

**Energy Consumption Series**

# **Energy End-Use Intensities in Commercial Buildings**

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This report was undertaken in response to CBECS customer requests for more information on how energy is used in buildings, which was an overall theme of the 1992 User Needs Study. (See *User Needs Study for the 1992 Commercial Buildings Energy Consumption Survey*, DOE/EIA-0555(92)/4 (Washington, DC, September 1992).) This is EIA's first report to present data on how much energy is used for heating, cooling, lighting, and other end uses in commercial buildings. We encourage comments from our readers. Feedback from the readers of this report will allow us to enhance our methodology and presentation as we undertake the end-use estimates based on the 1992 CBECS. Comments and suggestions regarding end-use estimates should be addressed to Eugene M. Burns by phone at (202) 586-1125, by FAX at (202) 586-0018, or by e-mail at [eburns@eia.doe.gov](mailto:eburns@eia.doe.gov). The mailing address is:

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# Executive Summary

The demand for energy in U.S. stores, offices, schools, hospitals, and other commercial buildings has been increasing. This report examines energy intensities in commercial buildings for nine end uses: space heating, cooling, ventilation, lighting, water heating, cooking, refrigeration, office equipment, and "other." The objective of this analysis was to increase understanding of how energy is used in commercial buildings and to identify targets for greater energy efficiency which could moderate future growth in demand.

The source of data for the analysis is the 1989 Commercial Buildings Energy Consumption Survey (CBECS), which collected detailed data on energy-related characteristics and energy consumption for a nationally representative sample of approximately 6,000 commercial buildings. The analysis used 1989 CBECS data because the 1992 CBECS data were not yet available at the time the study was initiated. The CBECS data were fed into the Facility Energy Decision Screening (FEDS) system, a building energy simulation program developed by the U.S. Department of Energy's Pacific Northwest Laboratory, to derive engineering estimates of end-use consumption for each building in the sample. The FEDS estimates were then statistically adjusted to match the total energy consumption for each building.

This is the Energy Information Administration's (EIA) first report on energy end-use consumption in commercial buildings. This report is part of an effort to address customer requests for more information on how energy is used in buildings, which was an overall theme of the 1992 user needs study. (See *User-Needs Study for the 1992 Commercial Buildings Energy Consumption Survey*, DOE/EIA-0555(92)/4, Washington, DC, September 1992.) The end-use data presented in this report were not available for publication in *Commercial Buildings Energy Consumption and Expenditures 1989* (DOE/EIA-0318(89), Washington, DC, April 1992). However, subsequent reports on end-use energy consumption will be part of the Commercial Buildings Energy Consumption and Expenditures series, beginning with a 1992 data report to be published in early 1995.

Since EIA is publishing commercial energy end-use estimates for the first time, readers are urged to provide comments and suggestions for the improvement of 1992 and future end-use energy estimates.

## Overview of Energy Consumption in Commercial Buildings

In spite of the gains in energy efficiency made since the 1970's, economic expansion and increases in energy-consuming services during the 1980's caused a net increase in energy consumption in the commercial sector. Energy demand in the commercial sector grew during the 1980's by 1.0 percent a year, second only to the transportation sector's rate of 1.4 percent a year. In contrast, energy demand in both the residential and industrial sectors declined during the 1980's. Commercial buildings in 1989 consumed almost 6 quadrillion Btu of energy for end uses and ran up an energy bill of over \$70 billion.

By type of building, the three largest energy users were (a) office buildings (1.2 quadrillion Btu); (b) department stores, drugstores, gasoline stations, post offices, and other mercantile and service buildings (1.0 quadrillion Btu); and (c) education buildings (0.7 trillion Btu).

Of the various end uses, space heating accounted for the largest share of consumption (35 percent), followed by lighting (18 percent), water heating (9 percent), office equipment (7 percent), cooling (5 percent), ventilation (5 percent), cooking (5 percent), and refrigeration (3 percent).

Of the four major energy sources (electricity, natural gas, fuel oil, and district heat) consumed in commercial buildings in 1989, electricity accounted for almost 50 percent of all the energy delivered to commercial sites, while natural gas accounted for 36 percent of site consumption. Natural gas space heating and electric lighting were the

two largest consumers of site energy. However, the amount spent on electric lighting was more than double the amount spent on natural gas for all end uses, due to the higher price of electricity compared with the price of natural gas.

An "energy intensity" is the ratio of energy consumption to a measure of the demand for energy services. A common measure of energy intensity is the ratio of the amount of energy consumed for the building as a whole or for a particular end use to the square footage of a building's floorspace. More precise measures of energy intensity can account for such factors as building operating hours or weather conditions. Intensity ratios allow buildings to be compared in terms of energy consumption, even though they are of different sizes, are located in different climates, and have different operating hours.

Analysis of energy intensities for the buildings in the 1989 CBECS showed that:

- The highest energy intensities per square foot were found in buildings constructed in the 1960's, with buildings constructed in the 1980's continuing a trend towards lower intensities.
- Buildings in the coolest climates had the highest energy intensities per square foot because of their greater demand for space heating, despite their lower demand for cooling.
- Each type of commercial building had a different end-use intensity profile, with no two end-use profiles being alike. Some end uses, such as heating, cooling, ventilation, and lighting, were found, to some degree, in all types of buildings. However, other end uses reflected the special activities performed within particular types of buildings.

## Space-Conditioning Intensities

Space conditioning--heating, cooling, and ventilation--accounted for 45 percent of all energy consumed in commercial buildings in 1989. Natural gas was the dominant energy source for space heating in commercial buildings in 1989, providing 63 percent of all the energy consumed for space heating.

- Whether electricity is measured by site energy (consumed by the end user) or by primary energy (consumed at the generating plant), natural gas provided a much higher percentage of the space heating energy consumed in buildings constructed during the 1980's than electricity did, even though the amount of floorspace heated by the two energy sources was roughly equal.
- Buildings constructed in the 1970's had the highest cooling intensities, defined as the ratio of energy used for cooling to the product of the cooled square footage, the annual building operating hours, and the average daily cooling degree-days (CDD's).
- Larger buildings had the highest ventilation intensities, defined as the ratio of energy used for ventilation to the product of the square footage and the annual building operating hours.

## Intensities of Other End Uses

Other end uses--lighting, water heating, cooking, refrigeration, office equipment, and miscellaneous uses--accounted for 55 percent of all energy consumed in commercial buildings in 1989. Lighting intensities were defined as the ratio of energy used for lighting to the product of the lighted square footage and the annual building operating hours. Intensities for the remaining end uses were defined as the ratio between the energy used and the product of square footage and the annual operating hours.

- Office buildings had the highest intensities for lighting and for office equipment.
- Buildings constructed during the 1970's and 1980's had the highest lighting intensities, while the oldest buildings had the lowest lighting intensities.
- Food service and health care buildings had the highest water-heating intensities per square foot--more than five times the average for all buildings.
- Food sales and food service buildings had the highest energy intensities for cooking and refrigeration.

## **Targets for Reducing Energy Intensities**

The method used to determine targets for reducing energy intensities was to extrapolate the energy consumption patterns of the 1980's buildings to the entire commercial building stock. Intensities were based upon the entire building stock, not just buildings using a particular fuel for a given end use. This method of extrapolation reflected both the level of penetration and the efficiencies of 1980's technologies in computing hypothetical consumption levels for the total building stock.

- If all commercial buildings used natural gas for heating with the same intensity as did buildings constructed in the 1980's, the total consumption of natural gas for space heating would fall 201 trillion Btu, or 17 percent.
- If all buildings used electricity for cooling with the same intensity as did buildings constructed in the 1980's, the total consumption of electricity for cooling would drop by 9 percent (23 trillion Btu). However, the consumption of electricity for ventilation would rise by 5 percent (14 trillion Btu), for a net reduction of 9 trillion Btu, or 2 percent.

The analysis showed that lighting and office equipment presented especially worthwhile opportunities for moderating future growth in energy demand by increasing energy efficiency. Although energy efficiencies may have improved during the 1980's, the demand for these two energy services, especially for office equipment, also increased dramatically.

- If all commercial buildings had the same lighting intensity as buildings constructed in the 1980's, consumption of electricity for lighting would increase 9 percent (94 trillion Btu).
- If all buildings used energy for office equipment with the same intensity as 1980's buildings, consumption of electricity for office equipment would increase by 26 percent (99 trillion Btu).

# Section 1. Introduction

The demand for energy has been increasing in U.S. stores, offices, schools, hospitals, and other commercial buildings. To find out where the best opportunities lie for improving energy efficiency, this report looks at the intensities of energy use in commercial buildings in 1989, the latest year for which energy consumption figures for commercial buildings are available.

This report is the first published by the Energy Information Administration (EIA) on the topic of energy end-use consumption in commercial buildings. The study of end-use energy consumption is important for the understanding of how and why energy is used. Conceptually, the end-uses of energy provide an intermediate level of analysis, below the consuming unit (the commercial building) but above the actual equipment used to perform the end use.

This report is part of an effort to address requests from customers for more information on how energy is used in buildings--an overall theme of the 1992 user needs study. (See *User-Needs Study for the 1992 Commercial Buildings Energy Consumption Survey*, DOE/EIA-0555(92)/4, Washington, DC, September 1992.) Subsequent reports on end-use energy consumption will be part of the Commercial Buildings Energy Consumption and Expenditures series, beginning with a 1992 data report to be published in early 1995. It is hoped that each successive report will increase understanding of how energy is being used in commercial buildings and, consequently, of where the best opportunities for improving energy efficiency lie.

## Report Outline

This report has five sections. Section 1 gives background information on energy consumption in commercial buildings and introduces energy end-use intensities. Section 2 presents an overview of energy consumption and energy intensities in commercial buildings. Section 3 is devoted to the largest end use: space conditioning--heating, cooling, and ventilation. Section 4 deals with all other end uses--lighting, water heating, cooking, refrigeration, and office equipment. The concluding section, Section 5, discusses potential targets for reducing end-use intensities in commercial buildings.

The main body of the report is followed by three appendices and a glossary. Appendix A discusses the methodology for developing the end-use intensity estimates. Appendix B consists of 13 tables presenting detailed energy end-use consumption data. Appendix C contains maps of U.S. climate zones and Census regions and divisions. The report concludes with a Glossary, which should be consulted for explanations of terms used in this report.

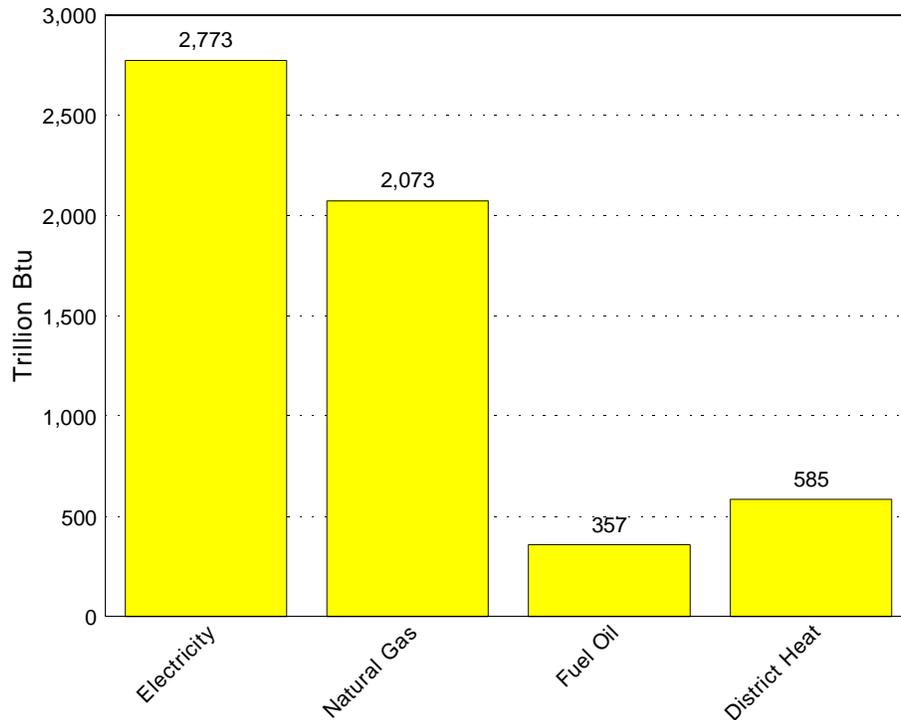
## Trends in Energy Consumption in Commercial Buildings

In the 1960's, when energy was cheap and the earth's resources seemed inexhaustible, building designers seldom discussed the conservation of energy during the design process. They saw little reason for making a building in Maine look different from one in Florida, and they favored all-glass buildings in all regions. They considered the climate in which the building was located to be largely irrelevant.

Then came the oil supply disruptions of 1973 and 1979, which caused the price of oil to skyrocket and triggered fears about U.S. energy security. At the same time, reports on how fossil fuel emissions were damaging the air, water, plant life and wildlife made Americans aware of the need to protect the environment.

As a result, energy conservation became a major concern in the 1980's. New commercial buildings built in that decade were designed for their specific climates. They were well-insulated, with multipane and reflective windows, more efficient space conditioning equipment, and better lighting systems. Furthermore, many older buildings were retrofitted to improve their energy efficiency.

**Figure 1. Energy Consumption in U.S. Commercial Buildings, by Energy Source, 1989**



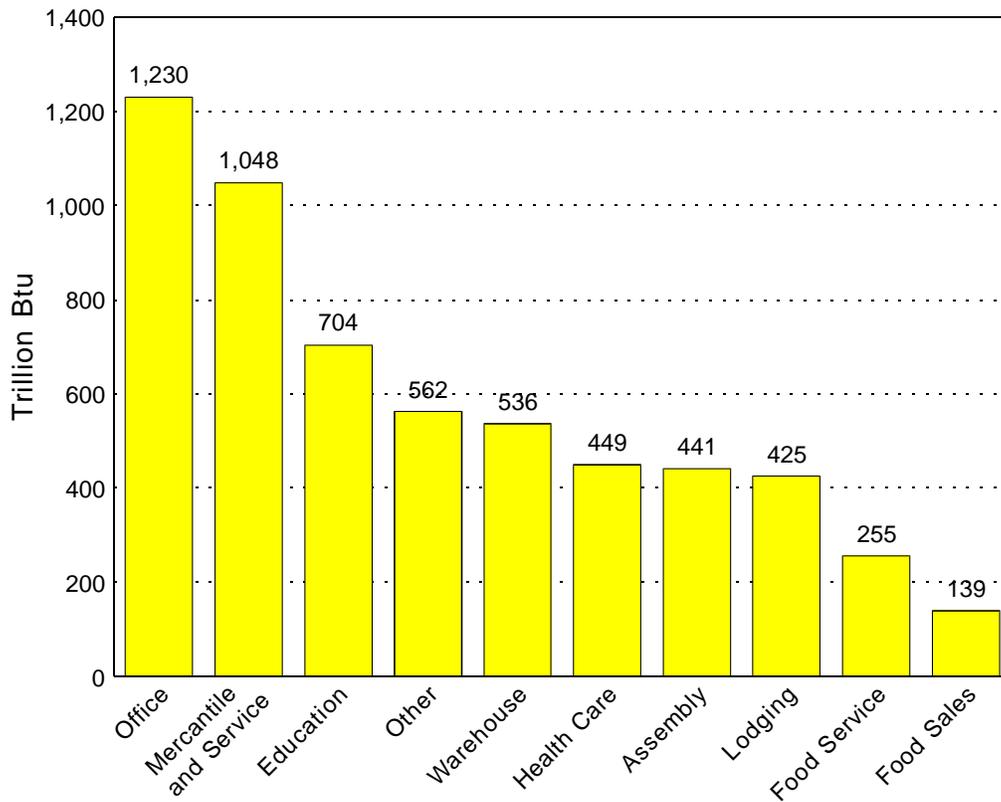
Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

In spite of the gains in energy efficiency made since the 1970's, an expanding economy and increases in energy-consuming services during the 1980's caused a net increase in energy consumption in the commercial sector. This demand was largely due to more computers and other office equipment, better lighting, and more comfortable heating, cooling, and ventilation. In the 1980's, energy demand in the commercial sector grew by 1.0 percent a year, second only to the transportation sector's rate of 1.4 percent a year. In contrast, energy demand in both the residential and industrial sectors declined during the 1980's.

In 1989, U.S. commercial buildings used 5.8 quadrillion Btu of energy, the equivalent to 260 million short tons of coal, 5.6 trillion cubic feet of dry natural gas, 1.0 billion barrels of crude oil, or 128 days of petroleum imports.

- Figure 1 shows that commercial buildings used 813 billion kilowatthours (2,773 trillion Btu) of electricity, equivalent to 478 million barrels of crude oil.
- Commercial buildings used 2.0 trillion cubic feet (2,073 trillion Btu) of natural gas, equivalent to 357 million barrels of crude oil.
- Commercial buildings used 2.55 billion gallons (357 trillion Btu) of fuel oil, equivalent to 61 million barrels of crude oil.
- Commercial buildings used 585 trillion Btu of district heat (steam and hot water delivered to a building from a central plant or utility), equivalent to 569 billion cubic feet of natural gas or 4.2 billion gallons of fuel oil.

Figure 2. Energy Consumption in U.S. Commercial Buildings, by Principal Building Activity, 1989



Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

- Figure 2 shows that the three largest energy users were: (a) **office** buildings (1,230 trillion Btu); (b) department stores, drugstores, automotive dealers, gasoline stations, laundries, post offices and other **mercantile and service** buildings (1,048 trillion Btu); and (c) **education** buildings (704 trillion Btu).
- The next largest energy users were: (a) **warehouses** (536 trillion Btu); (b) hospitals and other **health care** buildings (449 trillion Btu); (c) concert halls, night clubs, theaters, bowling alleys, indoor pools, skating rinks, auditoriums, convention halls, stadiums, and other buildings used for **assembly** (441 trillion Btu); and (d) hotels, motels, convents, dormitories, and other buildings used for **lodging** (425 trillion Btu).
- The smallest energy users were: (a) restaurants and other **food service** buildings (255 trillion Btu), and (b) supermarkets, grocery stores, bakeries, and other buildings used for **food sales** (139 trillion Btu).
- Laboratories, parking garages, public order and safety buildings, vacant buildings and all **other** commercial buildings not included in above categories used 562 trillion Btu.

## Energy Intensities for Commercial End Uses

"Energy intensity" is the term used to express the ratio of energy consumption to a measure of the demand for energy services. A common measure of energy intensity is the ratio of the amount of energy consumed for the building as a whole or for a particular end use to the square footage of a building's floorspace. This is the measure used throughout Appendix B, "Detailed Tables." However, a more precise measure would consider the building's operating hours and climate. Taking these factors into account allows the energy intensities of buildings to be compared, even though the buildings are of different sizes, are located in different climates, and have different operating hours.

In this report, energy intensities are often measured by taking into account operating hours or climate. For example:

- Space-heating intensity is expressed as the ratio of the energy used for space heating to the product of (1) the number of square feet of heated floorspace in a building, (2) the building's annual operating hours, and (3) the average daily number of "heating degree-days" (HDD's). The HDD's for a single day are the difference between 65 degrees Fahrenheit and the average temperature if the average temperature is below 65 degrees Fahrenheit, and is zero otherwise. Obviously, the more HDD's a building experiences the higher will be its demand for space heating.
- Cooling intensity is expressed in the same way as space-heating intensity, except that "cooling degree-days" (CDD's) are used instead of HDD's. The CDD's for a single day are the difference between 65 degrees Fahrenheit and the average temperature if the average temperature is above 65 degrees Fahrenheit, and is zero otherwise. Again, the more CDD's a building experiences the higher will be its demand for cooling.
- Ventilation intensity is expressed as the ratio of the energy used for ventilation to the product of the square footage of the building and the annual building operating hours. Since ventilation is used for both heating and cooling, as well as for circulating air within a building, HDD's and CDD's are irrelevant.
- Lighting intensity is expressed as the ratio of the energy used for lighting to the product of the square footage of lighted floorspace and the annual building operating hours.
- All other intensities (water heating, cooking, refrigeration, office equipment, and "other") are expressed only as the ratio of the energy used for the particular end use to the square footage of building floorspace.

## Data Sources and Methodology

The estimates of end-use energy intensities presented in this report were based on data from the 1989 Commercial Buildings Energy Consumption Survey (CBECS) in conjunction with end-use estimates modelled by the Facility Energy Decision Screening (FEDS) system.

The CBECS is a nationally representative probability sample of commercial buildings. For purposes of this survey, a commercial building is defined as one whose principal activity is not residential or industrial. The survey covers all commercial buildings over 1,000 square feet. For each of the roughly 6,000 buildings in the sample, the CBECS collects data on (1) energy-related characteristics of the building through personal interviews with the buildings' owners or managers and (2) total energy consumption for all end uses from billing data provided by the buildings' energy suppliers. The 1989 CBECS, which provides data for that calendar year, was used for the present analysis because this survey was the latest one available at the time the study was initiated. It is anticipated that the report containing estimates for 1992 will be published in early 1995.

The separate end-use consumption estimates were derived for each sampled building by using the FEDS system, a building energy simulation program developed at the Pacific Northwest Laboratory for the U.S. Department of Energy's Federal Energy Management Program and the U.S. Army Construction Engineering Research Laboratory. The FEDS engineering model was originally designed to assess the potential for energy retrofits at large federal installations. The FEDS was used to calculate the initial engineering end-use estimates for each building in the 1989 CBECS sample. These engineering estimates were then statistically adjusted to match the total energy consumption for each building.

The method for identifying targets for reducing energy intensities relied on the extrapolation of the energy consumption patterns of the 1980's buildings to the entire commercial building stock. This method highlights the ways in which new construction differs from the rest of the building stock. Thus, the end uses with significantly higher energy consumption would make the best targets for energy efficiency measures.

The method, performed for five major end uses (natural gas space heating and electric cooling, ventilation, lighting, and office equipment use), had two parts.

- First, the energy intensities of 1980's buildings were calculated by using the more precise measures of energy intensities. Energy intensities were calculated by principal building activity categories. For the five most numerous types of buildings in the CBECS sample (education, health care, mercantile, office, and warehouse), the buildings were divided into two groups: (1) small buildings, having 50,000 square feet of floorspace or less, and (2) large buildings, having over 50,000 square feet of floorspace.
- Second, estimates were made of the energy intensities and consumption for the five end uses, assuming that all buildings had the same end-use intensities as those of 1980's buildings.

The end uses that showed the greatest growth in consumption were identified as targets for energy efficiency measures.

For further information on sources and methodology, see Appendix A, "The Development of End-Use Intensity Estimates."

## Section 2. Energy Use in Commercial Buildings

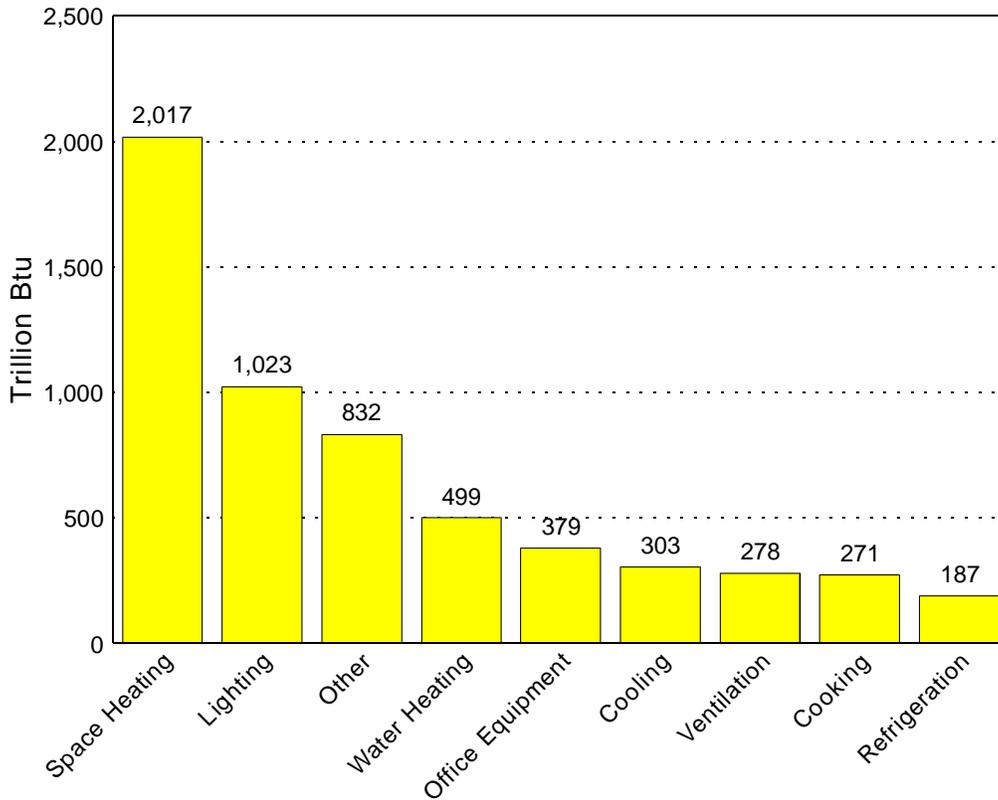
*The purpose of this section is to provide an overview of how energy was used in commercial buildings. Focusing on 1989 buildings, the section shows energy consumption by energy source (electricity, natural gas, fuel oil, and district heat), by energy end use (space heating, cooling, ventilation, water heating, lighting, cooking, refrigeration, office equipment, and other), and by various building characteristics (floorspace, year constructed, weekly operating hours, climate zone, and building activity).*

Key findings of this section include:

- Of all the various end uses, space heating accounted for the largest share of consumption (35 percent), followed by lighting (18 percent), water heating (9 percent), office equipment (7 percent), cooling (5 percent), ventilation (5 percent), cooking (5 percent), and refrigeration (3 percent) (Figure 3).
- Natural gas consumption was dominated by consumption for space heating, accounting for 61 percent of the natural gas consumed (Figure 4).
- Electricity accounted for almost 50 percent of all the energy delivered to commercial sites, while natural gas accounted for 36 percent of site consumption (Figure 5).
- Electricity accounted for over 70 percent of the primary energy consumption (the amount of energy consumed at commercial sites plus the amount of energy lost in producing and transmitting electricity and district heat) at commercial buildings, while natural gas accounted for only 18 percent of primary energy consumption (Figure 5).
- Electricity accounted for over 80 percent of the energy expenditures for commercial buildings, while natural gas accounted for only 13 percent (Figure 5).
- Natural gas space heating and electric lighting were the two largest consumers of site energy (Figure 6).
- Electric lighting accounted for the largest portion of energy expenditures in commercial buildings (Figure 6).
- Defining a building's energy intensity as the ratio of energy consumption to floorspace, the highest intensities were found in buildings constructed in the 1960's. Buildings constructed in the 1980's showed lower intensities (Figure 7).
- Buildings located in the coldest climate had the highest energy intensity because of the demand for space heating. Conversely, the buildings located in the warmest climate, had the lowest energy intensity because of the small demand for space heating, despite their greater need for cooling (Figure 8).
- The different types of commercial buildings had distinctive energy-use profiles (Figure 9).

## Energy Consumption by End Use

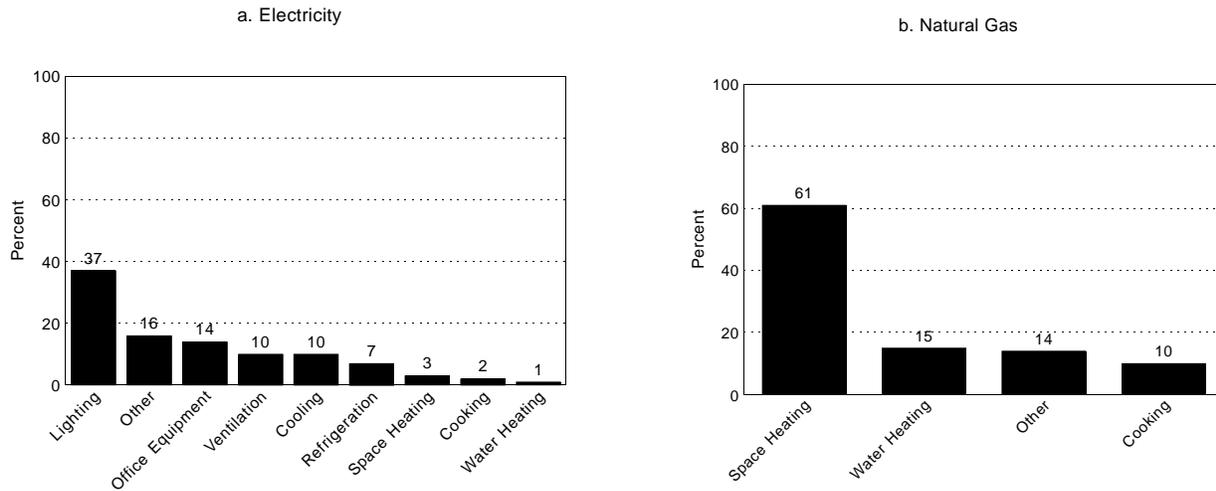
Figure 3. Energy Consumption in U.S. Commercial Buildings, by End Use, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 3 shows that of all the energy used for the various end uses in commercial buildings in 1989, the largest share was for space heating (35 percent), followed by lighting (18 percent), water heating (9 percent), office equipment (7 percent), cooling (5 percent), ventilation (5 percent), cooking (5 percent), and refrigeration (3 percent).
- Several other end uses, which have been grouped in the category called "other," used 14 percent of all energy used in buildings. Included in this category is energy consumed for such uses as elevators, medical and other laboratory equipment, and miscellaneous electrical appliances.

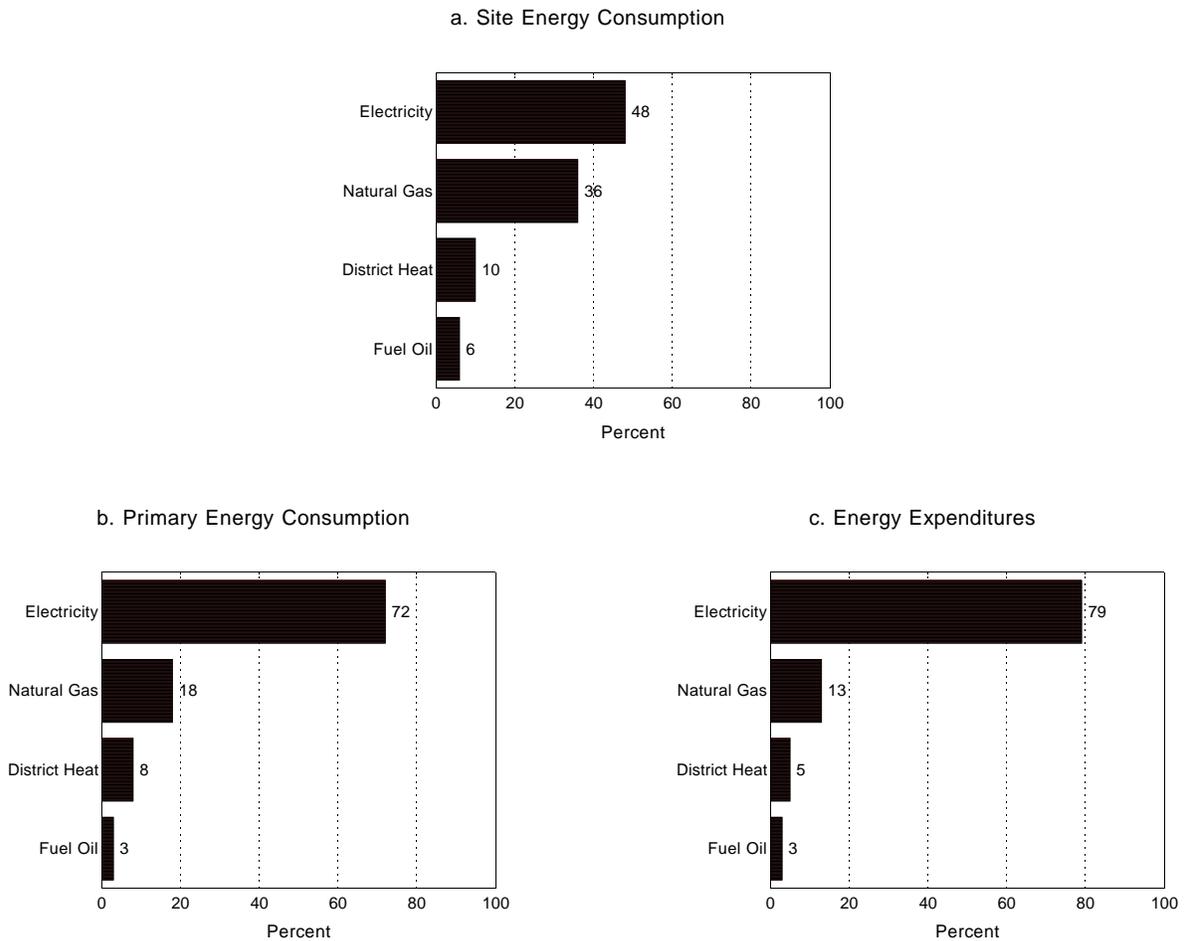
**Figure 4. Shares of Consumption for Electricity and Natural Gas, by End Use, 1989**



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- The two main energy sources consumed in commercial buildings in 1989 were electricity (2.8 quadrillion Btu) and natural gas (2.1 quadrillion Btu) (Figure 1).
- Figure 4 shows that electricity usage was spread among all nine end uses, while natural gas usage was more restricted to end uses involving heating (space heating, water heating, and cooking).
- Lighting was the largest single use of electricity, accounting for 37 percent of the electricity consumed.
- Natural gas consumption was dominated by space heating, accounting for 61 percent of the natural gas consumed.

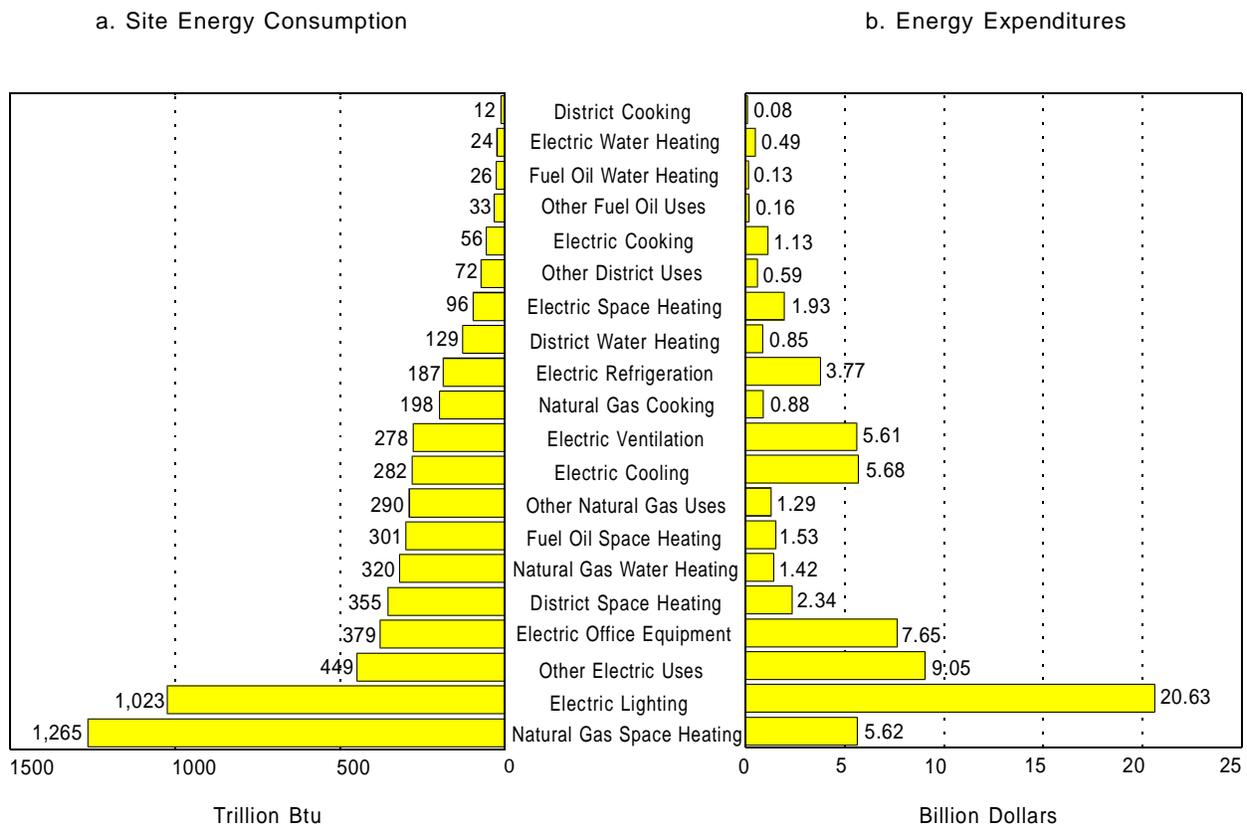
**Figure 5. Shares of End-Use Site Energy Consumption, Primary Energy Consumption, and Expenditures, by Energy Source, 1989**



Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

- Energy consumption can be measured by (1) the amount of energy delivered to a site (site consumption), (2) the amount of energy delivered to a site plus the amount of energy used to produce and transmit the electricity or district heat (primary energy consumption), or (3) the amount of money paid for the energy consumed at a site (energy expenditures).
- Figure 5 shows that electricity accounted for almost 50 percent of the site energy consumption, over 70 percent of the primary energy consumption, and almost 80 percent of the energy expenditures in commercial buildings.
- Natural gas, which accounted for 36 percent of site energy consumption, accounted for only 13 percent of energy expenditures, reflecting the lower price of natural gas in 1989 as with prices of other energy sources.
- Electricity, which in 1989 averaged \$20.17 per million Btu of site energy (6.9 cents per kilowatthour), was the most expensive energy source. (Natural gas averaged \$4.44 per million Btu; fuel oil, \$5.10 per million Btu; and district heat, \$6.59 per million Btu.)
- At a price of \$6.72 per million Btu of primary energy, electricity was still the most expensive energy source, but not by a wide margin. (The primary prices of natural gas and fuel oil were the same as the site prices; the primary price of district heat was \$4.40 per million Btu.)

