		13		33			0	0				1.17	10	0.0	0	T	7	9	3
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(March)	Anoth Not constad	pot							×	onthly r	neans o	ir totals	based	on incom	plete tim	Monthly means or totals based on incomplete time series. 1 to 9 days are	9 days		S Precip	Precipitation amount is continuing to be	nount	is contin	uing to	ee.
(Milbid)	Occurred of the Date fi 1983 only.	on one c field is the	or more p	revious d: / of occuri	Not reported. Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence. Used through December 1983 only.	the month d through	n. The dat Decembe	e in	ER D	issing. 9 days sed to i	missing. Annual means or totals includ to 9 days that were missing. M Used to indicate data element missing.	means the miss data ele	or totals ing. sment n	s include nissing.	one or n	missing. Annual means or totals include one or more months which had 1 to 9 days that were missing. Used to indicate data element missing.	which ha	1 p	accun subse Exam precip	accumulated. Total will be included in a subsequent monthly or yearly value. Example: Days 1-20 had 1.35 inches of precipitation, then a period of	oral working on the second sec	had 1.35 had 1.35 heriod of	/ value. 5 inches	jo
A	Accumula previous l	ated amo	unt. This months c	value is a	Accumulated amount. This value is a total that may include data from a previous month or months or year (for annual value).	may incluc alue).	le data fro	a	- 3	Trace of pl will = zero.	precipit. o.	ation, sr	,IIOWTAII,	OF SHOW	aepm. 11	Trace of precipitation, snowrall, or snowdeptin. The precipitation used value will = zero.	ni uala v	anip	would	accumulation began. The element income would then be 00135S and the total	00135	S and th	te total	5
8	Adjusted	Total. Mc	unthly valu	ue totals l	B Adjusted Total. Monthly value totals based on proportional available	roportiona	I available		Elem- E	lement	Types a	Ire inclu	ded to I	provide c	cross-refe	Element Types are included to provide cross-reference for users of the	ers of the	0	accun	accumulated amount value appears in a subsequent monthly value. If TPCP = "M"	mount	value a	TPCP =	N N
	data acro	data across the entire month.	tire mont	÷					Z ^	CDC C	NCDC CDO System.	tem.	Oloco,	NVBAN	Ctation N	> NCUC CUO System. > NCUC CUO System. Control Control Auto Control Number Name State			there	there was no precipitation measured	recipit	ation me	pasured	
L	An actim	nom both	this or an	C As actimated monthly or annual total					Station 2	Tauon II	Inniiani S	- · · na	indno,	"INDAA	Olawork 11	allin, current			durino	during the month. Flag is set to "5" and	th FIN	192 21 D	10 S 3	

- E An estimated monthly or annual total.

- Station Station is identified by: CoopIU/WBAN,
- during the month. Flag is set to "S" and the total accumulated amount appears in a subsequent monthly value.

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http://cdo.ncdc.noaa.gov/ancsum/ACS

6/16/2004

(1994) BURLINGTON FIRE STN #5, North Carolina Elev. 660 ft. above sea level Lat. 36°04'N, Lo MITM DEPT Tenperature (° F) Tenperature (° F) Tenperature (° F) Tenperature (° F) Precipitation (inches) MITM DEPT Tencipitation (inches) Marx Mitm Dept Dept <thde< th=""></thde<>							С	IMA	5	PLO	DD D	CA CA	5	SUN N		\RY			Ashe	ville, No	Asheville, North Carolina 28801	orth Carolina 28801	
MNP DT32 DT32 <th col<="" th=""><th></th><th></th><th></th><th></th><th>DE STN</th><th>#5 Nor</th><th>5</th><th>rolina</th><th></th><th></th><th>Elev</th><th>099.7</th><th>ft. ab</th><th>ove s</th><th>ea leve</th><th></th><th></th><th></th><th>Lat. 36</th><th>°04'N</th><th>Lon. 7</th><th>'9°27"</th></th>	<th></th> <th></th> <th></th> <th></th> <th>DE STN</th> <th>#5 Nor</th> <th>5</th> <th>rolina</th> <th></th> <th></th> <th>Elev</th> <th>099.7</th> <th>ft. ab</th> <th>ove s</th> <th>ea leve</th> <th></th> <th></th> <th></th> <th>Lat. 36</th> <th>°04'N</th> <th>Lon. 7</th> <th>'9°27"</th>					DE STN	#5 Nor	5	rolina			Elev	099.7	ft. ab	ove s	ea leve				Lat. 36	°04'N	Lon. 7	'9°27"
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matrix matrix	Mean	neew	from Normal	-	Cooling Degree Davs	Highest			Low Date	Max N =90° <	Aax N =32° <	Ain M =32° <:	-		from Normal	Day	Date	Total Fall	Max N Depth D		.10 >=.50	50 >=1.0	
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(blank) Not reported.

- Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence. Used through December 1983 only.
- A Accumulated amount. This value is a total that may include data from a previous month or months or year (for annual value).
 - B Adjusted Total. Monthly value totals based on proportional available data across the entire month.

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 - M Used to indicate data element missing.
- T Trace of precipitation, snowfall, or snowdepth. The precipitation data value
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 - Elem- Element Types are included to provide cross-reference for users of the > NCDC CDO System.
 - Station Station is identified by: CoopID/WBAN, Station Name, State.
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Annual Climatological Summary: 311239/99999, BURLINGTON FIRE STN #5, North Carolina

National Climatic Data Center

U.S. Department of Commerce National Oceanic & Atmospheric Administration	rtment of ceanic &	Commer Atmosph	ce leric Adm	inistration	-		•	CLI	IAM	O	A O	GICA (1995)	ANNUAL OGICAL (1995)	ר. גר	MML	ANNUAL IMATOLOGICAL SUMMARY (1995)			Ashe	ville, N	National Climatic Data Center Federal Building 151 Patton Avenue Asheville, North Carolina 28801	atic Data Center Federal Building I Patton Avenue Carolina 28801	enter Iding enue 8801
Station:	31123	6666/6	9, BUR	RLINGT	ON FIR	Station: 311239/99999, BURLINGTON FIRE STN #5, North Caro	#5, Nor	th Ca	rolina		1	Elev.	660 ft	. abov	Elev. 660 ft. above sea level	vel			Lat. 36	°04'N	Lat. 36°04'N, Lon. 79°27'W	79°2	M.2
Date					Te	Temperature	ature	(H o								Pre	Precipitation (inches	tion (nches	0			
Flem->	MMXT	MMNT	MNTM	DPNT	HTDD	CLDD	EMXT	F	EMNP	D	DT90 DX32		DT32 DT00	DO TPCP	DPNP	EMXP		TSNW MXSD	MXSD		DP01 DP05 DP10	05 D	P10
		_		Pond	Heating	Cooling		T		\vdash	Num	Number of Days	Jays		Depart	Greatest Observed	Dbserved	Sno	Snow, Sleet		Number of Days	r of Day	/S
1995 Month	Mean Max.	Mean Min.	Mean	from	Degree	Degree	Highest	High Date 1	Lowest D	Low Max Date >=90	0	Max Min <=32° <=32°	1 Min 32° <=0°	° Total		Day	Date	Total Fall	Max Mi Depth Da	Max Date >:	>=.10 >=.	>=.50 >=	>=1.0
1	50.7	_		_	749		73	15	14	9	0	-	20	0 4.94	4 1.44	4 2.00	15	0.0T	DT	31	7	2	2
2				-1.3	712	0	74	27	11	7	0	-	20	0 3.21	1 -0.42	2 1.50	17	0.0	0		5	2	2
6				3.8	356	2	83	23	22	5	0	0	9	0 3.57	7 -0.31	1 1.20	6	0.0	0		8	-	-
4		43.9	59.3	0.7	204	40	91	21	30	3	2	0	2	0 0.70	0 -2.42	2 0.50	13	0.0	0		2	-	0
5				0.7	55	139	92	19	38	4	+	0	0	0 3.52	2 -0.81	1 0.90	3	0.0	0		10	2	0
9	85.6	61.8	73.7	-0.9	1	271	96	10	54	24	9	0	0	0 12.00	0 7.74	4 4.40	29	0.0	0		16	5	5
7	92.9	68.5	80.7	2.5	0	492	66	25	61	6	23	0	0		17 0.37			0.0	0	1	6	4	-
8	90.5	68.8	7.67	2.7	0	461	100	17	64	29	20	0	0	0 5.06	6 0.79	9 4.67		0.0	0		2	-	-
6	81.0	57.5	69.3	-1.1	32	165	94	2	43	29	2	0	0	0 1.67	1.91	1 0.74	23	0.0	0		4	-	0
10	75.0	48.4	61.7	2.4	143	47	87	4	37	31	0	0	0	0 6.84	3.58	8 2.50	21	0.0	0		5	3	3
11	57.8	33.6	45.7	-4.7	573	0	73	29	25	16	0	0	18	0 4.03	0.96	6 0.90	8	0.0	0		10	3	0
12		25.4	37.1	-4.2	860	0	73	16	8	25	0	0	27	0 0.94	4 -2.52	2 0.80	9	0.0	0		-	-	0
Annual	71.2	46.7	59.0	0.3	3685	1618	100	Aug	80	Dec	54	2	93	0 51.45	6.49	9 4.67	Aug	0.0	0	Jan	62	26	15
											Notes	S											
									V Nov	- Hu mo	the ort	-toto	un para	umondi	tota tima e	V Monthly monor or totals have an incomplete time series 1 to 0 days are	ave are	C Pracir	S Precipitation amount is continuing to be	ount is	Continui	nd to be	
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- I SOO UIIIY.
- A Accumulated amount. This value is a total that may include data from a previous month or months or year (for annual value).
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the total accumulated amount appears in a subsequent monthly value. accumulated amount value appears in a subsequent monthly value. If TPCP = "M" precipitation, then a period of accumulation began. The element TPCP during the month. Flag is set to "S" and there was no precipitation measured would then be 00135S and the total

> Dynamically generated Wed Jun 16 17:24:34 EDT 2004 via http://cdo.ncdc.noaa.gov/ancsum/ACS Additional documentation can be found at http://www5.ncdc.noaa.gov/cdo/3220doc.txt Data provided from the NCDC CDO System

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Annual Climatological Summary: 51125919999, BURLINGTON FIRE STN #5, North Caroma

U.S. Department of Commerce National Oceanic & Atmospheric Administration	rtment of ceanic &	Commer	rce teric Adm	ninistrațion	E			CL	MA	TO	L O	ANNUAL	S IC	L S	MU	ANNUAL MATOLOGICAL SUMMARY	37			As	sheville	Asheville, North Carolina 2801	Federal Building Federal Building 151 Patton Avenue orth Carolina 28801	Avenue 28801
												(19	(1996)											
Station:	31123	6666/6	9, BUF	LONIJS	Station: 311239/99999, BURLINGTON FIRE STN #5, North Car	RE STN	#5, Nor	th Ca	arolina			Elev	, 660	ft. abc	Elev. 660 ft. above sea level	level				Lat.	36°0	Lat. 36°04'N, Lon. 79°27'W	n. 79	~27'W
Date					Te	Temperature	ature	(J °)									Prec	Precipitation (inches	ion (i	nche	es)			
	TVINI	AAAAIT	MANTAA	DPNT	HTDD	CLDD	EMXT	F	EMNP	F	DT90 DX32 DT32 DT00	X32 D	T32 D		TPCP DF	DPNP E	EMXP		TSNW MXSD	MXSD		DP01	DP05	DP10
Elem->	IVININ	_	IAI (A IIAI					T		T	Nur	Number of Days	Days		De	Denart G	Greatest Observed	served	Snt	Snow, Sleet	ti	Nur	Number of Days	Days
1996	Mean	Mean	Mood	from Mormal	Degree	Degree	Hichest	High	Lowest	Low N	Max M >=90° <:	Max M <=32° <=	Min Min <=32° <=0		Total No	from	Day	Date	Total Fall	Max Depth	Max Date	>=.10	>=.50	>=1.0
Month	Max.	DE A		_				_	17		0	3	26	0 2	2.63X	W	1.04	27	12.0X	9	-	7 4	e	-
							62	28	4	5	0	5	19	0 1	1.86X	W	W		X0.0		0	2	0	0
1 6						0	17	15	13	10	0	0	15	0	5.32	1.44	¥		0.0		0	9	e	2
						14	85	29	28	6	0	0	9	0 2	2.18X	M	0.50	2	0.0		0	9		0
						162	98	22	37	-	6	0	0	0	5.79	1.46	1.20	-	0.0		0	8	9	2
» «					4	340	100	25	43	2	15	0	0	0	1.43	-2.83	0.60	10	0.0		0	5	-	0
				1	0	407	98	20	53	5	21	0	0	0	2.94	-1.66	0.97	6	0.0		0	9		0
0					0	316	94	80	58	-	7	0	0	0	7.19	2.92	3.00	28	0.0		0	9	5	2
0 0					16	128	91	10	38	15	3	0	0	1	11.73	8.15	5.15	9	0.0		-	÷		2
10				-1.7	225	0	82	17	35	13	0	0	0	0	4.25	0.99	1.51	2	0.0		-	2		
5 5					582	3	84	-	21	12	0	0	20	0	3.06	-0.01	0.85	9	0.0		_	9		
12					647	0	78	13	12	22	0	0	19	0	3.84	0.38	0.91	-						0
Annual					4	1370	100	Jun	4	Feb	55	80	105	0 52	52.22X	Σ	Σ	Sep	12.0X		6 Jan	n 73	37	12
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TAULOS