**Figure 6. Energy End Uses Ranked by Site Energy Consumption and by Energy Expenditures, 1989**

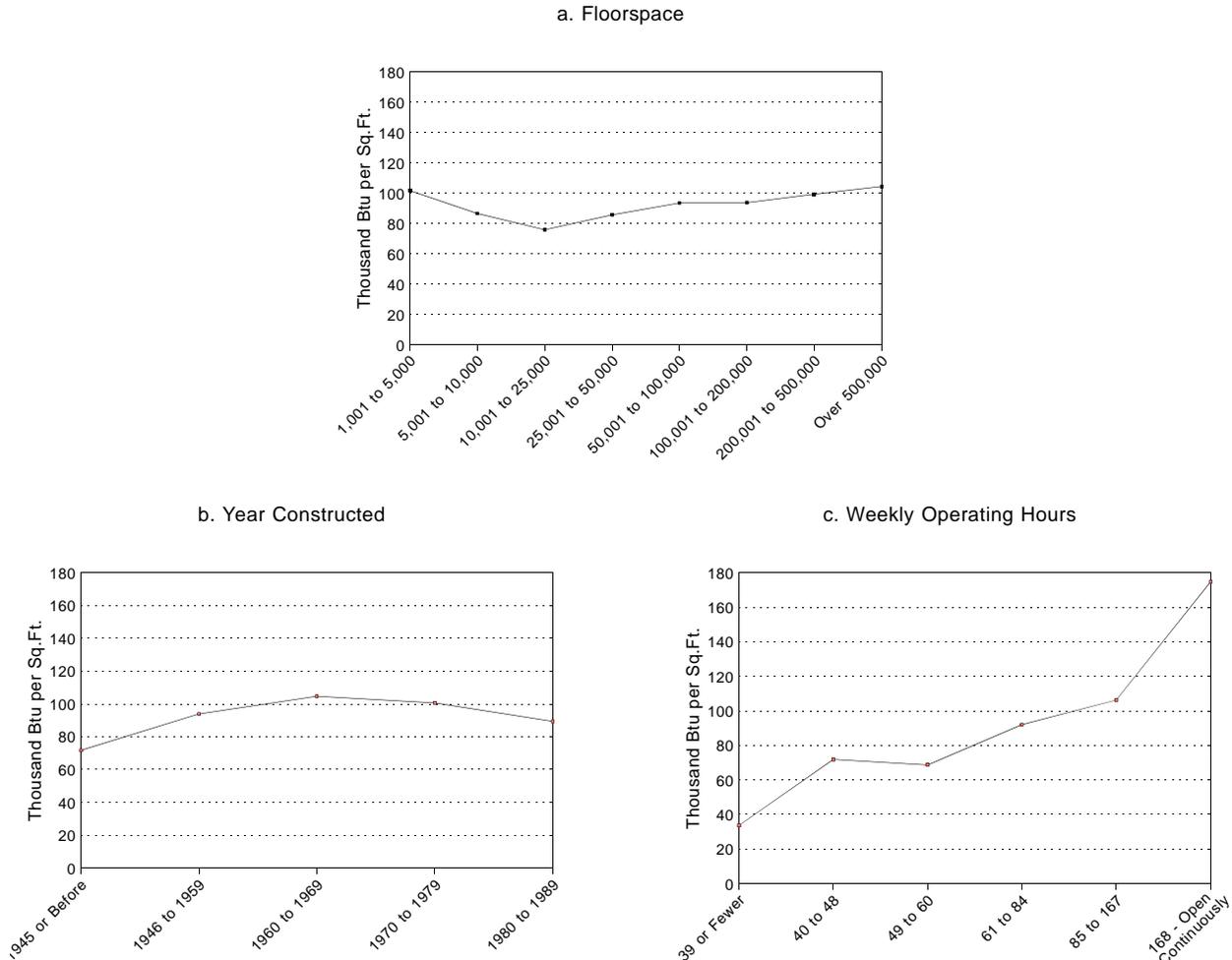


Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 6 shows that rankings of the top energy end uses differed markedly, depending on the criterion used (site consumption or expenditures). Rankings by primary energy were very similar to rankings by expenditures, due to the relatively narrow range of primary prices among the energy sources.
- Natural gas space heating and electric lighting were the two largest consumers of site energy. Each accounted for over 1 quadrillion Btu of energy consumption, out of a total site energy consumption of nearly 6 quadrillion Btu.
- Energy end-use expenditures can be approximated by multiplying the average fuel price by the amount of energy consumed for an end use.
- Electric lighting accounted for the largest portion of energy end-use expenditures in commercial buildings.
- The amount spent on electric lighting was more than double the amount spent on natural gas for all uses, and was considerably more than the amount spent for natural gas, fuel oil, and district heat combined.

## Major Influences on Energy Intensities

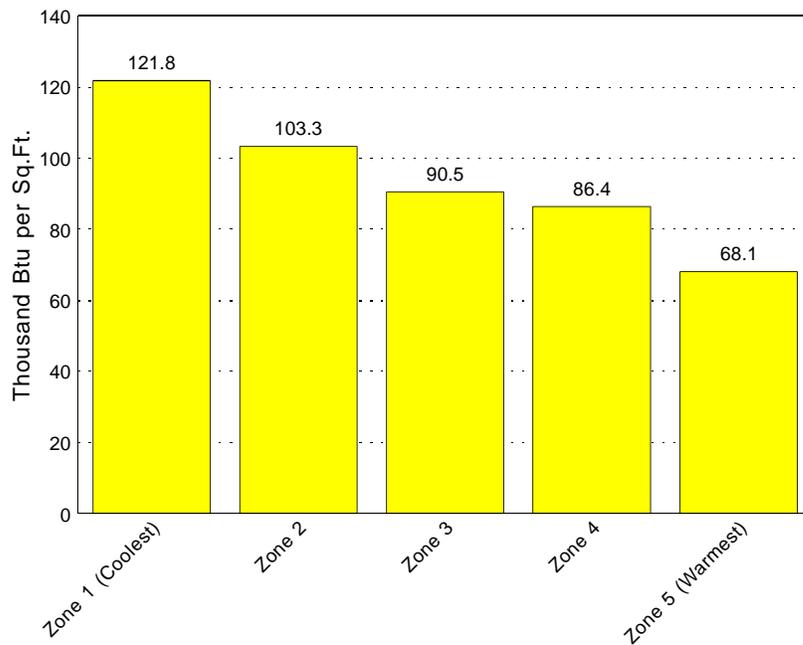
Figure 7. Energy Intensities for Commercial Buildings, 1989



Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

- "Energy intensity" is the ratio of energy consumption to a measure of the demand for energy services (such as building floorspace or weekly operating hours). Energy intensities facilitate the comparison of energy use across different kinds of buildings.
- Figure 7 shows that intensities per square foot were relatively flat across floorspace categories, indicating that the normalization by square footage largely achieved its aim.
- In general, the highest energy intensities were found in buildings constructed in the 1960's. Buildings constructed in the 1980's continued a trend towards lower intensities.
- In general, the longer the weekly operating hours, the higher the building's energy intensity per square foot.

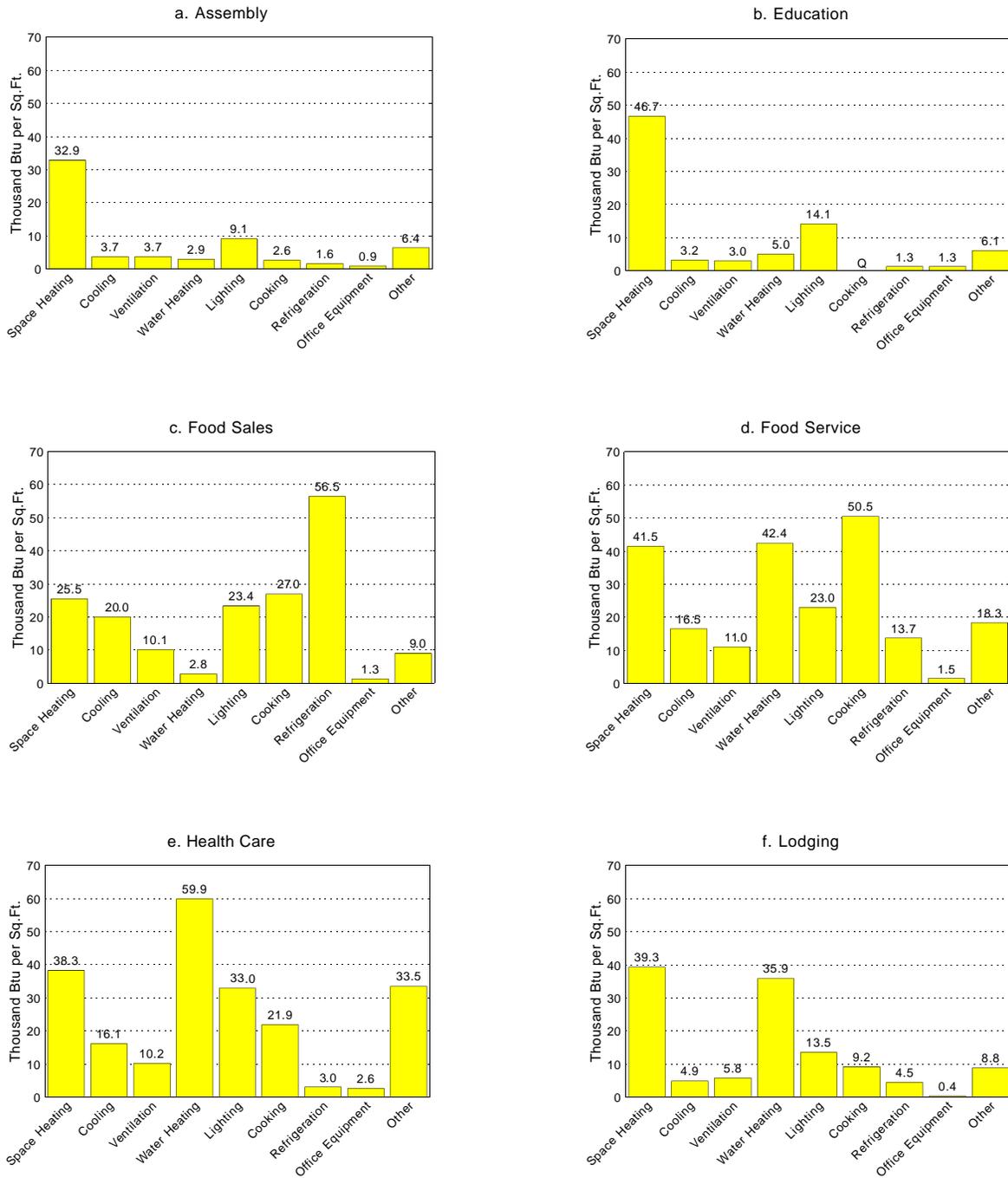
**Figure 8. Energy Intensities for Commercial Buildings, by Climate Zone, 1989**

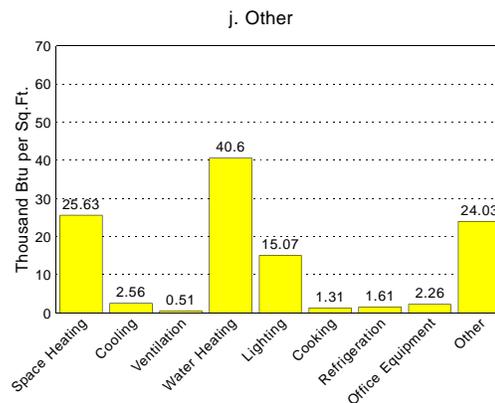
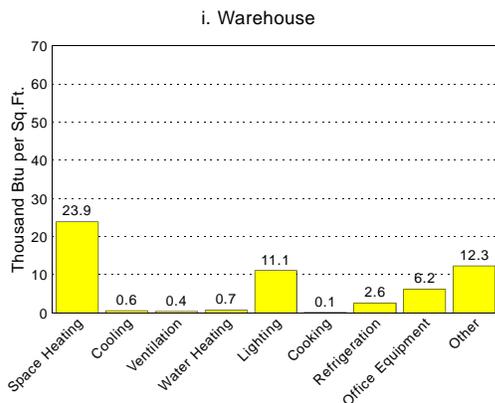
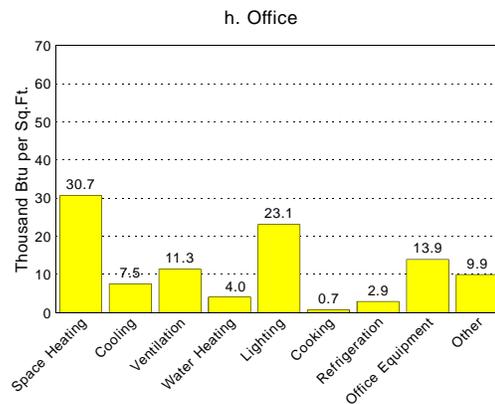
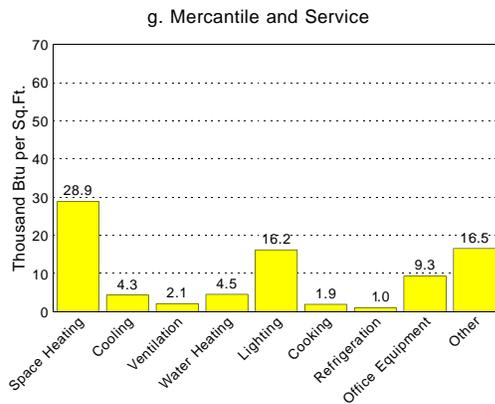


Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

- Figure 8 shows that the United States can be divided into climate zones according to the average number of heating degree-days (HDD's) and cooling degree-days (CDD's) that have occurred each year over a 45-year period. One HDD occurs when the temperature for the day averages one degree below 65 degrees Fahrenheit. One CDD occurs when the temperature for the day averages one degree above 65 degrees Fahrenheit.
- Zone 1 (the coolest) had the highest end-use intensity because of its greater demand for space heating. Conversely, Zone 5 (the warmest) had the lowest end-use intensity because of its small demand for space heating, even after taking into account the greater cooling load.

**Figure 9. End-Use Intensity Profiles, by Principal Building Activity, 1989**





Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- The ratio of a building's energy consumption for an end use to its floorspace is called an "end-use intensity."
- Figure 9 shows that the different types of commercial buildings had diverse end-use intensity profiles. No two end-use profiles were alike, and some were quite distinct.
- Some end uses, such as heating, cooling, ventilation, and lighting, were found to some degree in all types of buildings. However, other end-uses reflected the activities performed within particular types of buildings.
- Food sales, food service, and health care buildings were similar in having relatively high cooling, ventilation, and cooking intensities.
- Food sales buildings had relatively high refrigeration intensities.
- Food service and health care buildings had relatively high water-heating intensities.
- Office buildings had relatively high intensities for office equipment.
- Buildings in the "other" category, such as laboratories and some mixed commercial-industrial buildings, had a distinctively high intensity for "other" end use.

## Section 3. Space-Conditioning Intensities

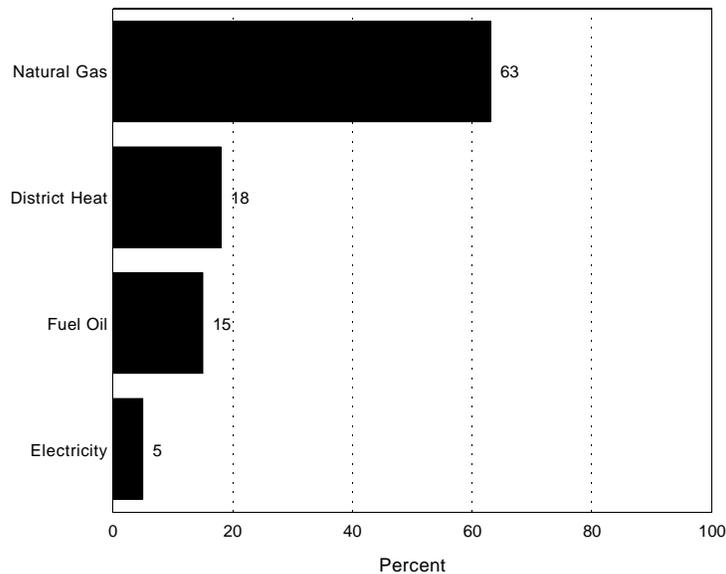
*The purpose of this section is to provide information on how energy was used for space conditioning--heating, cooling, and ventilation--in commercial buildings. For heating, it shows the percent of energy supplied by each energy source and compares space-heating intensities for natural gas and electricity, by the year the building was constructed, and by principal building activity. It also gives the heating intensities in buildings where natural gas was the main heating fuel, by year constructed, floorspace, weekly operating hours, and climate zone. In addition, it shows heating intensities in buildings where electricity was the main heating source, by year constructed and floorspace. This section also shows electric cooling and ventilation intensities in commercial buildings, by year constructed, floorspace, principal building activity, and climate zone.*

Key findings of this section include:

- Natural gas was the dominant energy source for space heating in commercial buildings in 1989, providing 63 percent of all the energy consumed for space heating (Figure 10).
- Natural gas provided a much higher percentage than electricity (whether measured by site or primary energy) of the space-heating energy consumed in buildings constructed during the 1980's, even though the amount of floorspace heated by the two energy sources was roughly equal (Figure 11).
- Natural gas space-heating intensities were higher than electricity intensities (site or primary). Possible explanations for the lower electricity intensities include the relatively higher prices of electricity (which may encourage more conservation measures, such as insulation) and the relatively younger age of electric space-heating equipment (Figure 12).
- Education and food service buildings had relatively high natural gas space-heating intensities, either per square foot or per heated square foot-hour-HDD. Health care buildings had the lowest intensities per square foot-hour-HDD (Figure 13).
- Buildings constructed in the 1970's had the highest cooling intensities, defined as the ratio of energy used for cooling to the product of the cooled square footage, the annual building operating hours, and the average daily CDD's (Figure 17).
- Larger buildings had the highest ventilation intensities, defined as the ratio of energy used for ventilation to the product of the square footage and the annual building hours. More energy is required to circulate air through the relatively large interior spaces of the larger buildings (Figure 18).

## Space Heating

Figure 10. Percent of Energy Supplied for Space Heating, by Energy Source, 1989

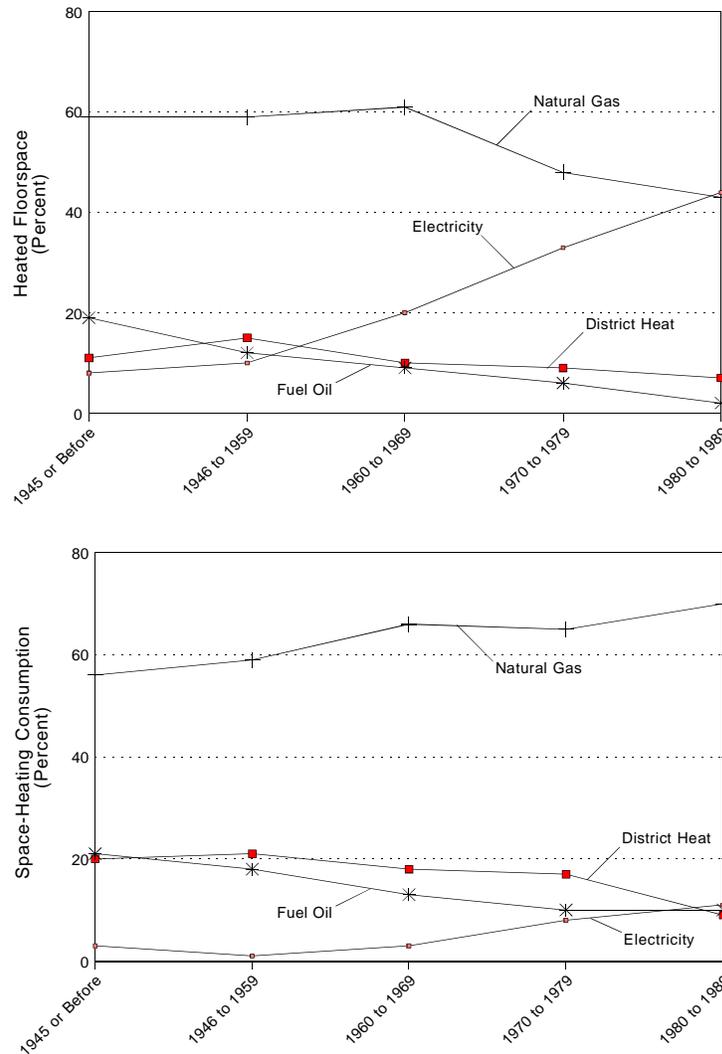


Note: Because of rounding, data may not sum to total.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 10 shows that natural gas was the dominant energy source for space heating in commercial buildings in 1989, providing 63 percent of all the energy consumed for space heating.
- District heat and fuel oil lagged far behind at 18 percent and 15 percent, respectively, with electricity trailing at 5 percent.
- Buildings using natural gas as the main space-heating fuel consumed 1.2 quadrillion Btu for space heating, 21 percent of all energy delivered to commercial buildings in 1989.
- Electricity, like fuel oil, was widely used both for main space heating and for secondary (supplemental or backup) space heating. In 1989, 75 trillion Btu of electricity were used for main space heating, while the rest (21 trillion Btu) was used for secondary space heating.

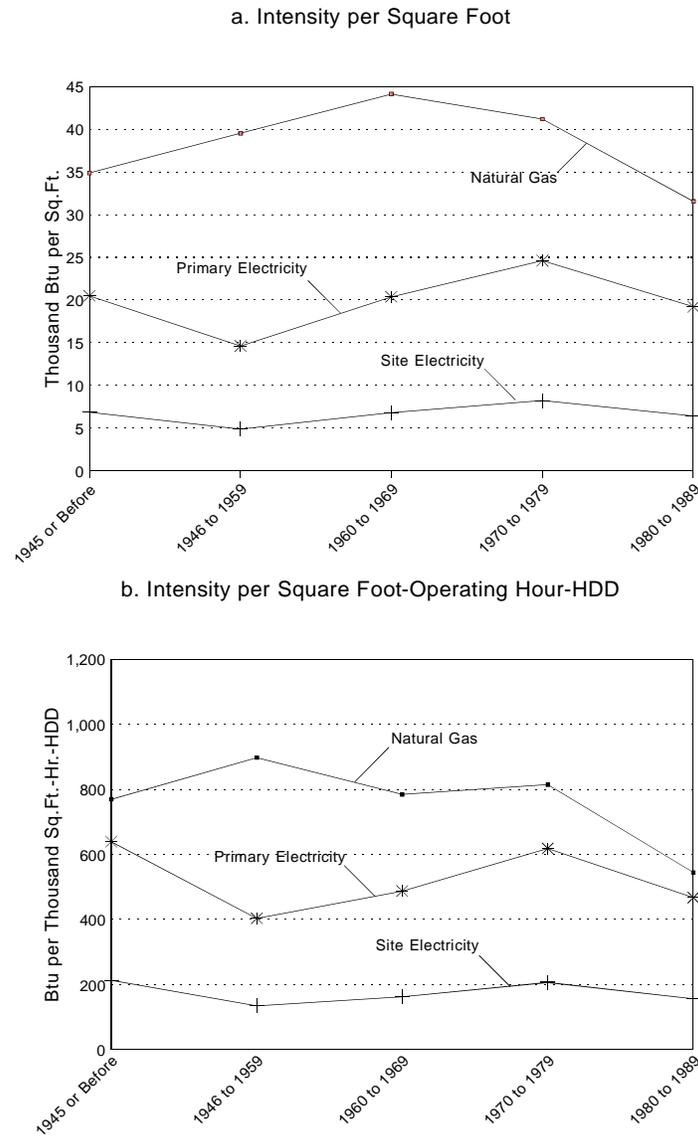
**Figure 11. Percent of Heated Floorspace Served by Each Main Space-Heating Energy Source and Percent of Space-Heating Consumption, by Year Constructed, 1989**



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 11 shows that natural gas provided a much higher percentage than electricity of the space-heating energy used in buildings constructed during the 1980's, even though the amount of floorspace heated by the two energy sources was roughly equal.
- The bulk of new construction during the 1980's occurred in warmer climates. In warmer climates, where space-heating demands were relatively lower, electricity tended to be the main heating energy source. Natural gas continued to be used in climates with higher space-heating demands.

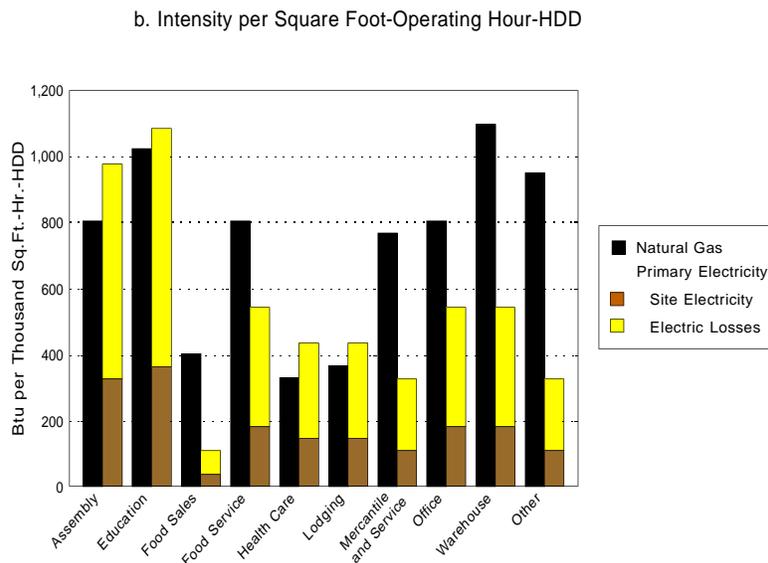
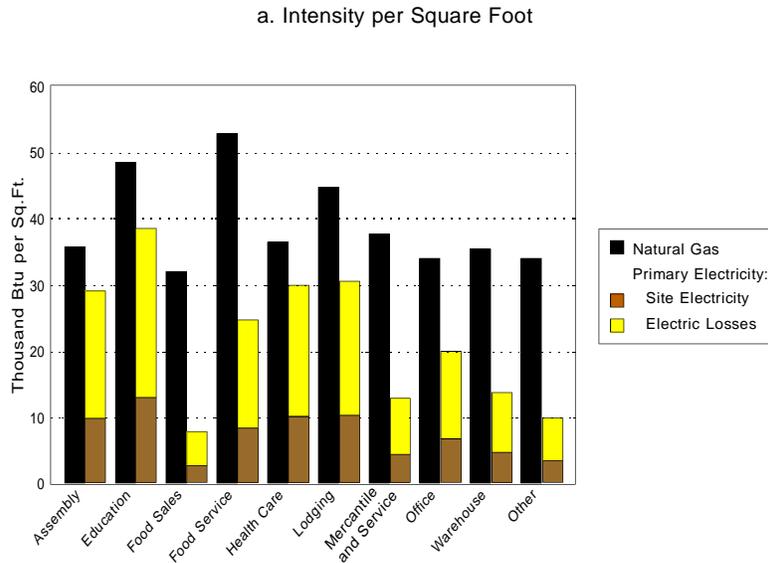
Figure 12. Comparison of Main Space-Heating Intensities for Natural Gas and Electricity, by Year Constructed, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 12 shows that no matter which measurement is used--energy consumption per square foot or energy consumption per square foot-operating hour-HDD--natural gas space-heating intensities were higher than site electricity intensities.
- Even after converting site electricity to primary energy, the electricity space-heating intensities would still be lower than those for natural gas. However, the gap between primary electricity and natural gas space-heating intensities was narrower in newer buildings, especially when differences in weather (HDD's) and operating hours are taken into account.
- Possible explanations for the lower electricity intensities include the relatively higher prices of electricity (which may encourage more conservation measures, such as insulation) and the relatively younger age of electric space-heating equipment.

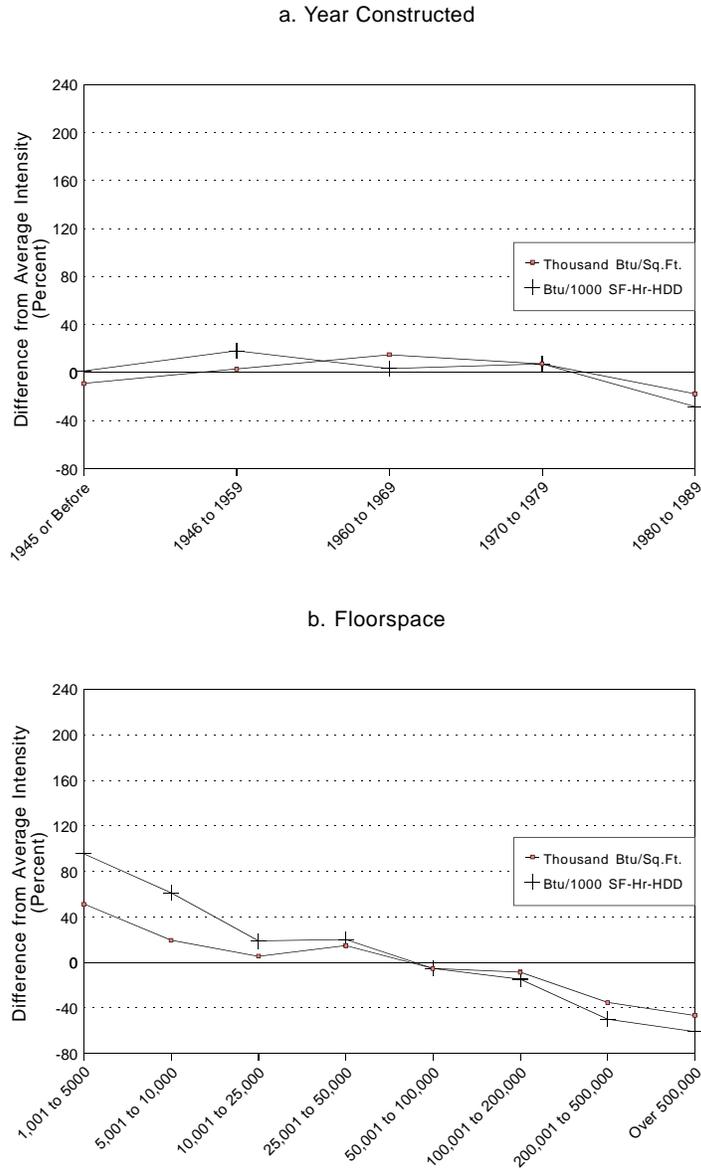
**Figure 13. Comparison of Main Space-Heating Intensities for Natural Gas and Electricity, by Principal Building Activity, 1989**



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 13 shows that natural gas space-heating intensities were higher than site electricity space-heating intensities in all types of buildings. However, electricity intensities were somewhat higher than natural gas intensities for assembly, education, health care, and lodging buildings when electric losses were included.
- Education and food service buildings had relatively high natural gas space-heating intensities, either per square foot or per heated square foot-hour-HDD.
- Natural gas intensities per square foot were about the same in health care buildings as in warehouses. However, health care buildings had the lowest intensities per heated square foot-hour-HDD, while warehouses had the highest. Warehouses consume energy more intensively to meet a much smaller demand (particularly in terms of operating hours and proportion of floorspace heated) than do health care buildings.

**Figure 14. Heating Intensities in Buildings Where Natural Gas Was Main Heating Fuel, by Year Constructed and by Floorspace, 1989**

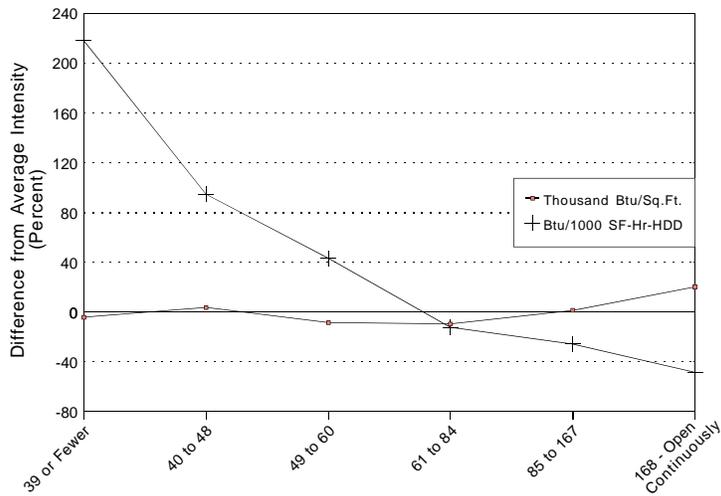


Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

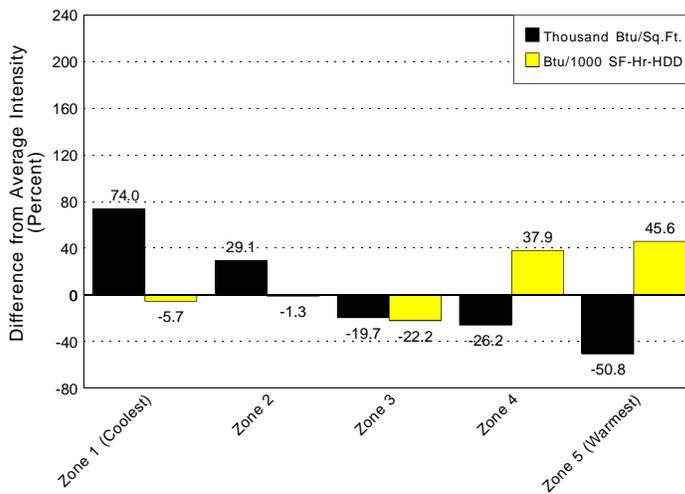
- Figure 14 shows that buildings constructed in the 1960's, when energy was plentiful and cheap, continued to have high natural gas heating intensities in 1989.
- In buildings constructed after the energy crisis of the early 1970's, heating intensities fell steadily until the mid-1980's.
- The larger a building's floorspace, the lower was its heating intensity. This phenomenon is probably due to the fact that since the ratio of exterior surface to total floorspace was smaller in larger buildings, building interiors required less heating to maintain a comfortable temperature.

**Figure 15. Heating Intensities in Buildings Where Natural Gas Was Main Heating Fuel, by Weekly Operating Hours and by Climate Zone, 1989**

a. Weekly Operating Hours



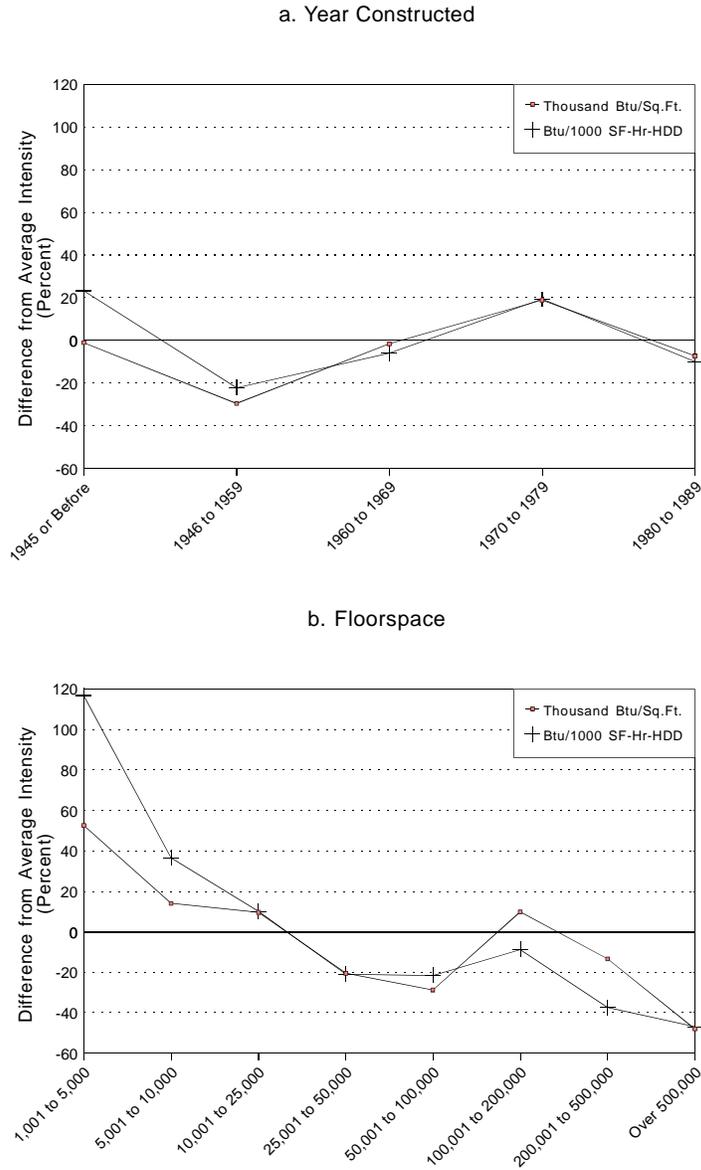
b. Climate Zone



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 15 shows that the fewer the number of operating hours, the higher the space-heating intensity (square foot-hour-HDD). This could indicate that heating systems in buildings with shorter weekly schedules tended to operate during off-hours.
- Heating intensity per square foot declined from the coolest to the warmest climate zone. However, intensity per square foot-HDD was relatively constant in the coolest three zones and increased in the warmest two zones, where heating demand was lowest. Buildings in warmer areas consumed relatively more energy in cooler weather than did buildings in colder climates, due either to differences in equipment efficiencies or to differences in the occupants' demands for space heating.

**Figure 16. Heating Intensities in Buildings Where Electricity Was Main Heating Fuel, by Year Constructed and by Floorspace, 1989**

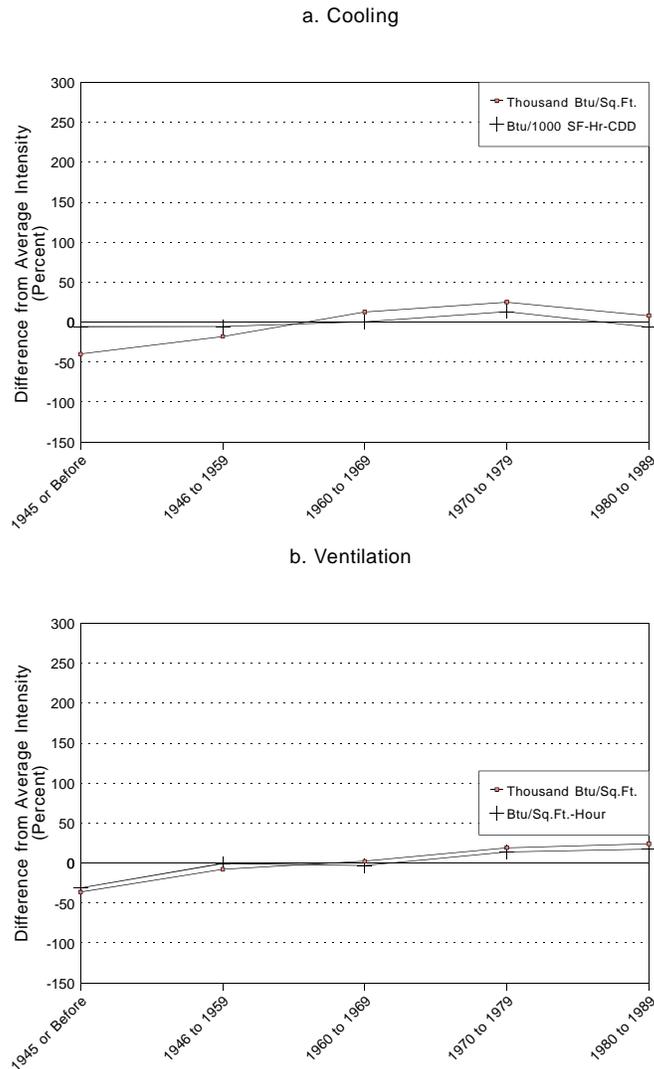


Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 16 shows that electricity heating intensities were highest for buildings constructed during the 1970's.
- Electricity heating intensities declined sharply for building constructed during the 1980's.
- As was the case for natural gas, electricity heating intensities declined as building size increased.

# Cooling and Ventilation

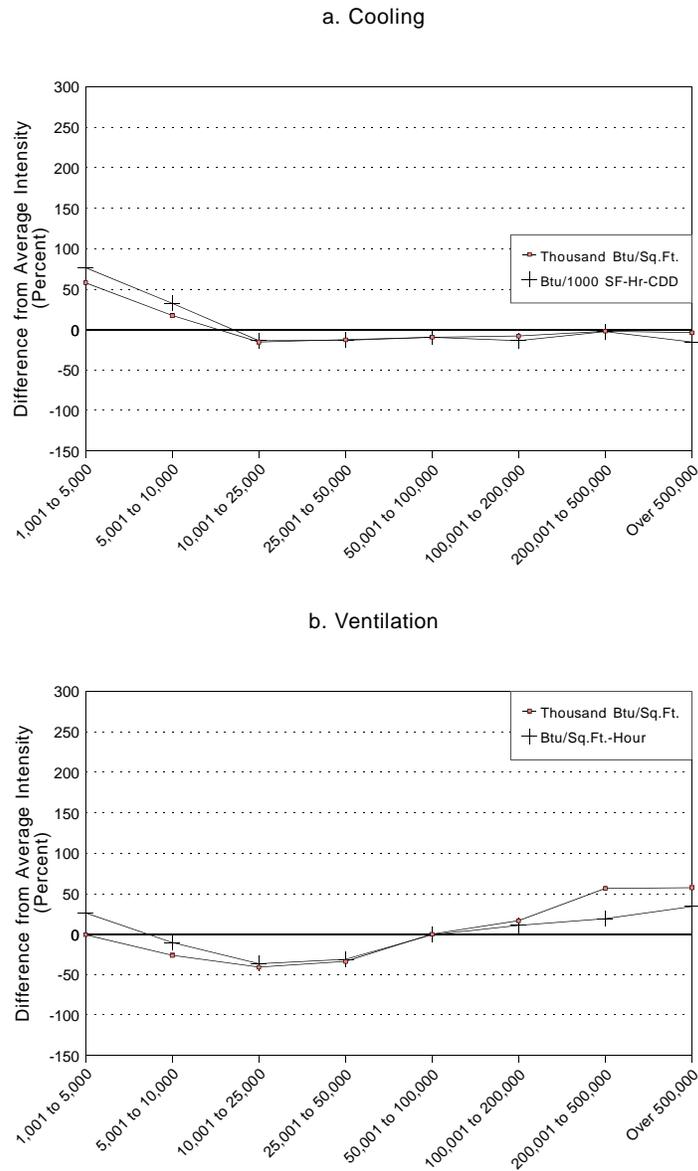
Figure 17. Electric Cooling and Ventilation Intensities, by Year Constructed, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Cooling intensities are defined as the ratio of energy used for cooling to the product of the cooled square footage, the annual building operating hours, and the average daily CDD's.
- Figure 17 shows that the oldest buildings had the lowest cooling intensities.
- Cooling intensities increased to a peak for buildings constructed in the 1970's.
- Ventilation intensities are defined as the ratio of energy used for ventilation to the product of the square footage and the annual building operating hours.
- The oldest buildings had the lowest ventilation intensities.
- Buildings constructed during the 1980's had the highest ventilation intensities.

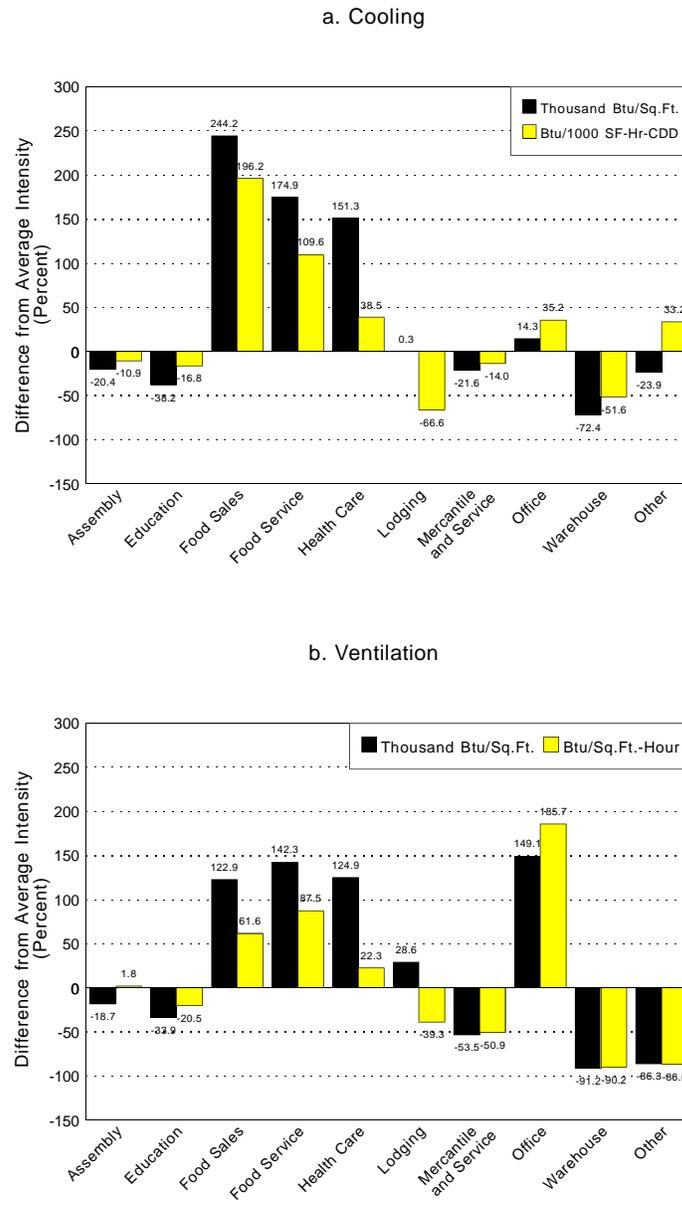
Figure 18. Electric Cooling and Ventilation Intensities, by Floorspace, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 18 shows that cooling intensities, like space-heating intensities, were higher for the smallest buildings. As with space heating, the larger buildings had proportionately less exposed exterior surface area, relative to their total floorspace.
- Ventilation intensities were high for the smallest buildings (as was true for heating and cooling intensities), but were the highest for the larger buildings. More ventilation was required in larger buildings, particularly in buildings such as offices and hospitals.

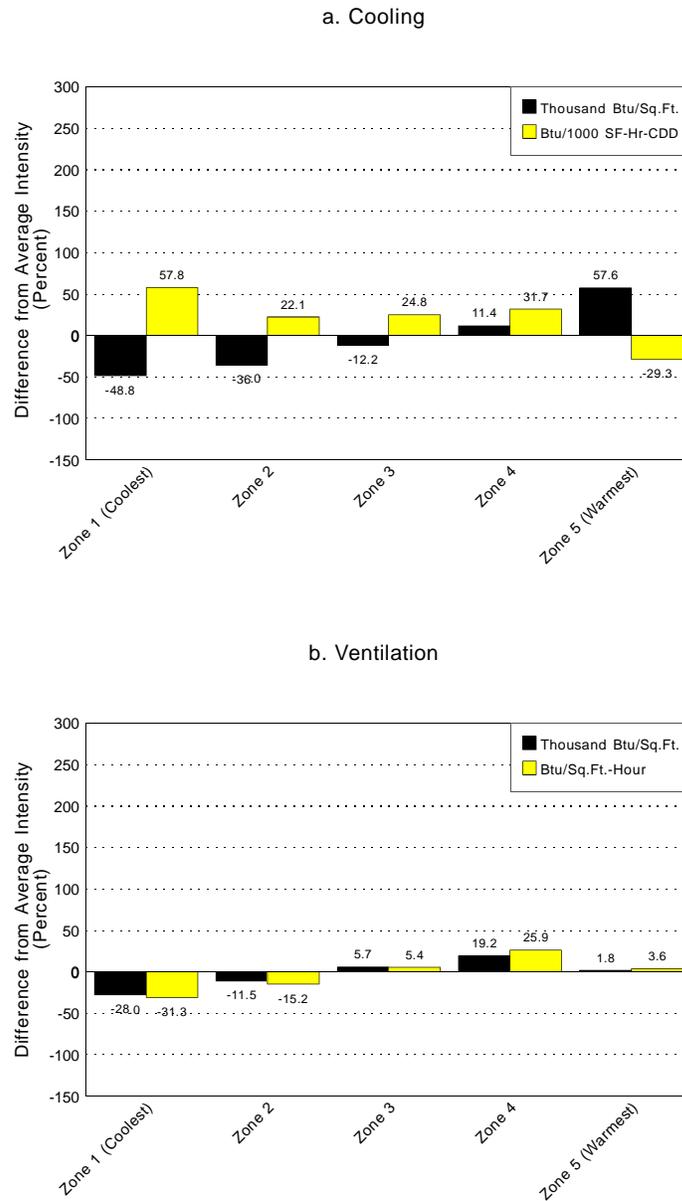
Figure 19. Electric Cooling and Ventilation Intensities, by Principal Building Activity, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 19 shows that cooling intensities in food sales, food service, and health care buildings were relatively high.
- High ventilation intensities were associated with high cooling intensities in food sales, food service, and health care buildings.
- The highest ventilation intensities were found among office buildings, which included a substantial number of larger buildings and had the highest occupant densities (workers per thousand square feet).

Figure 20. Electric Cooling and Ventilation Intensities, by Climate Zone, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 20 shows that cooling intensities per square foot increased from the coolest to the warmest climate. However, intensities per square foot-hour-CDD were the lowest in the warmest climate zone, where the cooling demand was greatest. Buildings in cooler areas consumed relatively more energy for cooling in warmer weather than did buildings in warmer climates, due either to differences in equipment efficiencies or to differences in the occupants' demands for cooling.
- Ventilation intensities were lowest in the coolest climate zone. However, climate zone was not as important for ventilation intensity as it was for cooling intensity.

## Section 4. Intensities for Other End Uses

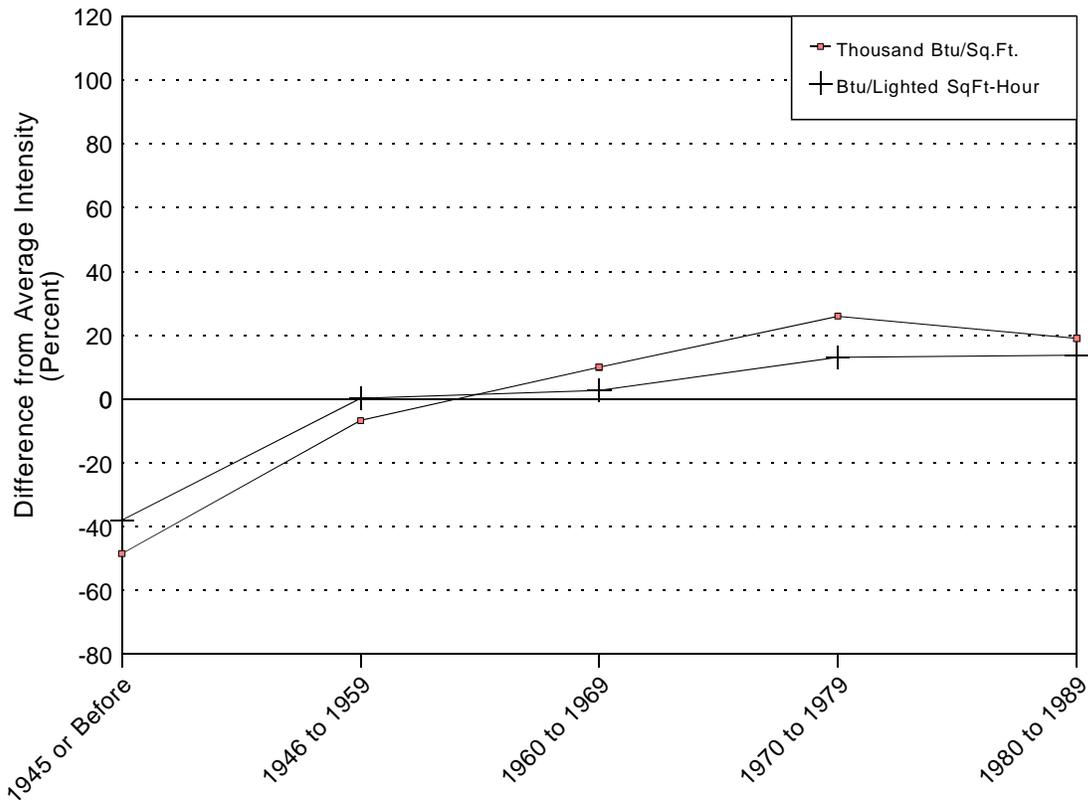
*The purpose of this section is to provide information on intensities for end uses other than space conditioning, including lighting, water heating, cooking, refrigeration, office equipment, and miscellaneous uses. These other end uses accounted for 55 percent of all energy consumed in commercial buildings in 1989. This section shows lighting intensities by year of construction, floorspace, and principal building activity. It also shows intensities for natural gas water heating and cooking and for electric refrigeration, by principal building activity. In addition, it shows electric intensities for office equipment.*

Key findings of this section include:

- The oldest buildings had the lowest lighting intensity, defined either as (1) the ratio of the amount of energy consumed for lighting to the square footage of building floorspace or (2) the ratio of the amount of energy consumed for lighting to the square footage of lighted floorspace (Figure 21).
- Buildings constructed during the 1970's and 1980's had the highest lighting intensities (Figure 21).
- Office buildings had the highest lighting intensities per lighted square foot-hour (Figure 23).
- Food service and health care buildings had the highest water-heating intensities per square foot--more than five times the average for all buildings (Figure 24).
- Food sales and food service buildings had the highest energy intensities for cooking and refrigeration (Figure 24).
- Office buildings had the highest intensities for office-equipment energy use (Figure 25).
- Buildings constructed during the 1980's had the highest intensities for office-equipment energy use (Figure 25).

## Lighting

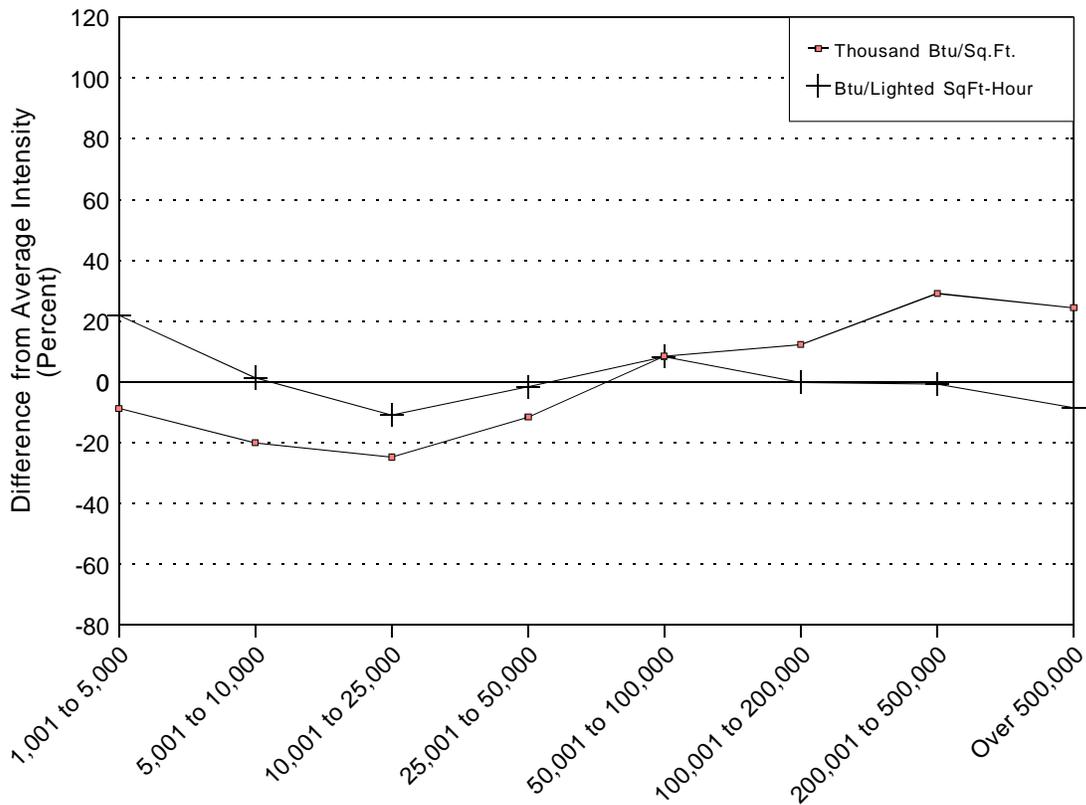
Figure 21. Lighting Intensities, by Year Constructed, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Lighting intensity can be defined either as (1) the ratio of the amount of energy consumed for lighting to the square footage of building floorspace or (2) the ratio of the amount of energy consumed for lighting to the product of the square footage of lighted floorspace and the operating hours.
- Figure 21 shows that the oldest buildings had the lowest lighting intensity.
- Buildings constructed during the 1970's and 1980's had the highest lighting intensities.
- Lighting intensity per lighted square foot-hour was lower than intensity per square foot among the more recently constructed buildings. This indicates that the rise in intensity per square foot can be partly explained by increasing operating hours.

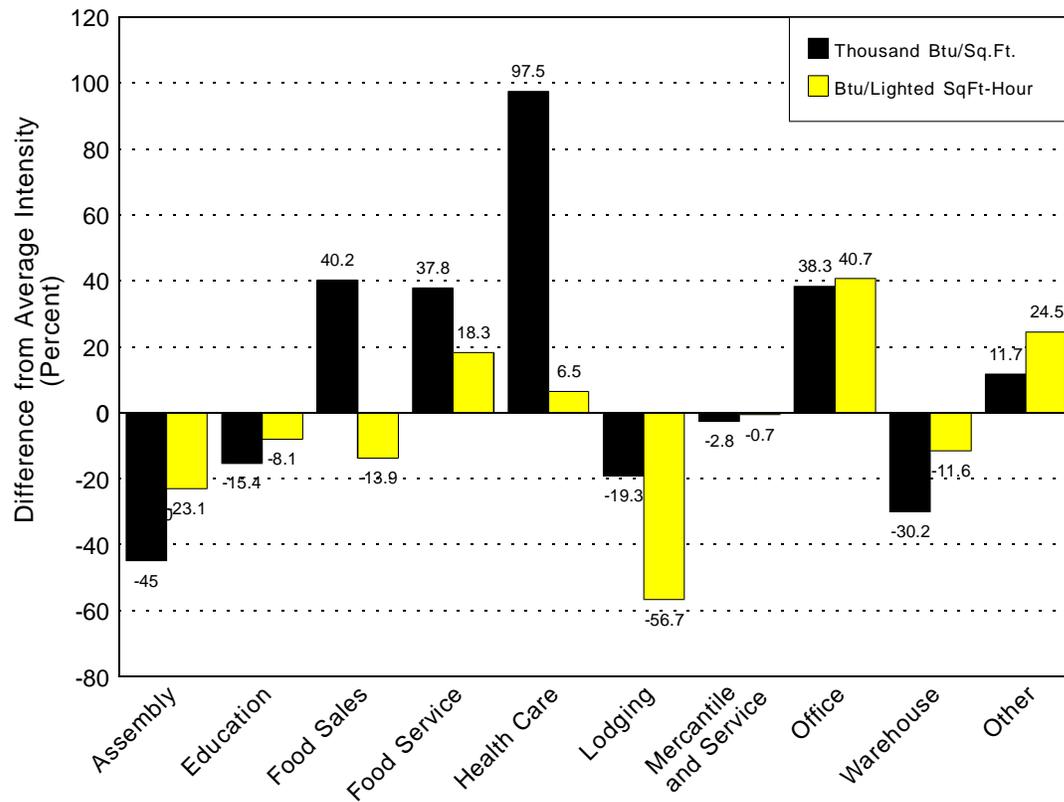
Figure 22. Lighting Intensities, by Floorspace, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 22 shows that lighting intensity per lighted square foot-hour remained relatively constant for all sizes of buildings.
- Lighting intensity per square foot was relatively low for the smaller buildings, and relatively high for larger buildings, reflecting the general tendency for smaller buildings to have shorter operating hours than larger buildings.

Figure 23. Lighting Intensities, by Principal Building Activity, 1989

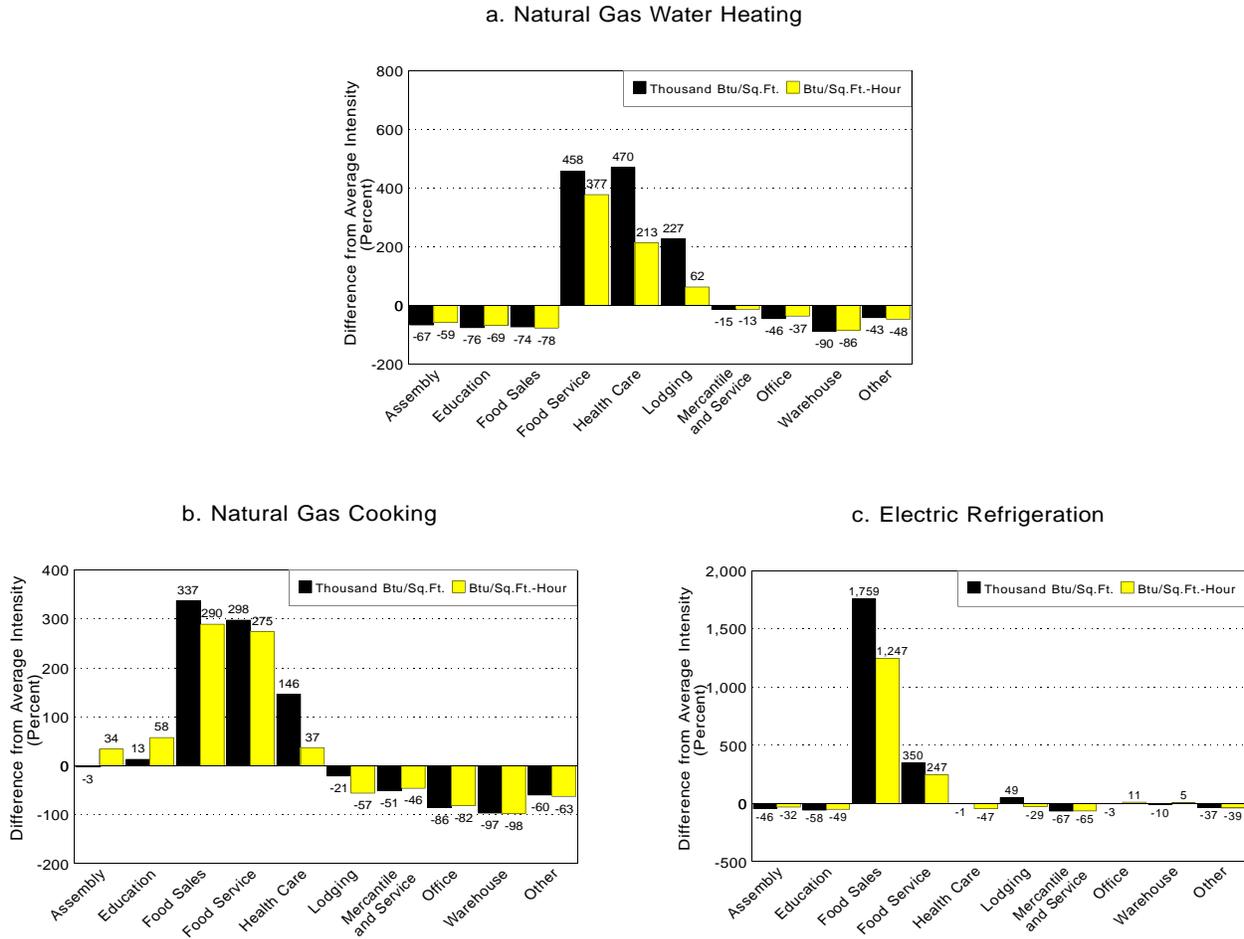


Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 23 shows that office buildings had the highest lighting intensities per lighted square foot-hour. Food service and "other" buildings also had high intensities.
- Although health care buildings had the highest lighting intensity per square foot, their intensity per lighted square foot-hour was only slightly above average. Health care buildings' high intensity per square foot resulted from relatively long operating hours.

## All Other End Uses

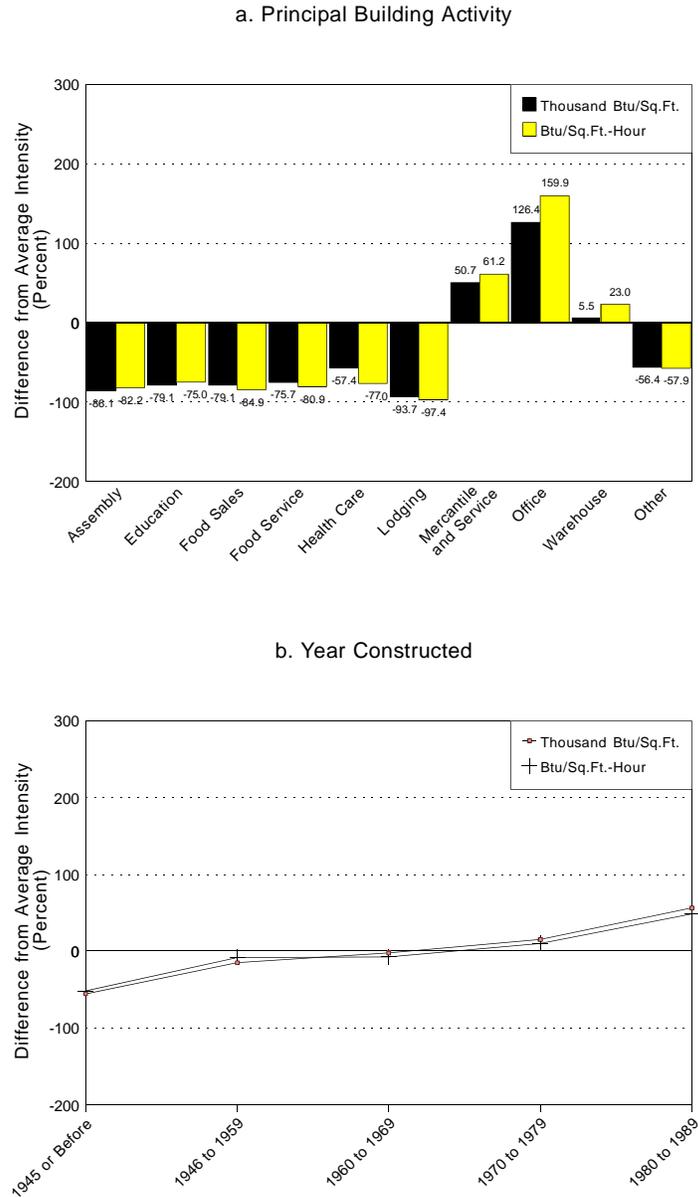
Figure 24. Intensities for Natural Gas Water Heating and Cooking and for Electric Refrigeration, by Principal Building Activity, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 24 shows that food service and health care buildings had the highest water-heating intensities per square foot, more than five times the average for all buildings. Lodging buildings were the third most intensive, with a water-heating intensity three times the average for all buildings.
- Food sales and food service buildings had the highest energy intensities for cooking.
- Food-related buildings dominated the refrigeration intensities. Food sales buildings had the highest refrigeration intensities by far, nearly 20 times the average intensity per square foot of all commercial buildings. Food service buildings also had high refrigeration intensities, over four times the average intensity per square foot of all buildings.

Figure 25. Electricity Intensities for Office Equipment, by Principal Building Activity and by Year Constructed, 1989



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 25 shows that office buildings had the highest energy intensities for office equipment.
- Mercantile and service buildings had the second highest intensities for office equipment.
- As with other electricity intensity patterns--such as cooling, ventilation, and lighting--the older buildings had relatively low intensities, with intensities increasing by vintage. Buildings constructed during the 1980's had the highest intensities.

## Section 5. Targets for Reducing Energy Intensities

*This section identifies targets for reducing energy intensities in commercial buildings. These targets are energy end uses that would show large increases if all buildings consumed at the same rate as buildings of the 1980's. In this section, intensities are based upon the entire building stock, not just those buildings using a particular fuel for a given end use. This method of computing intensities reflects both the level of penetration and the efficiency of 1980's technologies in computing hypothetical consumption levels for the total building stock.*

Key findings of this section include:

- If all buildings used natural gas for heating with the same intensity as did buildings constructed in the 1980's, the total consumption of natural gas for space heating would fall 201 trillion Btu, or 17 percent (Figure 26).
- If all buildings used electricity for cooling with the same intensity as did buildings constructed in the 1980's, the total consumption of electricity for cooling would drop by 23 trillion Btu. However, the consumption of electricity for ventilation would rise by 14 trillion Btu, for a net reduction of 9 trillion Btu, or 2 percent (Figure 27).
- If all buildings had the same lighting intensity as did buildings constructed in the 1980's, consumption of electricity for lighting would increase by 9 percent (94 trillion Btu) (Figure 28).
- If all buildings used office equipment with the same intensity as did 1980's buildings, consumption of electricity for office equipment would increase by 26 percent (99 trillion Btu) (Figure 29).

### Methodology

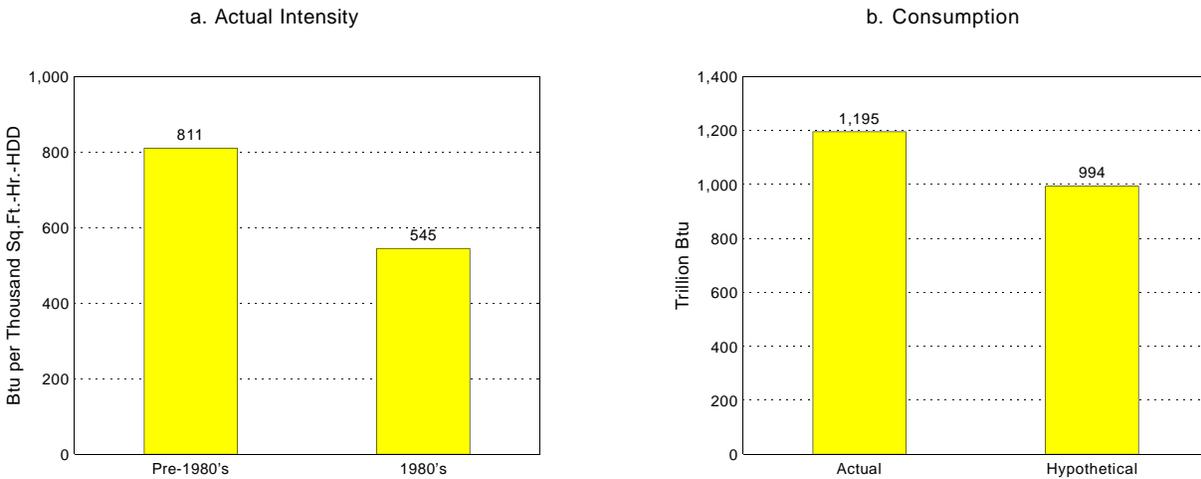
The method used to determine targets for reducing energy intensities was to extrapolate the energy consumption patterns of the 1980's buildings to the entire commercial building stock. The method, performed for five major end uses (natural gas space heating, electric cooling, ventilation, lighting, and office equipment use), had two parts.

- First, the energy intensities of 1980's buildings were calculated by using measures of energy intensities that accounted for differences in building size, operating hours, and weather (for heating and cooling). Energy intensities were calculated by principal building activity categories. For the five most numerous types of buildings in the CBECS sample (education, health care, mercantile, office, and warehouse), the buildings were divided into two groups: (1) small buildings, having 50,000 square feet of floorspace or less, and (2) large buildings, having over 50,000 square feet of floorspace.
- Second, estimates were made of the energy intensities and consumption for the five end uses, assuming that all buildings had the same end-use intensities as those of 1980's buildings.

The results show how the commercial building stock would be different if the entire commercial building stock consumed energy at the rates energy was consumed by the newer buildings, and also resembled the newer buildings in end uses served and in choices of energy sources for end uses. These results are based on the state of technology in commercial buildings in 1989 and do not account for any penetration of more efficient technologies (especially for lighting) which may have occurred since 1989.

## Results for Selected End Uses

Figure 26. Actual and Hypothetical Consumption of Natural Gas for Main Space Heating

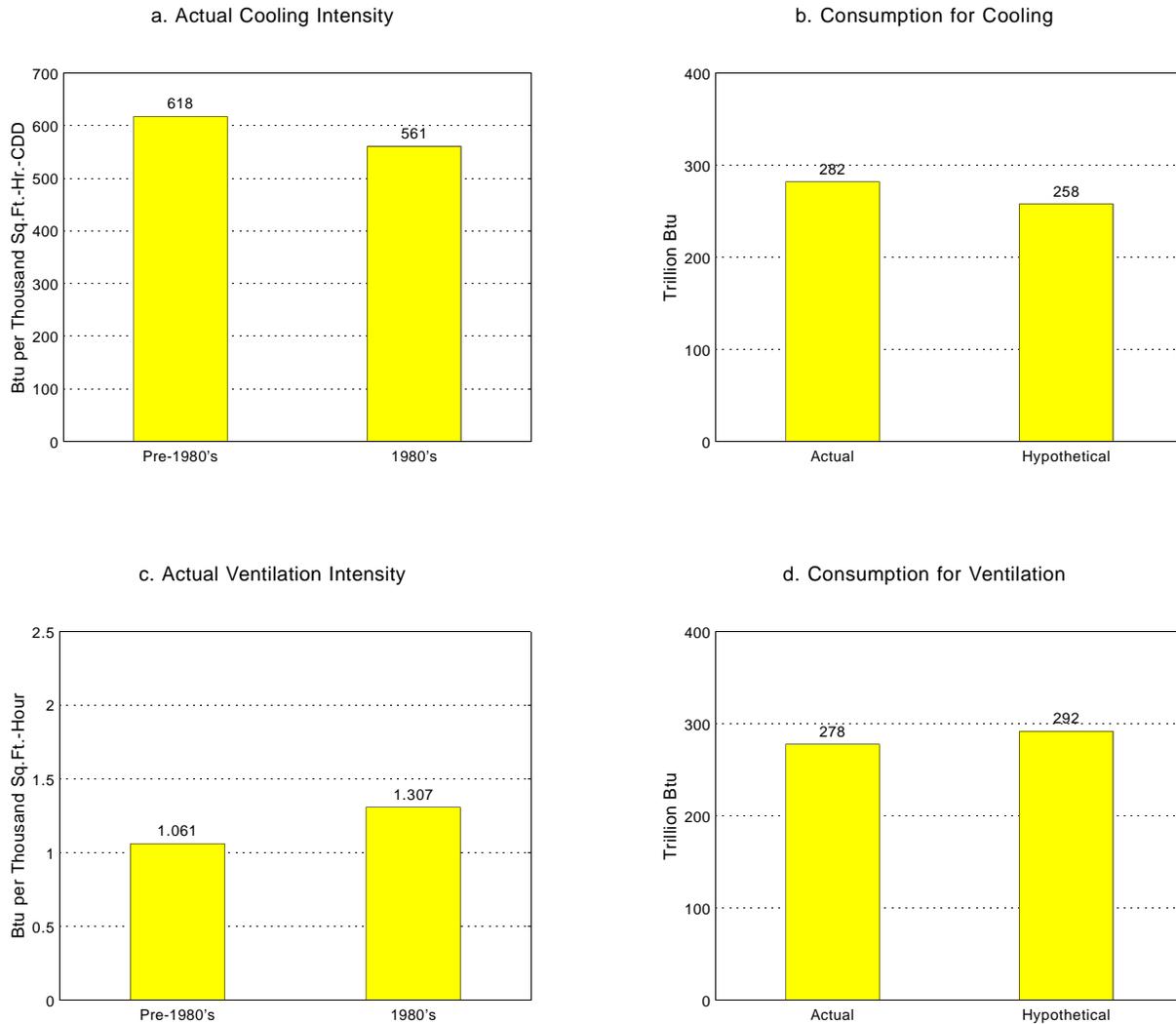


Note: Hypothetical consumption is that which would occur if all buildings consumed energy at the rate of 1980's buildings.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Heating intensity can be expressed as the ratio of energy consumed for heating to the product of the number of square feet of heated floorspace, operating hours, and average daily HDD's. (This formula allows comparison of heating intensities in buildings of different sizes, with different operating hours, and in different climates.)
- Figure 26 shows that buildings constructed during the 1980's consumed natural gas for main space heating about a third less intensively (per heated floorspace-hour-degree-day) than did older buildings.
- If all buildings used natural gas for main space heating with the same intensity as did buildings constructed in the 1980's, the total consumption of natural gas for heating would fall 201 trillion Btu, or 17 percent of the actual total consumption for heating.