(blank) Not reported

- + Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence. Used through December 1983 only
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Dynamically generated Wed Jun 16 17:25:13 EDT 2004 via http://cdo.ncdc.noaa.gov/ancsum/ACS Additional documentation can be found at http://www5.ncdc.noaa.gov/cdo/3220doc.txt Data provided from the NCDC CDO System

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Annual Climatological Summary: 311239/99999, BURLINGTON FIRE STN #5, North Carolina

Federal Building 151 Patton Avenue National Climatic Data Center

http://cdo.ncdc.noaa.gov/ancsum/ACS

6/16/2004

1239																						
	56666)), BUR	RLINGT	Station: 311239/99999, BURLINGTON FIRE STN #5, North Carolina	E STN	#5, Nor	th Ca	Irolina			Elev	6601	ft. above	Elev. 660 ft. above sea level	vel			Lat. 3	6°04'	Lat. 36°04'N, Lon. 79°27'W	. 79°2	M.2
				Te	Temperature	ature	(a F)								Pre	Precipitation (inches	tion (nche	(s			
	AAAAIT	MITIM	DPNT	HTDD	CLDD	EMXT	F	EMNP		DT90 DX32 DT32 DT00	X32 D1	32 DT	00 TPCP	DPNP	EMXP		TSNW	TSNW MXSD		DP01 1	DP05 [DP10
					-		T		t	Nun	Number of Days	Days		Denart	Greatest Observed	bserved	Sn	Snow, Sleet		Numb	Number of Days	ys
Mean	Mean	Mean	Depart. from Normal	Heating Degree Days	Degree	Highest	High Date	Lowest	Low M Date >:	Max Ma >=90° <=	Max Min <=32° <=32	Min Min <=32° <=0°	0° Total		I Day	Date	Total Fall	Max Depth	Max Date	>=.10 >	>=.50 >	>=1.0
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55.5	34.0	44.8	4.2	559	0	76	28	25	17	0	0	16	0 2.62					0		~	2	
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Pager of 1

Annual Climatological Summary: 31125979999, BURLINGTON TIRE STR #5, north Caronna

ANNUAL

U.S. Department of Commerce National Oceanic & Atmospheric Administration

Federal Building 151 Patton Avenue

National Climatic Data Center

Notes

(blank) Not reported

- + Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence. Used through December 1983 only
- A Accumulated amount. This value is a total that may include data from a previous month or months or year (for annual value).
 - B Adjusted Total. Monthly value totals based on proportional available data across the entire month.
 - E An estimated monthly or annual total

X Monthly means or totals based on incomplete time series. 1 to 9 days are missing. Annual means or totals include one or more months which had 1 to 9 days that were missing.

- T Trace of precipitation, snowfall, or snowdepth. The precipitation data value M Used to indicate data element missing.
 - will = zero.
 - Elem Element Types are included to provide cross-reference for users of the > NCDC CDO System.
 - Station Station is identified by: CoopID/WBAN, Station Name, State

the total accumulated amount appears in a subsequent monthly value. If TPCP = "M" accumulation began. The element TPCP accumulated amount value appears in a subsequent monthly or yearly value. Example: Days 1-20 had 1.35 inches of S Precipitation amount is continuing to be accumulated. Total will be included in a during the month. Flag is set to "S" and there was no precipitation measured would then be 00135S and the total precipitation, then a period of subsequent monthly value.

> Dynamically generated Wed Jun 16 17:25:21 EDT 2004 via http://cdo.ncdc.noaa.gov/ancsum/ACS Additional documentation can be found at http://www5.ncdc.noaa.gov/cdo/3220doc.txt Data provided from the NCDC CDO System

http://cdo.ncdc.noaa.gov/ancsum/ACS

(1998) 311239/99999, BURLINGTON FIRE STN #5, North Carolina Elev. 660 ft. above sea level TEN #5, North Carolina Elev. 660 ft. above sea level TEN #5, North Carolina Elev. 660 ft. above sea level TEN #10 CLD0 EMNP TEIEV. 660 ft. above sea level TEIN Main North Caroling Pigne EMNP TEIN III TINITI Mean Mean Mean Mean Mean Mean Mean Mean Mean Mean Mean Mean Mean Mean <	(1998) Image: Second Seco	partme	U.S. Department of Commerce National Oceanic & Atmospheric Administration	erce pheric Adr	ministratic	u			c	M	F	A C	ANNUAL		<u>_</u>	IMI	MARY				Asheville	Federal Building 151 Patton Avenue Asheville, North Carolina 28801	Federal Building 151 Patton Avenue orth Carolina 28801	151 Patton Avenue tederal Building 151 Patton Avenue sheville, North Carolina 28801						
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NOICS

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- + Occurred on one or more previous dates during the month. The date in the Date field is the last day of occurrence. Used through December 1983 only
- A Accumulated amount. This value is a total that may include data from a previous month or months or year (for annual value).
 - B Adjusted Total. Monthly value totals based on proportional available data across the entire month.
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- X Monthly means or totals based on incomplete time series. 1 to 9 days are missing. Annual means or totals include one or more months which had 1 to 9 days that were missing.
 - M Used to indicate data element missing.
- T Trace of precipitation, snowfall, or snowdepth. The precipitation data value
 - Elem- Element Types are included to provide cross-reference for users of the will = zero.
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 - Station Station is identified by: CoopID/WBAN, Station Name, State.
- the total accumulated amount appears in a subsequent monthly value. If TPCP = "M" precipitation, then a period of accumulation began. The element TPCP accumulated amount value appears in a subsequent monthly or yearly value. Example: Days 1-20 had 1.35 inches of S Precipitation amount is continuing to be accumulated. Total will be included in a during the month. Flag is set to "S" and there was no precipitation measured would then be 00135S and the total subsequent monthly value.

Dynamically generated Mon Jun 21 16:24:44 EDT 2004 via http://cdo.ncdc.noaa.gov/ancsum/ACS Additional documentation can be found at http://www5.ncdc.noaa.gov/cdo/3220doc.txt Data provided from the NCDC CDO System

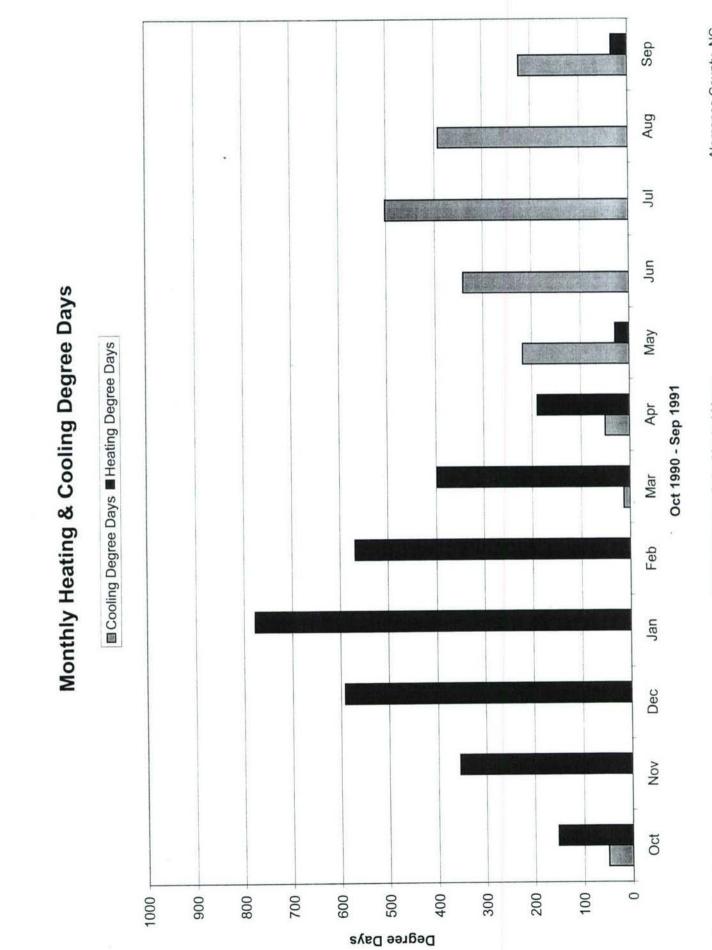
http://cdo.ncdc.noaa.gov/ancsum/ACS

Page 1 of 1

Annual Climatological Summary: 311239/99999, BURLINGTON FIRE STN #5, North Carolina

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6/21/2004

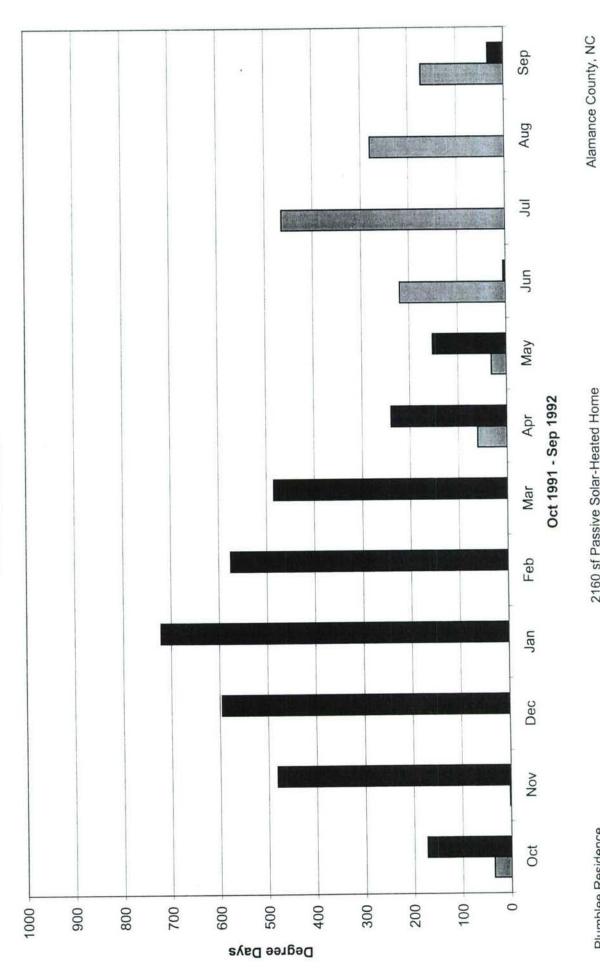


Alamance County, NC

2160 sf Passive Solar-Heated Home





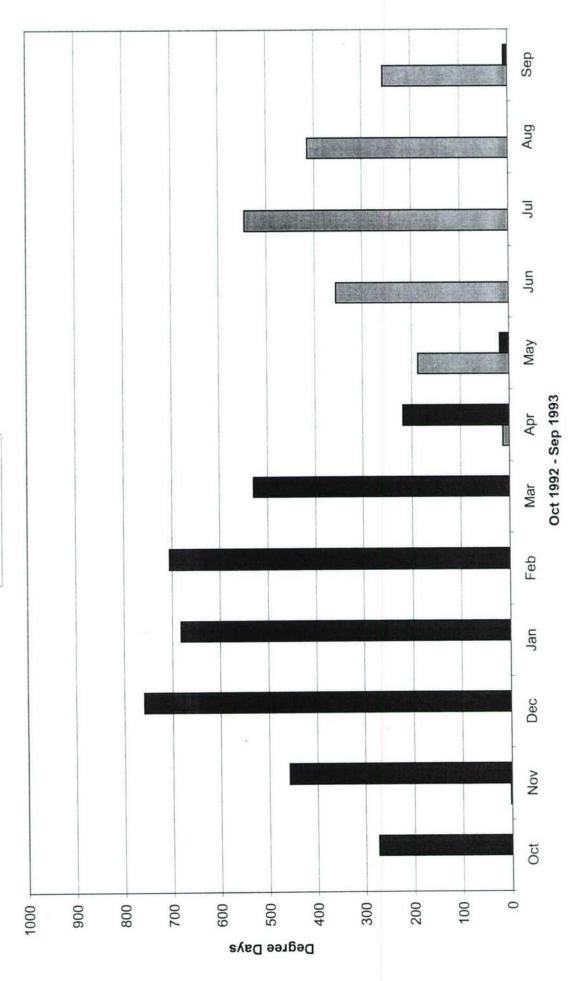


Plumblee Residence



Monthly Heating & Cooling Degree Days



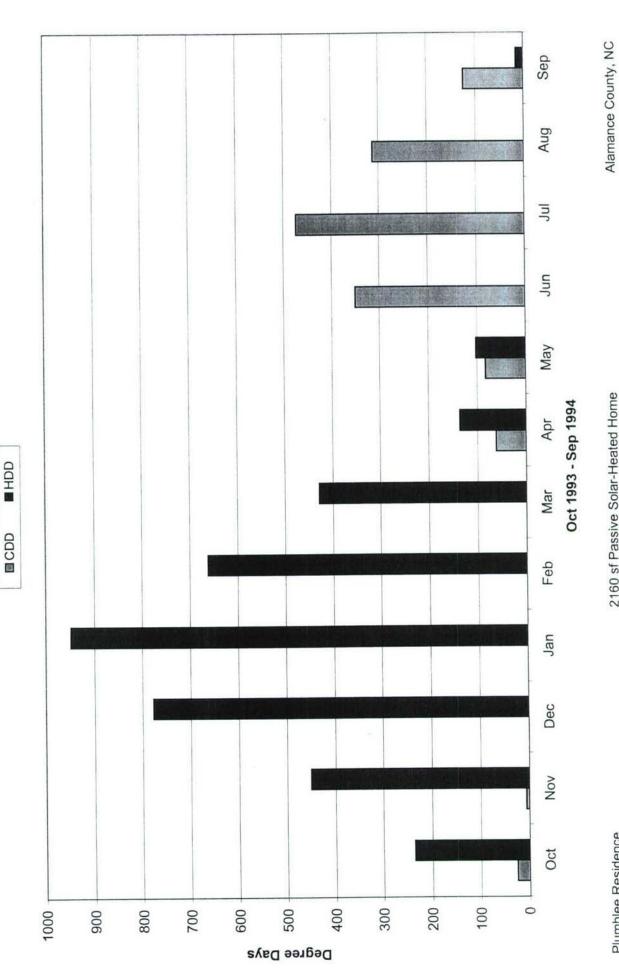


Plumblee Residence

Alamance County, NC

C



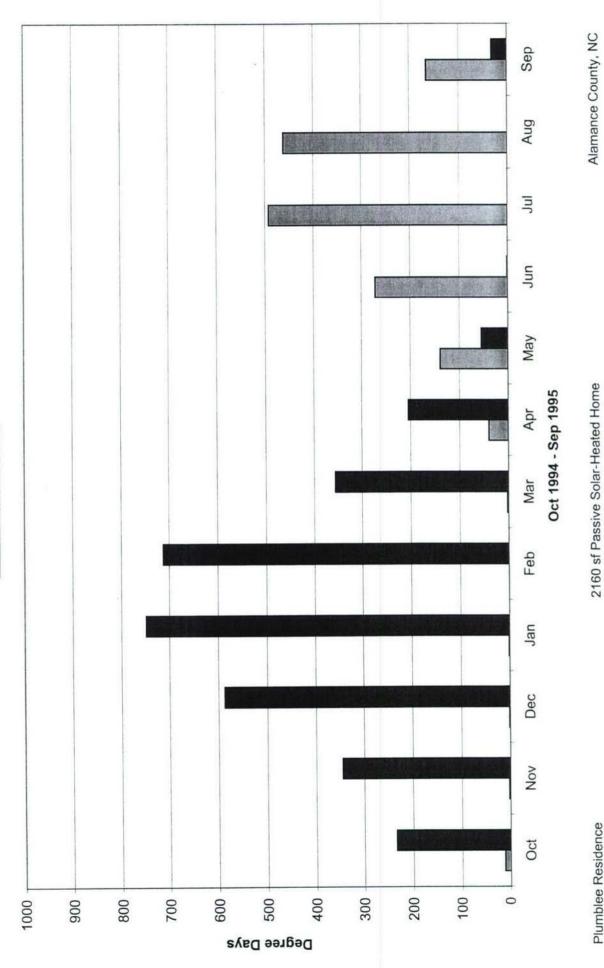


Plumblee Residence

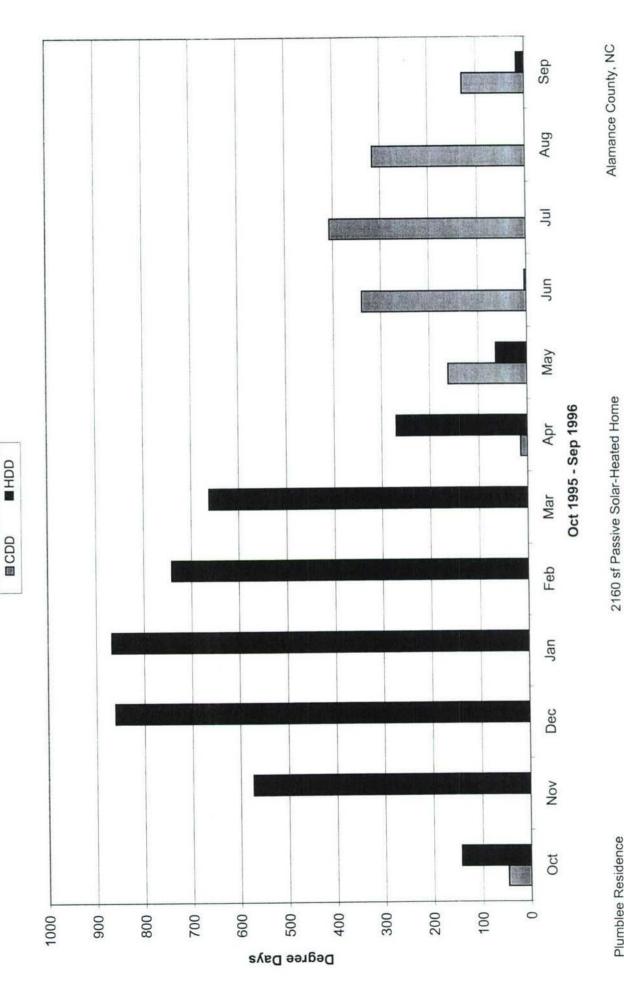


Monthly Heating & Cooling Degree Days





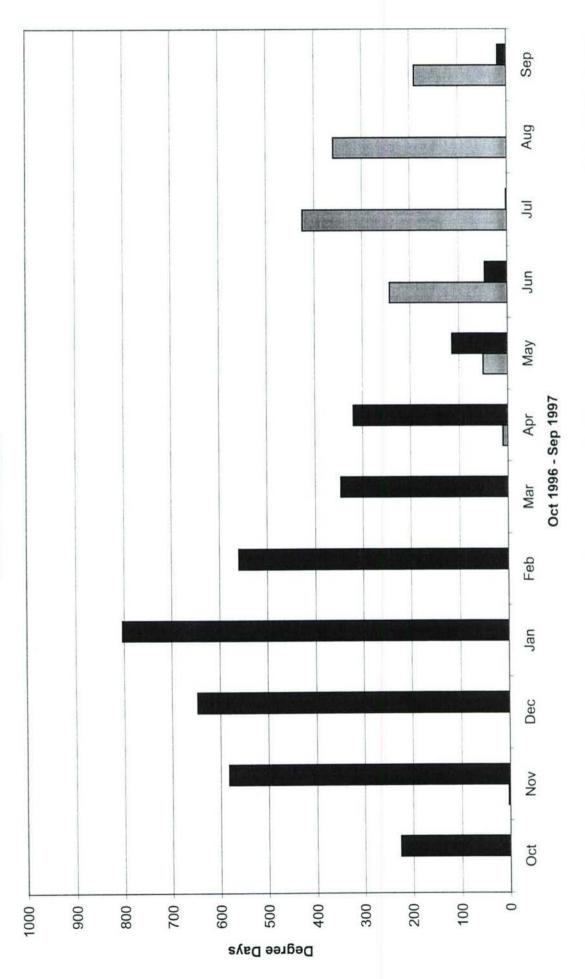






Monthly Heating & Cooling Degree Days





Plumblee Residence

Alamance County, NC

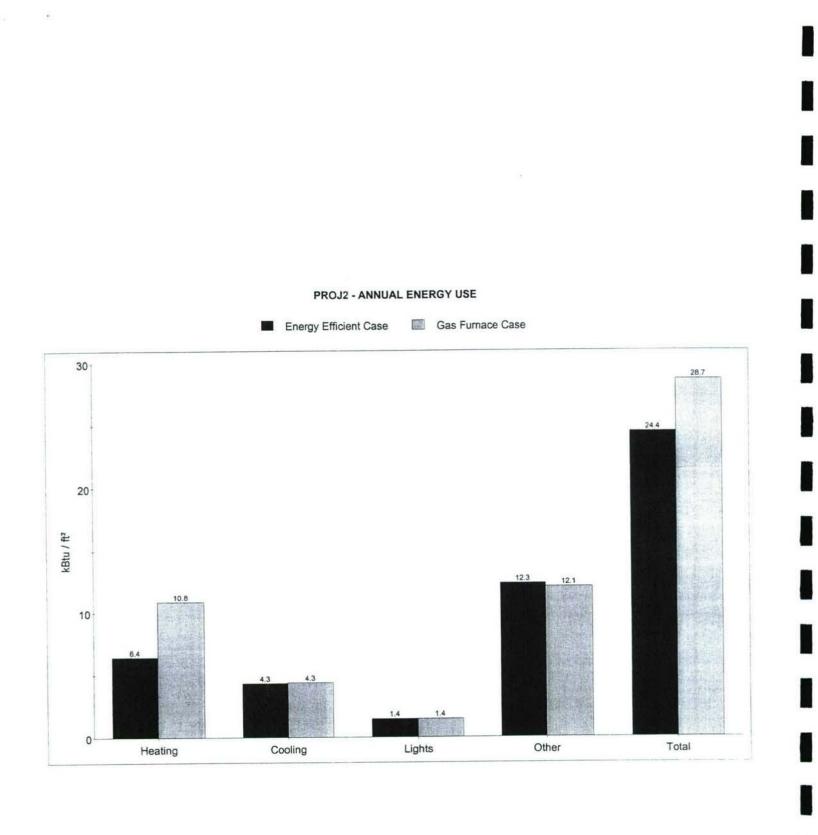
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APPENDIX D

{Energy-10: Thermal Performance Simulations}

			71 0	2 2004
Energy-10 Summary Page		242 24244		3, 2004
Project: PROJ2	Project Directory:	C:\Program	Files\Energy10v	1_5\PROJI
Description:	Energy Efficien	t Case		
Scheme Number:		Saved		none
the second s	PLUMBLEELIB /			-
Library Name:		lid/NA		-
Simulation status, Thermal/DL	EES by Harry Boo			
Comments:		ro.et1		-
Weather file:		2160.0		-
Floor Area, ft ²				-
Surface Area, ft ²		5856.5		
Volume, ft ³	1	8653.0		-
Total Conduction UA, Btu/h-F		362.4		-
Average U-value, Btu/hr-ft2-H	7	0.062		
Wall Construction	2 x 4 cypress, R=14	.5,etc		-
Roof Construction	shingle, attic, r-3	0, R=30.5		-
	Crawl Space, Reff=1	62 7.etc		
Floor type, insulation	2058 double, wood,	11=0 48 etc		-
Window Construction	2038 double, wood,	0-0.40,000		-
Window Shading	36 deg lat plumbl			-
Wall total gross area, ft ²		1536		
Roof total gross area, ft ²		2160		-
Ground total gross area, ft ²		2160		-
Window total gross area, ft ²		427		-
Windows (N/E/S/W:Roof)	5/7,	/13/4:0		-
	double,			-
Glazing name	do do 100			
Operating parameters for zone HVAC system Ai Rated Output (Heat/SCool/TCoo Rated Air Flow/MOOA,cfm Heating thermostat Cooling thermostat Heat/cool performance Economizer?/type Duct leaks/conduction losses Peak Gains; IL,EL,HW,OT; W/f Added mass? Daylighting? Infiltration, in ²	r Source Heat Pump/l ol),kBtu/h 39 68.0 °F, no 77.0 °F, no COP=3.0,E , total % t ² 0.20/0.04/2.0	0/25/34 1320/0 setback o setup ER=10.1 no/NA 11/10		
Results: Energy cost 2.020\$/Therm,(0.069\$/kWh,0.000\$/kW	21 Doc	- 00-Jap t) :0 00-Jan
Simulation dates	01-Jan to	52783	vv-van t	NA
Energy use, kBtu				NA
Energy cost, \$		1067		NA
Saved by daylighting, kWh		-		
Total Electric, kWh		15469		NA
Internal/External lights, k	Wh	915/0		NA
Heating/Cooling/Fan, kWh	4059/2	718/429		NC
Elec. Res./Heat Pump, kWh	3	083/976		NA
Hot water/Other, kWh	6	559/788		NC
Peak Electric, kW		15.6		NA
Fuel, hw/heat/total, kBtu		0/0/0		NC
ruel, nw/neat/total, kbtu	20790	/122/63		NA
Emissions, CO2/SO2/NOx, 1bs	20150	197913		0
Construction Costs		282963		248386
Life-Cycle Cost		202303		