**Figure 27. Actual and Hypothetical Consumption of Electricity for Cooling and Ventilation**

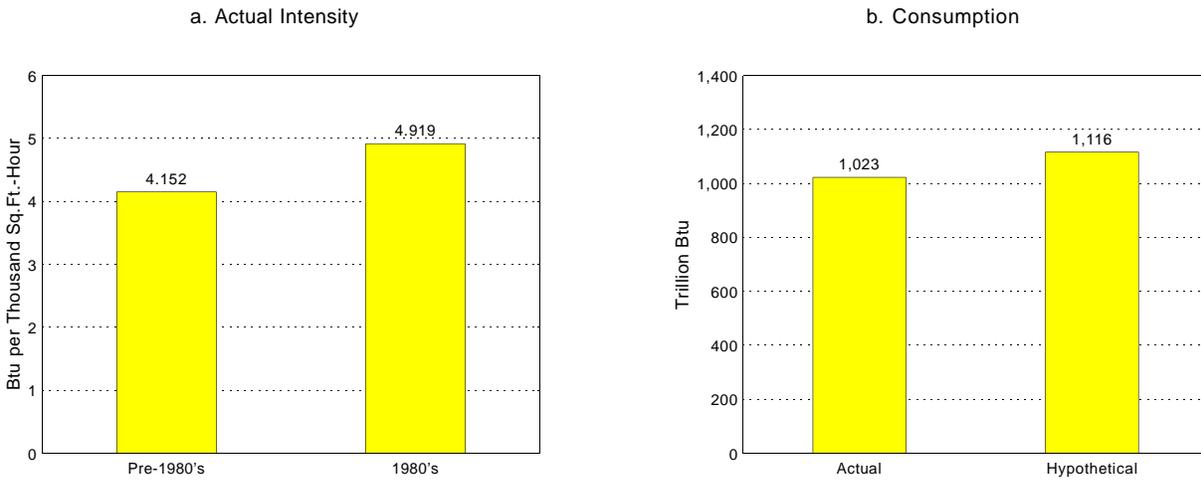


Note: Hypothetical consumption is that which would occur if all buildings consumed energy at the rate of 1980's buildings.

Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Cooling intensity can be expressed as the ratio of the energy consumed for cooling to the product of the number of square feet of cooled floorspace, operating hours, and average daily CDD's. (This formula allows comparison of cooling intensities in buildings of different sizes, with different operating hours, and in different climates.)
- Ventilation intensity can be expressed as the product of the number of square feet of ventilated floorspace and operating hours.
- Figure 27 shows that buildings constructed during the 1980's consumed electricity 9 percent less intensively for cooling, but 23 percent more intensively for ventilation, than did older buildings.
- If all buildings used electricity for cooling with the same intensity as buildings constructed in the 1980's, the total consumption of electricity for cooling would drop by 23 trillion Btu. However, the consumption of electricity for ventilation would rise by 14 trillion Btu, for a net reduction of 9 trillion Btu (2 percent).

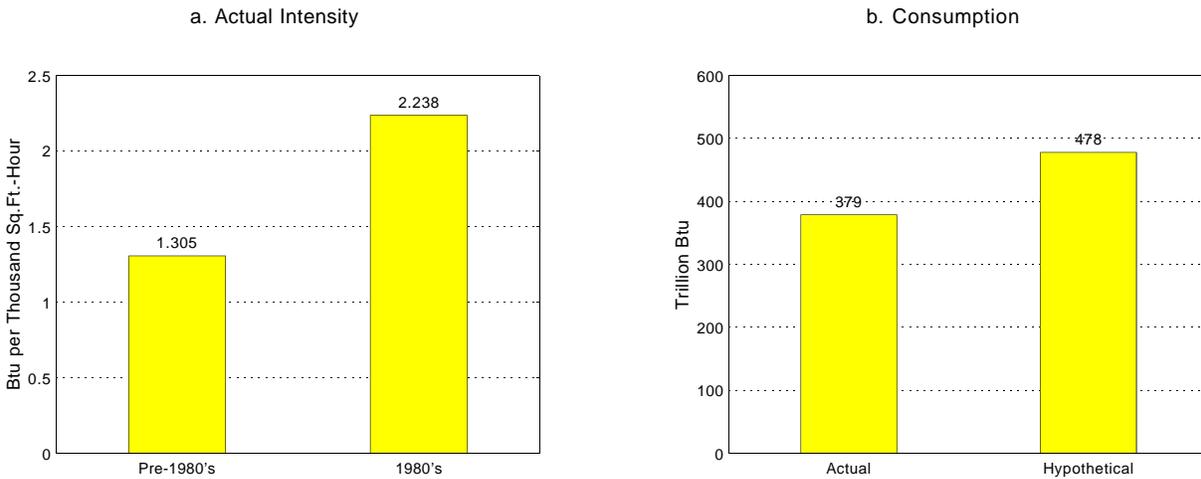
**Figure 28. Actual and Hypothetical Consumption of Electricity for Lighting**



Note: Hypothetical consumption is that which would occur if all buildings consumed energy at the rate of 1980's buildings.  
 Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Lighting intensity can be expressed as the ratio of the energy consumed for lighting to the product of the number of square feet of floorspace lighted and operating hours.
- Figure 28 shows that if all buildings had the same lighting intensity as did buildings constructed in the 1980's, consumption of electricity for lighting would increase by 9 percent (94 trillion Btu).

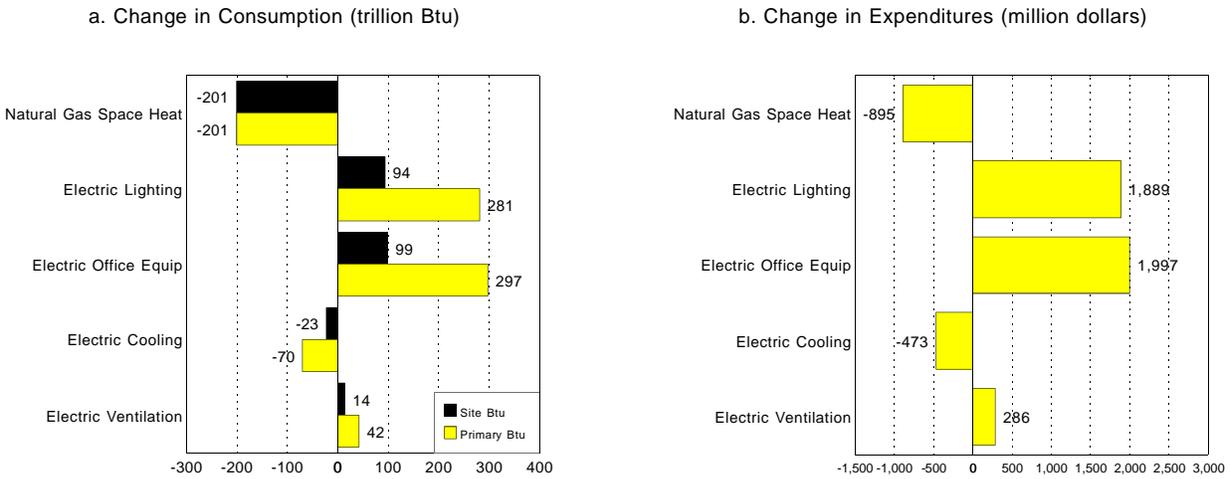
**Figure 29. Actual and Hypothetical Consumption of Electricity for Office Equipment**



Note: Hypothetical consumption is that which would occur if all buildings consumed energy at the rate of 1980's buildings.  
 Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Energy intensity for office equipment can be expressed as the product of the square feet of floorspace and operating hours.
- Figure 29 shows that buildings constructed during the 1980's consumed electricity for office equipment much more intensively (71 percent more per floorspace-hour) than did older buildings.
- Applying the 1980's intensities to all buildings, consumption of electricity for office equipment would increase by 26 percent (99 trillion Btu).

**Figure 30. Summary of Changes for Selected End-Use Energy Consumption and Expenditures that Would Occur If All Buildings Consumed at the Rate of 1980's Buildings**



Sources: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey and statistically adjusted engineering end-use estimates.

- Figure 30 shows that, as the 1980's buildings have shown, the demand for services is increasing, particularly in end uses served by electricity. It is important, for consumption in the 1990's and beyond, that these increasing demands be served by efficient technology.
- For the five selected end-uses, the changes in site energy consumption that would occur if all buildings consumed energy at the rate of the 1980's buildings would cancel each other out.
- The large decrease in natural gas consumption for space heating (201 trillion Btu) would be counterbalanced by increases in electricity consumption for lighting (94 trillion Btu) and office equipment (99 trillion Btu).
- Primary energy consumption would increase, driven by increases in intensity of electric lighting and office equipment use, despite gains in the efficiency of these technologies during the 1980's. Electricity end-use consumption would increase, offsetting decreases in fossil fuel end-use consumption.
- The increases in electricity consumption would have been greater if there had not been gains in the efficiency of technology during the 1980's. In particular, commercial lighting has been a prime target of commercial sector demand-side management programs sponsored by electric utilities, which were newly launched in 1989.

## Appendix A

# Development of End-Use Intensity Estimates

The end-use estimates had two main sources: the 1989 Commercial Buildings Energy Consumption Survey (CBECS) and the Facility Energy Decision Screening (FEDS) system. The CBECS provided data on building characteristics and total energy consumption (i.e., for all end uses) for a national sample of commercial buildings. Using data collected by the CBECS, the FEDS engineering modules were used to produce estimates of energy consumption by end use. The FEDS engineering estimates were then statistically adjusted to match the CBECS total energy consumption.

This appendix briefly describes the 1989 CBECS, the FEDS load estimation methodology, the statistical adjustment procedure, and the remaining steps necessary to produce the final end-use estimates presented in this report.

## The Commercial Buildings Energy Consumption Survey

The Energy Information Administration (EIA) is responsible for publishing national-level statistics on energy consumption by end users. Currently, the EIA publishes statistics for the residential, residential transportation (personal vehicles), commercial, and manufacturing sectors. For the commercial sector, consumption data are collected via a nationwide survey of commercial buildings, the CBECS.

The CBECS was designed to collect data on energy consumption, energy expenditures, and energy-related characteristics of commercial buildings. The sample consists of about 6,000 buildings, drawn from 119 locations nationwide. The survey is conducted in two stages: a Building Characteristics Survey and an Energy Suppliers Survey. The Building Characteristics Survey consists of personal interviews with knowledgeable respondents at each of the 6,000 buildings. The interview covers physical characteristics of the building, building occupancy patterns, major equipment, conservation practices, and the types and uses of energy in the building.

At the end of the interview, respondents are asked to provide the names and addresses of the companies that supply energy to their buildings in the form of electricity, natural gas, fuel oil, or district heating and cooling, and to sign a form authorizing the EIA to collect billing information directly from these energy supply companies. A separate mail survey, the Energy Suppliers Survey, asks these energy suppliers to provide data on the amounts and costs of energy delivered to the building during the survey year.

Additional details may be found in Appendix A, "How the Survey Was Conducted," of the two 1989 CBECS survey data reports.[3,4]

## The Facility Energy Decision Screening Engineering Estimates

The energy consumption data provided by energy suppliers cover all end uses performed within commercial buildings. The total energy consumption can be disaggregated into end-use consumption by several approaches: engineering simulations, statistical modeling, or a hybrid approach known as statistically adjusted engineering (SAE). The 1989 CBECS end-use estimates were developed by using the SAE approach, with the FEDS system providing the initial engineering estimates.

The FEDS software was developed for the Department of Energy's Federal Energy Management Program (FEMP) and the U.S. Army Construction Engineering Research Laboratory as a tool for screening groups of buildings on

federal facilities (such as Army bases) for energy efficiency retrofits.[2] The engineering modules, which estimate the energy load to be subjected to retrofit optimization, are the latest in a series of well-known building energy simulations, which include DOE-2 and ASEAM. In some ways FEDS is similar to Quick Input versions of ASEAM, in that it can operate from sparse data input. In other ways, such as its use of hourly load profiles rather than a bin method, FEDS is similar to DOE-2. The FEDS uses high-level installation information (number, age, size, and types of buildings and energy systems), an internal data base of typical energy-system configurations and performance data, and sophisticated energy simulation and optimization models to estimate the net present value of potential energy retrofits in federal installations. Release 1 of FEDS was used for the 1989 CBECS end-use estimates; Release 2 will be used for the 1992 CBECS end-use estimates.

The advantages of FEDS were that FEDS (without its retrofit optimization routines) can execute fairly quickly and that it does not demand a great deal of detailed data on each building. Both of these factors were important for the CBECS application, since there were nearly 6,000 buildings (with an average of two energy sources per building) and the only data available were those obtained from hour-long personal interviews.

The FEDS engineering models are designed to produce estimates for five end uses: space heating, cooling, ventilation, lighting, and water heating. Two other end uses, cooking and refrigeration, are also calculated internally by the model, although they are not part of the normal FEDS output. These seven end uses, plus an "other" end use, represent the FEDS accounting for total building end use. Estimates for office equipment energy use were not provided by the FEDS model.

Estimates for the first five end uses are based on detailed building engineering simulations. Estimates for the latter two are more sketchy and rely on parameters developed in the Regional End-Use Monitoring Program (REMP, formerly known as the End-Use Load and Consumer Assessment Program (ELCAP)) study.[6] REMP was a large end-use monitoring project sponsored by the Bonneville Power Administration. As designed to be used in facilities, only a general description of a building need be input for the building energy loads to be estimated interactively, relying on an extensive series of internal default values. Some of these defaults were based on data from the 1986 CBECS but many were based on REMP study. For use with the 1989 CBECS to produce the estimates in this report, the interface was changed from interactive to batch, with the 1989 CBECS data supplying as many values as possible.

Besides values relating to the building characteristics, the engineering estimates also required hourly weather profiles. For each calendar month, the average temperature during each hour of the day was calculated and input to the model.

## Statistically Adjusted Engineering Estimates

The FEDS estimates were based on building characteristics and weather only. At the statistically adjusted engineering (SAE) stage, the consumption data were brought into play. The basic idea behind the SAE method is simple. Let  $eui_{bfu}$  be the end-use consumption per square foot estimated by the FEDS model for building  $b$ , fuel  $f$ , and end use  $u$ , and let  $eui_{bf}$  be the total energy consumption (from the CBECS Energy Suppliers Survey) per square foot for building  $b$  and fuel  $f$ . Then a set of coefficients  $a_{fu}$  can be estimated statistically, i.e., by multiple regression, such that

$$e\hat{u}i_{bf} = \sum_u a_{fu} eui_{bfu}.$$

The coefficients adjust the FEDS engineering estimates upward or downward to match the reported energy use. The  $e\hat{u}i_{bf}$  are referred to as SAE estimates.

In practice, this simple version of SAE proved difficult. Instead of following the simple model, energy use was partitioned into two parts, seasonal and nonseasonal. The two parts were then statistically adjusted separately.[1]

The SAE procedures were produced for aggregates of buildings by principal building activity. Only buildings with 12 months of reported 1989 billing data were used. The adjustments were performed separately for electricity and natural gas. Due to the limited number of cases, fuel oil and district heat SAE estimates were produced by using parameters estimated for natural gas.

## The Final End-Use Estimates

Because the SAE procedure calibrated the engineering estimates to the reported data for aggregates of buildings, SAE estimates for individual buildings could still vary from the values on the 1989 CBECS Master File. For the final end-use estimates, those used in this report, the value on the CBECS Master File (whether reported or imputed) was prorated in proportion to the SAE estimates.

The office equipment estimate was also made after the SAE by using REMP estimates.[5] These estimates were based on data collected from mid-1986 to late 1988 and so are roughly contemporaneous with the 1989 CBECS. The REMP estimates were used to estimate the office equipment share of the "other" end use energy consumption. Included in office equipment were large computer equipment (if the CBECS data indicated the presence of a computer area with a separate air-conditioning system), personal computer equipment, and general office equipment (typewriters, copiers, cash registers, etc.).

## The Calculation of Energy Intensities

The energy intensities presented in this report for different sets of buildings are ratios of aggregate energy consumption to an aggregate measure of the demand for energy. The general equation was

$$Intensity = \frac{\sum_b w_b e_b}{\sum_b w_b d_b},$$

where  $w_b$  is building  $b$ 's weight (the number of buildings represented by building  $b$  in the sample),  $e_b$  is the amount of energy (total or end use) consumed by building  $b$ , and  $d_b$  is the demand measure (discussed below) for building  $b$ . The quantities are summed for all buildings in a particular category before dividing.

For intensity per square foot, the demand  $d_b$  is simply building  $b$ 's total square footage. For more involved intensities, the measure of demand is calculated for each building before summing. For example, for intensity per square foot-hour, the demand  $d_b$  calculated for each building  $b$  is the product of the square footage and the annual operating hours for building  $b$ .

## References

1. D. B. Belzer, L. E. Wrench, and T. L. Marsh, *End-Use Energy Consumption Estimates for U. S. Commercial Buildings, 1989*, PNL-8946 (Pacific Northwest Laboratory, Richland, WA, November 1993).

2. J. A. Dirks and L. R. Wrench, "Federal Energy Decision Screening (FEDS) System Software," PNL-SA-22780 (Pacific Northwest Laboratory, Richland, WA, August 1993).
3. Energy Information Administration, Office of Energy Markets and End Use, *Commercial Buildings Characteristics 1989*, DOE/EIA-0246(89) (Washington, DC, June 1991).
4. Energy Information Administration, Office of Energy Markets and End Use, *Commercial Buildings Energy Consumption and Expenditures 1989*, DOE/EIA-0318(89) (Washington, DC, April 1992).
5. R. G. Pratt, M. A. Williamson, E. E. Richman, and N. E. Miller, *Commercial Electric Loads: End-Use Load and Consumer Assessment Program (ELCAP)*, (Pacific Northwest Laboratory, Richland, WA, 1990).
6. Z. T. Taylor and R. G. Pratt, *Description of Electric Energy Use in Commercial Buildings in the Pacific Northwest*, DOE/BP-13795-22 (Pacific Northwest Laboratory, Richland, WA, 1989).

## Appendix B

# Detailed Tables

## Table Organization

The following 13 tables present detailed energy end-use consumption data from the 1989 CBECS. Summary tables for all major fuels (electricity, natural gas, fuel oil, and district heat) appear first, followed by separate tables for each of the four major fuels. Within each energy source's group of tables, there is a table showing end-use consumption, a table showing end-use intensities (consumption per square foot), and a table (except for fuel oil and district heat) showing the end-use shares of total consumption.

In the major fuels end-use intensity table, the intensity denominator is total commercial building floorspace. In the energy source-specific intensity tables, the intensity denominator is the total floorspace of all commercial buildings receiving that specific energy source.

## Row Stubs

There is a standard set of row categories (stubs), which appears in all the summary tables. Depending on the specific table topic, the standard stub may be augmented with selected variables pertinent to that topic. The standard stub items always appear in the same order, with any additional stub items interspersed adjacent to the related standard stub items.

There are two types of row stubs, those that divide commercial buildings into exclusive, nonoverlapping categories and those that indicate nonexclusive, overlapping subsets. For example, "Climate Zone" is a set of exclusive categories; a given building belongs in only one of these. "Energy Sources," on the other hand, is a set of nonexclusive categories; a given building may be represented in more than one line under this stub, because the building may use more than one energy source. The phrase "Solely or in Combination" indicates that the categories under this row header are overlapping. Both exclusive and overlapping categories may be nonexhaustive; that is, there may be some buildings that do not fall into any of the listed categories.

## Relative Standard Errors

Sampling error is inherent in any CBECS estimates, because the estimates are based on a relatively small sample randomly chosen to represent a large and variable population. Sampling errors are random differences between the survey estimate and the population value that occur because of the particular sample that was selected by chance. The average sampling error, averaged over all possible samples, would be zero. Although the sampling error is nonzero and unknown for the particular sample chosen, the sample design permits sampling errors to be estimated.

Due to the complexity of the sample design, the CBECS uses a jackknife replication method (with 40 collapsed strata) for variance estimation. To capture variation due to unit nonresponse, weight adjustment is performed separately within each replicate, as well as overall. The 40 sets of replicate weights are used to compute mean square errors about the full-sample point estimates.

The relative standard error (RSE) is the square root of the mean square error, expressed as a percent of the estimate. The RSE's which are displayed in the far-right columns of most tables are based only on the total energy

consumption or intensity estimates only. No RSE estimates are provided for energy end-use estimates, since the end-use breakdown of total fuel consumption is completely modeled. For these derived estimates, the uncertainty of the engineering assumptions is generally greater than the sampling error. The RSE's for end-use energy are at least as large as that for the total fuel consumption. For more details about the derivation of the row and column RSE factors, see Appendix B, "Nonsampling and Sampling Errors," of the 1989 CBECS data reports.[1,2]

## References

1. Energy Information Administration, Office of Energy Markets and End Use, *Commercial Buildings Characteristics 1989*, DOE/EIA-0246(89) (Washington, DC, June 1991).
2. Energy Information Administration, Office of Energy Markets and End Use, *Commercial Buildings Energy Consumption and Expenditures 1989*, DOE/EIA-0318(89) (Washington, DC, April 1992).

**Table B1. Consumption of All Major Fuels by End Use, 1989**

Building Characteristics  RSE Column Factor:	Sum of Major Fuel Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
All Buildings .....	5,788	2,017	303	278	499	1,023	271	187	379	832	6.11
<b>Building Floorspace (Square Feet)</b>											
1,001 to 5,000 .....	692	256	44	29	76	96	50	33	52	56	6.01
5,001 to 10,000 .....	567	229	33	21	53	83	17	16	41	75	9.94
10,001 to 25,000 .....	791	327	40	27	57	124	20	30	73	93	8.17
25,001 to 50,000 .....	756	319	34	26	43	127	22	27	46	113	10.13
50,001 to 100,000 .....	855	299	37	40	70	161	24	31	44	149	13.81
100,001 to 200,000 .....	777	266	36	43	65	153	37	19	47	109	13.60
200,001 to 500,000 .....	698	200	36	50	57	151	22	15	39	128	20.86
Over 500,000 .....	652	121	43	43	78	126	Q	15	37	109	27.21
<b>Year Constructed</b>											
1899 or Before .....	128	87	2	3	12	8	4	3	3	7	19.55
1900 to 1919 .....	239	111	5	7	16	29	9	4	10	Q	19.01
1920 to 1945 .....	636	285	26	29	64	76	28	14	23	89	19.00
1946 to 1959 .....	988	395	46	42	91	158	Q	21	53	114	15.54
1960 to 1969 .....	1,275	469	65	55	115	219	38	32	72	210	11.41
1970 to 1979 .....	1,342	399	85	70	117	276	71	51	93	179	8.91
1980 to 1983 .....	432	92	31	23	26	98	17	16	47	82	14.15
1984 to 1986 .....	464	102	29	37	38	104	21	25	50	59	11.59
1987 to 1989 .....	284	77	15	12	21	55	13	21	28	41	20.61
<b>BUILDING USE</b>											
<b>Principal Building Activity</b>											
Assembly .....	441	227	25	25	20	63	18	11	6	44	12.63
Education .....	704	377	26	24	40	114	Q	10	10	49	17.15
Food Sales .....	139	20	16	8	2	19	21	45	1	7	21.52
Food Service .....	255	48	19	13	49	27	59	16	2	21	9.41
Health Care .....	449	79	33	21	123	68	45	6	5	Q	25.01
Lodging .....	425	137	17	20	125	47	32	16	1	31	13.24
Mercantile and Service .....	1,048	358	53	26	56	201	23	12	115	204	10.23
Office .....	1,230	363	89	133	47	272	8	35	165	117	5.01
Parking Garage .....	42	Q	*	*	Q	8	Q	1	1	7	25.95
Public Order and Safety .....	78	42	1	2	Q	13	1	2	1	11	37.76
Warehouse .....	536	221	6	3	6	102	1	24	57	114	18.24
Other .....	344	86	14	1	15	76	Q	7	Q	126	34.71
Vacant .....	98	40	3	*	Q	13	1	2	2	30	29.15
<b>Weekly Operating Hours</b>											
39 or Fewer .....	203	121	7	10	10	23	3	6	7	17	8.37
40 to 48 .....	998	466	48	43	38	158	10	27	71	136	7.77
49 to 60 .....	925	371	46	52	32	169	15	24	93	122	6.94
61 to 84 .....	991	325	57	52	76	189	42	31	71	149	7.89
85 to 167 .....	998	324	58	38	62	196	101	44	56	119	15.24
168 (Open Continuously) .....	1,673	410	87	83	280	289	99	54	81	289	11.65
<b>Workers</b>											
4 or Fewer .....	697	321	34	28	68	88	23	30	44	61	4.94
5 to 9 .....	534	205	30	21	50	83	26	17	42	61	8.35
10 to 19 .....	540	215	30	20	47	74	26	20	42	67	7.34
20 to 49 .....	939	395	41	27	82	156	31	33	56	117	7.84
50 to 99 .....	701	277	37	25	28	133	21	28	39	112	11.18
100 to 249 .....	992	321	42	43	68	201	39	29	58	190	16.04
250 or More .....	1,386	281	89	113	155	288	105	31	99	225	18.30

See footnotes at end of table.

**Table B1. Consumption of All Major Fuels by End Use, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Sum of Major Fuel Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Ownership and Occupancy</b>											
Nongovernment Owned .....	4,239	1,364	238	209	374	757	190	154	311	642	6.39
Owner Occupied.....	3,331	1,102	182	166	321	566	150	121	211	512	7.35
Single Establishment .....	2,668	919	136	114	276	419	126	105	150	423	9.03
Multiple Establishment.....	663	184	46	51	45	146	24	16	61	89	7.87
Nonowner Occupied.....	908	262	56	44	53	192	40	33	100	130	9.17
Single Establishment .....	471	147	25	21	23	98	24	22	51	60	14.66
Multiple Establishment.....	394	94	30	22	25	91	15	11	48	57	11.59
Vacant .....	Q	21	1	*	Q	3	Q	*	*	Q	NF
Government Owned .....	1,549	652	65	69	125	266	Q	33	68	190	12.24
Federal .....	Q	Q	Q	17	11	60	Q	5	16	28	NF
State .....	585	255	20	22	56	83	13	14	29	93	20.97
Local .....	692	327	27	31	58	122	20	15	23	69	11.73
<b>Multibuilding Facility</b>											
Not on Multibuilding Facility.....	2,887	1,055	153	146	219	510	116	114	213	361	4.76
Part of Multibuilding Facility .....	2,901	961	150	132	280	513	154	73	166	471	11.23
On Facility with Central Plant .....	1,593	510	72	67	183	250	111	38	64	298	19.56
<b>Percent Vacant at Least Three Months</b>											
0 .....	4,320	1,561	216	194	373	756	178	151	287	604	6.12
1 to 50 .....	1,086	302	69	71	95	217	39	25	80	188	12.86
51 to 99 .....	218	84	Q	7	11	28	Q	4	6	16	47.15
100 .....	164	70	6	6	21	21	3	6	6	24	17.52
<b>Months in Use Out of Past 12 Months</b>											
0 to 8 .....	174	61	8	7	21	25	12	8	10	22	13.35
9 to 11 .....	272	162	7	11	22	32	3	4	4	26	14.63
12 .....	5,342	1,793	288	260	456	966	256	175	365	784	6.35
<b>LOCATION</b>											
<b>Census Region</b>											
Northeast.....	1,354	567	42	57	115	227	47	35	92	172	11.10
Midwest.....	1,659	733	56	59	166	241	69	48	79	209	11.11
South.....	1,648	423	136	93	113	341	63	65	122	291	11.08
West.....	1,126	294	69	69	104	214	Q	38	86	159	12.95
<b>Census Division</b>											
<b>Northeast</b>											
New England .....	298	126	8	13	36	46	11	8	16	36	19.75
Middle Atlantic .....	1,056	441	34	44	80	182	36	28	76	137	13.34
<b>Midwest</b>											
East North Central.....	1,086	494	30	37	106	160	47	34	54	125	12.70
West North Central .....	573	240	26	22	60	80	22	14	25	84	22.14
<b>South</b>											
South Atlantic.....	682	164	61	43	36	147	21	25	55	130	16.43
East South Central.....	373	100	20	17	30	71	15	15	30	73	22.17
West South Central .....	594	158	54	33	48	123	26	25	37	88	15.12
<b>West</b>											
Mountain.....	450	159	28	24	37	66	Q	12	24	38	28.59
Pacific .....	676	135	41	45	67	148	30	26	62	121	14.44
<b>Metropolitan Status</b>											
Metropolitan .....	4,780	1,561	266	244	418	873	236	156	324	701	6.53
Nonmetropolitan.....	1,008	456	37	34	81	149	34	31	55	131	14.99

See footnotes at end of table.

**Table B1. Consumption of All Major Fuels by End Use, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Sum of Major Fuel Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Climate Zone: 45-Year Average</b>											
Under 2,000 CDD and --											
Over 7,000 HDD.....	617	298	10	16	67	84	18	23	30	70	20.74
5,500-7,000 HDD.....	1,855	837	57	70	146	266	121	47	93	217	12.64
4,000-5,499 HDD.....	1,393	452	67	72	128	279	52	42	102	198	13.62
Under 4,000 HDD.....	1,115	271	71	67	88	225	45	38	93	216	14.43
2,000 CDD or More and --											
Under 4,000 HDD.....	809	158	98	52	70	169	34	37	60	130	13.86
<b>1989 Degree-Days</b>											
Under 2,000 CDD and --											
Over 7,000 HDD.....	875	448	14	23	78	117	30	29	38	98	18.16
5,500-7,000 HDD.....	2,206	891	82	91	205	335	128	55	119	301	13.48
4,000-5,499 HDD.....	917	280	45	54	69	212	41	34	81	102	10.88
Under 4,000 HDD.....	1,020	250	68	60	80	197	41	34	83	207	15.78
2,000 CDD or More and --											
Under 4,000 HDD.....	770	148	95	50	67	162	31	36	58	124	14.30
<b>STRUCTURE</b>											
<b>Floors</b>											
1.....	1,806	637	110	71	123	322	77	74	142	251	7.09
2.....	1,532	530	70	58	94	298	44	59	114	264	9.40
3.....	765	340	30	35	63	107	18	15	38	120	12.93
4 to 6.....	893	322	45	42	111	144	Q	20	35	88	17.64
7 or More.....	791	187	48	73	107	151	46	19	51	109	18.31
<b>Wall Materials</b>											
Masonry.....	3,919	1,466	200	168	381	634	174	127	230	539	6.15
Siding or Shingles.....	325	118	15	12	37	56	14	10	22	40	9.21
Metal Panels.....	457	162	21	19	18	97	6	15	42	79	23.07
Concrete Panels.....	706	172	46	38	36	144	Q	24	46	134	20.16
Window Glass.....	224	53	13	26	17	54	Q	7	24	20	21.66
Other.....	156	46	7	14	9	39	3	4	15	20	20.34
<b>Roof Materials</b>											
Built-Up.....	3,019	1,019	172	152	246	556	155	92	191	435	7.81
Shingles (Not Wood).....	794	327	40	35	76	119	36	31	45	86	9.59
Metal Surfacing.....	597	218	21	17	23	118	12	20	59	107	17.08
Synthetic or Rubber.....	850	288	42	45	77	151	30	30	57	131	15.49
Slate or Tile.....	206	95	8	8	20	23	19	6	Q	19	15.71
Concrete.....	111	20	8	12	14	28	Q	3	10	11	29.02
Wooden Materials.....	63	24	4	4	7	9	4	2	3	7	17.97
Other.....	Q	27	Q	6	Q	19	Q	2	5	Q	NF
<b>Building Shell Conservation</b>											
<b>Features (Solely or in Combination)</b>											
Roof or Ceiling Insulation.....	4,486	1,500	252	223	407	820	221	149	306	608	7.23
Wall Insulation.....	3,056	941	176	148	272	585	166	105	216	445	9.25
Storm or Multiple Glazing.....	2,557	848	130	128	287	455	126	92	180	310	7.91
Tinted, Reflective, or Shading											
Glass.....	2,385	657	150	143	193	490	135	76	189	352	9.87
Exterior or Interior Shadings											
or Awnings.....	2,720	848	158	149	230	496	162	82	195	399	9.18
Weather Stripping or Caulking.....	4,549	1,529	251	229	404	829	233	145	310	621	6.66
None of the Above.....	335	126	12	12	28	51	12	11	19	64	15.41

See footnotes at end of table.

**Table B1. Consumption of All Major Fuels by End Use, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Sum of Major Fuel Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>ENERGY SOURCES AND END USES</b>											
<b>Energy Sources</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	5,782	2,013	303	278	498	1,023	271	187	379	830	5.86
Natural Gas.....	4,336	1,570	205	195	429	689	253	122	237	636	7.27
Fuel Oil.....	1,589	572	71	85	186	263	65	40	91	214	13.31
District Heat .....	1,207	419	51	56	144	165	Q	21	46	217	24.84
Other.....	873	284	38	34	73	152	Q	33	42	148	23.78
<b>Energy End Uses</b>											
<b>(Solely or in Combination)</b>											
Heated Buildings.....	5,667	2,013	288	268	484	993	265	179	369	807	6.16
Air-Conditioned Buildings.....	5,101	1,659	303	256	436	933	258	172	342	742	6.12
Buildings with Water Heating.....	5,462	1,877	284	263	499	958	267	179	347	788	6.37
Buildings with Cooking.....	2,755	800	159	150	301	502	256	96	130	361	9.05
Buildings with Manufacturing.....	709	236	26	15	18	112	Q	19	38	195	22.68
<b>Space-Heating Energy Source</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	1,499	335	114	83	107	355	58	70	144	232	6.99
Natural Gas.....	3,418	1,331	150	140	326	529	144	93	177	527	7.46
Fuel Oil.....	1,305	511	55	61	160	201	51	33	66	166	13.51
District Heat .....	999	396	42	50	89	141	Q	19	38	143	20.27
Other.....	164	48	7	8	14	36	7	Q	12	17	35.97
<b>Main Space-Heating Energy Source</b>											
Electricity .....	978	132	93	68	68	263	46	59	120	130	6.01
Natural Gas.....	3,192	1,252	140	134	309	489	133	81	169	485	7.74
Fuel Oil.....	498	264	11	16	34	72	13	11	35	42	14.39
District Heat .....	979	385	41	49	88	139	Q	18	37	142	20.80
Other.....	87	21	3	5	2	23	Q	Q	9	9	40.87
<b>Air-Conditioning Energy Source</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	4,580	1,494	283	230	379	848	193	161	321	671	6.08
Other.....	713	222	32	33	72	116	Q	16	32	119	22.80
<b>Water-Heating Energy Source</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	1,761	537	123	100	36	381	42	74	175	291	7.58
Natural Gas.....	2,706	1,014	120	121	331	436	136	75	141	332	6.78
Fuel Oil.....	233	115	7	8	33	31	7	4	6	23	20.37
District Heat .....	890	277	38	38	130	114	Q	16	32	161	26.77
Other.....	108	29	6	5	Q	27	5	Q	Q	12	42.83
<b>HEATING AND COOLING</b>											
<b>Percent Heated</b>											
Not Heated .....	126	6	15	10	16	30	5	8	10	25	18.78
1 to 50 .....	371	112	15	11	22	76	8	24	41	61	13.48
51 to 99 .....	892	275	52	54	59	178	28	28	77	141	12.36
100 .....	4,399	1,622	221	203	402	739	229	127	250	605	7.04
<b>Percent Cooled</b>											
Not Cooled .....	687	358	NC	22	63	90	12	15	37	90	16.76
1 to 50 .....	1,336	661	31	29	74	172	26	34	75	234	10.18
51 to 99 .....	1,409	393	94	88	130	295	77	55	101	176	8.80
100 .....	2,356	605	178	138	232	466	155	83	166	332	8.98

See footnotes at end of table.