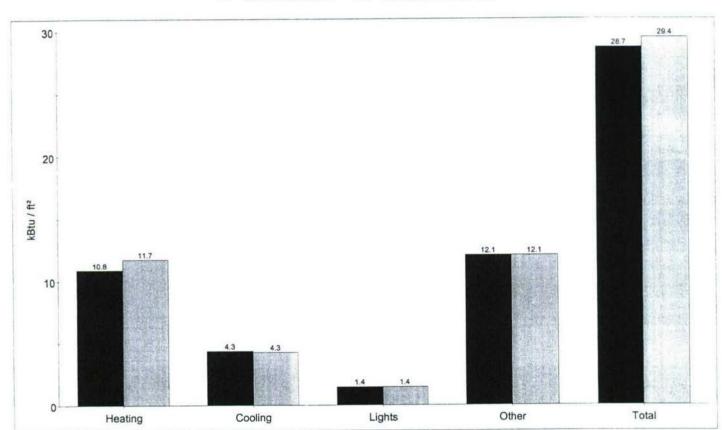
Jul 23, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 Gas Furnace Case Description: Energy Efficient Case 9 / Saved 8 / Saved cheme Number: PLUMBLEELIB / Saved PLUMBLEELIB / Saved Library Name: valid/NA valid/NA Simulation status, Thermal/DL Comments: EES by Harry Boody, PE EES by Harry Boody, PE Grnsboro.etl Grnsboro.et1 Weather file: 2160.0 Floor Area, ft² 2160.0 5856.5 5856.5 Surface Area, ft² Jolume, ft³ 18653.0 18653.0 362.4 Total Conduction UA, Btu/h-F 362.4 0.062 0.062 Average U-value, Btu/hr-ft2-F Average o-value, But/III-III-I0.0620.062Vall Construction2 x 4 cypress, R=14.5,etc2 x 4 cypress, R=14.5,etcKoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7,etcWindow Construction2058 double, wood, U=0.48,etc2058 double, wood, U=0.48,etc 36 deg lat plumblee,etc 36 deg lat plumblee,etc Vindow Shading Wall total gross area, ft² 1536 1536 2160 2160 Roof total gross area, ft² 2160 Ground total gross area, ft² 2160 Vindow total gross area, ft² Windows (N/E/S/W:Roof) 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 Air Source Heat Pump/ER Backup DX Cooling with Gas Furnace 38/25/33 Rated Output (Heat/SCool/TCool), kBtu/h 39/25/34 1210/0 1320/0 Rated Air Flow/MOOA, cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback Heating thermostat 77.0 °F, no setup Cooling thermostat eff=80,EER=10.1 Heat/cool performance COP=3.0, EER=10.1 no/NA no/NA Economizer?/type Duct leaks/conduction losses, total % 11/10 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none none Added mass? no no Davlighting? ACH=0.2 ACH=0.2 Infiltration, in² Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 52783 61933 Energy use, kBtu 1251 1067 Energy cost, \$ NA Saved by daylighting, kWh 4727 15469 Total Electric, kWh 915/0 Internal/External lights, kWh 915/0 0/2744/280 4059/2718/429 Heating/Cooling/Fan, kWh 0/0 Elec. Res./Heat Pump, kWh 3083/976 0/788 6559/788 Hot water/Other, kWh 3.7 Peak Electric, kW 15.6 22383/23420/45803 0/0/0 Fuel, hw/heat/total, kBtu Emissions, CO2/SO2/NOx, lbs 20790/122/63 11763/42/25 200474 197913 Construction Costs 257916 250873 Life-Cycle Cost



Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 roject: PROJ2 escription: Gas Furnace Case Orientation 15 East Case 9 / Saved 28 / Saved PLUMBLEELIB / Saved cheme Number: PLUMBLEELIB / Saved Library Name: valid/NA valid/NA imulation status, Thermal/DL EES by Harry Boody, PE EES by Harry Boody, PE comments: Grnsboro.etl Weather file: Grnsboro.et1 2160.0 2160.0 Floor Area, ft² 5856.5 5856.5 urface Area, ft² 18653.0 18653.0 'olume, ft³ 362.4 Total Conduction UA, Btu/h-F 362.4 Average U-value, Btu/hr-ft2-F 0.062 0.062 Value, brunnetter0.0620.062Vall Construction2 x 4 cypress, R=14.5,etc2 x 4 cypress, R=14.5,etcNoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7,etcWindow Construction2058 double, wood, U=0.48,etc2058 double, wood, U=0.48,etc Vall Construction Roof Construction 36 deg lat plumblee,etc 36 deg lat plumblee,etc Jindow Shading Vall total gross area, ft² 1536 1536 2160 2160 Roof total gross area, ft² Ground total gross area, ft² 2160 2160 Vindow total gross area, ft² Vindows (N/E/S/W:Roof) 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 AVAC system DX Cooling with Gas Furnace DX Cooling with Gas Furnace Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 38/25/34 1210/0 1232/0 Rated Air Flow/MOOA, cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback Heating thermostat 77.0 °F, no setup Cooling thermostat eff=80,EER=10.1 eff=80,EER=10.1 Heat/cool performance no/NA no/NA Economizer?/type Duct leaks/conduction losses, total % 11/10 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? ACH=0.2 ACH=0.2 Infiltration, in² Results: Energy cost 2.020\$/Therm, 0.069\$/kWh, 0.000\$/kW 2.020\$/Therm, 0.069\$/kWh, 0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 63611 61933 Energy use, kBtu 1285 1251 Energy cost, \$ NA Saved by daylighting, kWh 4678 4727 Total Electric, kWh 915/0 Internal/External lights, kWh 915/0 0/2692/283 0/2744/280 Heating/Cooling/Fan, kWh 0/788 Hot water/Other, kWh 0/788 3.7 3.7 Peak Electric, kW 22383/25264/47647
 Fuel, hw/heat/total, kBtu
 22383/23420/45803

 Emissions, C02/S02/NOx, lbs
 11763/42/25

 203458
 203458
 11915/42/25 200622 203458 Construction Costs 259123 257916 Life-Cycle Cost

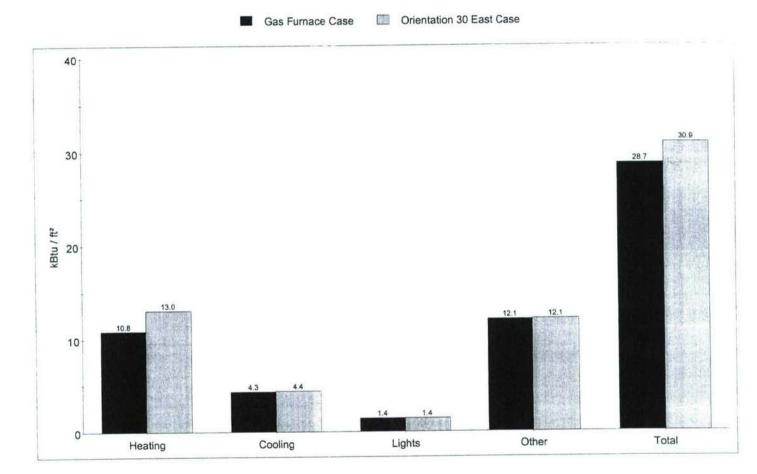


PROJ2 - ANNUAL ENERGY USE

Gas Furnace Case 🔲 Or

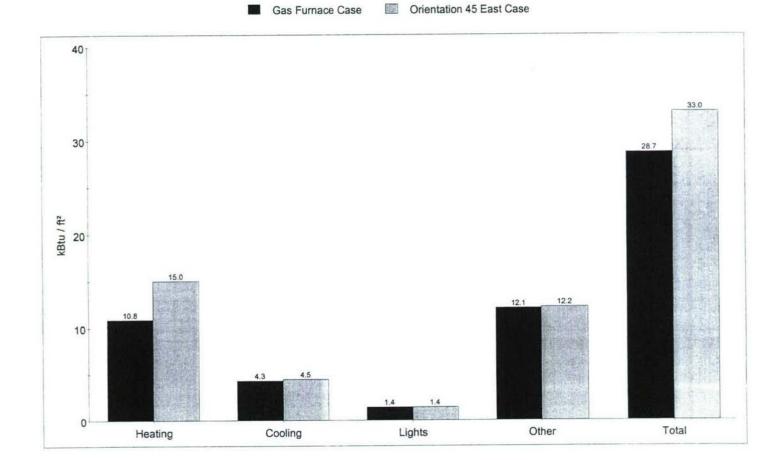
Orientation 15 East Case

Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 roject: PROJ2 Gas Furnace Case Orientation 30 East Case escription: scheme Number: 9 / Saved 12 / Saved PLUMBLEELIB / Saved PLUMBLEELIB / Saved Library Name: valid/NA valid/NA imulation status, Thermal/DL EES by Harry Boody, PE EES by Harry Boody, PE omments: Grnsboro.et1 Grnsboro.etl eather file: 2160.0 Floor Area, ft² 2160.0 5856.5 urface Area, ft² 5856.5 18653.0 olume, ft³ 18653.0 362.4 362.4 otal Conduction UA, Btu/h-F 0.062 Average U-value, Btu/hr-ft2-F 0.062 Average o-value, but/minuter0.0020.002all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etcoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7, etcWindow Construction2058 double, wood, U=0.48, etc2058 double, wood, U=0.48, etc oof Construction 36 deg lat plumblee, etc 36 deg lat plumblee, etc indow Shading all total gross area, ft² 1536 1536 Roof total gross area, ft² 2160 2160 Ground total gross area, ft² 2160 2160 indow total gross area, ft² indows (N/E/S/W:Roof) 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name perating parameters for zone 1 VAC system DX Cooling with Gas Furnace DX Cooling with Gas Furnace 38/25/34 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 1249/0 1210/0 Rated Air Flow/MOOA, cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback leating thermostat 77.0 °F, no setup Cooling thermostat eff=80,EER=10.1 Heat/cool performance eff=80,EER=10.1 no/NA no/NA conomizer?/type puct leaks/conduction losses, total % 11/10 11/10 Peak Gains; IL,EL,HW,OT; W/ft² 0.20/0.04/2.08/0.25 0.20/0.04/2.08/0.25 none none Added mass? no no Davlighting? ACH=0.2 ACH=0.2 Infiltration, in² Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 61933 66806 Energy use, kBtu 1350 1251 Energy cost, \$ NA Saved by daylighting, kWh 4777 4727 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh 0/2773/301 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 3.7 3.7 Peak Electric, kW Peak Electric, KW Fuel, hw/heat/total, kBtu Emissions, CO2/SO2/NOx, lbs 22383/28124/50507 22383/23420/45803 11763/42/25 12385/43/26 200711 203458 Construction Costs 261133 257916 Life-Cycle Cost



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Jul 27, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 roject: PROJ2 Gas Furnace Case Orientation 45 East Case escription: 14 / Saved 9 / Saved cheme Number: PLUMBLEELIB / Saved PLUMBLEELIB / Saved Library Name: valid/NA valid/NA imulation status, Thermal/DL EES by Harry Boody, PE omments: EES by Harry Boody, PE Grnsboro.et1 Grnsboro.etl Weather file: Floor Area, ft² 2160.0 2160.0 5856.5 urface Area, ft² 5856.5 olume, ft³ 18653.0 18653.0 362.4 362.4 Total Conduction UA, Btu/h-F 0.062 Average U-value, Btu/hr-ft2-F 0.062 2 x 4 cypress, R=14.5,etc 2 x 4 cypress, R=14.5,etc shingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5 Crawl Space, Reff=162.7,etc Crawl Space, Reff=162.7,etc 2058 double, wood, U=0.48,etc2058 double, wood, U=0.48,etc all Construction Floor type, insulation Window Construction 36 deg lat plumblee,etc 36 deg lat plumblee,etc Vindow Shading Vall total gross area, ft² 1536 1536 2160 Roof total gross area, ft² 2160 2160 fround total gross area, ft² 2160 Vindow total gross area, ft² Windows (N/E/S/W:Roof) 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 Glazing name double, U=0.49 perating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace AVAC system Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 40/30/40 1614/0 1210/0 Rated Air Flow/MOOA, cfm 68.0 °F, no setback 68.0 °F, no setback leating thermostat 77.0 °F, no setup 77.0 °F, no setup Cooling thermostat eff=80,EER=10.1 Heat/cool performance eff=80,EER=10.1 no/NA no/NA Conomizer?/type 11/10 Duct leaks/conduction losses, total % 11/10 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? Infiltration, in² ACH=0.2 ACH=0.2 Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 71326 61933 Energy use, kBtu 1251 1441 Energy cost, \$ Saved by daylighting, kWh NA 4880 Total Electric, kWh 4727 915/0 Internal/External lights, kWh 915/0 0/2823/354 Heating/Cooling/Fan, kWh 0/2744/280 0/788 0/788 Hot water/Other, kWh 3.7 3.7 Peak Electric, kW Fuel, hw/heat/total, kBtu Emissions, CO2/SO2/NOx, lbs Construction Costs 22383/32292/54675 22383/23420/45803 13015/45/27 11763/42/25 202620 203458 261133 259123 Life-Cycle Cost



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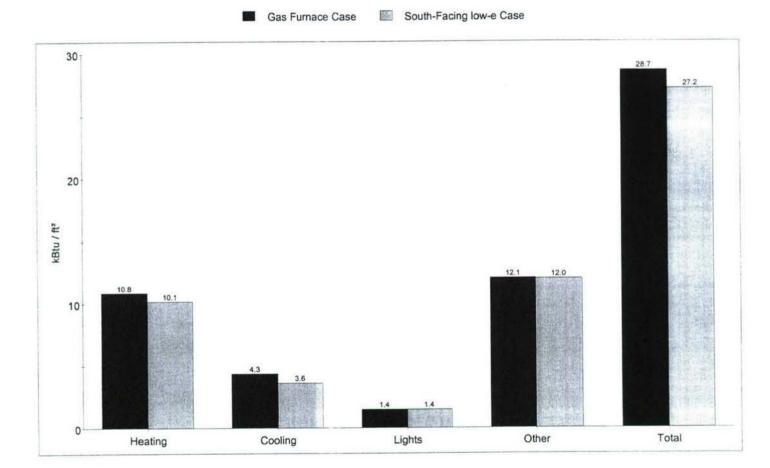
Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 roject: PROJ2 Gas Furnace Case South-Facing low-e Case escription: cheme Number: 9 / Saved 30 / Saved valid/NA EES by Harry Boody, PE Grnsboro.et1 modified / Saved valid/NA EES by Harry Boody, PE Grnsboro.et1 Library Name: imulation status, Thermal/DL omments: weather file: 2160.0 Floor Area, ft² 5856.5 5856.5 Turface Area, ft² 18653.0 18653.0 olume, ft³ Total Conduction UA, Btu/h-F 306.8 362.4 0.052 Average U-value, Btu/hr-ft2-F 0.062 all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etcoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7, etcCrawl Space, Reff=162.7, etcCrawl Space, Reff=162.7, etc 2058 double, wood, U=0.48, etc2058 double, wood, U=0.28, etc Window Construction 36 deg lat plumblee, etc 36 deg lat plumblee, etc indow Shading 1536 1536 all total gross area, ft² 2160 2160 Roof total gross area, ft² Ground total gross area, ft² lindow total gross area, ft² lindows (N/E/S/W:Roof) 2160 2160 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double low-e, U=0.26 Glazing name perating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace IVAC system 34/23/31 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 1119/0 1210/0 Rated Air Flow/MOOA, cfm leating thermostat 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback 77.0 °F, no setup cooling thermostat eff=80,EER=10.1 eff=80,EER=10.1 Heat/cool performance no/NA no/NA Conomizer?/type Duct leaks/conduction losses, total % 11/10 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? ACH=0.2 ACH=0.2 Infiltration, in² Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 58727 61933 Energy use, kBtu 1187 1251 Energy cost, \$ NA Saved by daylighting, kWh 4232 fotal Electric, kWh 4727 915/0 915/0 Internal/External lights, kWh Heating/Cooling/Fan, kWh 0/2288/240 0/2744/280 0/788 0/788 Hot water/Other, kWh 3.4 3.7 Peak Electric, kW

 Fuel, hw/heat/total, kBtu
 22383/23420/45803

 Emissions, CO2/SO2/NOx, lbs
 11763/42/25

 Construction Costs
 203458

 22383/21905/44288 10918/38/23 199623 257916 254460 Life-Cycle Cost

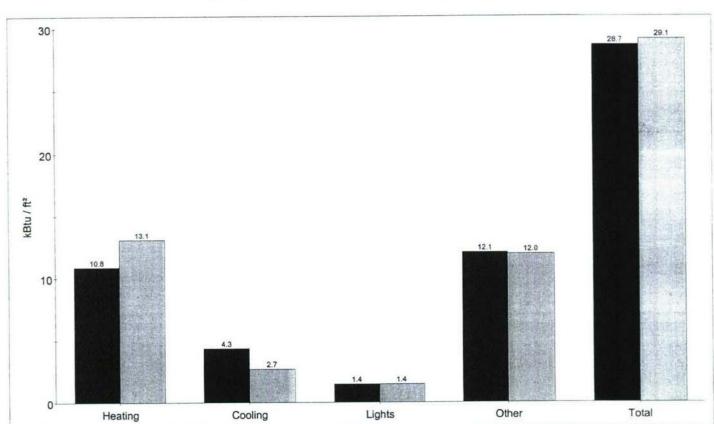


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Jul 27, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 escription: Gas Furnace Case 8 South-Facing low-e Case 9 / Saved 31 / Saved 9 / Saved PLUMBLEELIB / Saved cheme Number: PLBLELOWELIB / Saved Library Name: valid/NA valid/NA EES by Harry Boody, PE Grnsboro et1 EES by Harry Boody, PE imulation status, Thermal/DL comments: Grnsboro.et1 Weather file: Floor Area, ft² 2160.0 2160.0 Surface Area, ft² 5856.5 5856.5 Yolume, ft³ 18653.0 18653.0 281.0 362.4 Total Conduction UA, Btu/h-F 0.048 Average U-value, Btu/hr-ft2-F 0.062 Average 0-value, Btu/HI-Itt-F0.0620.048Vall Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etcNoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7, etcWindow Construction2058 double, wood, U=0.48, etc2058 double, wood, U=0.28, etc 36 deg lat plumblee,etc 36 deg lat plumblee,etc Vindow Shading Wall total gross area, ft² 1536 1536 2160 2160 Roof total gross area, ft² Fround total gross area, ft² Vindow total gross area, ft² Windows (N/E/S/W:Roof) 2160 2160 299 427 5/7/9/4:0 5/7/13/4:0 double, U=0.49 double low-e, U=0.26 Glazing name Operating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace AVAC system Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 32/22/29 1030/0 1210/0 Rated Air Flow/MOOA,cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback 77.0 °F, no setup Heating thermostat Cooling thermostat Heat/cool performance eff=80,EER=10.1 eff=80,EER=10.1 no/NA no/NA Economizer?/type Duct leaks/conduction losses, total % 11/10 11/10 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 0.20/0.04/2.08/0.25 none Added mass? none no no Daylighting? ACH=0.2 Infiltration, in² ACH=0.2 Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 62957 61933 Energy use, kBtu 1272 1251 Energy cost, \$ aved by daylighting, kWh NA 3612 Total Electric, kWh 4727 915/0 Internal/External lights, kWh 915/0 0/2744/280 0/1693/217 Heating/Cooling/Fan, kWh 0/788 Hot water/Other, kWh 0/788 3.1 3.7 Peak Electric, kW
 Fuel, hw/heat/total, kBtu
 22383/23420/45803

 Emissions, CO2/SO2/NOx, lbs
 11763/42/25

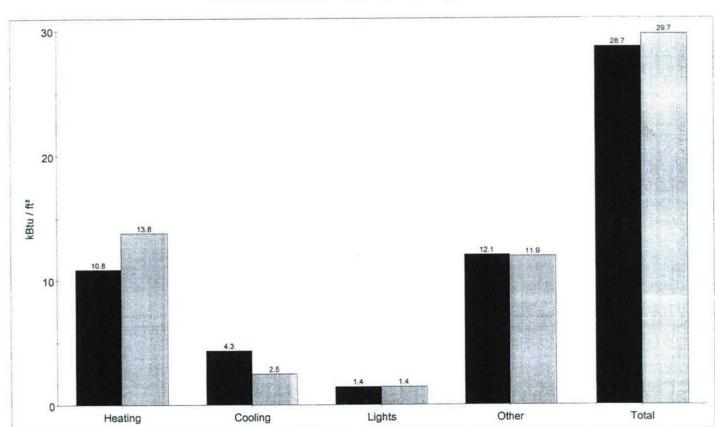
 Construction Costs
 203458
 22383/28247/50630 10834/34/21 198945 255458 257916 Life-Cycle Cost



Gas Furnace Case

8 South-Facing low-e Case

Jul 27, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1_5\PROJ1 Project: PROJ2 Description: Gas Furnace Case 6 South-Facing low-e Case 32 / Saved Scheme Number: 9 / Saved PLUMBLEELIB / Saved PLBLELOWELIB / Saved Library Name: valid/NA valid/NA Simulation status, Thermal/DL Comments: EES by Harry Boody, PE EES by Harry Boody, PE Grnsboro.et1 Grnsboro.et1 Weather file: 2160.0 Floor Area, ft² 2160.0 5856.5 5856.5 Surface Area, ft² Volume, ft³ 18653.0 18653.0 362.4 274.9 Total Conduction UA, Btu/h-F 0.047 Average U-value, Btu/hr-ft2-F 0.062 2 x 4 cypress, R=14.5, etc 2 x 4 cypress, R=14.5, etc shingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5 Crawl Space, Reff=162.7, etc Crawl Space, Reff=162.7, etc Vall Construction Roof Construction Floor type, insulation 2058 double, wood, U=0.48, etc2058 double, wood, U=0.28, etc Window Construction 36 deg lat plumblee, etc 36 deg lat plumblee, etc Window Shading Nall total gross area, ft² 1536 1536 2160 2160 Roof total gross area, ft² 2160 Ground total gross area, ft² 2160 Vindow total gross area, ft² Windows (N/E/S/W:Roof) 270 427 5/7/7/4:0 5/7/13/4:0 double low-e, U=0.26 double, U=0.49 Glazing name Operating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace HVAC system 31/21/28 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 1010/0 1210/0 Rated Air Flow/MOOA,cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback 77.0 °F, no setup Heating thermostat Cooling thermostat eff=80,EER=10.1 eff=80,EER=10.1 Heat/cool performance no/NA no/NA Economizer?/type 11/10 Duct leaks/conduction losses, total % 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? Infiltration, in² ACH=0.2 ACH=0.2 Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec Simulation dates 01-Jan to 31-Dec 64148 61933 Energy use, kBtu 1296 1251 Energy cost, \$ NA Saved by daylighting, kWh 4727 3499 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh 0/2744/280 0/1582/214 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 3.7 3.0 Peak Electric, kW Fuel, hw/heat/total, kBtu Emissions, CO2/SO2/NOx, lbs Construction Costs 22383/29825/52208 22383/23420/45803 11763/42/25 10868/33/21 198785 203458 257916 255811 Life-Cycle Cost



Gas Furnace Case

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6 South-Facing low-e Case

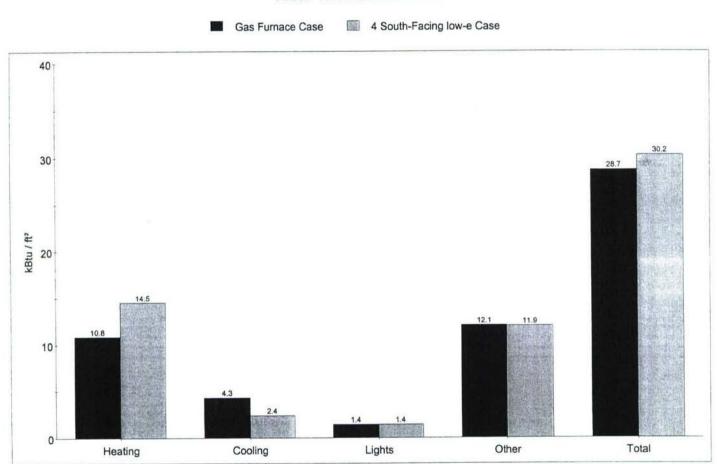
Jul 27, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 Gas Furnace Case 4 South-Facing low-e Case Description: 9 / Saved36 / SavedPLUMBLEELIB / Saved36 / Savedvalid/NAPLBLELOWELIB / Savedvalid/NAvalid/NAEES by Harry Boody, PEEES by Harry Boody, PEGrnsboro.etlGrnsboro.etl Scheme Number: Library Name: Simulation status, Thermal/DL Comments: Weather file: 2160.0 Floor Area, ft² 2160.0 Surface Area, ft² 5856.5 5856.5 Volume, ft³ 18653.0 18653.0 269.2 Total Conduction UA, Btu/h-F 362.4 0.046 Average U-value, Btu/hr-ft2-F 0.062 Average 0-value, Btu/nr-It*-F0.0620.046Vall Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etcNoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7, etcWindow Construction2058 double, wood, U=0.48, etc2028 double low-e, wood, U=0.30, etc Window Shading Wall total gross area, ft² 36 deg lat plumblee,etc 36 deg lat plumblee,etc 1536 1536 2160 Roof total gross area, ft² 2160 Ground total gross area, ft² Vindow total gross area, ft² Windows (N/E/S/W:Roof) 2160 2160 427 244 5/7/5/4:0 5/7/13/4:0 double low-e, U=0.26 double, U=0.49 Glazing name Operating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace HVAC system 31/21/28 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 992/0 Rated Air Flow/MOOA, cfm 1210/0 1210/0 992/0 68.0 °F, no setback 68.0 °F, no setback 77.0 °F, no setup 77.0 °F, no setup Heating thermostat Cooling thermostat Heat/cool performance eff=80,EER=10.1 eff=80,EER=10.1 no/NA no/NA Economizer?/type Duct leaks/conduction losses, total % 11/10 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none Added mass? none no Daylighting? no Infiltration, in² ACH=0.2 ACH=0.2 Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW Simulation dates 01-Jan to 31-Dec Energy use, kBtu 61933 01-Jan to 31-Dec 65331 Energy use, kBtu 1320 1251 Energy cost, \$ Saved by daylighting, kWh NA 4727 3402 Total Electric, kWh 915/0 Internal/External lights, kWh 915/0 0/1488/212 0/2744/280 Heating/Cooling/Fan, kWh Hot water/Other, kWh 0/788 0/788 2.9 3.7 Peak Electric, kW