**Table B1. Consumption of All Major Fuels by End Use, 1989 (Continued)**

Building Characteristics	Sum of Major Fuel Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Heating Equipment (Solely or in Combination)</b>											
Furnaces.....	1,387	562	55	45	95	219	52	52	99	207	9.81
Boilers.....	2,249	955	89	108	212	354	77	56	103	297	8.03
Individual Space Heaters.....	2,032	709	92	82	163	358	105	54	133	335	10.89
Packaged Heating Units.....	1,549	416	103	68	100	316	76	50	117	302	9.73
Heat Pumps.....	730	189	50	43	55	148	28	31	57	130	11.97
Air Ducts.....	3,982	1,237	224	205	347	753	214	125	275	603	8.05
Heating or Reheating Coils.....	2,098	603	115	127	204	401	127	52	123	345	13.47
Fan-Coil Units.....	1,578	514	75	79	173	273	113	34	77	240	14.15
Steam or Hot Water Radiators or Baseboards.....	1,973	858	62	77	212	256	125	34	71	278	12.30
Other.....	258	59	14	Q	Q	41	8	9	14	Q	41.29
<b>Cooling Equipment (Solely or in Combination)</b>											
Central Chillers.....	1,775	441	122	132	183	344	136	42	108	268	13.51
Individual Air Conditioners.....	1,839	747	80	70	181	269	71	52	87	283	7.64
Packaged Cooling Units.....	3,468	1,091	219	170	260	655	202	122	244	505	6.82
Heat Pumps.....	773	190	49	40	50	152	31	30	64	166	15.26
Air Ducts.....	3,669	1,109	223	195	337	696	208	116	246	537	7.24
Fan-Coil Units.....	1,527	385	94	108	177	288	122	35	89	229	15.03
Other.....	Q	Q	Q	5	12	29	Q	3	8	12	NF
<b>Year Main Central Chiller Installed</b>											
1959 or Before.....	175	54	12	16	20	32	Q	4	10	18	22.39
1960 to 1969.....	525	148	40	29	28	90	Q	9	26	92	30.60
1970 to 1979.....	413	99	26	32	54	89	22	10	29	50	12.29
1980 to 1986.....	462	101	29	41	60	93	19	12	30	75	25.31
1987 to 1989.....	200	39	14	14	20	40	21	6	12	33	20.91
<b>Year Packaged Cooling System Installed</b>											
1959 or Before.....	172	65	11	9	14	36	3	3	9	23	15.62
1960 to 1969.....	608	199	34	21	35	98	Q	13	36	109	22.64
1970 to 1979.....	1,042	330	69	53	90	205	62	36	73	125	8.08
1980 to 1986.....	1,002	278	65	55	73	213	40	47	88	142	9.38
1987 to 1989.....	643	219	40	31	48	104	33	23	38	106	12.80
<b>Computer Area with Separate Air-Conditioning System</b>											
Present in Building.....	2,274	619	133	145	189	452	119	63	181	374	11.02
Not Present.....	3,514	1,398	171	133	310	570	152	124	198	458	5.73
<b>LIGHTING AND REFRIGERATION</b>											
<b>Percent Lit When Open</b>											
Not Lit.....	22	12	*	*	Q	2	*	1	Q	4	25.96
1 to 50.....	533	271	20	22	51	48	19	15	32	57	7.42
51 to 99.....	1,625	565	83	85	125	293	64	43	114	252	8.79
100.....	3,608	1,168	200	171	322	680	187	129	232	519	8.67
<b>Percent Lit When Closed</b>											
Not Lit.....	2,146	845	105	85	196	309	79	63	135	329	6.45
1 to 50.....	3,147	1,063	163	160	225	613	154	102	220	449	8.49
51 to 99.....	408	89	25	27	72	81	32	13	22	47	18.91
100.....	87	20	10	7	6	20	6	Q	2	7	29.88
<b>Lighting Equipment (Solely or in Combination)</b>											
Incandescent Lamps.....	3,786	1,311	198	183	388	685	219	115	206	482	7.03
Fluorescent Lamps.....	5,683	1,968	300	274	485	1,008	268	185	375	820	6.12
High-Intensity Discharge Lamps.....	1,980	626	102	95	129	396	112	63	122	335	11.76
Other Lamps.....	51	11	4	4	6	12	3	Q	3	7	20.91
High-Efficiency Ballasts.....	2,730	858	148	152	227	490	109	99	213	434	9.71

See footnotes at end of table.

**Table B1. Consumption of All Major Fuels by End Use, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Sum of Major Fuel Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Refrigeration Equipment (Solely or in Combination)</b>											
Commercial											
Refrigeration Units.....	2,974	832	174	160	318	552	251	128	158	401	8.57
Freezers.....	2,802	750	167	150	309	526	244	124	148	383	8.70
Residential											
Refrigerators.....	4,411	1,551	222	215	382	794	189	117	292	649	7.40
Freezers.....	1,479	448	84	63	172	248	129	42	65	227	13.72
Ice-Making Machines.....	2,988	757	192	177	340	562	242	111	164	444	8.67
Refrigerated Vending Machines.....	4,347	1,388	234	222	391	816	224	141	283	651	7.38
Water Coolers.....	4,454	1,513	236	224	365	811	193	124	289	699	8.01
Other.....	346	59	22	14	Q	55	17	10	22	103	35.63
<b>ENERGY MANAGEMENT</b>											
<b>Occupant Control</b>											
Any Control of Heating.....	2,331	805	126	97	251	393	110	67	147	334	7.04
With Thermostats.....	2,158	739	115	89	238	362	100	58	135	321	7.84
Any Control of Cooling.....	2,320	783	137	100	248	394	112	68	148	329	7.17
With Thermostats.....	2,115	691	127	91	225	363	105	62	135	315	8.28
<b>Reduced Use During Off-Hours</b>											
Heating Only.....	649	333	9	21	60	85	16	15	33	78	16.76
Cooling Only.....	429	119	26	18	28	69	21	11	30	106	14.79
Heating and Cooling.....	3,347	1,173	190	178	229	616	161	98	233	467	7.42
<b>Computerized Energy Management and Control System</b>											
Present in Building.....	1,714	458	109	115	164	356	108	56	99	248	12.73
Controls Heating and Cooling.....	1,668	453	107	113	159	344	104	53	96	239	13.31
Controls Lighting.....	431	96	30	22	20	88	Q	16	26	70	29.23
Controls Other.....	336	67	23	19	Q	62	14	10	16	74	35.31
<b>Other Energy Management</b>											
Regular HVAC Maintenance.....	4,773	1,594	255	241	413	870	221	153	307	717	6.86
Participated in Utility Conservation Program.....	1,206	412	66	75	115	214	53	40	71	160	9.79

\* = Value rounds to zero in the units displayed.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B2. Energy End-Use Intensities for All Major Fuels, 1989**

Building Characteristics  RSE Column Factor:	Energy Intensity for Major Fuels (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
All Buildings .....	91.6	31.9	4.8	4.4	7.9	16.2	4.3	3.0	6.0	13.2	4.95
<b>Building Floorspace (Square Feet)</b>											
1,001 to 5,000 .....	101.9	37.7	6.5	4.2	11.1	14.2	7.3	4.9	7.7	8.3	4.76
5,001 to 10,000 .....	86.8	35.1	5.0	3.2	8.1	12.7	2.6	2.5	6.3	11.4	8.36
10,001 to 25,000 .....	76.1	31.5	3.9	2.6	5.5	12.0	2.0	2.9	7.0	8.9	5.88
25,001 to 50,000 .....	85.9	36.2	3.9	2.9	4.8	14.4	2.5	3.1	5.2	12.9	8.54
50,001 to 100,000 .....	93.7	32.8	4.0	4.3	7.7	17.7	2.7	3.4	4.9	16.3	12.68
100,001 to 200,000 .....	93.9	32.2	4.4	5.2	7.9	18.5	4.5	2.3	5.6	13.2	9.73
200,001 to 500,000 .....	99.4	28.5	5.1	7.1	8.1	21.5	3.1	2.2	5.6	18.2	16.68
Over 500,000 .....	104.5	19.4	6.9	6.9	12.6	20.2	Q	2.5	6.0	17.5	20.20
<b>Year Constructed</b>											
1899 or Before .....	77.2	52.7	1.1	1.5	7.2	5.1	2.2	1.5	1.8	4.0	12.85
1900 to 1919 .....	56.4	26.1	1.2	1.5	3.7	6.7	2.0	.9	2.3	11.9	25.02
1920 to 1945 .....	78.5	35.2	3.2	3.6	7.9	9.4	3.5	1.7	2.9	11.0	15.75
1946 to 1959 .....	94.0	37.5	4.4	4.0	8.6	15.0	Q	2.0	5.1	10.8	11.13
1960 to 1969 .....	104.8	38.6	5.3	4.5	9.5	18.0	3.1	2.7	5.9	17.3	10.07
1970 to 1979 .....	100.7	29.9	6.4	5.3	8.8	20.7	5.3	3.9	7.0	13.4	7.18
1980 to 1983 .....	101.2	21.5	7.3	5.3	6.1	22.9	4.0	3.8	10.9	19.3	9.80
1984 to 1986 .....	81.9	18.0	5.1	6.5	6.6	18.3	3.7	4.5	8.9	10.3	10.75
1987 to 1989 .....	87.7	23.7	4.5	3.8	6.4	17.1	4.1	6.5	8.7	12.8	16.22
<b>BUILDING USE</b>											
<b>Principal Building Activity</b>											
Assembly .....	63.8	32.9	3.7	3.7	2.9	9.1	2.6	1.6	.9	6.4	10.48
Education .....	87.2	46.7	3.2	3.0	5.0	14.1	Q	1.3	1.3	6.1	12.03
Food Sales .....	175.6	25.5	20.0	10.1	2.8	23.4	27.0	56.5	1.3	9.0	16.05
Food Service .....	218.4	41.5	16.5	11.0	42.4	23.0	50.5	13.7	1.5	18.3	12.02
Health Care .....	218.7	38.3	16.1	10.2	59.9	33.0	21.9	3.0	2.6	33.5	10.85
Lodging .....	122.4	39.3	4.9	5.8	35.9	13.5	9.2	4.5	.4	8.8	12.24
Mercantile and Service .....	84.8	28.9	4.3	2.1	4.5	16.2	1.9	1.0	9.3	16.5	8.37
Office .....	104.2	30.7	7.5	11.3	4.0	23.1	.7	2.9	13.9	9.9	6.82
Parking Garage .....	42.6	19.9	.4	.4	Q	8.4	Q	.9	1.1	7.6	23.00
Public Order and Safety .....	127.0	67.6	2.3	3.7	Q	20.5	1.3	2.9	2.2	18.6	33.18
Warehouse .....	57.9	23.9	.6	.4	.7	11.1	.1	2.6	6.2	12.3	14.29
Other .....	224.8	56.0	9.4	.4	9.7	49.4	Q	4.5	Q	82.7	28.47
Vacant .....	23.5	9.6	.6	.1	Q	3.2	Q	.5	.5	7.2	33.85
<b>Weekly Operating Hours</b>											
39 or Fewer .....	33.5	19.9	1.2	1.6	1.7	3.8	.5	1.0	1.1	2.8	6.43
40 to 48 .....	71.8	33.5	3.5	3.1	2.8	11.3	.7	2.0	5.1	9.8	5.65
49 to 60 .....	68.6	27.6	3.4	3.9	2.4	12.5	1.1	1.8	6.9	9.1	6.68
61 to 84 .....	92.0	30.1	5.3	4.8	7.0	17.6	3.9	2.9	6.6	13.8	6.86
85 to 167 .....	106.3	34.5	6.2	4.0	6.6	20.8	10.8	4.7	6.0	12.7	11.77
168 (Open Continuously) .....	174.8	42.8	9.1	8.7	29.3	30.2	10.4	5.6	8.5	30.2	8.71
<b>Workers</b>											
4 or Fewer .....	46.0	21.2	2.2	1.9	4.5	5.8	1.5	2.0	2.9	4.0	7.15
5 to 9 .....	67.3	25.8	3.8	2.6	6.3	10.4	3.3	2.2	5.3	7.7	7.34
10 to 19 .....	83.8	33.4	4.6	3.0	7.3	11.5	4.0	3.1	6.6	10.3	7.59
20 to 49 .....	97.2	40.9	4.3	2.8	8.5	16.2	3.2	3.4	5.8	12.1	6.65
50 to 99 .....	94.8	37.5	5.0	3.4	3.8	18.0	2.8	3.8	5.2	15.1	9.85
100 to 249 .....	146.5	47.4	6.3	6.4	10.1	29.7	5.8	4.2	8.6	28.0	11.25
250 or More .....	141.0	28.6	9.1	11.5	15.7	29.3	10.7	3.1	10.1	22.9	10.67

See footnote at end of table.

**Table B2. Energy End-Use Intensities for All Major Fuels, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Energy Intensity for Major Fuels (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Ownership and Occupancy</b>											
Nongovernment Owned .....	86.8	27.9	4.9	4.3	7.7	15.5	3.9	3.1	6.4	13.1	5.15
Owner Occupied.....	92.6	30.7	5.1	4.6	8.9	15.7	4.2	3.4	5.9	14.2	5.92
Single Establishment .....	98.5	33.9	5.0	4.2	10.2	15.5	4.6	3.9	5.5	15.6	7.47
Multiple Establishment.....	74.7	20.7	5.2	5.8	5.0	16.5	2.7	1.8	6.8	10.1	3.84
Nonowner Occupied.....	70.5	20.3	4.3	3.4	4.1	14.9	3.1	2.5	7.8	10.1	6.65
Single Establishment .....	75.4	23.6	4.0	3.4	3.7	15.6	3.9	3.4	8.2	9.6	9.70
Multiple Establishment.....	75.2	17.9	5.8	4.2	4.7	17.4	2.9	2.0	9.2	11.0	9.26
Vacant .....	Q	14.9	.6	.1	Q	2.2	Q	.4	.3	Q	NF
Government Owned .....	108.0	45.5	4.5	4.8	8.7	18.5	Q	2.3	4.8	13.3	9.84
Federal .....	142.1	36.9	9.1	8.7	5.7	31.2	Q	2.6	8.5	14.4	34.01
State .....	149.8	65.3	5.2	5.5	14.3	21.3	3.2	3.5	7.5	23.9	18.14
Local .....	81.2	38.3	3.2	3.6	6.8	14.4	2.4	1.7	2.7	8.1	8.90
<b>Multibuilding Facility</b>											
Not on Multibuilding Facility.....	77.5	28.3	4.1	3.9	5.9	13.7	3.1	3.1	5.7	9.7	4.11
Part of Multibuilding Facility .....	111.8	37.0	5.8	5.1	10.8	19.8	5.9	2.8	6.4	18.2	8.09
On Facility with Central Plant .....	190.9	61.1	8.6	8.0	21.9	30.0	13.3	4.6	7.7	35.7	11.24
<b>Percent Vacant at Least Three Months</b>											
0 .....	100.3	36.2	5.0	4.5	8.6	17.6	4.1	3.5	6.7	14.0	5.35
1 to 50 .....	87.3	24.3	5.6	5.7	7.6	17.4	3.2	2.0	6.4	15.1	8.84
51 to 99 .....	62.1	24.0	Q	1.9	3.1	8.0	Q	1.2	1.8	4.4	35.57
100 .....	39.5	16.8	1.5	1.5	5.0	5.2	.7	1.5	1.4	5.9	17.47
<b>Months in Use Out of Past 12 Months</b>											
0 to 8 .....	38.2	13.5	1.7	1.5	4.6	5.6	2.5	1.7	2.1	4.9	14.71
9 to 11 .....	72.0	43.0	1.9	3.0	5.8	8.4	.8	1.1	1.1	6.9	13.70
12 .....	97.4	32.7	5.3	4.7	8.3	17.6	4.7	3.2	6.7	14.3	5.47
<b>LOCATION</b>											
<b>Census Region</b>											
Northeast.....	99.8	41.8	3.1	4.2	8.5	16.8	3.5	2.6	6.8	12.7	10.72
Midwest.....	104.0	46.0	3.5	3.7	10.4	15.1	4.3	3.0	4.9	13.1	8.40
South.....	74.8	19.2	6.2	4.2	5.1	15.5	2.8	3.0	5.5	13.2	7.20
West.....	96.9	25.3	6.0	6.0	8.9	18.4	Q	3.3	7.4	13.7	11.61
<b>Census Division</b>											
<b>Northeast</b>											
New England .....	94.0	39.6	2.6	4.0	11.2	14.4	3.5	2.4	5.1	11.2	18.57
Middle Atlantic .....	101.6	42.4	3.3	4.2	7.7	17.5	3.4	2.7	7.3	13.1	12.82
<b>Midwest</b>											
East North Central.....	101.7	46.2	2.8	3.4	9.9	15.0	4.4	3.2	5.0	11.7	10.95
West North Central .....	108.7	45.4	5.0	4.2	11.5	15.2	4.2	2.7	4.7	16.0	12.60
<b>South</b>											
South Atlantic.....	67.6	16.3	6.1	4.3	3.5	14.5	2.1	2.5	5.5	12.9	12.26
East South Central.....	86.8	23.4	4.8	4.0	6.9	16.6	3.5	3.5	7.0	17.1	13.77
West South Central .....	77.6	20.7	7.1	4.3	6.3	16.1	3.5	3.3	4.9	11.5	8.12
<b>West</b>											
Mountain.....	102.5	36.3	6.3	5.5	8.4	15.0	Q	2.7	5.6	8.7	18.04
Pacific .....	93.4	18.6	5.7	6.3	9.3	20.5	4.2	3.6	8.6	16.8	12.01
<b>Metropolitan Status</b>											
Metropolitan .....	94.1	30.7	5.2	4.8	8.2	17.2	4.7	3.1	6.4	13.8	5.28
Nonmetropolitan.....	81.5	36.8	3.0	2.7	6.6	12.1	2.8	2.5	4.5	10.6	11.42

See footnote at end of table.

**Table B2. Energy End-Use Intensities for All Major Fuels, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Major Fuels (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Climate Zone: 45-Year Average</b>											
Under 2,000 CDD and --											
Over 7,000 HDD.....	121.8	58.9	2.0	3.2	13.2	16.6	3.6	4.5	6.0	13.9	13.94
5,500-7,000 HDD.....	103.3	46.6	3.2	3.9	8.1	14.8	6.8	2.6	5.2	12.1	9.27
4,000-5,499 HDD.....	90.5	29.4	4.3	4.7	8.3	18.1	3.4	2.8	6.6	12.9	9.34
Under 4,000 HDD.....	86.4	21.0	5.5	5.2	6.8	17.4	3.5	3.0	7.2	16.8	8.37
2,000 CDD or More and --											
Under 4,000 HDD.....	68.1	13.3	8.3	4.4	5.9	14.2	2.8	3.1	5.1	11.0	8.70
<b>1989 Degree-Days</b>											
Under 2,000 CDD and --											
Over 7,000 HDD.....	114.3	58.5	1.9	3.0	10.2	15.3	3.9	3.7	5.0	12.8	12.22
5,500-7,000 HDD.....	100.3	40.5	3.7	4.1	9.3	15.2	5.8	2.5	5.4	13.7	8.10
4,000-5,499 HDD.....	87.9	26.8	4.3	5.2	6.6	20.3	3.9	3.2	7.8	9.8	8.07
Under 4,000 HDD.....	84.7	20.8	5.6	5.0	6.6	16.3	3.4	2.8	6.9	17.2	9.50
2,000 CDD or More and --											
Under 4,000 HDD.....	69.6	13.4	8.6	4.5	6.0	14.6	2.8	3.2	5.2	11.2	8.66
<b>STRUCTURE</b>											
<b>Floors</b>											
1.....	76.0	26.8	4.6	3.0	5.2	13.6	3.2	3.1	6.0	10.5	5.52
2.....	95.1	32.9	4.4	3.6	5.9	18.5	2.7	3.7	7.1	16.4	7.35
3.....	88.9	39.5	3.5	4.0	7.3	12.4	2.1	1.8	4.4	13.9	13.73
4 to 6.....	107.5	38.7	5.4	5.1	13.4	17.3	Q	2.4	4.2	10.6	11.16
7 or More.....	123.7	29.2	7.5	11.4	16.8	23.7	7.2	3.0	7.9	17.0	11.84
<b>Wall Materials</b>											
Masonry.....	93.2	34.8	4.7	4.0	9.1	15.1	4.1	3.0	5.5	12.8	4.96
Siding or Shingles.....	68.0	24.7	3.2	2.6	7.7	11.6	2.9	2.1	4.7	8.4	9.84
Metal Panels.....	80.4	28.4	3.8	3.3	3.2	17.0	1.0	2.6	7.3	13.8	20.05
Concrete Panels.....	97.7	23.8	6.4	5.3	5.0	20.0	Q	3.3	6.4	18.5	15.57
Window Glass.....	116.4	27.7	6.9	13.6	9.0	27.9	Q	3.8	12.6	10.2	14.95
Other.....	105.1	30.8	5.0	9.6	5.9	25.9	2.0	2.4	9.8	13.6	25.71
<b>Roof Materials</b>											
Built-Up.....	97.2	32.8	5.5	4.9	7.9	17.9	5.0	3.0	6.2	14.0	7.03
Shingles (Not Wood).....	72.8	29.9	3.7	3.2	7.0	10.9	3.3	2.9	4.1	7.9	6.79
Metal Surfacing.....	72.8	26.6	2.6	2.1	2.8	14.4	1.5	2.4	7.2	13.1	16.25
Synthetic or Rubber.....	123.0	41.6	6.0	6.5	11.2	21.8	4.4	4.4	8.2	18.9	10.56
Slate or Tile.....	79.8	36.6	3.3	3.0	7.6	8.8	7.3	2.2	Q	7.2	15.64
Concrete.....	57.4	10.3	4.4	6.2	7.3	14.3	Q	1.7	5.0	5.5	13.60
Wooden Materials.....	87.2	32.4	6.0	4.9	9.5	12.7	5.7	3.3	3.5	9.0	11.88
Other.....	172.1	31.4	8.2	7.2	40.9	22.5	10.0	2.4	5.8	Q	28.73
<b>Building Shell Conservation</b>											
<b>Features (Solely or in Combination)</b>											
Roof or Ceiling Insulation.....	99.5	33.3	5.6	4.9	9.0	18.2	4.9	3.3	6.8	13.5	5.47
Wall Insulation.....	102.9	31.7	5.9	5.0	9.2	19.7	5.6	3.5	7.3	15.0	6.77
Storm or Multiple Glazing.....	106.2	35.2	5.4	5.3	11.9	18.9	5.2	3.8	7.5	12.9	5.24
Tinted, Reflective, or Shading											
Glass.....	108.2	29.8	6.8	6.5	8.8	22.2	6.1	3.4	8.6	16.0	7.29
Exterior or Interior Shadings											
or Awnings.....	103.9	32.4	6.1	5.7	8.8	18.9	6.2	3.1	7.5	15.3	6.84
Weather Stripping or Caulking.....	101.8	34.2	5.6	5.1	9.0	18.5	5.2	3.2	6.9	13.9	4.76
None of the Above.....	43.2	16.2	1.6	1.6	3.6	6.6	1.5	1.5	2.5	8.2	16.63

See footnote at end of table.

**Table B2. Energy End-Use Intensities for All Major Fuels, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Energy Intensity for Major Fuels (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>ENERGY SOURCES AND END USES</b>											
<b>Energy Sources</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	93.9	32.7	4.9	4.5	8.1	16.6	4.4	3.0	6.2	13.5	4.52
Natural Gas.....	105.4	38.1	5.0	4.7	10.4	16.8	6.2	3.0	5.8	15.5	5.19
Fuel Oil.....	126.1	45.4	5.6	6.7	14.8	20.9	5.2	3.2	7.2	17.0	10.84
District Heat .....	183.5	63.6	7.7	8.5	21.9	25.0	13.6	3.2	7.0	32.9	13.79
Other.....	108.9	35.4	4.8	4.2	9.1	19.0	Q	4.1	5.3	18.4	17.31
<b>Energy End Uses</b>											
<b>(Solely or in Combination)</b>											
Heated Buildings.....	97.9	34.8	5.0	4.6	8.4	17.2	4.6	3.1	6.4	13.9	4.91
Air-Conditioned Buildings.....	98.5	32.0	5.9	4.9	8.4	18.0	5.0	3.3	6.6	14.3	4.92
Buildings with Water Heating.....	101.9	35.0	5.3	4.9	9.3	17.9	5.0	3.3	6.5	14.7	5.05
Buildings with Cooking.....	116.4	33.8	6.7	6.4	12.7	21.2	10.8	4.1	5.5	15.2	6.63
Buildings with Manufacturing.....	126.5	42.1	4.7	2.7	3.2	20.0	Q	3.4	6.7	34.7	16.09
<b>Space-Heating Energy Source</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	80.1	17.9	6.1	4.5	5.7	19.0	3.1	3.7	7.7	12.4	5.43
Natural Gas.....	103.5	40.3	4.6	4.2	9.9	16.0	4.4	2.8	5.4	16.0	6.03
Fuel Oil.....	124.0	48.6	5.3	5.8	15.2	19.1	4.9	3.1	6.3	15.8	10.75
District Heat .....	164.7	65.3	6.9	8.3	14.7	23.3	Q	3.1	6.3	23.5	11.29
Other.....	60.0	17.8	2.5	2.9	5.3	13.0	2.7	Q	4.4	6.2	30.29
<b>Main Space-Heating Energy Source</b>											
Electricity .....	72.7	9.8	6.9	5.1	5.0	19.6	3.4	4.4	8.9	9.7	4.84
Natural Gas.....	102.6	40.2	4.5	4.3	9.9	15.7	4.3	2.6	5.4	15.6	6.28
Fuel Oil.....	88.9	47.1	1.9	2.9	6.0	12.9	2.3	2.0	6.2	7.5	10.79
District Heat .....	164.2	64.6	6.9	8.2	14.8	23.3	Q	3.1	6.2	23.8	11.20
Other.....	43.7	10.3	1.7	2.4	1.0	11.4	Q	Q	4.6	4.6	36.22
<b>Air-Conditioning Energy Source</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	95.6	31.2	5.9	4.8	7.9	17.7	4.0	3.4	6.7	14.0	4.74
Other.....	147.6	45.9	6.7	6.9	14.9	24.0	Q	3.4	6.6	24.6	13.60
<b>Water-Heating Energy Source</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	82.0	25.0	5.7	4.7	1.7	17.7	2.0	3.5	8.2	13.6	6.24
Natural Gas.....	104.4	39.1	4.6	4.7	12.8	16.8	5.3	2.9	5.4	12.8	5.46
Fuel Oil.....	102.2	50.3	2.9	3.6	14.6	13.7	2.9	1.7	2.5	10.1	14.40
District Heat .....	189.8	59.2	8.0	8.0	27.8	24.3	17.9	3.5	6.8	34.3	16.20
Other.....	76.1	20.4	3.9	3.7	Q	18.8	3.4	Q	5.4	8.3	34.01
<b>HEATING AND COOLING</b>											
<b>Percent Heated</b>											
Not Heated .....	23.3	1.2	2.7	1.8	2.9	5.6	1.0	1.5	1.9	4.7	14.83
1 to 50 .....	39.8	12.1	1.6	1.2	2.4	8.1	.9	2.6	4.5	6.5	12.68
51 to 99 .....	102.8	31.7	6.0	6.2	6.8	20.5	3.2	3.2	8.9	16.3	9.19
100.....	110.6	40.8	5.6	5.1	10.1	18.6	5.8	3.2	6.3	15.2	5.23
<b>Percent Cooled</b>											
Not Cooled .....	60.2	31.3	NC	2.0	5.5	7.9	1.1	1.3	3.3	7.9	16.82
1 to 50 .....	75.0	37.1	1.8	1.6	4.2	9.6	1.5	1.9	4.2	13.1	9.13
51 to 99 .....	107.2	29.9	7.1	6.7	9.9	22.4	5.8	4.2	7.7	13.4	6.40
100.....	113.2	29.1	8.6	6.6	11.1	22.4	7.5	4.0	8.0	16.0	6.25

See footnotes at end of table.

**Table B2. Energy End-Use Intensities for All Major Fuels, 1989 (Continued)**

Building Characteristics	Energy Intensity for Major Fuels (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Heating Equipment (Solely or in Combination)</b>											
Furnaces.....	89.0	36.1	3.6	2.9	6.1	14.1	3.4	3.4	6.4	13.3	7.95
Boilers.....	113.0	48.0	4.5	5.4	10.6	17.8	3.8	2.8	5.2	14.9	5.63
Individual Space Heaters.....	90.1	31.4	4.1	3.6	7.2	15.9	4.6	2.4	5.9	14.9	7.90
Packaged Heating Units.....	99.3	26.7	6.6	4.4	6.4	20.3	4.9	3.2	7.5	19.4	7.53
Heat Pumps.....	87.4	22.6	6.0	5.1	6.5	17.7	3.3	3.7	6.9	15.6	9.94
Air Ducts.....	106.8	33.2	6.0	5.5	9.3	20.2	5.7	3.4	7.4	16.2	5.41
Heating or Reheating Coils.....	133.7	38.4	7.3	8.1	13.0	25.6	8.1	3.3	7.9	22.0	7.57
Fan-Coil Units.....	133.3	43.4	6.4	6.7	14.6	23.0	9.5	2.9	6.5	20.3	9.53
Steam or Hot Water Radiators or Baseboards.....	124.7	54.2	3.9	4.9	13.4	16.2	7.9	2.2	4.5	17.6	9.10
Other.....	174.6	39.7	9.4	12.2	27.6	27.8	5.7	6.0	9.3	36.9	20.74
<b>Cooling Equipment (Solely or in Combination)</b>											
Central Chillers.....	126.4	31.4	8.6	9.4	13.0	24.5	9.7	3.0	7.7	19.1	9.05
Individual Air Conditioners.....	95.6	38.8	4.1	3.6	9.4	14.0	3.7	2.7	4.5	14.7	8.69
Packaged Cooling Units.....	99.8	31.4	6.3	4.9	7.5	18.9	5.8	3.5	7.0	14.5	5.15
Heat Pumps.....	98.7	24.3	6.2	5.1	6.4	19.4	4.0	3.9	8.1	21.3	13.69
Air Ducts.....	107.2	32.4	6.5	5.7	9.9	20.3	6.1	3.4	7.2	15.7	4.96
Fan-Coil Units.....	141.5	35.7	8.7	10.0	16.4	26.7	11.3	3.2	8.3	21.3	9.52
Other.....	118.9	24.5	11.3	3.3	Q	19.7	35.7	1.8	5.7	8.3	24.32
<b>Year Main Central Chiller Installed</b>											
1959 or Before.....	118.5	36.8	8.2	10.8	13.6	21.7	6.1	2.5	7.0	12.0	13.11
1960 to 1969.....	141.3	39.8	10.7	7.7	7.4	24.2	Q	2.6	7.0	24.7	22.49
1970 to 1979.....	116.6	28.0	7.4	9.2	15.3	25.2	6.2	3.0	8.1	14.2	9.02
1980 to 1986.....	131.5	28.6	8.4	11.8	17.2	26.5	5.5	3.5	8.7	21.4	15.28
1987 to 1989.....	111.3	21.9	7.7	7.8	11.3	22.1	11.9	3.6	6.6	18.4	19.39
<b>Year Packaged Cooling System Installed</b>											
1959 or Before.....	99.3	37.2	6.1	5.3	7.9	20.7	2.0	1.8	5.3	13.1	12.62
1960 to 1969.....	125.5	41.1	7.1	4.4	7.1	20.3	Q	2.6	7.5	22.5	16.95
1970 to 1979.....	99.5	31.5	6.6	5.0	8.6	19.5	5.9	3.4	6.9	12.0	6.40
1980 to 1986.....	88.4	24.5	5.8	4.9	6.4	18.8	3.6	4.2	7.8	12.5	8.17
1987 to 1989.....	101.2	34.5	6.3	4.9	7.6	16.3	5.3	3.7	5.9	16.7	11.70
<b>Computer Area with Separate Air-Conditioning System</b>											
Present in Building.....	136.3	37.1	7.9	8.7	11.3	27.1	7.1	3.8	10.9	22.4	7.24
Not Present.....	75.6	30.1	3.7	2.9	6.7	12.3	3.3	2.7	4.3	9.9	5.15
<b>LIGHTING AND REFRIGERATION</b>											
<b>Percent Lit When Open</b>											
Not Lit.....	9.1	4.9	.2	.2	Q	.8	*	.3	.5	1.9	22.17
1 to 50.....	49.1	25.0	1.8	2.0	4.7	4.4	1.7	1.4	2.9	5.2	8.38
51 to 99.....	95.9	33.4	4.9	5.0	7.4	17.3	3.8	2.5	6.7	14.9	7.53
100.....	109.3	35.4	6.0	5.2	9.8	20.6	5.7	3.9	7.0	15.7	5.76
<b>Percent Lit When Closed</b>											
Not Lit.....	76.5	30.1	3.8	3.0	7.0	11.0	2.8	2.2	4.8	11.7	6.47
1 to 50.....	98.9	33.4	5.1	5.0	7.1	19.3	4.8	3.2	6.9	14.1	6.04
51 to 99.....	176.5	38.4	10.7	11.5	31.1	35.0	14.0	5.7	9.7	20.4	14.68
100.....	87.3	20.1	10.2	6.6	5.9	20.0	5.8	Q	1.8	7.4	23.17
<b>Lighting Equipment (Solely or in Combination)</b>											
Incandescent Lamps.....	97.6	33.8	5.1	4.7	10.0	17.7	5.6	3.0	5.3	12.4	5.53
Fluorescent Lamps.....	96.5	33.4	5.1	4.7	8.2	17.1	4.5	3.1	6.4	13.9	4.87
High-Intensity Discharge Lamps.....	108.9	34.4	5.6	5.2	7.1	21.7	6.2	3.5	6.7	18.4	7.76
Other Lamps.....	98.5	21.3	7.4	7.0	11.9	22.7	5.3	Q	5.2	13.4	16.93
High-Efficiency Ballasts.....	112.7	35.4	6.1	6.3	9.4	20.2	4.5	4.1	8.8	17.9	6.61

See footnotes at end of table.

**Table B2. Energy End-Use Intensities for All Major Fuels, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Major Fuels (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Refrigeration Equipment (Solely or in Combination)</b>											
Commercial											
Refrigeration Units.....	120.6	33.8	7.0	6.5	12.9	22.4	10.2	5.2	6.4	16.3	5.99
Freezers.....	129.3	34.6	7.7	6.9	14.3	24.3	11.2	5.7	6.8	17.7	5.62
Residential											
Refrigerators.....	99.6	35.0	5.0	4.9	8.6	17.9	4.3	2.6	6.6	14.7	6.13
Freezers.....	119.0	36.1	6.8	5.1	13.9	20.0	10.4	3.4	5.2	18.2	10.67
Ice-Making Machines.....	127.5	32.3	8.2	7.6	14.5	24.0	10.3	4.7	7.0	18.9	5.94
Refrigerated Vending Machines.....	111.9	35.7	6.0	5.7	10.0	21.0	5.8	3.6	7.3	16.7	5.22
Water Coolers.....	103.9	35.3	5.5	5.2	8.5	18.9	4.5	2.9	6.7	16.3	5.65
Other.....	245.4	42.0	15.6	9.8	31.1	39.0	12.3	7.3	15.5	72.8	22.72
<b>ENERGY MANAGEMENT</b>											
<b>Occupant Control</b>											
Any Control of Heating.....	86.2	29.8	4.6	3.6	9.3	14.5	4.1	2.5	5.4	12.4	7.08
With Thermostats.....	87.1	29.8	4.7	3.6	9.6	14.6	4.0	2.4	5.5	13.0	7.65
Any Control of Cooling.....	88.2	29.8	5.2	3.8	9.4	15.0	4.3	2.6	5.6	12.5	6.94
With Thermostats.....	87.9	28.8	5.3	3.8	9.4	15.1	4.4	2.6	5.6	13.1	7.48
<b>Reduced Use During Off-Hours</b>											
Heating Only.....	90.8	46.6	1.3	2.9	8.3	11.9	2.2	2.1	4.6	10.9	15.32
Cooling Only.....	104.3	29.0	6.4	4.3	6.8	16.8	5.1	2.7	7.4	25.8	17.11
Heating and Cooling.....	86.5	30.3	4.9	4.6	5.9	15.9	4.2	2.5	6.0	12.1	6.66
<b>Computerized Energy Management and Control System</b>											
Present in Building.....	119.5	32.0	7.6	8.0	11.4	24.8	7.5	3.9	6.9	17.3	8.29
Controls Heating and Cooling.....	120.9	32.8	7.7	8.2	11.6	24.9	7.6	3.9	6.9	17.3	8.63
Controls Lighting.....	111.9	24.8	7.8	5.7	5.2	22.9	Q	4.1	6.7	18.2	13.87
Controls Other.....	145.1	29.0	9.9	8.2	21.5	27.0	6.0	4.4	7.0	32.0	21.81
<b>Other Energy Management</b>											
Regular HVAC Maintenance.....	111.0	37.1	5.9	5.6	9.6	20.2	5.1	3.6	7.1	16.7	5.04
Participated in Utility Conservation Program.....	111.4	38.0	6.1	7.0	10.7	19.7	4.9	3.7	6.5	14.8	7.95

\* = Value rounds to zero in the units displayed.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B3. End-Use Consumption Percentages for All Major Fuels, 1989**

Building Characteristics	Percent of Major Fuel Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>All Buildings</b> .....	100	35	5	5	9	18	5	3	7	14
<b>Building Floorspace (Square Feet)</b>										
1,001 to 5,000 .....	100	37	6	4	11	14	7	5	8	8
5,001 to 10,000 .....	100	40	6	4	9	15	3	3	7	13
10,001 to 25,000 .....	100	41	5	3	7	16	3	4	9	12
25,001 to 50,000 .....	100	42	5	3	6	17	3	4	6	15
50,001 to 100,000 .....	100	35	4	5	8	19	3	4	5	17
100,001 to 200,000 .....	100	34	5	6	8	20	5	2	6	14
200,001 to 500,000 .....	100	29	5	7	8	22	3	2	6	18
Over 500,000 .....	100	19	7	7	12	19	12	2	6	17
<b>Year Constructed</b>										
1899 or Before .....	100	68	1	2	9	7	3	2	2	5
1900 to 1919 .....	100	46	2	3	7	12	4	2	4	21
1920 to 1945 .....	100	45	4	5	10	12	4	2	4	14
1946 to 1959 .....	100	40	5	4	9	16	Q	2	5	12
1960 to 1969 .....	100	37	5	4	9	17	3	3	6	16
1970 to 1979 .....	100	30	6	5	9	21	5	4	7	13
1980 to 1983 .....	100	21	7	5	6	23	4	4	11	19
1984 to 1986 .....	100	22	6	8	8	22	5	5	11	13
1987 to 1989 .....	100	27	5	4	7	19	5	7	10	15
<b>BUILDING USE</b>										
<b>Principal Building Activity</b>										
Assembly .....	100	52	6	6	5	14	4	3	1	10
Education .....	100	54	4	3	6	16	Q	1	1	7
Food Sales .....	100	15	11	6	2	13	15	32	1	5
Food Service .....	100	19	8	5	19	11	23	6	1	8
Health Care .....	100	18	7	5	27	15	10	1	1	15
Lodging .....	100	32	4	5	29	11	8	4	*	7
Mercantile and Service .....	100	34	5	2	5	19	2	1	11	20
Office .....	100	30	7	11	4	22	1	3	13	10
Parking Garage .....	100	47	1	Q	Q	20	Q	2	3	18
Public Order and Safety .....	100	53	2	3	6	16	1	2	2	15
Warehouse .....	100	41	1	1	1	19	*	5	11	21
Other .....	100	25	4	*	4	22	2	2	4	37
Vacant .....	100	41	3	1	6	14	Q	2	2	30
<b>Weekly Operating Hours</b>										
39 or Fewer .....	100	60	3	5	5	11	2	3	3	8
40 to 48 .....	100	47	5	4	4	16	1	3	7	14
49 to 60 .....	100	40	5	6	3	18	2	3	10	13
61 to 84 .....	100	33	6	5	8	19	4	3	7	15
85 to 167 .....	100	32	6	4	6	20	10	4	6	12
168 (Open Continuously) .....	100	24	5	5	17	17	6	3	5	17
<b>Workers</b>										
4 or Fewer .....	100	46	5	4	10	13	3	4	6	9
5 to 9 .....	100	38	6	4	9	16	5	3	8	11
10 to 19 .....	100	40	6	4	9	14	5	4	8	12
20 to 49 .....	100	42	4	3	9	17	3	4	6	12
50 to 99 .....	100	40	5	4	4	19	3	4	6	16
100 to 249 .....	100	32	4	4	7	20	4	3	6	19
250 or More .....	100	20	6	8	11	21	8	2	7	16

See footnotes at end of table.