 Fuel, hw/heat/total, kBtu
 22383/23420/45803

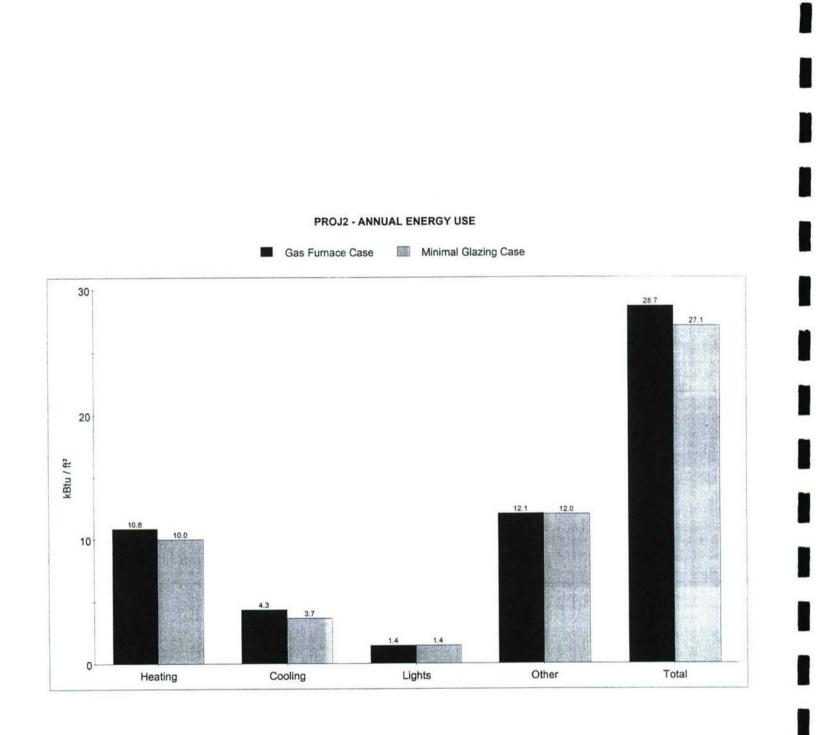
 Emissions, C02/S02/NOx, lbs
 11763/42/25

 Construction Costs
 2024123

 22383/31338/53721 10917/33/21 198653 Construction Costs 256222 250494 Life-Cycle Cost



Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 roject: PROJ2 Gas Furnace Case Minimal Glazing Case escription: 35 / Saved 9 / Saved cheme Number: obsolete / Not Saved PLUMBLEELIB / Saved Library Name: valid/NA valid/NA imulation status, Thermal/DL omments: EES by Harry Boody, PE EES by Harry Boody, PE Grnsboro.etl Grnsboro.et1 Weather file: 2160.0 2160.0 Floor Area, ft² 5856.5 5856.5 urface Area, ft² 18653.0 18653.0 'olume, ft³ 337.0 362.4 Total Conduction UA, Btu/h-F 0.058 0.062 Average U-value, Btu/hr-ft2-F Average U-value, Btu/hf-ftt-r0.0020.002(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etc(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etc(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etc(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etc(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etc(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etc(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etc(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etc(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=30.5(all Constructi all Construction 36 deg lat plumblee, etc 36 deg lat plumblee, etc lindow Shading 1536 Mall total gross area, ft² 1536 2160 2160 Roof total gross area, ft² 2160 Ground total gross area, ft² 2160 lindow total gross area, ft² 325 427 Windows (N/E/S/W:Roof) 2/4/13/2:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace NVAC system Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 35/22/29 1054/0 1210/0 Rated Air Flow/MOOA, cfm 68.0 °F, no setback 68.0 °F, no setback 77.0 °F, no setup leating thermostat 77.0 °F, no setup Cooling thermostat eff=80,EER=10.1 eff=80,EER=10.1 Heat/cool performance no/NA no/NA Economizer?/type Duct leaks/conduction losses, total % 11/10 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none none Added mass? no Daylighting? no ACH=0.2 ACH=0.2 Infiltration, in² Results: Energy cost 2.020\$/Therm, 0.069\$/kWh, 0.000\$/kW 2.020\$/Therm, 0.069\$/kWh, 0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 58564 61933 Energy use, kBtu 1183 1251 Energy cost, \$ NA Saved by daylighting, kWh 4267 4727 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh 0/2328/236 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 3.3 3.7 Peak Electric, kW 22383/23420/45803 Fuel, hw/heat/total, kBtu Emissions, CO2/SO2/NOx, lbs 22383/21619/44002 10932/39/23 11763/42/25 199404 203458 Construction Costs 253958 257916 Life-Cycle Cost



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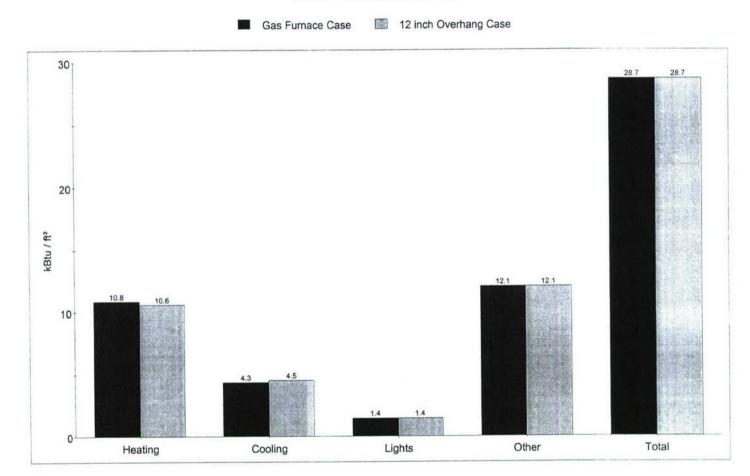
Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 Gas Furnace Case Description: 12 inch Overhang Case 16 / Saved 9 / Saved cheme Number: PLBLEVARIEDLIB / Saved PLUMBLEELIB / Saved Library Name: valid/NA imulation status, Thermal/DL valid/NA Comments: EES by Harry Boody, PE EES by Harry Boody, PE Grnsboro.et1 Grnsboro.et1 Weather file: 2160.0 2160.0 Floor Area, ft² Surface Area, ft² 5856.5 5856.5 Volume, ft³ 18653.0 18653.0 362.4 362.4 Total Conduction UA, Btu/h-F 0.062 0.062 Average U-value, Btu/hr-ft²-F0.0620.062Vall Construction2 x 4 cypress, R=14.5,etc2 x 4 cypress, R=14.5,etcVall Construction2 s 4 cypress, R=14.5,etc2 x 4 cypress, R=14.5,etcNoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7,etcCrawl Space, Reff=162.7,etcWindow Construction2058 double, wood, U=0.48,etc2058 double, wood, U=0.48,etc Average U-value, Btu/hr-ft2-F 36 deg lat plumblee, etc 12 inch overhang, etc Vindow Shading Wall total gross area, ft² 1536 1536 2160 2160 Roof total gross area, ft² Fround total gross area, ft² 2160 2160 Vindow total gross area, ft² Windows (N/E/S/W:Roof) 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace HVAC system Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 38/25/33 1218/0 1210/0 Rated Air Flow/MOOA,cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback Heating thermostat 77.0 °F, no setup Cooling thermostat Heat/cool performance eff=80,EER=10.1 eff=80,EER=10.1 no/NA no/NA Economizer?/type 11/10 Duct leaks/conduction losses, total % 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none Added mass? none Daylighting? no no Infiltration, in² ACH=0.2 ACH=0.2 Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 61889 61933 Energy use, kBtu 1250 1251 Energy cost, \$ NA Saved by daylighting, kWh 4863 4727 Total Electric, kWh 915/0 Internal/External lights, kWh 915/0 0/2870/289 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 3.7 3.7 Peak Electric, kW

 Fuel, hw/heat/total, kBtu
 22383/23420/45803

 Emissions, C02/S02/NOx, lbs
 11763/42/25

 Construction Costs
 202450

 22383/22914/45297 11885/43/26 200517 Construction Costs 257998 257916 Life-Cycle Cost



Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1_5\PROJ1 Project: PROJ2 Gas Furnace Case 24 inch Overhang Case escription: 17 / Saved 9 / Saved scheme Number: PLUMBLEELIB / Saved PLBLEVARIEDLIB / Not Saved Library Name: valid/NA valid/NA imulation status, Thermal/DL EES by Harry Boody, PE Grnsboro.et1 EES by Harry Boody, PE comments: Grnsboro.et1 Weather file: 2160.0 Floor Area, ft² 2160.0 Surface Area, ft² Jolume, ft³ 5856.5 5856.5 18653.0 18653.0 362.4 Total Conduction UA, Btu/h-F 362.4 Average U-value, Btu/hr-ft2-F 0.062 0.062 Verage of value, bed/mining0.0020.002Value, bed/mining2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etcValue construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etcKoof ConstructionShingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7, etcWindow Construction2058 double, wood, U=0.48, etc2058 double, wood, U=0.48, etc 36 deg lat plumblee,etc 24 inch overhang,etc Vindow Shading Wall total gross area, ft² 1536 1536 2160 Roof total gross area, ft² 2160 2160 Fround total gross area, ft² 2160 Vindow total gross area, ft² Windows (N/E/S/W:Roof) 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name perating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace HVAC system Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 38/25/33 1208/0 1210/0 Rated Air Flow/MOOA, cfm Heating thermostat Cooling thermostat Heat/cool performance 68.0 °F, no setback 68.0 °F, no setback 77.0 °F, no setup 77.0 °F, no setup eff=80,EER=10.1 eff=80,EER=10.1 no/NA Conomizer?/type no/NA Duct leaks/conduction losses, total % 11/10 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? infiltration, in² ACH=0.2 ACH=0.2 Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 62306 61933 Energy use, kBtu 1259 1251 Energy cost, \$ NA Baved by daylighting, kWh 4727 4573 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh 0/2599/272 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 3.7 3.7 Peak Electric, kW
 Fuel, hw/heat/total, kBtu
 22383/23420/45803

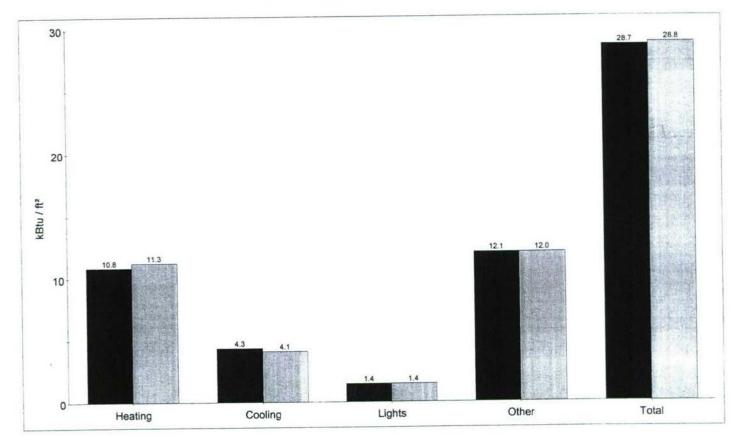
 Emissions, C02/S02/NOx, lbs
 11763/42/25

 Construction Costs
 203458
 22383/24318/46701 11662/41/25 200465 257916 258054 Life-Cycle Cost



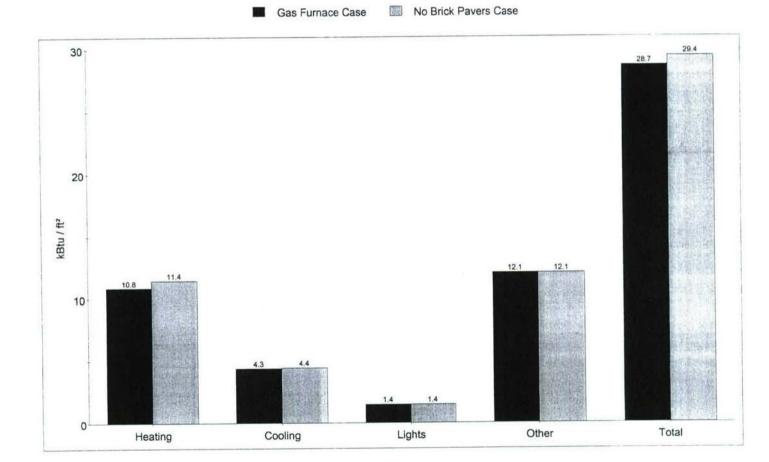
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24 inch Overhang Case



Jul 26, 2004 Energy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 Description: Gas Furnace Case No Brick Pavers Case PLUMBLEELIB / Saved valid/NA EES by Harry Boody, PE Grnsboro.et1 Crosbory Scheme Number: Library Name: Bimulation status, Thermal/DL Comments: Weather file: Floor Area, ft² 5856.5 Surface Area, ft² 5856.5 Volume, ft³ 18653.0 18653.0 362.8 Total Conduction UA, Btu/h-F 362.4 Average U-value, Btu/hr-ft2-F0.0620.062Wall Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etcRoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7, etcCrawl Space, Reff=132.4Window Construction2058 double, wood, U=0.48, etc2058 double, wood, U=0.48, etc Roof Construction 36 deg lat plumblee, etc 36 deg lat plumblee, etc Window Shading Wall total gross area, ft² 1536 1536 Roof total gross area, ft² 2160 2160 Ground total gross area, ft² Window total gross area, ft² Windows (N/E/S/W:Roof) 2160 2160 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 HVAC system DX Cooling with Gas Furnace DX Cooling with Gas Furnace 38/25/33 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 1210/0 1221/0 Rated Air Flow/MOOA,cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback 77.0 °F, no setup Heating thermostat Cooling thermostat Heat/cool performance eff=80,EER=10.1 eff=80,EER=10.1 no/NA no/NA Economizer?/type Duct leaks/conduction losses, total % 11/10 11/10 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 0.20/0.04/2.08/0.25 none none Added mass? no Davlighting? no Infiltration, in² ACH=0.2 ACH=0.2 Results: Energy cost 2.020\$/Therm, 0.069\$/kWh, 0.000\$/kW 2.020\$/Therm, 0.069\$/kWh, 0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 63481 61933 Energy use, kBtu 1251 1283 Energy cost, \$ NA Saved by daylighting, kWh 4801 4727 Total Electric, kWh 915/0 Internal/External lights, kWh 915/0 0/2807/292 Heating/Cooling/Fan, kWh 0/2744/280 0/788 0/788 Hot water/Other, kWh 3.7 3.7 Peak Electric, kW 22383/24715/47098
 Fuel, hw/heat/total, kBtu
 22383/23420/45803