**Table B3. End-Use Consumption Percentages for All Major Fuels, 1989 (Continued)**

Building Characteristics	Percent of Major Fuel Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>Ownership and Occupancy</b>										
Nongovernment Owned .....	100	32	6	5	9	18	4	4	7	15
Owner Occupied.....	100	33	5	5	10	17	5	4	6	15
Single Establishment .....	100	34	5	4	10	16	5	4	6	16
Multiple Establishment.....	100	28	7	8	7	22	4	2	9	13
Nonowner Occupied.....	100	29	6	5	6	21	4	4	11	14
Single Establishment .....	100	31	5	4	5	21	5	5	11	13
Multiple Establishment.....	100	24	8	6	6	23	4	3	12	15
Vacant .....	100	48	2	*	12	7	Q	1	1	28
Government Owned .....	100	42	4	4	8	17	5	2	4	12
Federal .....	100	26	6	6	4	22	18	2	6	10
State .....	100	44	3	4	10	14	2	2	5	16
Local .....	100	47	4	4	8	18	3	2	3	10
<b>Multibuilding Facility</b>										
Not on Multibuilding Facility.....	100	37	5	5	8	18	4	4	7	13
Part of Multibuilding Facility.....	100	33	5	5	10	18	5	3	6	16
On Facility with Central Plant .....	100	32	5	4	11	16	7	2	4	19
<b>Percent Vacant at Least Three Months</b>										
0 .....	100	36	5	4	9	18	4	4	7	14
1 to 50 .....	100	28	6	7	9	20	4	2	7	17
51 to 99 .....	100	39	5	3	5	13	23	2	3	7
100 .....	100	43	4	4	13	13	2	4	4	15
<b>Months in Use Out of Past 12 Months</b>										
0 to 8 .....	100	35	4	4	12	15	7	5	6	13
9 to 11 .....	100	60	3	4	8	12	1	2	1	10
12 .....	100	34	5	5	9	18	5	3	7	15
<b>LOCATION</b>										
<b>Census Region</b>										
Northeast.....	100	42	3	4	9	17	3	3	7	13
Midwest.....	100	44	3	4	10	14	4	3	5	13
South.....	100	26	8	6	7	21	4	4	7	18
West.....	100	26	6	6	9	19	8	3	8	14
<b>Census Division</b>										
Northeast										
New England.....	100	42	3	4	12	15	4	3	5	12
Middle Atlantic .....	100	42	3	4	8	17	3	3	7	13
Midwest										
East North Central.....	100	45	3	3	10	15	4	3	5	11
West North Central .....	100	42	5	4	11	14	4	2	4	15
South										
South Atlantic.....	100	24	9	6	5	22	3	4	8	19
East South Central.....	100	27	5	5	8	19	4	4	8	20
West South Central .....	100	27	9	6	8	21	4	4	6	15
West										
Mountain.....	100	35	6	5	8	15	14	3	5	8
Pacific.....	100	20	6	7	10	22	4	4	9	18
<b>Metropolitan Status</b>										
Metropolitan .....	100	33	6	5	9	18	5	3	7	15
Nonmetropolitan.....	100	45	4	3	8	15	3	3	5	13

See footnotes at end of table.

**Table B3. End-Use Consumption Percentages for All Major Fuels, 1989 (Continued)**

Building Characteristics	Percent of Major Fuel Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>Climate Zone: 45-Year Average</b>										
Under 2,000 CDD and --										
Over 7,000 HDD.....	100	48	2	3	11	14	3	4	5	11
5,500-7,000 HDD.....	100	45	3	4	8	14	7	3	5	12
4,000-5,499 HDD.....	100	32	5	5	9	20	4	3	7	14
Under 4,000 HDD.....	100	24	6	6	8	20	4	3	8	19
2,000 CDD or More and --										
Under 4,000 HDD.....	100	20	12	6	9	21	4	5	7	16
<b>1989 Degree-Days</b>										
Under 2,000 CDD and --										
Over 7,000 HDD.....	100	51	2	3	9	13	3	3	4	11
5,500-7,000 HDD.....	100	40	4	4	9	15	6	3	5	14
4,000-5,499 HDD.....	100	30	5	6	8	23	4	4	9	11
Under 4,000 HDD.....	100	25	7	6	8	19	4	3	8	20
2,000 CDD or More and --										
Under 4,000 HDD.....	100	19	12	7	9	21	4	5	8	16
<b>STRUCTURE</b>										
<b>Floors</b>										
1.....	100	35	6	4	7	18	4	4	8	14
2.....	100	35	5	4	6	19	3	4	7	17
3.....	100	44	4	5	8	14	2	2	5	16
4 to 6.....	100	36	5	5	12	16	10	2	4	10
7 or More.....	100	24	6	9	14	19	6	2	6	14
<b>Wall Materials</b>										
Masonry.....	100	37	5	4	10	16	4	3	6	14
Siding or Shingles.....	100	36	5	4	11	17	4	3	7	12
Metal Panels.....	100	35	5	4	4	21	1	3	9	17
Concrete Panels.....	100	24	7	5	5	20	Q	3	7	19
Window Glass.....	100	24	6	12	8	24	4	3	11	9
Other.....	100	29	5	9	6	25	2	2	9	13
<b>Roof Materials</b>										
Built-Up.....	100	34	6	5	8	18	5	3	6	14
Shingles (Not Wood).....	100	41	5	4	10	15	5	4	6	11
Metal Surfacing.....	100	37	4	3	4	20	2	3	10	18
Synthetic or Rubber.....	100	34	5	5	9	18	4	4	7	15
Slate or Tile.....	100	46	4	4	10	11	9	3	5	9
Concrete.....	100	18	8	11	13	25	Q	3	9	10
Wooden Materials.....	100	37	7	6	11	15	7	4	4	10
Other.....	100	18	5	4	24	13	6	1	Q	25
<b>Building Shell Conservation</b>										
<b>Features (Solely or in Combination)</b>										
Roof or Ceiling Insulation.....	100	33	6	5	9	18	5	3	7	14
Wall Insulation.....	100	31	6	5	9	19	5	3	7	15
Storm or Multiple Glazing.....	100	33	5	5	11	18	5	4	7	12
Tinted, Reflective, or Shading										
Glass.....	100	28	6	6	8	21	6	3	8	15
Exterior or Interior Shadings										
or Awnings.....	100	31	6	5	8	18	6	3	7	15
Weather Stripping or Caulking.....	100	34	6	5	9	18	5	3	7	14
None of the Above.....	100	38	4	4	8	15	3	3	6	19

See footnotes at end of table.

**Table B3. End-Use Consumption Percentages for All Major Fuels, 1989 (Continued)**

Building Characteristics	Percent of Major Fuel Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>ENERGY SOURCES AND END USES</b>										
<b>Energy Sources</b>										
<b>(Solely or in Combination)</b>										
Electricity .....	100	35	5	5	9	18	5	3	7	14
Natural Gas.....	100	36	5	5	10	16	6	3	5	15
Fuel Oil.....	100	36	4	5	12	17	4	3	6	13
District Heat .....	100	35	4	5	12	14	7	2	4	18
Other .....	100	33	4	4	8	17	Q	4	5	17
<b>Energy End Uses</b>										
<b>(Solely or in Combination)</b>										
Heated Buildings.....	100	36	5	5	9	18	5	3	7	14
Air-Conditioned Buildings.....	100	33	6	5	9	18	5	3	7	15
Buildings with Water Heating.....	100	34	5	5	9	18	5	3	6	14
Buildings with Cooking .....	100	29	6	5	11	18	9	3	5	13
Buildings with Manufacturing.....	100	33	4	2	3	16	Q	3	5	27
<b>Space-Heating Energy Source</b>										
<b>(Solely or in Combination)</b>										
Electricity .....	100	22	8	6	7	24	4	5	10	15
Natural Gas.....	100	39	4	4	10	15	4	3	5	15
Fuel Oil.....	100	39	4	5	12	15	4	3	5	13
District Heat .....	100	40	4	5	9	14	8	2	4	14
Other .....	100	30	4	5	9	22	5	8	7	10
<b>Main Space-Heating Energy Source</b>										
Electricity .....	100	13	9	7	7	27	5	6	12	13
Natural Gas.....	100	39	4	4	10	15	4	3	5	15
Fuel Oil.....	100	53	2	3	7	15	3	2	7	8
District Heat .....	100	39	4	5	9	14	8	2	4	14
Other .....	100	24	4	6	2	26	4	14	10	11
<b>Air-Conditioning Energy Source</b>										
<b>(Solely or in Combination)</b>										
Electricity .....	100	33	6	5	8	19	4	4	7	15
Other .....	100	31	5	5	10	16	10	2	4	17
<b>Water-Heating Energy Source</b>										
<b>(Solely or in Combination)</b>										
Electricity .....	100	30	7	6	2	22	2	4	10	17
Natural Gas.....	100	37	4	4	12	16	5	3	5	12
Fuel Oil.....	100	49	3	3	14	13	3	2	2	10
District Heat .....	100	31	4	4	15	13	9	2	4	18
Other .....	100	27	5	5	Q	25	4	14	7	11
<b>HEATING AND COOLING</b>										
<b>Percent Heated</b>										
Not Heated .....	100	5	12	8	12	24	4	6	8	20
1 to 50 .....	100	30	4	3	6	20	2	7	11	16
51 to 99 .....	100	31	6	6	7	20	3	3	9	16
100 .....	100	37	5	5	9	17	5	3	6	14
<b>Percent Cooled</b>										
Not Cooled .....	100	52	NC	3	9	13	2	2	5	13
1 to 50 .....	100	49	2	2	6	13	2	3	6	17
51 to 99 .....	100	28	7	6	9	21	5	4	7	12
100 .....	100	26	8	6	10	20	7	4	7	14

See footnotes at end of table.

**Table B3. End-Use Consumption Percentages for All Major Fuels, 1989 (Continued)**

Building Characteristics	Percent of Major Fuel Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>Heating Equipment (Solely or in Combination)</b>										
Furnaces.....	100	41	4	3	7	16	4	4	7	15
Boilers.....	100	42	4	5	9	16	3	2	5	13
Individual Space Heaters.....	100	35	5	4	8	18	5	3	7	17
Packaged Heating Units.....	100	27	7	4	6	20	5	3	8	20
Heat Pumps.....	100	26	7	6	7	20	4	4	8	18
Air Ducts.....	100	31	6	5	9	19	5	3	7	15
Heating or Reheating Coils.....	100	29	5	6	10	19	6	2	6	16
Fan-Coil Units.....	100	33	5	5	11	17	7	2	5	15
Steam or Hot Water Radiators or Baseboards.....	100	43	3	4	11	13	6	2	4	14
Other.....	100	23	5	7	16	16	3	3	5	21
<b>Cooling Equipment (Solely or in Combination)</b>										
Central Chillers.....	100	25	7	7	10	19	8	2	6	15
Individual Air Conditioners.....	100	41	4	4	10	15	4	3	5	15
Packaged Cooling Units.....	100	31	6	5	7	19	6	4	7	15
Heat Pumps.....	100	25	6	5	6	20	4	4	8	22
Air Ducts.....	100	30	6	5	9	19	6	3	7	15
Fan-Coil Units.....	100	25	6	7	12	19	8	2	6	15
Other.....	100	21	10	3	7	17	30	2	5	7
<b>Year Main Central Chiller Installed</b>										
1959 or Before.....	100	31	7	9	11	18	5	2	6	10
1960 to 1969.....	100	28	8	5	5	17	12	2	5	17
1970 to 1979.....	100	24	6	8	13	22	5	3	7	12
1980 to 1986.....	100	22	6	9	13	20	4	3	7	16
1987 to 1989.....	100	20	7	7	10	20	11	3	6	17
<b>Year Packaged Cooling System Installed</b>										
1959 or Before.....	100	37	6	5	8	21	2	2	5	13
1960 to 1969.....	100	33	6	3	6	16	Q	2	6	18
1970 to 1979.....	100	32	7	5	9	20	6	3	7	12
1980 to 1986.....	100	28	7	6	7	21	4	5	9	14
1987 to 1989.....	100	34	6	5	7	16	5	4	6	17
<b>Computer Area with Separate Air-Conditioning System</b>										
Present in Building.....	100	27	6	6	8	20	5	3	8	16
Not Present.....	100	40	5	4	9	16	4	4	6	13
<b>LIGHTING AND REFRIGERATION</b>										
<b>Percent Lit When Open</b>										
Not Lit.....	100	54	2	2	Q	9	*	3	5	20
1 to 50.....	100	51	4	4	10	9	4	3	6	11
51 to 99.....	100	35	5	5	8	18	4	3	7	16
100.....	100	32	6	5	9	19	5	4	6	14
<b>Percent Lit When Closed</b>										
Not Lit.....	100	39	5	4	9	14	4	3	6	15
1 to 50.....	100	34	5	5	7	19	5	3	7	14
51 to 99.....	100	22	6	7	18	20	8	3	6	12
100.....	100	23	12	8	7	23	7	Q	2	8
<b>Lighting Equipment (Solely or in Combination)</b>										
Incandescent Lamps.....	100	35	5	5	10	18	6	3	5	13
Fluorescent Lamps.....	100	35	5	5	9	18	5	3	7	14
High-Intensity Discharge Lamps.....	100	32	5	5	7	20	6	3	6	17
Other Lamps.....	100	22	8	7	12	23	5	Q	5	14
High-Efficiency Ballasts.....	100	31	5	6	8	18	4	4	8	16

See footnotes at end of table.

**Table B3. End-Use Consumption Percentages for All Major Fuels, 1989 (Continued)**

Building Characteristics	Percent of Major Fuel Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>Refrigeration Equipment (Solely or in Combination)</b>										
Commercial										
Refrigeration Units.....	100	28	6	5	11	19	8	4	5	13
Freezers.....	100	27	6	5	11	19	9	4	5	14
Residential										
Refrigerators.....	100	35	5	5	9	18	4	3	7	15
Freezers.....	100	30	6	4	12	17	9	3	4	15
Ice-Making Machines.....	100	25	6	6	11	19	8	4	5	15
Refrigerated Vending Machines.....	100	32	5	5	9	19	5	3	7	15
Water Coolers.....	100	34	5	5	8	18	4	3	6	16
Other.....	100	17	6	4	13	16	5	3	6	30
<b>ENERGY MANAGEMENT</b>										
<b>Occupant Control</b>										
Any Control of Heating.....	100	35	5	4	11	17	5	3	6	14
With Thermostats.....	100	34	5	4	11	17	5	3	6	15
Any Control of Cooling.....	100	34	6	4	11	17	5	3	6	14
With Thermostats.....	100	33	6	4	11	17	5	3	6	15
<b>Reduced Use During Off-Hours</b>										
Heating Only.....	100	51	1	3	9	13	2	2	5	12
Cooling Only.....	100	28	6	4	7	16	5	3	7	25
Heating and Cooling.....	100	35	6	5	7	18	5	3	7	14
<b>Computerized Energy Management and Control System</b>										
Present in Building.....	100	27	6	7	10	21	6	3	6	14
Controls Heating and Cooling.....	100	27	6	7	10	21	6	3	6	14
Controls Lighting.....	100	22	7	5	5	20	15	4	6	16
Controls Other.....	100	20	7	6	15	19	4	3	5	22
<b>Other Energy Management</b>										
Regular HVAC Maintenance.....	100	33	5	5	9	18	5	3	6	15
Participated in Utility Conservation Program.....	100	34	5	6	10	18	4	3	6	13

\* = Value rounds to zero in the units displayed.

NC = No cases in responding sample.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B4. Consumption of Electricity by End Use, 1989**

Building Characteristics RSE Column Factor:	Electricity Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
All Buildings .....	2,773	96	282	278	24	1,023	56	187	379	449	5.91
<b>Building Floorspace (Square Feet)</b>											
1,001 to 5,000 .....	326	15	44	29	8	96	15	33	52	33	6.53
5,001 to 10,000 .....	246	9	33	21	3	83	6	16	41	34	12.33
10,001 to 25,000 .....	381	25	39	27	4	124	8	30	73	52	10.32
25,001 to 50,000 .....	331	Q	34	26	2	127	6	27	46	46	10.91
50,001 to 100,000 .....	433	9	36	40	2	161	6	31	44	104	16.23
100,001 to 200,000 .....	387	12	35	43	2	153	5	19	47	71	12.79
200,001 to 500,000 .....	366	7	35	50	2	151	5	15	39	62	17.96
Over 500,000 .....	303	3	26	43	1	126	4	15	37	46	17.56
<b>Year Constructed</b>											
1899 or Before .....	25	1	2	3	Q	8	1	3	3	4	17.03
1900 to 1919 .....	75	2	5	7	1	29	1	4	10	18	16.56
1920 to 1945 .....	211	Q	24	29	1	76	5	14	23	25	12.34
1946 to 1959 .....	379	5	35	42	2	158	6	21	53	56	13.12
1960 to 1969 .....	589	15	60	55	5	219	10	32	72	121	15.03
1970 to 1979 .....	730	31	83	70	9	276	16	51	93	101	7.28
1980 to 1983 .....	295	15	30	23	3	98	7	16	47	56	16.84
1984 to 1986 .....	303	11	29	37	2	104	7	25	50	39	12.71
1987 to 1989 .....	167	4	14	12	1	55	3	21	28	28	19.81
<b>BUILDING USE</b>											
<b>Principal Building Activity</b>											
Assembly .....	186	19	25	25	1	63	1	11	6	35	17.84
Education .....	217	10	17	24	2	114	1	10	10	28	9.30
Food Sales .....	105	*	16	8	1	19	9	45	1	7	22.55
Food Service .....	113	1	19	13	3	27	17	16	2	15	11.37
Health Care .....	154	3	31	21	2	68	5	6	5	12	13.95
Lodging .....	138	11	17	20	5	47	14	16	1	6	11.61
Mercantile and Service .....	550	12	51	26	4	201	4	12	115	124	10.77
Office .....	781	27	81	133	4	272	3	35	165	62	6.40
Parking Garage .....	18	Q	*	*	*	8	*	1	1	7	25.81
Public Order and Safety .....	29	Q	1	2	*	13	*	2	1	8	28.04
Warehouse .....	243	Q	6	3	1	102	1	24	57	39	18.91
Other .....	201	Q	14	1	Q	76	1	7	Q	Q	41.44
Vacant .....	39	1	3	*	*	13	*	2	2	18	19.68
<b>Weekly Operating Hours</b>											
39 or Fewer .....	71	5	7	10	1	23	1	6	7	12	11.94
40 to 48 .....	440	16	47	43	3	158	2	27	71	73	9.57
49 to 60 .....	478	22	44	52	3	169	3	24	93	69	7.93
61 to 84 .....	522	14	54	52	3	189	7	31	71	100	10.12
85 to 167 .....	485	12	47	38	4	196	14	44	56	72	10.27
168 (Open Continuously) .....	779	27	83	83	9	289	28	54	81	123	13.40
<b>Workers</b>											
4 or Fewer .....	294	15	34	28	6	88	11	30	44	39	5.56
5 to 9 .....	258	16	30	21	4	83	8	17	42	37	8.81
10 to 19 .....	238	11	30	20	3	74	8	20	42	31	11.44
20 to 49 .....	401	14	40	27	4	156	9	33	56	61	9.28
50 to 99 .....	348	17	36	25	2	133	7	28	39	60	10.76
100 to 249 .....	478	9	42	43	3	201	6	29	58	87	15.02
250 or More .....	758	13	71	113	2	288	8	31	99	133	17.20

See footnotes at end of table.

**Table B4. Consumption of Electricity by End Use, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Electricity Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Ownership and Occupancy</b>											
Nongovernment Owned .....	2,113	76	228	209	21	757	48	154	311	310	5.71
Owner Occupied.....	1,575	58	173	166	16	566	38	121	211	227	6.90
Single Establishment .....	1,182	45	133	114	14	419	34	105	150	168	8.22
Multiple Establishment.....	393	14	40	51	2	146	4	16	61	59	10.38
Nonowner Occupied.....	537	17	54	44	5	192	10	33	100	83	9.12
Single Establishment .....	265	7	25	21	3	98	6	22	51	32	13.09
Multiple Establishment.....	265	10	29	22	2	91	Q	11	48	48	12.80
Vacant .....	8	*	1	*	*	3	*	*	*	3	25.16
Government Owned .....	660	20	54	69	3	266	8	33	68	139	14.93
Federal .....	132	3	8	17	1	60	1	5	16	21	35.56
State .....	240	Q	19	22	1	83	5	14	29	Q	28.90
Local .....	288	12	27	31	2	122	3	15	23	54	13.95
<b>Multibuilding Facility</b>											
Not on Multibuilding Facility.....	1,428	46	148	146	16	510	36	114	213	199	4.25
Part of Multibuilding Facility .....	1,345	50	134	132	8	513	20	73	166	249	11.09
On Facility with Central Plant .....	635	13	57	67	3	250	11	38	64	132	20.83
<b>Percent Vacant at Least Three Months</b>											
0 .....	2,062	75	210	194	20	756	47	151	287	322	6.35
1 to 50 .....	583	16	62	71	3	217	6	25	80	103	8.92
51 to 99 .....	64	2	3	7	*	28	Q	4	6	12	33.39
100 .....	63	3	6	6	1	21	2	6	6	12	11.17
<b>Months in Use Out of Past 12 Months</b>											
0 to 8 .....	81	3	8	7	1	25	2	8	10	17	14.45
9 to 11 .....	76	5	7	11	1	32	1	4	4	10	9.75
12 .....	2,616	87	267	260	22	966	53	175	365	422	6.20
<b>LOCATION</b>											
<b>Census Region</b>											
Northeast.....	586	23	35	57	3	227	11	35	92	102	13.99
Midwest.....	609	26	51	59	6	241	14	48	79	85	9.11
South.....	975	31	135	93	12	341	20	65	122	155	8.65
West.....	604	15	61	69	4	214	11	38	86	106	12.01
<b>Census Division</b>											
Northeast											
New England .....	115	4	7	13	1	46	3	8	16	19	14.84
Middle Atlantic .....	470	19	27	44	2	182	8	28	76	84	16.91
Midwest											
East North Central.....	399	17	28	37	4	160	9	34	54	56	11.91
West North Central .....	210	10	24	22	2	80	5	14	25	29	15.15
South											
South Atlantic.....	416	13	61	43	6	147	7	25	55	60	11.69
East South Central.....	215	11	20	17	3	71	6	15	30	41	19.47
West South Central .....	344	8	54	33	3	123	7	25	37	54	15.08
West											
Mountain.....	179	5	20	24	1	66	4	12	24	23	29.65
Pacific .....	425	10	41	45	2	148	7	26	62	83	16.21
<b>Metropolitan Status</b>											
Metropolitan .....	2,366	71	245	244	17	873	44	156	324	390	6.46
Nonmetropolitan.....	407	24	37	34	7	149	12	31	55	58	13.40

See footnotes at end of table.

**Table B4. Consumption of Electricity by End Use, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Electricity Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Climate Zone: 45-Year Average</b>											
Under 2,000 CDD and --											
Over 7,000 HDD.....	211	10	10	16	2	84	6	23	30	31	17.08
5,500-7,000 HDD.....	668	25	45	70	5	266	16	47	93	102	14.48
4,000-5,499 HDD.....	706	33	59	72	7	279	11	42	102	101	10.12
Under 4,000 HDD.....	663	17	70	67	5	225	12	38	93	135	16.48
2,000 CDD or More and --											
Under 4,000 HDD.....	525	11	98	52	6	169	12	37	60	80	11.41
<b>1989 Degree-Days</b>											
Under 2,000 CDD and --											
Over 7,000 HDD.....	286	10	14	23	2	117	8	29	38	44	15.40
5,500-7,000 HDD.....	852	34	67	91	7	335	18	55	119	126	13.17
4,000-5,499 HDD.....	539	28	38	54	5	212	9	34	81	79	13.41
Under 4,000 HDD.....	594	13	67	60	4	197	10	34	83	126	16.04
2,000 CDD or More and --											
Under 4,000 HDD.....	503	11	94	50	6	162	11	36	58	75	11.76
<b>STRUCTURE</b>											
<b>Floors</b>											
1.....	922	31	110	71	11	322	23	74	142	138	6.91
2.....	793	29	69	58	5	298	13	59	114	148	10.14
3.....	320	17	29	35	3	107	5	15	38	Q	21.45
4 to 6.....	342	9	34	42	2	144	8	20	35	47	13.89
7 or More.....	396	10	39	73	2	151	7	19	51	44	11.85
<b>Wall Materials</b>											
Masonry.....	1,740	54	191	168	16	634	40	127	230	279	6.33
Siding or Shingles.....	150	9	15	12	3	56	4	10	22	19	11.52
Metal Panels.....	246	10	21	19	2	97	2	15	42	40	19.67
Concrete Panels.....	397	15	36	38	2	144	6	24	46	84	15.84
Window Glass.....	146	6	12	26	1	54	Q	7	24	13	22.39
Other.....	94	2	6	14	*	39	1	4	15	13	22.18
<b>Roof Materials</b>											
Built-Up.....	1,484	48	154	152	12	556	29	92	191	249	8.05
Shingles (Not Wood).....	341	14	40	35	5	119	10	31	45	43	8.20
Metal Surfacing.....	314	10	21	17	3	118	4	20	59	61	15.58
Synthetic or Rubber.....	416	16	40	45	2	151	6	30	57	68	15.18
Slate or Tile.....	70	3	8	8	1	23	3	6	Q	9	23.25
Concrete.....	71	2	6	12	Q	28	1	3	10	9	32.42
Wooden Materials.....	29	1	4	4	*	9	1	2	3	4	18.89
Other.....	48	Q	7	Q	Q	19	1	2	Q	5	38.31
<b>Building Shell Conservation</b>											
<b>Features (Solely or in Combination)</b>											
Roof or Ceiling Insulation.....	2,201	79	234	223	19	820	45	149	306	326	5.92
Wall Insulation.....	1,547	56	162	148	14	585	30	105	216	229	7.36
Storm or Multiple Glazing.....	1,225	43	123	128	12	455	28	92	180	163	7.24
Tinted, Reflective, or Shading											
Glass.....	1,295	39	132	143	9	490	20	76	189	198	7.35
Exterior or Interior Shadings											
or Awnings.....	1,381	41	140	149	12	496	27	82	195	239	8.24
Weather Stripping or Caulking.....	2,257	80	230	229	20	829	44	145	310	371	6.64
None of the Above.....	134	4	12	12	1	51	3	11	19	20	10.78

See footnotes at end of table.

**Table B4. Consumption of Electricity by End Use, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Electricity Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>ENERGY SOURCES AND END USES</b>											
<b>Energy Sources</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	2,773	96	282	278	24	1,023	56	187	379	449	5.91
Natural Gas.....	1,824	29	187	195	10	689	41	122	237	313	8.39
Fuel Oil.....	662	10	66	85	5	263	11	40	91	90	15.56
District Heat .....	444	Q	34	56	Q	165	8	21	46	98	20.92
Other .....	402	9	30	34	4	152	9	33	42	89	15.70
<b>Energy End Uses</b>											
<b>(Solely or in Combination)</b>											
Heated Buildings.....	2,676	96	267	268	23	993	54	179	369	427	5.99
Air-Conditioned Buildings.....	2,555	91	282	256	23	933	51	172	342	406	5.78
Buildings with Water Heating.....	2,602	90	263	263	24	958	54	179	347	422	6.17
Buildings with Cooking.....	1,331	32	142	150	12	502	41	96	130	226	9.79
Buildings with Manufacturing.....	291	Q	17	15	1	112	1	19	38	81	17.76
<b>Space-Heating Energy Source</b>											
Electricity .....	1,039	96	112	83	15	355	20	70	144	144	6.02
Main.....	800	75	92	68	13	263	17	59	120	92	5.83
With Secondary.....	118	9	13	10	2	37	3	Q	14	16	21.04
Natural Gas Only.....	57	3	6	3	*	18	Q	Q	6	8	30.58
Other Energy Sources or Combinations.....	54	6	5	Q	2	18	1	2	Q	7	38.11
With No Secondary.....	682	66	78	58	11	226	14	46	106	76	5.36
Secondary.....	239	21	20	15	1	92	3	11	24	52	15.24
Other Excluding Electricity.....	1,637	NC	155	185	8	637	34	109	225	284	8.50
Building Not Heated.....	97	NC	15	10	2	30	2	8	10	21	22.85
<b>Main Space-Heating Energy Source</b>											
Electricity .....	800	75	92	68	13	263	17	59	120	92	5.83
Natural Gas.....	1,287	9	136	134	6	489	26	81	169	237	8.70
Fuel Oil.....	182	1	11	16	2	72	4	11	35	30	18.86
District Heat .....	349	Q	25	49	1	139	7	18	37	60	17.80
Other.....	62	Q	3	5	1	23	Q	Q	9	8	41.49
<b>Air-Conditioning Energy Source</b>											
Electricity .....	2,373	86	282	230	22	848	47	161	321	376	5.81
Other Excluding Electricity.....	182	Q	NC	26	1	85	5	11	21	30	17.62
Air-Conditioning Not Performed.....	218	5	NC	22	1	90	4	15	37	43	17.62
<b>Water-Heating Energy Source</b>											
Electricity .....	1,135	65	122	100	24	381	15	74	175	178	6.36
Other Excluding Electricity.....	1,466	25	141	163	NC	577	39	105	172	245	8.57
Water Heating Not Performed.....	171	6	18	15	NC	65	1	8	32	26	9.30
<b>HEATING AND COOLING</b>											
<b>Percent Heated</b>											
Not Heated .....	98	Q	15	10	2	30	2	8	10	21	22.55
1 to 50 .....	210	4	15	11	2	76	3	24	41	33	15.51
51 to 99 .....	496	13	51	54	4	178	9	28	77	83	11.17
100.....	1,969	79	201	203	17	739	42	127	250	310	7.68
<b>Percent Cooled</b>											
Not Cooled .....	218	5	NC	22	1	90	4	15	37	43	17.62
1 to 50 .....	461	16	31	29	3	172	8	34	75	93	9.26
51 to 99 .....	783	22	91	88	7	295	16	55	101	109	7.78
100.....	1,311	53	161	138	13	466	28	83	166	204	9.51

See footnotes at end of table.

**Table B4. Consumption of Electricity by End Use, 1989 (Continued)**

Building Characteristics	Electricity Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Heating Equipment (Solely or in Combination)</b>											
Furnaces.....	608	22	55	45	6	219	15	52	99	95	8.80
Boilers.....	874	19	85	108	5	354	14	56	103	131	9.13
Individual Space Heaters.....	942	50	80	82	9	358	15	54	133	160	9.04
Packaged Heating Units.....	878	31	100	68	7	316	18	50	117	171	10.89
Heat Pumps.....	426	26	49	43	4	148	8	31	57	60	10.47
Air Ducts.....	2,004	58	205	205	15	753	37	125	275	330	7.44
Heating or Reheating Coils.....	1,040	28	97	127	5	401	16	52	123	191	13.64
Fan-Coil Units.....	682	Q	59	79	3	273	10	34	77	129	15.07
Steam or Hot Water Radiators or Baseboards.....	603	12	45	77	3	256	12	34	71	93	10.51
Other.....	117	Q	14	Q	1	41	2	9	14	14	29.18
<b>Cooling Equipment (Solely or in Combination)</b>											
Central Chillers.....	922	28	101	132	5	344	13	42	108	150	13.05
Individual Air Conditioners.....	754	28	75	70	9	269	15	52	87	150	10.36
Packaged Cooling Units.....	1,804	53	203	170	15	655	37	122	244	305	7.32
Heat Pumps.....	467	26	48	40	5	152	7	30	64	96	16.32
Air Ducts.....	1,877	63	205	195	14	696	36	116	246	305	7.31
Fan-Coil Units.....	753	22	76	108	3	288	10	35	89	121	14.29
Other.....	63	1	8	5	*	29	1	3	8	8	33.67
<b>Year Main Central Chiller Installed</b>											
1959 or Before.....	91	Q	11	16	1	32	1	4	10	8	24.98
1960 to 1969.....	252	3	26	29	*	90	2	9	26	Q	31.68
1970 to 1979.....	231	5	24	32	2	89	3	10	29	36	15.03
1980 to 1986.....	245	9	28	41	1	93	4	12	30	26	21.11
1987 to 1989.....	103	2	12	14	Q	40	2	6	12	13	22.77
<b>Year Packaged Cooling System Installed</b>											
1959 or Before.....	79	1	8	9	*	36	1	3	9	11	18.32
1960 to 1969.....	276	6	25	21	1	98	3	13	36	Q	25.88
1970 to 1979.....	547	24	67	53	6	205	12	36	73	73	8.37
1980 to 1986.....	599	19	64	55	5	213	14	47	88	93	10.44
1987 to 1989.....	303	5	37	31	2	104	7	23	38	56	10.68
<b>Computer Area with Separate Air-Conditioning System</b>											
Present in Building.....	1,194	24	114	145	5	452	13	63	181	198	10.59
Not Present.....	1,579	72	168	133	20	570	43	124	198	250	5.77
<b>LIGHTING AND REFRIGERATION</b>											
<b>Percent Lit When Open</b>											
Not Lit.....	8	Q	*	*	*	2	*	1	Q	3	30.06
1 to 50.....	192	14	20	22	4	48	5	15	32	35	9.45
51 to 99.....	813	22	80	85	6	293	12	43	114	157	9.92
100.....	1,760	59	182	171	14	680	39	129	232	253	7.78
<b>Percent Lit When Closed</b>											
Not Lit.....	947	52	100	85	10	309	22	63	135	172	8.73
1 to 50.....	1,566	42	149	160	11	613	25	102	220	244	6.46
51 to 99.....	203	2	23	27	2	81	6	13	22	28	25.13
100.....	57	Q	10	7	Q	20	Q	Q	2	5	36.11
<b>Lighting Equipment (Solely or in Combination)</b>											
Incandescent Lamps.....	1,747	62	180	183	15	685	38	115	206	265	7.40
Fluorescent Lamps.....	2,735	94	279	274	24	1,008	55	185	375	440	5.93
High-Intensity Discharge Lamps.....	982	31	85	95	5	396	13	63	122	173	10.04
Other Lamps.....	28	Q	4	4	*	12	Q	Q	3	3	24.45
High-Efficiency Ballasts.....	1,415	53	141	152	11	490	28	99	213	228	8.82

See footnotes at end of table.

**Table B4. Consumption of Electricity by End Use, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Electricity Consumption (trillion Btu)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Refrigeration Equipment (Solely or in Combination)</b>											
<b>Commercial</b>											
Refrigeration Units.....	1,495	31	155	160	13	552	44	128	158	253	8.76
Freezers.....	1,424	29	148	150	12	526	43	124	148	244	8.92
<b>Residential</b>											
Refrigerators.....	2,054	61	202	215	15	794	30	117	292	328	6.59
Freezers.....	651	17	71	63	6	248	17	42	65	121	12.78
Ice-Making Machines.....	1,540	44	173	177	13	562	43	111	164	254	8.62
Refrigerated Vending Machines.....	2,122	64	213	222	16	816	42	141	283	325	6.03
Water Coolers.....	2,147	70	215	224	14	811	31	124	289	369	7.52
Other.....	186	Q	21	14	2	55	3	10	22	Q	31.51
<b>ENERGY MANAGEMENT</b>											
<b>Occupant Control</b>											
Any Control of Heating.....	1,074	42	120	97	13	393	24	67	147	170	6.04
With Thermostats.....	986	39	110	89	12	362	22	58	135	160	6.88
Any Control of Cooling.....	1,094	44	130	100	14	394	25	68	148	171	6.20
With Thermostats.....	1,010	42	120	91	12	363	23	62	135	161	7.31
<b>Reduced Use During Off-Hours</b>											
Heating Only.....	216	7	8	21	2	85	5	15	33	40	18.35
Cooling Only.....	202	Q	24	18	2	69	5	11	30	36	14.97
Heating and Cooling.....	1,671	62	174	178	13	616	27	98	233	270	6.73
<b>Computerized Energy Management and Control System</b>											
Present in Building.....	896	19	93	115	4	356	14	56	99	139	9.52
Controls Heating and Cooling.....	866	19	90	113	3	344	14	53	96	133	9.73
Controls Lighting.....	223	4	21	22	1	88	4	16	26	42	18.15
Controls Other.....	160	3	22	19	1	62	3	10	16	25	15.51
<b>Other Energy Management</b>											
Regular HVAC Maintenance.....	2,328	77	234	241	18	870	44	153	307	383	6.59
Participated in Utility Conservation Program.....	584	27	60	75	4	214	11	40	71	83	7.74

\* = Value rounds to zero in the units displayed.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B5. Energy End-Use Intensities for Electricity, 1989**

Building Characteristics  RSE Column Factor:	Energy Intensity for Electricity (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
All Buildings .....	45.0	1.6	4.6	4.5	0.4	16.6	0.9	3.0	6.2	7.3	4.56
<b>Building Floorspace (Square Feet)</b>											
1,001 to 5,000 .....	50.8	2.4	6.8	4.5	1.3	15.0	2.3	5.2	8.1	5.1	5.81
5,001 to 10,000 .....	39.1	1.5	5.2	3.3	.5	13.2	.9	2.6	6.5	5.4	11.89
10,001 to 25,000 .....	38.2	2.5	3.9	2.7	.4	12.5	.8	3.0	7.3	5.2	7.99
25,001 to 50,000 .....	38.2	1.9	3.9	3.0	.3	14.7	.7	3.1	5.3	5.3	8.59
50,001 to 100,000 .....	48.6	1.0	4.0	4.4	.2	18.1	.7	3.4	5.0	11.7	15.70
100,001 to 200,000 .....	47.1	1.4	4.2	5.3	.2	18.7	.7	2.3	5.7	8.6	9.75
200,001 to 500,000 .....	52.3	1.0	5.0	7.1	.2	21.6	.7	2.2	5.6	8.8	14.99
Over 500,000 .....	50.0	.5	4.4	7.1	.1	20.8	.7	2.5	6.2	7.6	11.45
<b>Year Constructed</b>											
1899 or Before .....	15.9	.7	1.1	1.6	Q	5.4	.7	1.6	1.9	2.4	10.91
1900 to 1919 .....	19.5	.5	1.2	1.7	.2	7.4	.3	1.0	2.5	4.6	20.87
1920 to 1945 .....	26.7	Q	3.0	3.7	.2	9.7	.7	1.7	3.0	3.2	11.35
1946 to 1959 .....	37.2	.5	3.5	4.2	.2	15.5	.6	2.0	5.2	5.5	11.53
1960 to 1969 .....	49.4	1.3	5.1	4.6	.4	18.3	.8	2.7	6.0	10.2	12.55
1970 to 1979 .....	55.4	2.4	6.3	5.3	.7	20.9	1.2	3.9	7.1	7.7	5.02
1980 to 1983 .....	70.0	3.6	7.1	5.4	.7	23.2	1.6	3.9	11.1	13.4	11.14
1984 to 1986 .....	53.8	1.9	5.1	6.6	.3	18.5	1.3	4.5	8.9	6.8	11.26
1987 to 1989 .....	53.1	1.2	4.6	3.9	.3	17.5	.9	6.7	9.0	9.0	14.96
<b>BUILDING USE</b>											
<b>Principal Building Activity</b>											
Assembly .....	27.2	2.8	3.6	3.7	.2	9.2	.1	1.6	.9	5.0	16.14
Education .....	26.9	1.3	2.2	3.0	.2	14.2	.1	1.3	1.3	3.4	5.96
Food Sales .....	133.0	.3	20.0	10.1	1.7	23.4	11.4	56.5	1.3	8.3	12.75
Food Service .....	96.5	1.2	16.4	11.0	2.4	23.0	14.9	13.7	1.5	12.5	11.87
Health Care .....	74.9	1.4	15.1	10.2	1.2	33.0	2.3	3.0	2.6	6.0	5.63
Lodging .....	39.7	3.3	4.9	5.8	1.5	13.5	4.0	4.5	.4	1.8	10.87
Mercantile and Service .....	44.5	1.0	4.1	2.1	.3	16.2	.3	1.0	9.3	10.0	7.28
Office .....	66.2	2.3	6.9	11.3	.3	23.1	.2	2.9	14.0	5.2	6.11
Parking Garage .....	18.2	Q	.4	.4	.1	8.4	.1	.9	1.1	6.9	14.65
Public Order and Safety .....	47.0	Q	2.4	3.7	.1	20.8	.2	3.0	2.2	13.8	25.33
Warehouse .....	27.4	.9	.7	.4	.1	11.6	.1	2.7	6.5	4.5	14.74
Other .....	131.3	Q	9.1	.4	.3	49.4	.4	4.5	Q	57.7	34.69
Vacant .....	12.9	.2	.8	.2	.1	4.4	*	.7	.6	5.8	24.40
<b>Weekly Operating Hours</b>											
39 or Fewer .....	14.9	1.0	1.5	2.1	.2	4.8	.1	1.3	1.4	2.5	10.67
40 to 48 .....	31.8	1.1	3.4	3.1	.2	11.4	.2	2.0	5.1	5.3	5.80
49 to 60 .....	35.8	1.6	3.3	3.9	.2	12.6	.2	1.8	6.9	5.1	7.84
61 to 84 .....	48.5	1.3	5.1	4.8	.3	17.6	.7	2.9	6.6	9.3	8.05
85 to 167 .....	51.7	1.3	5.0	4.1	.5	20.9	1.5	4.7	6.0	7.7	9.14
168 (Open Continuously) .....	81.7	2.9	8.7	8.7	1.0	30.3	3.0	5.6	8.5	12.9	11.68
<b>Workers</b>											
4 or Fewer .....	21.7	1.1	2.5	2.1	.4	6.5	.8	2.2	3.2	2.9	7.50
5 to 9 .....	32.5	2.1	3.7	2.6	.6	10.4	1.0	2.2	5.3	4.7	8.27
10 to 19 .....	36.9	1.6	4.6	3.0	.5	11.5	1.2	3.1	6.6	4.8	11.10
20 to 49 .....	41.5	1.5	4.1	2.8	.4	16.2	.9	3.4	5.8	6.4	7.28
50 to 99 .....	47.0	2.3	4.9	3.4	.3	18.0	.9	3.8	5.2	8.1	9.37
100 to 249 .....	70.6	1.4	6.1	6.4	.4	29.7	.9	4.2	8.6	12.9	8.96
250 or More .....	77.2	1.3	7.2	11.5	.2	29.3	.8	3.1	10.1	13.6	8.56

See footnote at end of table.

**Table B5. Energy End-Use Intensities for Electricity, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Energy Intensity for Electricity (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Ownership and Occupancy</b>											
Nongovernment Owned .....	44.4	1.6	4.8	4.4	0.4	15.9	1.0	3.2	6.5	6.5	4.17
Owner Occupied.....	44.5	1.6	4.9	4.7	.4	16.0	1.1	3.4	5.9	6.4	4.96
Single Establishment .....	44.5	1.7	5.0	4.3	.5	15.8	1.3	3.9	5.7	6.3	6.69
Multiple Establishment.....	44.4	1.6	4.6	5.8	.2	16.6	.4	1.8	6.8	6.7	4.71
Nonowner Occupied.....	44.4	1.4	4.5	3.6	.4	15.8	.8	2.7	8.3	6.8	7.03
Single Establishment .....	42.8	1.1	4.0	3.4	.5	15.8	1.0	3.5	8.3	5.2	11.25
Multiple Establishment.....	50.6	2.0	5.5	4.3	.3	17.4	.7	2.0	9.2	9.2	7.76
Vacant .....	11.2	.2	1.1	.3	.1	4.4	*	.7	.6	3.7	23.46
Government Owned .....	47.1	1.4	3.9	4.9	.2	19.0	.6	2.4	4.9	9.9	13.06
Federal .....	69.4	1.7	4.2	8.7	.5	31.5	.4	2.6	8.5	11.3	17.87
State .....	62.1	1.1	4.9	5.6	.2	21.5	1.2	3.6	7.5	Q	27.97
Local .....	35.0	1.5	3.3	3.7	.2	14.8	.3	1.8	2.8	6.5	10.86
<b>Multibuilding Facility</b>											
Not on Multibuilding Facility.....	39.1	1.3	4.0	4.0	.4	14.0	1.0	3.1	5.8	5.5	3.49
Part of Multibuilding Facility .....	53.7	2.0	5.4	5.3	.3	20.5	.8	2.9	6.6	10.0	8.23
On Facility with Central Plant .....	76.5	1.5	6.9	8.0	.3	30.2	1.4	4.6	7.7	15.9	15.60
<b>Percent Vacant at Least Three Months</b>											
0 .....	48.3	1.7	4.9	4.5	.5	17.7	1.1	3.5	6.7	7.5	5.74
1 to 50 .....	47.0	1.3	5.0	5.7	.2	17.5	.5	2.0	6.4	8.3	4.89
51 to 99 .....	18.6	Q	1.0	1.9	.1	8.2	Q	1.3	1.8	3.4	24.80
100 .....	21.1	1.0	2.0	2.1	.4	7.1	.5	2.1	1.9	3.9	9.94
<b>Months in Use Out of Past 12 Months</b>											
0 to 8 .....	24.4	1.0	2.3	2.1	.3	7.7	.7	2.4	2.9	5.0	15.78
9 to 11 .....	20.2	1.4	1.9	3.0	.2	8.4	.3	1.1	1.1	2.8	7.80
12 .....	48.0	1.6	4.9	4.8	.4	17.7	1.0	3.2	6.7	7.7	4.88
<b>LOCATION</b>											
<b>Census Region</b>											
Northeast.....	43.9	1.7	2.6	4.3	.2	17.1	.8	2.6	6.9	7.7	11.20
Midwest.....	38.8	1.7	3.3	3.7	.4	15.3	.9	3.1	5.0	5.4	6.11
South.....	45.9	1.5	6.4	4.4	.6	16.1	.9	3.1	5.8	7.3	4.32
West.....	53.3	1.4	5.4	6.1	.3	18.9	1.0	3.4	7.6	9.4	11.62
<b>Census Division</b>											
<b>Northeast</b>											
New England .....	36.9	1.2	2.4	4.0	.2	14.6	.9	2.4	5.1	6.0	9.87
Middle Atlantic .....	46.1	1.9	2.7	4.3	.2	17.8	.8	2.7	7.4	8.2	13.83
<b>Midwest</b>											
East North Central.....	37.9	1.6	2.6	3.5	.4	15.2	.9	3.3	5.1	5.4	8.31
West North Central .....	40.5	1.8	4.6	4.2	.3	15.5	1.0	2.7	4.8	5.6	8.46
<b>South</b>											
South Atlantic.....	43.2	1.3	6.3	4.5	.6	15.2	.7	2.6	5.7	6.2	6.69
East South Central.....	51.0	2.6	4.8	4.1	.8	16.9	1.4	3.6	7.1	9.8	15.25
West South Central .....	46.7	1.0	7.3	4.5	.4	16.7	1.0	3.4	5.1	7.3	8.48
<b>West</b>											
Mountain.....	42.8	1.3	4.7	5.8	.3	15.8	.9	2.8	5.8	5.5	14.73
Pacific .....	59.5	1.4	5.7	6.3	.3	20.7	1.0	3.7	8.7	11.6	15.04
<b>Metropolitan Status</b>											
Metropolitan .....	47.5	1.4	4.9	4.9	.3	17.5	.9	3.1	6.5	7.8	5.01
Nonmetropolitan.....	34.7	2.1	3.1	2.9	.6	12.7	1.0	2.6	4.7	5.0	10.12

See footnote at end of table.

**Table B5. Energy End-Use Intensities for Electricity, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Electricity (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Climate Zone: 45-Year Average</b>											
Under 2,000 CDD and --											
Over 7,000 HDD.....	42.4	1.9	2.0	3.3	0.4	16.9	1.1	4.6	6.1	6.2	10.51
5,500-7,000 HDD.....	38.2	1.4	2.5	4.0	.3	15.2	.9	2.7	5.3	5.8	9.21
4,000-5,499 HDD.....	46.9	2.2	3.9	4.8	.4	18.6	.7	2.8	6.8	6.7	8.21
Under 4,000 HDD.....	52.7	1.3	5.6	5.3	.4	17.9	1.0	3.0	7.4	10.7	12.65
2,000 CDD or More and --											
Under 4,000 HDD.....	45.7	1.0	8.5	4.5	.5	14.7	1.0	3.2	5.3	7.0	8.02
<b>1989 Degree-Days</b>											
Under 2,000 CDD and --											
Over 7,000 HDD.....	38.1	1.4	1.9	3.1	.3	15.6	1.0	3.8	5.1	5.8	10.86
5,500-7,000 HDD.....	39.5	1.6	3.1	4.2	.3	15.6	.8	2.6	5.5	5.8	7.07
4,000-5,499 HDD.....	53.3	2.7	3.8	5.3	.5	21.0	.8	3.3	8.0	7.8	8.61
Under 4,000 HDD.....	50.6	1.1	5.7	5.1	.4	16.8	.9	2.9	7.1	10.7	13.48
2,000 CDD or More and --											
Under 4,000 HDD.....	47.1	1.0	8.8	4.7	.5	15.1	1.1	3.4	5.4	7.0	7.50
<b>STRUCTURE</b>											
<b>Floors</b>											
1.....	40.8	1.4	4.9	3.1	.5	14.3	1.0	3.3	6.3	6.1	4.77
2.....	50.1	1.8	4.4	3.6	.3	18.8	.8	3.7	7.2	9.4	7.48
3.....	37.6	2.0	3.5	4.1	.4	12.6	.5	1.8	4.4	Q	22.47
4 to 6.....	41.6	1.1	4.1	5.1	.3	17.5	1.0	2.4	4.3	5.8	9.33
7 or More.....	61.9	1.5	6.2	11.4	.3	23.7	1.0	3.0	7.9	6.9	5.70
<b>Wall Materials</b>											
Masonry.....	42.3	1.3	4.6	4.1	.4	15.4	1.0	3.1	5.6	6.8	5.31
Siding or Shingles.....	33.2	1.9	3.4	2.7	.7	12.3	.9	2.2	5.0	4.2	11.44
Metal Panels.....	45.7	1.8	3.8	3.5	.3	18.0	.4	2.8	7.8	7.4	15.92
Concrete Panels.....	55.7	2.1	5.1	5.4	.3	20.3	.9	3.4	6.5	11.8	10.31
Window Glass.....	76.2	3.2	6.5	13.7	.3	28.0	Q	3.9	12.7	6.9	12.51
Other.....	63.5	1.6	4.3	9.7	.2	26.0	.5	2.5	9.8	8.9	12.78
<b>Roof Materials</b>											
Built-Up.....	49.0	1.6	5.1	5.0	.4	18.4	1.0	3.0	6.3	8.2	6.80
Shingles (Not Wood).....	32.2	1.3	3.7	3.3	.5	11.2	1.0	3.0	4.2	4.1	5.48
Metal Surfacing.....	40.3	1.3	2.7	2.2	.3	15.1	.5	2.5	7.6	7.9	14.77
Synthetic or Rubber.....	60.2	2.4	5.8	6.5	.3	21.8	.9	4.4	8.3	9.9	9.42
Slate or Tile.....	27.3	1.1	3.3	3.0	.3	8.9	1.1	2.2	Q	3.5	23.08
Concrete.....	38.0	Q	3.4	6.4	Q	14.7	.5	1.8	5.1	4.9	12.65
Wooden Materials.....	41.8	1.6	6.3	5.2	.4	13.4	1.6	3.5	3.7	6.1	13.50
Other.....	56.7	Q	8.2	7.3	Q	22.7	1.5	2.5	5.9	5.5	23.33
<b>Building Shell Conservation</b>											
<b>Features (Solely or in Combination)</b>											
Roof or Ceiling Insulation.....	49.4	1.8	5.3	5.0	.4	18.4	1.0	3.3	6.9	7.3	4.02
Wall Insulation.....	52.6	1.9	5.5	5.0	.5	19.9	1.0	3.6	7.4	7.8	4.74
Storm or Multiple Glazing.....	51.1	1.8	5.1	5.3	.5	19.0	1.2	3.8	7.5	6.8	4.88
Tinted, Reflective, or Shading											
Glass.....	59.1	1.8	6.0	6.5	.4	22.4	.9	3.4	8.6	9.0	5.20
Exterior or Interior Shadings											
or Awnings.....	53.1	1.6	5.4	5.7	.5	19.0	1.0	3.1	7.5	9.2	5.95
Weather Stripping or Caulking.....	50.9	1.8	5.2	5.2	.5	18.7	1.0	3.3	7.0	8.4	5.05
None of the Above.....	19.5	.7	1.7	1.8	.2	7.4	.5	1.7	2.8	2.9	13.74

See footnote at end of table.

**Table B5. Energy End-Use Intensities for Electricity, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Energy Intensity for Electricity (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>ENERGY SOURCES AND END USES</b>											
<b>Energy Sources</b>											
<b>(Solely or in Combination)</b>											
Electricity .....	45.0	1.6	4.6	4.5	0.4	16.6	0.9	3.0	6.2	7.3	4.56
Natural Gas.....	44.4	.7	4.6	4.7	.2	16.8	1.0	3.0	5.8	7.6	6.03
Fuel Oil.....	52.6	.8	5.2	6.7	.4	20.9	.9	3.2	7.2	7.2	13.24
District Heat .....	67.5	Q	5.1	8.5	Q	25.0	1.3	3.2	7.0	15.0	15.74
Other.....	50.2	1.2	3.7	4.2	.4	19.0	1.1	4.1	5.3	11.1	11.91
<b>Energy End Uses</b>											
<b>(Solely or in Combination)</b>											
Heated Buildings.....	46.3	1.7	4.6	4.6	.4	17.2	.9	3.1	6.4	7.4	4.59
Air-Conditioned Buildings.....	49.4	1.8	5.4	4.9	.4	18.0	1.0	3.3	6.6	7.8	4.44
Buildings with Water Heating.....	48.6	1.7	4.9	4.9	.5	17.9	1.0	3.3	6.5	7.9	4.69
Buildings with Cooking.....	56.3	1.4	6.0	6.4	.5	21.2	1.7	4.1	5.5	9.6	6.94
Buildings with Manufacturing.....	52.1	Q	3.0	2.7	.2	20.1	.2	3.4	6.7	14.5	11.71
<b>Space-Heating Energy Source</b>											
Electricity .....	55.6	5.1	6.0	4.5	.8	19.0	1.1	3.7	7.7	7.7	4.12
Main.....	59.5	5.6	6.8	5.1	1.0	19.6	1.3	4.4	8.9	6.8	4.80
With Secondary.....	59.0	4.5	6.7	5.1	1.1	18.5	1.6	Q	7.3	7.9	12.17
Natural Gas Only.....	50.0	2.7	5.5	2.6	.4	15.6	Q	Q	4.9	7.1	22.27
Other Energy Sources or Combinations.....	69.0	7.4	7.0	6.8	2.2	22.4	1.0	2.8	10.1	9.4	12.16
With No Secondary.....	59.6	5.8	6.8	5.1	1.0	19.8	1.2	4.0	9.2	6.7	5.21
Secondary.....	45.5	3.9	3.8	2.9	.3	17.5	.5	2.1	4.5	9.9	12.13
Other Excluding Electricity.....	41.8	NC	4.0	4.7	.2	16.3	.9	2.8	5.8	7.2	6.70
Building Not Heated.....	26.0	NC	3.9	2.6	.4	8.0	.5	2.1	2.7	5.6	21.16
<b>Main Space-Heating Energy Source</b>											
Electricity.....	59.5	5.6	6.8	5.1	1.0	19.6	1.3	4.4	8.9	6.8	4.80
Natural Gas.....	41.4	.3	4.4	4.3	.2	15.7	.8	2.6	5.4	7.6	7.13
Fuel Oil.....	32.6	.2	1.9	2.9	.3	12.9	.7	2.0	6.3	5.3	15.62
District Heat .....	58.6	Q	4.2	8.2	.2	23.3	1.2	3.1	6.2	10.0	12.47
Other.....	31.4	Q	1.7	2.4	.3	11.5	Q	Q	4.6	3.9	35.83
<b>Air-Conditioning Energy Source</b>											
Electricity .....	49.5	1.8	5.9	4.8	.5	17.7	1.0	3.4	6.7	7.9	4.66
Other Excluding Electricity.....	47.2	Q	NC	6.7	.1	22.0	1.3	2.9	5.4	7.7	9.25
Air-Conditioning Not Performed.....	22.3	.5	NC	2.3	.2	9.2	.4	1.5	3.8	4.4	17.27
<b>Water-Heating Energy Source</b>											
Electricity.....	52.8	3.0	5.7	4.7	1.1	17.7	.7	3.5	8.2	8.3	4.85
Other Excluding Electricity.....	45.7	.8	4.4	5.1	NC	18.0	1.2	3.3	5.4	7.6	7.58
Water Heating Not Performed.....	21.4	.7	2.3	1.9	NC	8.1	.2	1.0	4.0	3.3	8.70
<b>HEATING AND COOLING</b>											
<b>Percent Heated</b>											
Not Heated .....	25.6	Q	3.8	2.6	.4	7.9	.5	2.1	2.7	5.6	21.16
1 to 50 .....	22.5	.4	1.6	1.2	.2	8.1	.3	2.6	4.5	3.6	13.82
51 to 99 .....	57.3	1.5	5.8	6.2	.5	20.5	1.0	3.2	8.9	9.6	6.67
100.....	49.5	2.0	5.1	5.1	.4	18.6	1.0	3.2	6.3	7.8	5.50
<b>Percent Cooled</b>											
Not Cooled .....	22.3	.5	NC	2.3	.2	9.2	.4	1.5	3.8	4.4	17.27
1 to 50 .....	25.9	.9	1.7	1.6	.2	9.6	.4	1.9	4.2	5.2	7.78
51 to 99 .....	59.6	1.7	6.9	6.7	.5	22.5	1.2	4.2	7.7	8.3	5.51
100.....	63.0	2.5	7.7	6.6	.6	22.4	1.3	4.0	8.0	9.8	6.82

See footnotes at end of table.

**Table B5. Energy End-Use Intensities for Electricity, 1989 (Continued)**

Building Characteristics	Energy Intensity for Electricity (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
RSE Column Factor:											
<b>Heating Equipment (Solely or in Combination)</b>											
Furnaces.....	39.0	1.4	3.5	2.9	0.4	14.1	0.9	3.4	6.4	6.1	6.69
Boilers.....	44.0	.9	4.3	5.5	.2	17.8	.7	2.8	5.2	6.6	7.21
Individual Space Heaters.....	41.8	2.2	3.5	3.6	.4	15.9	.7	2.4	5.9	7.1	5.96
Packaged Heating Units.....	56.3	2.0	6.4	4.4	.5	20.3	1.1	3.2	7.5	10.9	8.36
Heat Pumps.....	51.0	3.1	5.9	5.1	.5	17.7	1.0	3.7	6.9	7.2	7.31
Air Ducts.....	53.8	1.6	5.5	5.5	.4	20.2	1.0	3.4	7.4	8.9	5.08
Heating or Reheating Coils.....	66.3	1.8	6.2	8.1	.3	25.6	1.0	3.3	7.9	12.2	7.39
Fan-Coil Units.....	57.6	Q	5.0	6.7	.3	23.0	.9	2.9	6.5	10.9	12.44
Steam or Hot Water Radiators or Baseboards.....	38.2	.8	2.9	4.9	.2	16.2	.7	2.2	4.5	5.9	8.42
Other.....	79.5	Q	9.2	12.2	.6	27.8	1.6	6.0	9.3	9.3	19.54
<b>Cooling Equipment (Solely or in Combination)</b>											
Central Chillers.....	65.7	2.0	7.2	9.4	.3	24.5	.9	3.0	7.7	10.7	8.69
Individual Air Conditioners.....	39.2	1.5	3.9	3.6	.5	14.0	.8	2.7	4.5	7.8	10.70
Packaged Cooling Units.....	51.9	1.5	5.8	4.9	.4	18.9	1.1	3.5	7.0	8.8	4.63
Heat Pumps.....	59.7	3.3	6.1	5.1	.6	19.4	.9	3.9	8.1	12.2	16.07
Air Ducts.....	54.9	1.9	6.0	5.7	.4	20.4	1.0	3.4	7.2	8.9	4.98
Fan-Coil Units.....	69.8	2.1	7.0	10.0	.3	26.7	1.0	3.2	8.3	11.2	10.01
Other.....	43.2	.6	5.5	3.3	.3	19.7	.4	1.8	5.7	5.8	15.18
<b>Year Main Central Chiller Installed</b>											
1959 or Before.....	61.8	Q	7.1	10.8	.3	21.7	.8	2.5	7.0	5.6	17.17
1960 to 1969.....	67.8	.9	7.0	7.7	.1	24.3	.6	2.6	7.0	Q	29.29
1970 to 1979.....	65.4	1.4	6.9	9.2	.5	25.2	.9	3.0	8.2	10.3	12.80
1980 to 1986.....	69.6	2.6	7.9	11.8	.3	26.5	1.1	3.5	8.7	7.4	11.59
1987 to 1989.....	57.1	1.0	6.8	7.8	Q	22.1	1.1	3.6	6.6	7.5	16.61
<b>Year Packaged Cooling System Installed</b>											
1959 or Before.....	45.4	.4	4.9	5.3	.1	20.7	.3	1.8	5.3	6.6	14.05
1960 to 1969.....	57.0	1.1	5.2	4.4	.3	20.3	.7	2.6	7.5	Q	22.69
1970 to 1979.....	52.3	2.2	6.4	5.0	.5	19.5	1.2	3.4	6.9	7.0	6.37
1980 to 1986.....	52.9	1.7	5.7	4.9	.4	18.8	1.2	4.2	7.8	8.2	8.89
1987 to 1989.....	47.7	.7	5.8	4.9	.4	16.3	1.1	3.7	5.9	8.8	8.70
<b>Computer Area with Separate Air-Conditioning System</b>											
Present in Building.....	71.6	1.4	6.8	8.7	.3	27.1	.8	3.8	10.9	11.9	6.79
Not Present.....	35.2	1.6	3.7	3.0	.4	12.7	1.0	2.8	4.4	5.6	4.58
<b>LIGHTING AND REFRIGERATION</b>											
<b>Percent Lit When Open</b>											
Not Lit.....	10.5	Q	.6	.5	.1	2.5	.1	.8	1.6	4.3	26.00
1 to 50.....	17.7	1.3	1.8	2.0	.3	4.4	.4	1.4	2.9	3.2	9.47
51 to 99.....	48.0	1.3	4.7	5.0	.4	17.3	.7	2.5	6.7	9.3	7.88
100.....	53.3	1.8	5.5	5.2	.4	20.6	1.2	3.9	7.0	7.7	4.72
<b>Percent Lit When Closed</b>											
Not Lit.....	35.8	1.9	3.8	3.2	.4	11.7	.8	2.4	5.1	6.5	8.84
1 to 50.....	49.2	1.3	4.7	5.0	.4	19.3	.8	3.2	6.9	7.7	4.53
51 to 99.....	88.1	Q	10.1	11.5	.7	35.0	2.5	5.7	9.7	12.0	18.57
100.....	57.0	.3	10.2	6.6	Q	20.0	Q	Q	1.8	5.2	29.63
<b>Lighting Equipment (Solely or in Combination)</b>											
Incandescent Lamps.....	45.1	1.6	4.6	4.7	.4	17.7	1.0	3.0	5.3	6.8	5.60
Fluorescent Lamps.....	46.4	1.6	4.7	4.7	.4	17.1	.9	3.1	6.4	7.5	4.57
High-Intensity Discharge Lamps.....	54.0	1.7	4.7	5.2	.2	21.8	.7	3.5	6.7	9.5	7.76
Other Lamps.....	55.1	Q	7.2	7.0	.6	22.7	Q	Q	5.2	5.9	15.06
High-Efficiency Ballasts.....	58.6	2.2	5.8	6.3	.4	20.3	1.2	4.1	8.8	9.5	6.27

See footnotes at end of table.

**Table B5. Energy End-Use Intensities for Electricity, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Electricity (thousand Btu per sq. ft.)										RSE Row Factor
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other	
	1.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	
<b>Refrigeration Equipment (Solely or in Combination)</b>											
Commercial											
Refrigeration Units.....	60.7	1.3	6.3	6.5	0.5	22.4	1.8	5.2	6.4	10.3	5.61
Freezers.....	65.9	1.3	6.8	6.9	.6	24.3	2.0	5.7	6.9	11.3	4.61
Residential											
Refrigerators.....	46.5	1.4	4.6	4.9	.3	18.0	.7	2.6	6.6	7.4	5.31
Freezers.....	52.4	1.4	5.7	5.1	.5	20.0	1.4	3.4	5.3	9.8	11.74
Ice-Making Machines.....	65.8	1.9	7.4	7.6	.6	24.0	1.9	4.8	7.0	10.8	5.73
Refrigerated Vending Machines.....	54.7	1.6	5.5	5.7	.4	21.0	1.1	3.6	7.3	8.4	3.80
Water Coolers.....	50.2	1.6	5.0	5.2	.3	19.0	.7	2.9	6.7	8.6	5.26
Other.....	132.0	Q	14.9	9.8	1.4	39.0	2.3	7.4	15.5	Q	33.37
<b>ENERGY MANAGEMENT</b>											
<b>Occupant Control</b>											
Any Control of Heating.....	39.7	1.5	4.4	3.6	.5	14.5	.9	2.5	5.4	6.3	4.79
With Thermostats.....	39.8	1.6	4.4	3.6	.5	14.6	.9	2.4	5.5	6.4	5.75
Any Control of Cooling.....	41.6	1.7	5.0	3.8	.5	15.0	.9	2.6	5.6	6.5	4.68
With Thermostats.....	42.0	1.7	5.0	3.8	.5	15.1	.9	2.6	5.6	6.7	5.30
<b>Reduced Use During Off-Hours</b>											
Heating Only.....	30.3	1.0	1.1	2.9	.3	12.0	.7	2.1	4.6	5.5	17.47
Cooling Only.....	49.1	Q	5.7	4.3	.6	16.8	1.1	2.7	7.4	8.8	16.60
Heating and Cooling.....	43.2	1.6	4.5	4.6	.3	15.9	.7	2.5	6.0	7.0	5.61
<b>Computerized Energy Management and Control System</b>											
Present in Building.....	62.6	1.4	6.5	8.1	.3	24.9	1.0	3.9	6.9	9.7	4.49
Controls Heating and Cooling.....	62.9	1.4	6.6	8.2	.2	25.0	1.0	3.9	7.0	9.7	4.47
Controls Lighting.....	58.3	1.0	5.5	5.7	.1	23.0	1.1	4.1	6.7	10.9	9.28
Controls Other.....	69.2	1.1	9.3	8.2	.3	27.0	1.3	4.4	7.0	10.6	6.57
<b>Other Energy Management</b>											
Regular HVAC Maintenance.....	54.2	1.8	5.5	5.6	.4	20.3	1.0	3.6	7.2	8.9	4.76
Participated in Utility Conservation Program.....	53.9	2.5	5.5	7.0	.4	19.7	1.0	3.7	6.5	7.7	5.69

\* = Value rounds to zero in the units displayed.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B6. End-Use Consumption Percentages for Electricity, 1989**

Building Characteristics	Percent of Electricity Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>All Buildings</b> .....	100	3	10	10	1	37	2	7	14	16
<b>Building Floorspace (Square Feet)</b>										
1,001 to 5,000 .....	100	5	13	9	3	30	5	10	16	10
5,001 to 10,000 .....	100	4	13	9	1	34	2	7	17	14
10,001 to 25,000 .....	100	6	10	7	1	33	2	8	19	14
25,001 to 50,000 .....	100	5	10	8	1	38	2	8	14	14
50,001 to 100,000 .....	100	2	8	9	*	37	1	7	10	24
100,001 to 200,000 .....	100	3	9	11	1	40	1	5	12	18
200,001 to 500,000 .....	100	2	10	14	*	41	1	4	11	17
Over 500,000 .....	100	1	9	14	*	42	1	5	12	15
<b>Year Constructed</b>										
1899 or Before .....	100	4	7	10	3	34	4	10	12	15
1900 to 1919 .....	100	3	6	9	1	38	1	5	13	24
1920 to 1945 .....	100	Q	11	14	1	36	3	6	11	12
1946 to 1959 .....	100	1	9	11	1	42	1	5	14	15
1960 to 1969 .....	100	3	10	9	1	37	2	5	12	21
1970 to 1979 .....	100	4	11	10	1	38	2	7	13	14
1980 to 1983 .....	100	5	10	8	1	33	2	6	16	19
1984 to 1986 .....	100	4	9	12	1	34	2	8	17	13
1987 to 1989 .....	100	2	9	7	1	33	2	13	17	17
<b>BUILDING USE</b>										
<b>Principal Building Activity</b>										
Assembly .....	100	10	13	14	1	34	*	6	3	19
Education .....	100	5	8	11	1	53	*	5	5	13
Food Sales .....	100	*	15	8	1	18	9	42	1	6
Food Service .....	100	1	17	11	2	24	15	14	2	13
Health Care .....	100	2	20	14	2	44	3	4	4	8
Lodging .....	100	8	12	15	4	34	10	11	1	5
Mercantile and Service .....	100	2	9	5	1	37	1	2	21	23
Office .....	100	3	10	17	*	35	*	4	21	8
Parking Garage .....	100	Q	2	2	1	46	*	5	6	38
Public Order and Safety .....	100	Q	5	8	*	44	*	6	5	29
Warehouse .....	100	3	2	1	*	42	1	10	24	16
Other .....	100	Q	7	*	*	38	*	3	6	44
Vacant .....	100	2	6	1	*	34	*	6	5	45
<b>Weekly Operating Hours</b>										
39 or Fewer .....	100	7	10	14	2	32	1	9	9	17
40 to 48 .....	100	4	11	10	1	36	1	6	16	17
49 to 60 .....	100	5	9	11	1	35	1	5	19	14
61 to 84 .....	100	3	10	10	1	36	1	6	14	19
85 to 167 .....	100	3	10	8	1	40	3	9	12	15
168 (Open Continuously) .....	100	4	11	11	1	37	4	7	10	16
<b>Workers</b>										
4 or Fewer .....	100	5	11	10	2	30	4	10	15	13
5 to 9 .....	100	6	11	8	2	32	3	7	16	14
10 to 19 .....	100	4	13	8	1	31	3	8	18	13
20 to 49 .....	100	4	10	7	1	39	2	8	14	15
50 to 99 .....	100	5	10	7	1	38	2	8	11	17
100 to 249 .....	100	2	9	9	1	42	1	6	12	18
250 or More .....	100	2	9	15	*	38	1	4	13	18

See footnotes at end of table.

**Table B6. End-Use Consumption Percentages for Electricity, 1989 (Continued)**

Building Characteristics	Percent of Electricity Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>Ownership and Occupancy</b>										
Nongovernment Owned .....	100	4	11	10	1	36	2	7	15	15
Owner Occupied.....	100	4	11	11	1	36	2	8	13	14
Single Establishment .....	100	4	11	10	1	35	3	9	13	14
Multiple Establishment.....	100	4	10	13	*	37	1	4	15	15
Nonowner Occupied.....	100	3	10	8	1	36	2	6	19	15
Single Establishment .....	100	3	9	8	1	37	2	8	19	12
Multiple Establishment.....	100	4	11	8	1	34	1	4	18	18
Vacant .....	100	2	10	2	1	39	*	6	6	33
Government Owned .....	100	3	8	10	1	40	1	5	10	21
Federal .....	100	Q	6	13	Q	45	1	4	12	16
State .....	100	2	8	9	*	35	2	6	12	26
Local .....	100	4	9	11	1	42	1	5	8	19
<b>Multibuilding Facility</b>										
Not on Multibuilding Facility.....	100	3	10	10	1	36	3	8	15	14
Part of Multibuilding Facility.....	100	4	10	10	1	38	1	5	12	19
On Facility with Central Plant .....	100	2	9	11	*	39	2	6	10	21
<b>Percent Vacant at Least Three Months</b>										
0 .....	100	4	10	9	1	37	2	7	14	16
1 to 50 .....	100	3	11	12	1	37	1	4	14	18
51 to 99 .....	100	3	5	10	*	44	Q	7	10	18
100 .....	100	5	10	10	2	34	3	10	9	19
<b>Months in Use Out of Past 12 Months</b>										
0 to 8 .....	100	4	10	9	1	31	3	10	12	20
9 to 11 .....	100	7	9	15	1	42	1	6	5	14
12 .....	100	3	10	10	1	37	2	7	14	16
<b>LOCATION</b>										
<b>Census Region</b>										
Northeast.....	100	4	6	10	1	39	2	6	16	17
Midwest .....	100	4	8	10	1	39	2	8	13	14
South.....	100	3	14	10	1	35	2	7	13	16
West.....	100	3	10	11	1	35	2	6	14	18
<b>Census Division</b>										
<b>Northeast</b>										
New England.....	100	3	6	11	1	40	2	7	14	16
Middle Atlantic .....	100	4	6	9	1	39	2	6	16	18
<b>Midwest</b>										
East North Central.....	100	4	7	9	1	40	2	9	13	14
West North Central .....	100	5	11	10	1	38	2	7	12	14
<b>South</b>										
South Atlantic.....	100	3	15	10	1	35	2	6	13	14
East South Central.....	100	5	9	8	2	33	3	7	14	19
West South Central .....	100	2	16	10	1	36	2	7	11	16
<b>West</b>										
Mountain.....	100	3	11	13	1	37	2	7	14	13
Pacific.....	100	2	10	11	1	35	2	6	15	20
<b>Metropolitan Status</b>										
Metropolitan .....	100	3	10	10	1	37	2	7	14	17
Nonmetropolitan.....	100	6	9	8	2	37	3	8	14	14

See footnotes at end of table.