 Emissions, CO2/SO2/NOx, lbs
 11763/42/25
 12015/43/26 203458 200547 Construction Costs 257916 258932 Life-Cycle Cost



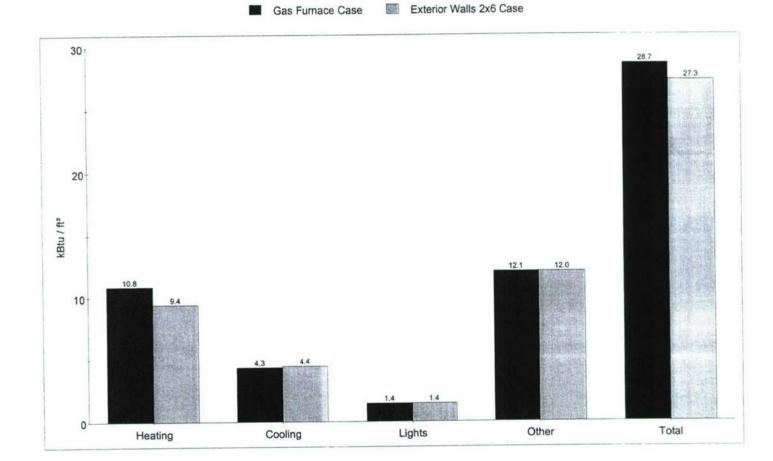
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PROJ2 - ANNUAL ENERGY USE

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Jul 26, 2004 Energy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 Gas Furnace Case Exterior Walls 2x6 Case Description: 34 / Saved 9 / Saved Scheme Number: obsolete / Not Saved PLUMBLEELIB / Saved Library Name: valid/NA valid/NA Simulation status, Thermal/DL Comments: EES by Harry Boody, PE EES by Harry Boody, PE Grnsboro.et1 Grnsboro.et1 Weather file: Floor Area, ft² 2160.0 2160.0 5856.5 5856.5 Surface Area, ft² 18653.0 Volume, ft³ 18653.0 339.3 Total Conduction UA, Btu/h-F 362.4 0.062 0.058 Average U-value, Btu/hr-ft2-F Wall Construction2 x 4 cypress, R=14.5,etc2 x 6 cypress, R=19.8,etcRoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7,etcWindow Construction2058 double, wood, U=0.48,etc2058 double, wood, U=0.48,etc Roof Construction Floor type, insulation 36 deg lat plumblee,etc 36 deg lat plumblee,etc Window Shading 1536 1536 Wall total gross area, ft² Roof total gross area, ft² 2160 2160 2160 Ground total gross area, ft² 2160 Window total gross area, ft² Windows (N/E/S/W:Roof) 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 HVAC system DX Cooling with Gas Furnace DX Cooling with Gas Furnace 36/24/32 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 1187/0 1210/0 Rated Air Flow/MOOA,cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback Heating thermostat 77.0 °F, no setup Cooling thermostat eff=80,EER=10.1 eff=80,EER=10.1 Heat/cool performance no/NA no/NA Economizer?/type 11/10 Duct leaks/conduction losses, total % 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? ACH=0.2 Infiltration, in² ACH=0.2 Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 59019 61933 Energy use, kBtu 1192 Energy cost, \$ 1251 NA Saved by daylighting, kWh 4796 4727 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh 0/2816/277 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 3.7 Peak Electric, kW 3.7 Fuel, hw/heat/total, kBtu Emissions, CO2/SO2/NOx, lbs 22383/20270/42653 22383/23420/45803 11763/42/25 11483/43/25 203458 200187 Construction Costs 255790 257916 Life-Cycle Cost



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Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 roject: PROJ2 Gas Furnace Case Infiltration 0.5 ACH Case Description: 9 / Saved 20 / Saved Scheme Number: PLUMBLEELIB / Saved PLUMBLEELIB / Saved valid/NA valid/NA EES by Harry Boody, PE Grnsboro.et1 Library Name: imulation status, Thermal/DL comments: Weather file: Floor Area, ft² 5856.5 5856.5 Surface Area, ft² 18653.0 Jolume, ft³ 18653.0 362.4 Total Conduction UA, Btu/h-F 362.4 0.062 0.062 Average 0-value, Btu/HI-Itt-F0.062Vall Construction2 x 4 cypress, R=14.5, etcVall Construction2 x 4 cypress, R=14.5, etckoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7, etcWindow Construction2058 double, wood, U=0.48, etc2058 double, wood, U=0.48, etcVindow Shadirg26 dog lat plurblag ota Average U-value, Btu/hr-ft2-F 36 deg lat plumblee,etc 36 deg lat plumblee,etc Vindow Shading Wall total gross area, ft² 1536 1536 2160 Roof total gross area, ft² 2160 Ground total gross area, ft² 2160 2160 Vindow total gross area, ft² Windows (N/E/S/W:Roof) Glazing pare 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 HVAC system DX Cooling with Gas Furnace DX Cooling with Gas Furnace Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 46/28/37 1287/0 1210/0 Rated Air Flow/MOOA, cfm 68.0 °F, no setback 77.0 °F, no setup eff=80.EER=10.1 68.0 °F, no setback Heating thermostat Cooling thermostat 77.0 °F, no setup Heat/cool performance eff=80,EER=10.1 eff=80,EER=10.1 no/NA no/NA Economizer?/type 11/10 Duct leaks/conduction losses, total % 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? Infiltration, in² ACH=0.5 ACH=0.2 Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW Simulation dates 01-Jan to 31-Dec Energy use, kBtu 61933 01-Jan to 31-Dec 76381 Energy use, kBtu 1543 1251 Energy cost, \$ Saved by daylighting, kWh NA 4666 4727 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh 0/2664/299 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 3.7 4.2

 Fuel, hw/heat/total, kBtu
 22383/23420/45803

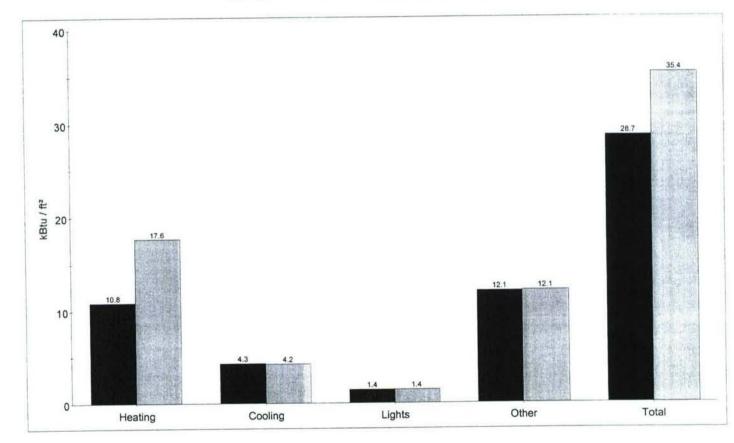
 Emissions, C02/S02/NOx, lbs
 11763/42/25

 Construction Costs
 203458

 Peak Electric, kW 22383/38078/60461 13411/44/27 201844 268556 257916 Life-Cycle Cost

Gas Furnace Case

Infiltration 0.5 ACH Case



Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 Gas Furnace Case Infiltration 1.0 ACH Case Description: 21 / Saved
PLUMBLEELIB / Saved 9 / Saved Scheme Number: PLUMBLEELIB / Saved Library Name: valid/NA Simulation status, Thermal/DL EES by Harry Boody, PE Grnsboro.et1 EES by Harry Boody, PE Grnsboro.et1 Comments: Weather file: 2160.0 2160.0 Floor Area, ft² 5856.5 5856.5 Surface Area, ft² Volume, ft³ 18653.0 18653.0 362.4 362.4 Total Conduction UA, Btu/h-F 0.062 Average U-value, Btu/hr-ft²-F 0.062 Average 0-value, Btu/hF=ft=F0.0620.062Vall Construction2 x 4 cypress, R=14.5, etc2 x 4 cypress, R=14.5, etcRoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7, etcWindow Construction2058 double, wood, U=0.48, etc2058 double, wood, U=0.48, etc 36 deg lat plumblee, etc 36 deg lat plumblee, etc Vindow Shading Wall total gross area, ft² 1536 1536 2160 Roof total gross area, ft² 2160 2160 Ground total gross area, ft² 2160 Window total gross area, ft² Windows (N/E/S/W:Roof) 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace HVAC system 59/32/43 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 1417/0 1210/0 Rated Air Flow/MOOA, cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback Heating thermostat 77.0 °F, no setup Cooling thermostat Heat/cool performance eff=80,EER=10.1 eff=80,EER=10.1 no/NA no/NA Economizer?/type 11/10 Duct leaks/conduction losses, total % 11/10 Peak Gains; IL,EL,HW,OT; W/ft² 0.20/0.04/2.08/0.25 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? Infiltration, in² ACH=1.0 ACH=0.2 Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 104793 61933 Energy use, kBtu 2117 1251 Energy cost, \$ Saved by daylighting, kWh NA 4727 4653 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh 0/2610/340 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 4.9 3.7 Peak Electric, kW

 Fuel, hw/heat/total, kBtu
 22383/23420/45803

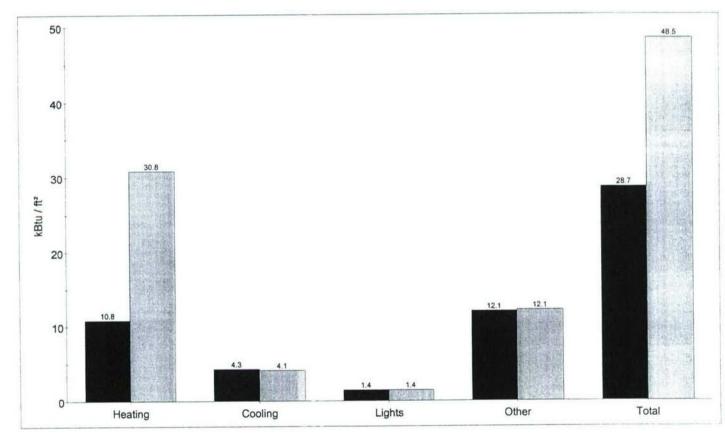
 Emissions, C02/S02/NOx, lbs
 11763/42/25

 Construction Costs
 203458

 22383/66534/88916 16754/47/31 204221 288936 257916 Life-Cycle Cost

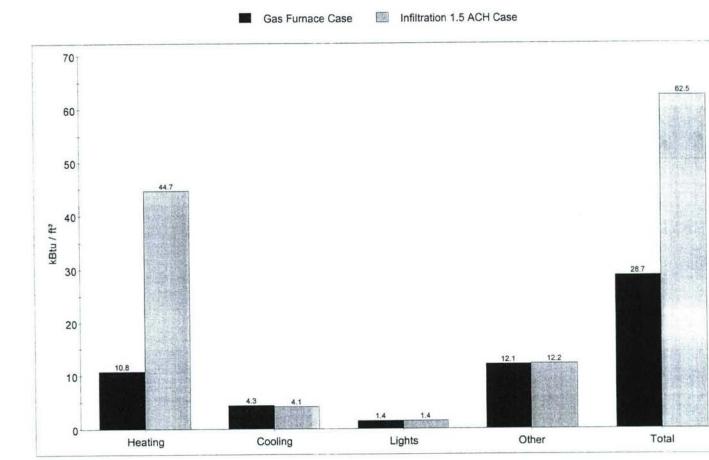


Infiltration 1.0 ACH Case



Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 Gas Furnace Case Infiltration 1.5 ACH Case escription: 22 / Saved 9 / Saved cheme Number: PLUMBLEELIB / Saved PLUMBLEELIB / Saved Library Name: valid/NA valid/NA imulation status, Thermal/DL comments: EES by Harry Boody, PE EES by Harry Boody, PE Grnsboro.et1 Grnsboro.et1 Weather file: Floor Area, ft² 2160.0 2160.0 5856.5 Surface Area, ft² 5856.5 18653.0 18653.0 'olume, ft³ 362.4 362.4 Total Conduction UA, Btu/h-F 0.062 Average U-value, Btu/hr-ft2-F 0.062 Velage 5-value, btd/mint0.0020.002Vall Construction2 x 4 cypress, R=14.5,etc2 x 4 cypress, R=14.5,etctoof Constructionshingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5Floor type, insulationCrawl Space, Reff=162.7,etcWindow Construction2058 double, wood, U=0.48,etc2058 double, wood, U=0.48,etc 36 deg lat plumblee,etc 36 deg lat plumblee,etc Jindow Shading 1536 1536 Vall total gross area, ft² 2160 Roof total gross area, ft² 2160 2160 Ground total gross area, ft² 2160 Vindow total gross area, ft² Vindows (N/E/S/W:Roof) 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace WAC system 73/37/49 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 1560/0 1210/0 Rated Air Flow/MOOA,cfm 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback 77.0 °F, no setup leating thermostat Cooling thermostat eff=80,EER=10.1 Heat/cool performance eff=80,EER=10.1 no/NA no/NA Conomizer?/type 11/10 Duct leaks/conduction losses, total % 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? ACH=0.2 ACH=1.5 Infiltration, in² Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 135009 61933 Energy use, kBtu 2727 1251 Energy cost, \$ NA Saved by daylighting, kWh 4702 Total Electric, kWh 4727 915/0 915/0 Internal/External lights, kWh 0/2613/386 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 5.6 3.7 Peak Electric, kW 22383/96583/118965 Fuel, hw/heat/total, kBtu Emissions, CO2/SO2/NOx, lbs 22383/23420/45803 20369/50/35 11763/42/25 206580 203458 Construction Costs 310302 257916 Life-Cycle Cost





Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1_5\PROJ1 roject: PROJ2 Gas Furnace Case Infiltration 2.0 ACH Case escription: cheme Number: 9 / Saved23 / SavedPLUMBLEELIB / SavedPLUMBLEELIB / Savedvalid/NAvalid/NAEES by Harry Boody, PE
Grnsboro.et1Grnsboro.et1Office cGrnsboro.et1 Library Name: Simulation status, Thermal/DL comments: Weather file: Floor Area, ft² 2160.0 5856.5 5856.5 Surface Area, ft² 18653.0 Yolume, ft³ Yotal Conduction UA, Btu/h-F 18653.0 362.4 362.4 0.062 Average U-value, Btu/hr-ft2-F 0.062 2 x 4 cypress, R=14.5, etc 2 x 4 cypress, R=14.5, etc shingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5 Vall Construction koof Construction Crawl Space, Reff=162.7,etc Crawl Space, Reff=162.7,etc 2058 double, wood, U=0.48,etc2058 double, wood, U=0.48,etc Floor type, insulation Window Construction 36 deg lat plumblee,etc 36 deg lat plumblee,etc Vindow Shading Wall total gross area, ft² 1536 1536 Roof total gross area, ft² 2160 2160 Ground total gross area, ft² Window total gross area, ft² Windows (N/E/S/W:Roof) 2160 2160 427 427 5/7/13/4:0 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 HVAC system DX Cooling with Gas Furnace DX Cooling with Gas Furnace 88/41/55 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 1778/0 Rated Air Flow/MOOA, cfm 1210/0 68.0 °F, no setback 77.0 °F, no setup 68.0 °F, no setback Heating thermostat 77.0 °F, no setup Cooling thermostat eff=80,EER=10.1 eff=80,EER=10.1 Heat/cool performance no/NA no/NA Economizer?/type Duct leaks/conduction losses, total % 11/10 11/10 0.20/0.04/2.08/0.25 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 none Added mass? none no no Daylighting? ACH=2.0 ACH=0.2 Infiltration, in² Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 166753 61933 Energy use, kBtu 3369 1251 Energy cost, \$ NA Saved by daylighting, kWh 4793 4727 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh Heating/Cooling/Fan, kWh 0/2636/454 0/2744/280 0/788 0/788 Hot water/Other, kWh 6.2 3.7 Peak Electric, kW

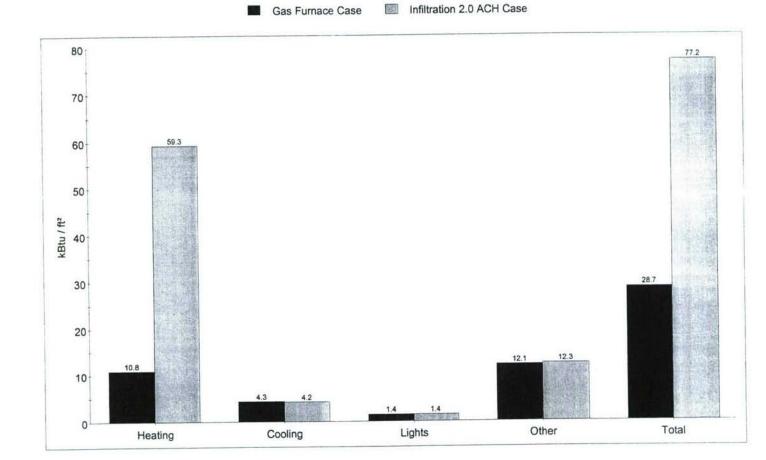
 Fuel, hw/heat/total, kBtu
 22383/23420/45803

 Emissions, C02/S02/NOx, lbs
 11763/42/25

 Construction Costs
 203458

 22383/128014/150397 24204/54/39 209245 Construction Costs 333136 257916 Life-Cycle Cost





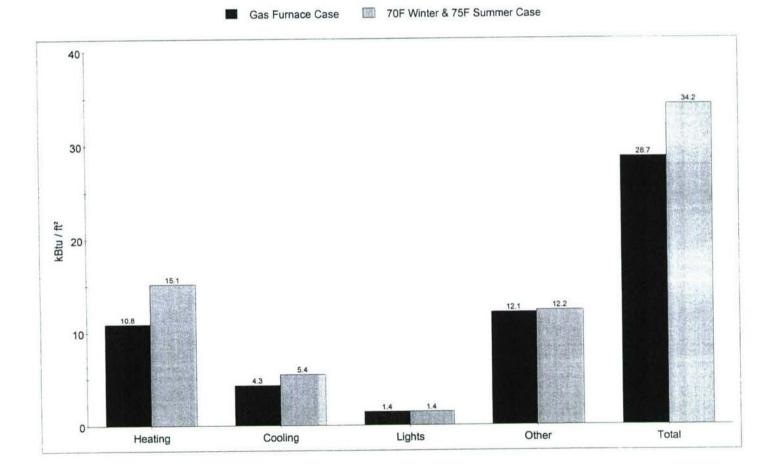
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Jul 26, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 Gas Furnace Case 70F Winter & 75F Summer Case Description: Scheme Number: 9 / Saved 24 / Saved PLUMBLEELIB / Saved PLUMBLEELIB / Saved valid/NA valid/NA 24 / Saved Library Name: Simulation status, Thermal/DL EES by Harry Boody, PE Grnsboro.et1 Crnsboro.et1 Crnsboro.et1 Comments: Weather file: 2160.0 2160.0 Floor Area, ft² 5856.5 5856.5 Surface Area, ft² 18653.0 18653.0 Volume, ft³ Total Conduction UA, Btu/h-F 362.4 362.4 0.062 0.062 Average U-value, Btu/hr-ft²-F 2 x 4 cypress, R=14.5,etc 2 x 4 cypress, R=14.5,etc shingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5 Crawl Space, Reff=162.7,etc Crawl Space, Reff=162.7,etc Wall Construction Roof Construction Floor type, insulation 2058 double, wood, U=0.48,etc2058 double, wood, U=0.48,etc Window Construction 36 deg lat plumblee,etc 36 deg lat plumblee,etc Vindow Shading Wall total gross area, ft² 1536 1536 2160 2160 Roof total gross area, ft² Ground total gross area, ft² Vindow total gross area, ft² 2160 2160 427 427 5/7/13/4:0 5/7/13/4:0 Windows (N/E/S/W:Roof) double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace HVAC system 41/26/35 Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 1416/0 1210/0 Rated Air Flow/MOOA, cfm 70.0 °F, no setback 75.0 °F, no setup 68.0 °F, no setback Heating thermostat 77.0 °F, no setup Cooling thermostat eff=80,EER=10.1 eff=80,EER=10.1 Heat/cool performance no/NA Duct leaks/conduction losses, total % 11/10 Peak Gains; IL,EL,HW,OT; W/ft² 0.20/0.04/2.08/0.25 no/NA 11/10 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? ACH=0.2 ACH=0.2 Infiltration, in² Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 73980 61933 Energy use, kBtu 1495 1251 Energy cost, \$ NA Saved by daylighting, kWh 4727 5546 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh 0/3438/405 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 4.0 3.7 Peak Electric, kW
 Feak Electric, km
 22383/23420/45803

 Fuel, hw/heat/total, kBtu
 22383/23420/45803

 Emissions, C02/S02/NOx, lbs
 11763/42/25

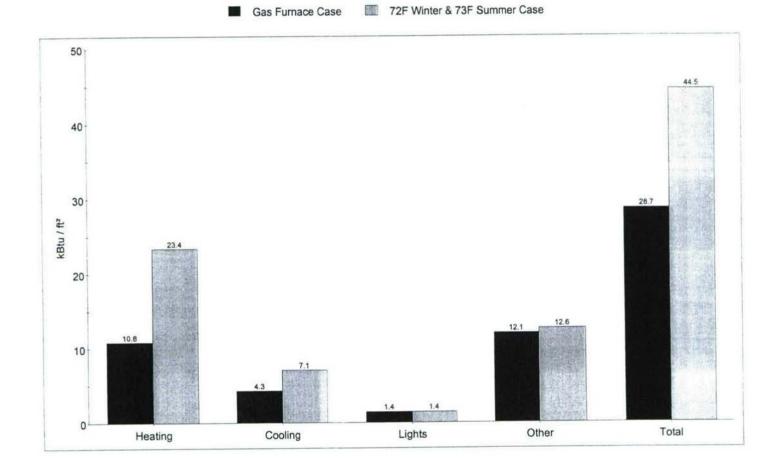
 Construction Costs
 203458
 22383/32673/55056 13956/50/30 203458 201592 Construction Costs 266986 257916 Life-Cycle Cost



PROJ2 - ANNUAL ENERGY USE

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Jul 27, 2004 nergy-10 Summary Page Project Directory: C:\Program Files\Energy10v1 5\PROJ1 Project: PROJ2 Gas Furnace Case 72F Winter & 73F Summer Case Scheme Number: Gas Furnace current 9 / Saved PLUMBLEELIB / Saved walid/NA PLUMBLEELIB / Saved valid/NA PLUMBLEELIB / Saved PLUMBLEELIB / SAVES 29 / Saved Library Name: EES by Harry Boody, PE Grnsboro.et1 Valid/NA EES by Harry Boody, PE Grnsboro.et1 Simulation status, Thermal/DL Comments: Neather file: 2160.0 2160.0 Floor Area, ft² 5856.5 5856.5 Surface Area, ft² 18653.0 18653.0 Volume, ft³ Fotal Conduction UA, Btu/h-F 362.4 362.4 0.062 Average U-value, Btu/hr-ft2-F 0.062 2 x 4 cypress, R=14.5,etc 2 x 4 cypress, R=14.5,etc shingle, attic, r-30, R=30.5 shingle, attic, r-30, R=30.5 Crawl Space, Reff=162.7,etc Crawl Space, Reff=162.7,etc Nall Construction Roof Construction Floor type, insulation 2058 double, wood, U=0.48,etc2058 double, wood, U=0.48,etc Window Construction 36 deg lat plumblee,etc 36 deg lat plumblee,etc Vindow Shading Vall total gross area, ft² 1536 1536 2160 Roof total gross area, ft² 2160 2160 Ground total gross area, ft² 2160 427 427 Vindow total gross area, ft² 5/7/13/4:0 Windows (N/E/S/W:Roof) 5/7/13/4:0 double, U=0.49 double, U=0.49 Glazing name Operating parameters for zone 1 DX Cooling with Gas Furnace DX Cooling with Gas Furnace HVAC system Rated Output (Heat/SCool/TCool), kBtu/h 38/25/33 44/28/37 1674/0 1210/0 Rated Air Flow/MOOA, cfm 72.0 °F, no setback 73.0 °F, no setup 68.0 °F, no setback 77.0 °F, no setup Heating thermostat Cooling thermostat eff=80,EER=10.1 eff=80, EER=10.1 Heat/cool performance no/NA no/NA Economizer?/type Duct leaks/conduction losses, total % 11/10 11/10 Peak Gains; IL, EL, HW, OT; W/ft² 0.20/0.04/2.08/0.25 0.20/0.04/2.08/0.25 none none Added mass? no no Daylighting? ACH=0.2 ACH=0.2 Infiltration, in² Results: Energy cost 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 2.020\$/Therm,0.069\$/kWh,0.000\$/kW 01-Jan to 31-Dec 01-Jan to 31-Dec Simulation dates 96174 61933 Energy use, kBtu 1943 1251 Energy cost, \$ NA Saved by daylighting, kWh 6815 4727 Total Electric, kWh 915/0 915/0 Internal/External lights, kWh 0/4482/630 0/2744/280 Heating/Cooling/Fan, kWh 0/788 0/788 Hot water/Other, kWh 4.2 3.7 Peak Electric, kW Fuel, hw/heat/total, kBtu Emissions, CO2/SO2/NOx, lbs 22383/50536/72919 22383/23420/45803 11763/42/25 17771/62/37 202916 203458 Construction Costs 282253 Life-Cycle Cost 257916



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