**Table B6. End-Use Consumption Percentages for Electricity, 1989 (Continued)**

Building Characteristics	Percent of Electricity Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>Climate Zone: 45-Year Average</b>										
Under 2,000 CDD and --										
Over 7,000 HDD.....	100	5	5	8	1	40	3	11	14	15
5,500-7,000 HDD.....	100	4	7	11	1	40	2	7	14	15
4,000-5,499 HDD.....	100	5	8	10	1	40	2	6	14	14
Under 4,000 HDD.....	100	2	11	10	1	34	2	6	14	20
2,000 CDD or More and --										
Under 4,000 HDD.....	100	2	19	10	1	32	2	7	12	15
<b>1989 Degree-Days</b>										
Under 2,000 CDD and --										
Over 7,000 HDD.....	100	4	5	8	1	41	3	10	13	15
5,500-7,000 HDD.....	100	4	8	11	1	39	2	6	14	15
4,000-5,499 HDD.....	100	5	7	10	1	39	2	6	15	15
Under 4,000 HDD.....	100	2	11	10	1	33	2	6	14	21
2,000 CDD or More and --										
Under 4,000 HDD.....	100	2	19	10	1	32	2	7	12	15
<b>STRUCTURE</b>										
<b>Floors</b>										
1.....	100	3	12	8	1	35	3	8	15	15
2.....	100	4	9	7	1	38	2	7	14	19
3.....	100	5	9	11	1	33	1	5	12	22
4 to 6.....	100	3	10	12	1	42	2	6	10	14
7 or More.....	100	2	10	18	1	38	2	5	13	11
<b>Wall Materials</b>										
Masonry.....	100	3	11	10	1	36	2	7	13	16
Siding or Shingles.....	100	6	10	8	2	37	3	7	15	13
Metal Panels.....	100	4	8	8	1	39	1	6	17	16
Concrete Panels.....	100	4	9	10	1	36	2	6	12	21
Window Glass.....	100	4	9	18	*	37	Q	5	17	9
Other.....	100	3	7	15	*	41	1	4	15	14
<b>Roof Materials</b>										
Built-Up.....	100	3	10	10	1	38	2	6	13	17
Shingles (Not Wood).....	100	4	12	10	2	35	3	9	13	13
Metal Surfacing.....	100	3	7	6	1	38	1	6	19	20
Synthetic or Rubber.....	100	4	10	11	1	36	1	7	14	16
Slate or Tile.....	100	4	12	11	1	33	4	8	14	13
Concrete.....	100	Q	9	17	Q	39	1	5	13	13
Wooden Materials.....	100	4	15	12	1	32	4	8	9	15
Other.....	100	Q	14	13	Q	40	3	4	10	10
<b>Building Shell Conservation</b>										
<b>Features (Solely or in Combination)</b>										
Roof or Ceiling Insulation.....	100	4	11	10	1	37	2	7	14	15
Wall Insulation.....	100	4	10	10	1	38	2	7	14	15
Storm or Multiple Glazing.....	100	4	10	10	1	37	2	8	15	13
Tinted, Reflective, or Shading										
Glass.....	100	3	10	11	1	38	2	6	15	15
Exterior or Interior Shadings										
or Awnings.....	100	3	10	11	1	36	2	6	14	17
Weather Stripping or Caulking.....	100	4	10	10	1	37	2	6	14	16
None of the Above.....	100	3	9	9	1	38	2	9	14	15

See footnotes at end of table.

**Table B6. End-Use Consumption Percentages for Electricity, 1989 (Continued)**

Building Characteristics	Percent of Electricity Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>ENERGY SOURCES AND END USES</b>										
<b>Energy Sources</b>										
<b>(Solely or in Combination)</b>										
Electricity .....	100	3	10	10	1	37	2	7	14	16
Natural Gas.....	100	2	10	11	1	38	2	7	13	17
Fuel Oil.....	100	2	10	13	1	40	2	6	14	14
District Heat .....	100	Q	8	13	*	37	2	5	10	22
Other.....	100	2	7	8	1	38	2	8	10	22
<b>Energy End Uses</b>										
<b>(Solely or in Combination)</b>										
Heated Buildings.....	100	4	10	10	1	37	2	7	14	16
Air-Conditioned Buildings.....	100	4	11	10	1	37	2	7	13	16
Buildings with Water Heating.....	100	3	10	10	1	37	2	7	13	16
Buildings with Cooking.....	100	2	11	11	1	38	3	7	10	17
Buildings with Manufacturing.....	100	3	6	5	*	38	*	7	13	28
<b>Space-Heating Energy Source</b>										
Electricity .....	100	9	11	8	1	34	2	7	14	14
Main.....	100	9	11	9	2	33	2	7	15	12
With Secondary .....	100	8	11	9	2	31	3	11	12	13
Natural Gas Only.....	100	5	11	5	1	31	Q	18	10	14
Other Energy Sources or Combinations.....	100	11	10	10	3	32	2	4	15	14
With No Secondary.....	100	10	11	8	2	33	2	7	15	11
Secondary .....	100	9	8	6	1	39	1	5	10	22
Other Excluding Electricity .....	100	NC	9	11	*	39	2	7	14	17
Building Not Heated.....	100	NC	15	10	2	31	2	8	10	22
<b>Main Space-Heating Energy Source</b>										
Electricity .....	100	9	11	9	2	33	2	7	15	12
Natural Gas.....	100	1	11	10	*	38	2	6	13	18
Fuel Oil.....	100	1	6	9	1	40	2	6	19	16
District Heat .....	100	Q	7	14	*	40	2	5	11	17
Other.....	100	Q	5	8	1	36	Q	19	15	13
<b>Air-Conditioning Energy Source</b>										
Electricity .....	100	4	12	10	1	36	2	7	14	16
Other Excluding Electricity .....	100	2	NC	14	*	47	3	6	11	16
Air-Conditioning Not Performed.....	100	2	NC	10	1	41	2	7	17	20
<b>Water-Heating Energy Source</b>										
Electricity .....	100	6	11	9	2	34	1	7	15	16
Other Excluding Electricity .....	100	2	10	11	NC	39	3	7	12	17
Water Heating Not Performed.....	100	3	11	9	NC	38	1	5	19	15
<b>HEATING AND COOLING</b>										
<b>Percent Heated</b>										
Not Heated .....	100	Q	15	10	2	31	2	8	11	22
1 to 50 .....	100	2	7	5	1	36	2	12	20	16
51 to 99 .....	100	3	10	11	1	36	2	6	16	17
100.....	100	4	10	10	1	38	2	6	13	16
<b>Percent Cooled</b>										
Not Cooled .....	100	2	NC	10	1	41	2	7	17	20
1 to 50 .....	100	3	7	6	1	37	2	7	16	20
51 to 99 .....	100	3	12	11	1	38	2	7	13	14
100.....	100	4	12	11	1	36	2	6	13	16

See footnotes at end of table.

**Table B6. End-Use Consumption Percentages for Electricity, 1989 (Continued)**

Building Characteristics	Percent of Electricity Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>Heating Equipment (Solely or in Combination)</b>										
Furnaces.....	100	4	9	7	1	36	2	9	16	16
Boilers.....	100	2	10	12	1	41	2	6	12	15
Individual Space Heaters.....	100	5	8	9	1	38	2	6	14	17
Packaged Heating Units.....	100	3	11	8	1	36	2	6	13	19
Heat Pumps.....	100	6	12	10	1	35	2	7	13	14
Air Ducts.....	100	3	10	10	1	38	2	6	14	16
Heating or Reheating Coils.....	100	3	9	12	*	39	1	5	12	18
Fan-Coil Units.....	100	2	9	12	*	40	1	5	11	19
Steam or Hot Water Radiators or Baseboards.....	100	2	7	13	*	42	2	6	12	15
Other.....	100	Q	12	15	1	35	2	8	12	12
<b>Cooling Equipment (Solely or in Combination)</b>										
Central Chillers.....	100	3	11	14	1	37	1	5	12	16
Individual Air Conditioners.....	100	4	10	9	1	36	2	7	12	20
Packaged Cooling Units.....	100	3	11	9	1	36	2	7	14	17
Heat Pumps.....	100	6	10	9	1	32	2	7	14	20
Air Ducts.....	100	3	11	10	1	37	2	6	13	16
Fan-Coil Units.....	100	3	10	14	*	38	1	5	12	16
Other.....	100	1	13	8	1	46	1	4	13	13
<b>Year Main Central Chiller Installed</b>										
1959 or Before.....	100	Q	12	18	1	35	1	4	11	9
1960 to 1969.....	100	1	10	11	*	36	1	4	10	26
1970 to 1979.....	100	2	11	14	1	39	1	5	12	16
1980 to 1986.....	100	4	11	17	*	38	2	5	12	11
1987 to 1989.....	100	2	12	14	Q	39	2	6	12	13
<b>Year Packaged Cooling System Installed</b>										
1959 or Before.....	100	Q	11	12	Q	45	1	4	12	15
1960 to 1969.....	100	2	9	8	1	36	1	5	13	26
1970 to 1979.....	100	4	12	10	1	37	2	7	13	13
1980 to 1986.....	100	3	11	9	1	36	2	8	15	16
1987 to 1989.....	100	1	12	10	1	34	2	8	12	18
<b>Computer Area with Separate Air-Conditioning System</b>										
Present in Building.....	100	2	10	12	*	38	1	5	15	17
Not Present.....	100	5	11	8	1	36	3	8	13	16
<b>LIGHTING AND REFRIGERATION</b>										
<b>Percent Lit When Open</b>										
Not Lit.....	100	Q	5	5	1	24	1	8	15	41
1 to 50.....	100	7	10	11	2	25	2	8	16	18
51 to 99.....	100	3	10	10	1	36	2	5	14	19
100.....	100	3	10	10	1	39	2	7	13	14
<b>Percent Lit When Closed</b>										
Not Lit.....	100	5	11	9	1	33	2	7	14	18
1 to 50.....	100	3	9	10	1	39	2	7	14	16
51 to 99.....	100	1	11	13	1	40	3	6	11	14
100.....	100	Q	18	12	Q	35	5	Q	3	9
<b>Lighting Equipment (Solely or in Combination)</b>										
Incandescent Lamps.....	100	4	10	10	1	39	2	7	12	15
Fluorescent Lamps.....	100	3	10	10	1	37	2	7	14	16
High-Intensity Discharge Lamps.....	100	3	9	10	*	40	1	6	12	18
Other Lamps.....	100	2	13	13	1	41	2	8	9	11
High-Efficiency Ballasts.....	100	4	10	11	1	35	2	7	15	16

See footnotes at end of table.

**Table B6. End-Use Consumption Percentages for Electricity, 1989 (Continued)**

Building Characteristics	Percent of Electricity Consumption									
	Total	Space Heating	Cooling	Ventilation	Water Heating	Lighting	Cooking	Refrigeration	Office Equipment	Other
<b>Refrigeration Equipment (Solely or in Combination)</b>										
Commercial										
Refrigeration Units.....	100	2	10	11	1	37	3	9	11	17
Freezers.....	100	2	10	11	1	37	3	9	10	17
Residential										
Refrigerators.....	100	3	10	10	1	39	1	6	14	16
Freezers.....	100	3	11	10	1	38	3	6	10	19
Ice-Making Machines.....	100	3	11	11	1	36	3	7	11	16
Refrigerated Vending Machines.....	100	3	10	10	1	38	2	7	13	15
Water Coolers.....	100	3	10	10	1	38	1	6	13	17
Other.....	100	Q	11	7	1	30	2	6	12	Q
<b>ENERGY MANAGEMENT</b>										
<b>Occupant Control</b>										
Any Control of Heating.....	100	4	11	9	1	37	2	6	14	16
With Thermostats.....	100	4	11	9	1	37	2	6	14	16
Any Control of Cooling.....	100	4	12	9	1	36	2	6	14	16
With Thermostats.....	100	4	12	9	1	36	2	6	13	16
<b>Reduced Use During Off-Hours</b>										
Heating Only.....	100	3	4	10	1	40	2	7	15	18
Cooling Only.....	100	4	12	9	1	34	2	5	15	18
Heating and Cooling.....	100	4	10	11	1	37	2	6	14	16
<b>Computerized Energy Management and Control System</b>										
Present in Building.....	100	2	10	13	*	40	2	6	11	15
Controls Heating and Cooling.....	100	2	10	13	*	40	2	6	11	15
Controls Lighting.....	100	2	9	10	*	40	2	7	11	19
Controls Other.....	100	2	13	12	*	39	2	6	10	15
<b>Other Energy Management</b>										
Regular HVAC Maintenance.....	100	3	10	10	1	37	2	7	13	16
Participated in Utility Conservation Program.....	100	5	10	13	1	37	2	7	12	14

\* = Value rounds to zero in the units displayed.

NC = No cases in responding sample.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B7. Consumption of Natural Gas by End Use, 1989**

Building Characteristics  RSE Column Factor:	Natural Gas Consumption (trillion Btu)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
All Buildings .....	2,073	1,265	320	198	290	7.27
<b>Building Floorspace</b>						
<b>(Square Feet)</b>						
1,001 to 5,000 .....	302	183	62	35	23	7.78
5,001 to 10,000 .....	265	174	43	11	37	12.17
10,001 to 25,000 .....	278	200	43	12	24	8.90
25,001 to 50,000 .....	309	207	31	15	56	12.87
50,001 to 100,000 .....	249	186	31	12	20	12.43
100,001 to 200,000 .....	238	153	42	28	16	18.86
200,001 to 500,000 .....	228	110	43	17	Q	31.35
Over 500,000 .....	203	53	26	Q	Q	37.56
<b>Year Constructed</b>						
1899 or Before .....	53	43	5	2	2	27.79
1900 to 1919 .....	123	74	12	Q	Q	26.02
1920 to 1945 .....	244	155	20	19	Q	20.89
1946 to 1959 .....	411	234	71	Q	46	16.84
1960 to 1969 .....	458	309	62	25	62	13.09
1970 to 1979 .....	441	261	87	50	44	13.05
1980 to 1983 .....	117	61	21	10	25	14.15
1984 to 1986 .....	141	79	29	14	19	15.60
1987 to 1989 .....	85	50	14	10	Q	22.82
<b>BUILDING USE</b>						
<b>Principal Building Activity</b>						
Assembly .....	174	135	13	17	8	9.72
Education .....	323	237	15	Q	20	19.04
Food Sales .....	27	14	1	12	1	23.80
Food Service .....	128	37	44	41	7	11.93
Health Care .....	186	45	71	29	Q	25.43
Lodging .....	187	78	84	17	9	13.83
Mercantile and Service .....	417	275	47	19	76	12.80
Office .....	238	171	27	4	36	11.63
Parking Garage .....	Q	Q	Q	Q	Q	NF
Public Order and Safety .....	25	21	1	Q	1	33.20
Warehouse .....	206	156	4	Q	Q	24.47
Other .....	102	57	6	Q	34	33.01
Vacant .....	49	31	Q	Q	Q	45.09
<b>Weekly Operating Hours</b>						
39 or Fewer .....	100	85	8	2	5	10.94
40 to 48 .....	388	309	28	7	44	8.24
49 to 60 .....	326	245	23	Q	46	10.76
61 to 84 .....	342	212	47	34	49	10.77
85 to 167 .....	360	193	44	Q	37	20.22
168 (Open Continuously) .....	557	222	171	56	108	13.40
<b>Workers</b>						
4 or Fewer .....	300	220	51	12	16	8.34
5 to 9 .....	218	145	38	18	17	8.16
10 to 19 .....	248	157	40	18	33	8.65
20 to 49 .....	332	228	49	22	34	9.18
50 to 99 .....	253	179	19	14	42	16.71
100 to 249 .....	358	216	38	29	75	20.83
250 or More .....	364	121	85	Q	73	23.29

See footnotes at end of table.

**Table B7. Consumption of Natural Gas by End Use, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Natural Gas Consumption (trillion Btu)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
<b>Ownership and Occupancy</b>						
Nongovernment Owned .....	1,601	950	257	130	264	8.01
Owner Occupied.....	1,292	749	213	103	228	8.64
Single Establishment .....	1,083	622	181	83	197	10.40
Multiple Establishment.....	210	127	32	20	31	11.20
Nonowner Occupied.....	309	201	44	27	36	14.72
Single Establishment .....	176	123	18	15	20	22.17
Multiple Establishment.....	102	62	21	12	7	16.89
Vacant .....	Q	17	Q	Q	Q	NF
Government Owned .....	472	315	63	Q	26	15.34
Federal .....	Q	16	5	Q	Q	NF
State .....	112	79	18	4	11	21.52
Local .....	290	220	40	17	13	12.64
<b>Multibuilding Facility</b>						
Not on Multibuilding Facility.....	1,168	765	175	80	147	7.35
Part of Multibuilding Facility.....	905	500	145	118	143	12.68
On Facility with Central Plant .....	423	182	66	Q	90	24.78
<b>Percent Vacant at Least Three Months</b>						
0 .....	1,562	988	257	119	198	7.65
1 to 50 .....	324	178	41	29	76	17.42
51 to 99 .....	Q	47	5	Q	4	NF
100 .....	82	52	16	1	Q	29.05
<b>Months in Use Out of Past 12 Months</b>						
0 to 8 .....	72	42	16	9	4	18.41
9 to 11 .....	138	106	16	2	Q	21.43
12 .....	1,863	1,117	288	187	271	7.43
<b>LOCATION</b>						
<b>Census Region</b>						
Northeast.....	353	235	52	30	Q	17.15
Midwest.....	831	579	101	46	105	10.12
South.....	498	263	84	42	108	17.83
West.....	391	189	82	Q	41	14.77
<b>Census Division</b>						
Northeast						
New England.....	39	19	Q	Q	4	22.84
Middle Atlantic .....	314	215	40	26	Q	19.38
Midwest						
East North Central.....	561	398	73	36	54	12.18
West North Central .....	270	180	28	11	Q	20.01
South						
South Atlantic.....	198	106	24	15	Q	31.50
East South Central.....	126	64	Q	9	28	29.22
West South Central .....	174	94	34	19	27	19.57
West						
Mountain.....	197	97	28	Q	13	25.75
Pacific.....	195	91	54	21	28	14.77
<b>Metropolitan Status</b>						
Metropolitan.....	1,608	939	254	176	239	7.68
Nonmetropolitan.....	465	326	66	22	51	18.83

See footnotes at end of table.

**Table B7. Consumption of Natural Gas by End Use, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Natural Gas Consumption (trillion Btu)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
<b>Climate Zone: 45-Year Average</b>						
Under 2,000 CDD and --						
Over 7,000 HDD.....	252	178	39	11	25	21.64
5,500-7,000 HDD.....	850	579	94	Q	81	12.19
4,000-5,499 HDD.....	407	224	67	38	Q	19.13
Under 4,000 HDD.....	350	189	67	31	63	20.00
2,000 CDD or More and --						
Under 4,000 HDD.....	213	96	54	22	42	20.93
<b>1989 Degree-Days</b>						
Under 2,000 CDD and --						
Over 7,000 HDD.....	375	279	44	21	32	19.70
5,500-7,000 HDD.....	953	593	123	Q	139	13.89
4,000-5,499 HDD.....	209	124	39	31	16	14.77
Under 4,000 HDD.....	339	184	64	28	63	22.18
2,000 CDD or More and --						
Under 4,000 HDD.....	197	85	50	20	41	21.84
<b>STRUCTURE</b>						
<b>Floors</b>						
1.....	732	485	104	53	90	9.75
2.....	560	360	75	31	95	12.14
3.....	252	192	26	11	24	8.21
4 to 6.....	331	161	70	Q	32	22.31
7 or More.....	197	68	46	34	Q	26.51
<b>Wall Materials</b>						
Masonry.....	1,509	943	238	122	205	7.85
Siding or Shingles.....	120	73	26	10	11	12.43
Metal Panels.....	185	129	15	3	38	30.61
Concrete Panels.....	180	75	22	Q	30	31.77
Window Glass.....	49	28	Q	Q	4	34.55
Other.....	30	17	Q	2	Q	41.46
<b>Roof Materials</b>						
Built-Up.....	1,052	630	164	121	137	10.12
Shingles (Not Wood).....	333	216	56	25	35	13.38
Metal Surfacing.....	226	160	16	7	43	25.15
Synthetic or Rubber.....	259	155	50	20	35	15.37
Slate or Tile.....	86	51	15	16	5	17.67
Concrete.....	23	12	9	1	1	29.11
Wooden Materials.....	29	19	5	3	2	24.30
Other.....	Q	22	Q	Q	Q	NF
<b>Building Shell Conservation Features (Solely or in Combination)</b>						
Roof or Ceiling Insulation.....	1,571	943	257	161	209	8.65
Wall Insulation.....	1,096	629	170	127	170	10.85
Storm or Multiple Glazing.....	959	577	181	85	116	8.43
Tinted, Reflective, or Shading Glass.....	769	414	119	Q	130	12.15
Exterior or Interior Shadings or Awnings.....	878	498	136	124	119	10.00
Weather Stripping or Caulking.....	1,553	950	251	173	179	7.32
None of the Above.....	141	76	23	9	Q	21.93

See footnotes at end of table.

**Table B7. Consumption of Natural Gas by End Use, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Natural Gas Consumption (trillion Btu)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
<b>ENERGY SOURCES AND END USES</b>						
<b>Energy Sources</b>						
<b>(Solely or in Combination)</b>						
Electricity .....	2,068	1,264	319	198	288	7.38
Natural Gas.....	2,073	1,265	320	198	290	7.27
Fuel Oil.....	427	206	94	42	85	20.36
District Heat .....	Q	Q	11	Q	Q	NF
Other.....	198	94	21	Q	Q	39.94
<b>Energy End Uses</b>						
<b>(Solely or in Combination)</b>						
Heated Buildings.....	2,051	1,262	309	195	286	7.36
Air-Conditioned Buildings.....	1,780	1,045	285	191	260	7.46
Buildings with Water Heating.....	1,960	1,171	320	196	273	7.40
Buildings with Cooking.....	975	478	199	198	100	9.69
Buildings with Manufacturing.....	286	144	12	Q	81	28.43
<b>Space-Heating Energy Source</b>						
Natural Gas.....	1,856	1,236	257	102	261	7.44
Main.....	1,778	1,195	247	98	238	7.62
With Secondary.....	560	318	99	26	116	16.72
Electricity Only.....	156	100	17	5	Q	19.84
Other Energy Sources or Combinations.....	360	192	78	20	70	20.36
With No Secondary.....	1,218	877	148	72	122	6.47
Secondary.....	78	41	Q	4	23	30.02
Other Excluding Natural Gas.....	195	26	51	Q	25	29.19
Building Not Heated.....	22	Q	11	Q	4	27.76
<b>Main Space-Heating Energy Source</b>						
Electricity.....	170	54	51	29	36	17.17
Natural Gas.....	1,778	1,195	247	98	238	7.62
Fuel Oil.....	25	8	Q	4	2	NF
District Heat .....	Q	Q	9	Q	Q	99.99
Other.....	6	Q	*	Q	Q	42.65
<b>Water-Heating Energy Source</b>						
Natural Gas.....	1,451	878	320	100	153	7.09
Other Excluding Natural Gas.....	509	293	NC	Q	120	17.70
Water Heating Not Performed.....	113	94	NC	2	Q	18.63
<b>HEATING AND COOLING</b>						
<b>Percent Heated</b>						
Not Heated .....	23	Q	12	Q	4	26.91
1 to 50 .....	128	80	19	5	25	11.38
51 to 99 .....	274	170	44	19	41	19.77
100.....	1,648	1,011	245	171	220	7.63
<b>Percent Cooled</b>						
Not Cooled .....	293	220	35	7	30	22.25
1 to 50 .....	616	451	46	17	103	13.11
51 to 99 .....	424	219	96	56	54	11.23
100.....	740	375	143	118	103	11.26

See footnotes at end of table.

**Table B7. Consumption of Natural Gas by End Use, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Natural Gas Consumption (trillion Btu)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
<b>Heating Equipment (Solely or in Combination)</b>						
Furnaces.....	680	455	84	38	103	12.58
Boilers.....	1,043	667	178	55	144	9.35
Individual Space Heaters.....	787	455	103	Q	148	13.62
Packaged Heating Units.....	593	336	83	56	117	11.11
Heat Pumps.....	248	118	44	19	67	18.67
Air Ducts.....	1,367	771	220	161	216	9.79
Heating or Reheating Coils.....	629	303	113	Q	117	15.71
Fan-Coil Units.....	551	281	99	Q	80	14.63
Steam or Hot Water Radiators or Baseboards.....	776	453	107	Q	116	NF
Other.....	Q	35	10	3	Q	99.99
<b>Cooling Equipment (Solely or in Combination)</b>						
Central Chillers.....	574	253	118	Q	95	15.44
Individual Air Conditioners.....	719	455	122	52	90	10.36
Packaged Cooling Units.....	1,257	758	191	156	152	8.58
Heat Pumps.....	239	114	36	22	68	20.17
Air Ducts.....	1,268	709	216	157	185	9.01
Fan-Coil Units.....	452	187	98	Q	71	NF
Other.....	Q	12	Q	Q	Q	99.99
<b>ENERGY MANAGEMENT</b>						
<b>Occupant Control</b>						
Any Control of Heating.....	895	535	153	78	129	8.28
With Thermostats.....	825	486	143	70	126	8.81
Any Control of Cooling.....	868	510	157	79	122	8.45
With Thermostats.....	784	452	138	74	119	9.13
<b>Reduced Use During Off-Hours</b>						
Heating Only.....	279	208	32	10	29	21.37
Cooling Only.....	150	73	16	Q	Q	20.03
Heating and Cooling.....	1,214	767	149	128	171	8.89
<b>Computerized Energy Management and Control System</b>						
Present in Building.....	495	242	82	Q	87	15.47
Controls Heating and Cooling.....	481	237	77	Q	84	16.09
Controls Lighting.....	143	49	14	Q	Q	40.75
Controls Other.....	120	50	17	8	Q	45.83
<b>Other Energy Management</b>						
Regular HVAC Maintenance.....	1,631	964	258	161	248	8.43
Participated in Utility Conservation Program.....	404	235	74	37	58	15.03

<sup>a</sup> Includes cooling.

\* = Value rounds to zero in the units displayed.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B8. Energy End-Use Intensities for Natural Gas, 1989**

Building Characteristics  RSE Column Factor:	Energy Intensity for Natural Gas (thousand Btu per sq. ft.)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
All Buildings .....	50.4	30.7	7.8	4.8	7.0	5.91
<b>Building Floorspace (Square Feet)</b>						
1,001 to 5,000 .....	88.3	53.5	18.0	10.2	6.7	4.96
5,001 to 10,000 .....	67.1	43.9	11.0	2.9	9.3	11.63
10,001 to 25,000 .....	48.3	34.7	7.4	2.0	4.1	6.51
25,001 to 50,000 .....	56.7	38.0	5.7	2.7	10.2	11.69
50,001 to 100,000 .....	40.1	29.9	5.0	1.9	3.3	9.67
100,001 to 200,000 .....	39.6	25.4	7.0	4.6	2.6	18.17
200,001 to 500,000 .....	45.2	21.8	8.4	3.3	Q	26.13
Over 500,000 .....	38.5	10.0	4.9	Q	Q	29.95
<b>Year Constructed</b>						
1899 or Before .....	52.3	42.6	5.1	2.3	2.3	19.97
1900 to 1919 .....	40.2	24.0	3.8	Q	Q	30.69
1920 to 1945 .....	42.5	27.0	3.4	3.4	Q	15.03
1946 to 1959 .....	56.8	32.3	9.8	Q	6.4	11.28
1960 to 1969 .....	54.0	36.4	7.3	3.0	7.3	10.14
1970 to 1979 .....	54.4	32.2	10.7	6.1	5.4	13.87
1980 to 1983 .....	53.6	27.8	9.4	4.8	11.6	12.66
1984 to 1986 .....	40.9	22.9	8.4	4.0	5.6	18.94
1987 to 1989 .....	45.4	26.8	7.7	5.5	Q	19.37
<b>BUILDING USE</b>						
<b>Principal Building Activity</b>						
Assembly .....	40.4	31.4	3.0	4.0	1.9	11.33
Education .....	48.7	35.6	2.2	Q	3.0	11.47
Food Sales .....	49.8	24.6	1.5	22.6	1.0	16.88
Food Service .....	156.4	44.8	53.3	49.9	8.5	9.53
Health Care .....	116.3	28.4	44.5	18.2	Q	10.48
Lodging .....	73.7	30.7	33.0	6.6	3.4	11.94
Mercantile and Service .....	47.4	31.3	5.4	2.2	8.6	10.21
Office .....	33.0	23.7	3.7	.6	4.9	11.19
Parking Garage .....	37.6	28.2	Q	Q	Q	47.02
Public Order and Safety .....	55.7	48.8	Q	Q	2.6	33.93
Warehouse .....	40.2	30.5	.7	Q	Q	22.86
Other .....	109.1	61.2	6.3	Q	36.9	18.36
Vacant .....	Q	16.2	Q	Q	Q	NF
<b>Weekly Operating Hours</b>						
39 or Fewer .....	38.0	32.4	2.9	.9	1.8	9.06
40 to 48 .....	42.3	33.7	3.0	.8	4.8	8.15
49 to 60 .....	38.5	28.9	2.7	Q	5.5	9.40
61 to 84 .....	43.0	26.6	5.9	4.3	6.2	11.28
85 to 167 .....	54.8	29.3	6.7	13.1	5.7	16.39
168 (Open Continuously) .....	87.7	34.9	26.8	8.8	17.1	11.18
<b>Workers</b>						
4 or Fewer .....	44.6	32.7	7.6	1.8	2.4	11.29
5 to 9 .....	42.0	28.0	7.3	3.4	3.3	9.37
10 to 19 .....	55.7	35.3	8.9	4.0	7.4	9.10
20 to 49 .....	50.2	34.4	7.3	3.3	5.2	9.29
50 to 99 .....	47.3	33.4	3.6	2.6	7.8	16.09
100 to 249 .....	71.0	42.8	7.6	5.8	14.8	14.03
250 or More .....	46.9	15.5	10.9	Q	9.4	14.93

See footnote at end of table.

**Table B8. Energy End-Use Intensities for Natural Gas, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Natural Gas (thousand Btu per sq. ft.)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
<b>Ownership and Occupancy</b>						
Nongovernment Owned .....	50.5	30.0	8.1	4.1	8.3	6.61
Owner Occupied.....	54.7	31.7	9.0	4.4	9.6	7.13
Single Establishment .....	63.1	36.2	10.6	4.8	11.5	8.68
Multiple Establishment.....	32.4	19.6	4.9	3.1	4.7	13.59
Nonowner Occupied.....	38.3	24.9	5.4	3.4	4.5	14.39
Single Establishment .....	41.0	28.7	4.3	3.5	4.6	20.79
Multiple Establishment.....	29.0	17.6	5.9	3.4	2.1	15.42
Vacant .....	Q	60.2	Q	Q	Q	NF
Government Owned .....	50.0	33.4	6.7	Q	2.8	10.45
Federal .....	76.3	17.3	5.4	51.8	Q	17.88
State .....	48.3	34.0	7.8	1.7	4.8	18.59
Local .....	46.8	35.5	6.4	2.7	2.1	10.58
<b>Multibuilding Facility</b>						
Not on Multibuilding Facility.....	44.7	29.3	6.7	3.1	5.6	7.06
Part of Multibuilding Facility.....	60.3	33.3	9.6	7.9	9.5	7.85
On Facility with Central Plant .....	91.4	39.4	14.3	18.3	19.5	13.32
<b>Percent Vacant at Least Three Months</b>						
0 .....	56.9	36.0	9.4	4.3	7.2	6.21
1 to 50 .....	35.1	19.3	4.5	3.1	8.3	15.18
51 to 99 .....	36.8	16.6	1.7	Q	1.3	36.19
100 .....	51.6	32.9	10.3	.7	Q	27.59
<b>Months in Use Out of Past 12 Months</b>						
0 to 8 .....	41.3	24.2	9.4	5.3	2.4	16.22
9 to 11 .....	52.4	40.2	5.9	.7	Q	17.23
12 .....	50.7	30.4	7.8	5.1	7.4	6.57
<b>LOCATION</b>						
<b>Census Region</b>						
Northeast.....	41.5	27.5	6.1	3.5	4.2	15.13
Midwest.....	64.8	45.1	7.9	3.6	8.2	8.71
South.....	42.7	22.6	7.2	3.6	9.3	13.83
West.....	48.0	23.1	10.1	Q	5.1	7.97
<b>Census Division</b>						
Northeast						
New England.....	31.8	15.7	Q	Q	3.6	24.95
Middle Atlantic .....	43.1	29.5	5.6	3.6	4.3	17.07
Midwest						
East North Central.....	63.8	45.3	8.3	4.1	6.2	11.99
West North Central .....	67.2	44.9	7.1	2.7	12.5	11.90
South						
South Atlantic.....	46.7	24.9	5.8	3.4	12.6	22.34
East South Central.....	61.8	31.4	Q	4.3	13.6	22.35
West South Central .....	32.3	17.4	6.3	3.5	5.0	18.59
West						
Mountain.....	63.0	31.1	9.0	Q	4.2	10.42
Pacific.....	38.7	18.2	10.8	4.1	5.6	8.85
<b>Metropolitan Status</b>						
Metropolitan.....	46.9	27.4	7.4	5.1	7.0	6.90
Nonmetropolitan.....	67.7	47.5	9.7	3.2	7.4	9.34

See footnote at end of table.

**Table B8. Energy End-Use Intensities for Natural Gas, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Natural Gas (thousand Btu per sq. ft.)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
<b>Climate Zone: 45-Year Average</b>						
Under 2,000 CDD and --						
Over 7,000 HDD.....	82.4	57.9	12.6	3.6	8.2	9.60
5,500-7,000 HDD.....	61.2	41.6	6.8	Q	5.8	8.27
4,000-5,499 HDD.....	42.1	23.1	6.9	3.9	8.2	14.31
Under 4,000 HDD.....	41.5	22.5	7.9	3.6	7.5	16.17
2,000 CDD or More and --						
Under 4,000 HDD.....	35.1	15.7	8.8	3.6	7.0	14.18
<b>1989 Degree-Days</b>						
Under 2,000 CDD and --						
Over 7,000 HDD.....	73.3	54.5	8.5	4.0	6.2	7.61
5,500-7,000 HDD.....	57.4	35.7	7.4	Q	8.4	9.10
4,000-5,499 HDD.....	35.1	20.8	6.5	5.2	2.6	14.74
Under 4,000 HDD.....	42.8	23.3	8.1	3.6	7.9	14.87
2,000 CDD or More and --						
Under 4,000 HDD.....	35.5	15.4	9.1	3.6	7.4	14.95
<b>STRUCTURE</b>						
<b>Floors</b>						
1.....	52.9	35.1	7.5	3.8	6.5	7.95
2.....	51.0	32.8	6.8	2.8	8.7	11.59
3.....	44.1	33.5	4.5	2.0	4.2	12.14
4 to 6.....	54.8	26.6	11.5	Q	5.3	12.43
7 or More.....	43.0	14.9	10.1	7.5	Q	22.83
<b>Wall Materials</b>						
Masonry.....	51.4	32.1	8.1	4.2	7.0	6.74
Siding or Shingles.....	51.0	31.2	11.1	4.2	4.5	16.44
Metal Panels.....	69.6	48.5	5.6	1.2	14.4	27.30
Concrete Panels.....	36.9	15.3	4.5	Q	6.0	19.00
Window Glass.....	Q	22.5	Q	Q	Q	NF
Other.....	45.1	25.6	12.3	3.5	Q	30.14
<b>Roof Materials</b>						
Built-Up.....	47.9	28.7	7.5	5.5	6.2	9.53
Shingles (Not Wood).....	47.5	30.8	8.0	3.6	5.1	9.81
Metal Surfacing.....	59.6	42.1	4.1	2.0	11.4	21.21
Synthetic or Rubber.....	58.4	35.0	11.2	4.4	7.8	10.03
Slate or Tile.....	46.5	27.3	8.1	8.5	2.6	14.87
Concrete.....	Q	Q	Q	Q	Q	NF
Wooden Materials.....	59.4	39.0	9.4	Q	4.7	17.71
Other.....	115.7	39.7	Q	Q	57.3	14.38
<b>Building Shell Conservation</b>						
<b>Features (Solely or in Combination)</b>						
Roof or Ceiling Insulation.....	52.8	31.7	8.7	5.4	7.0	6.34
Wall Insulation.....	55.8	32.0	8.7	6.5	8.6	7.33
Storm or Multiple Glazing.....	56.2	33.8	10.6	5.0	6.8	6.97
Tinted, Reflective, or Shading						
Glass.....	49.7	26.7	7.7	6.9	8.4	8.94
Exterior or Interior Shadings						
or Awnings.....	47.7	27.0	7.4	6.8	6.5	6.29
Weather Stripping or Caulking.....	51.3	31.4	8.3	5.7	5.9	5.60
None of the Above.....	36.5	19.5	5.9	2.2	Q	26.50

See footnote at end of table.

**Table B8. Energy End-Use Intensities for Natural Gas, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Natural Gas (thousand Btu per sq. ft.)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
<b>ENERGY SOURCES AND END USES</b>						
<b>Energy Sources</b>						
<b>(Solely or in Combination)</b>						
Electricity .....	50.3	30.7	7.8	4.8	7.0	6.08
Natural Gas.....	50.4	30.7	7.8	4.8	7.0	5.91
Fuel Oil.....	54.3	26.2	11.9	5.4	10.8	15.95
District Heat .....	48.1	Q	3.2	Q	Q	29.19
Other .....	59.7	28.3	6.2	Q	Q	23.41
<b>Energy End Uses</b>						
<b>(Solely or in Combination)</b>						
Heated Buildings.....	50.3	30.9	7.6	4.8	7.0	5.96
Air-Conditioned Buildings.....	48.5	28.5	7.8	5.2	7.1	6.74
Buildings with Water Heating.....	51.0	30.5	8.3	5.1	7.1	5.94
Buildings with Cooking.....	51.7	25.3	10.5	10.5	5.3	7.77
Buildings with Manufacturing.....	75.8	38.1	3.2	Q	21.6	20.56
<b>Space-Heating Energy Source</b>						
Natural Gas.....	56.2	37.4	7.8	3.1	7.9	6.26
Main.....	57.2	38.4	7.9	3.1	7.7	6.34
With Secondary.....	71.0	40.4	12.6	3.3	14.7	13.12
Electricity Only.....	43.1	27.7	4.6	1.5	Q	18.22
Other Energy Sources or Combinations.....	87.0	46.4	18.8	5.0	16.8	15.17
With No Secondary.....	52.5	37.8	6.4	3.1	5.2	6.89
Secondary.....	41.0	21.5	Q	2.3	11.9	22.95
Other Excluding Natural Gas.....	25.0	3.3	6.6	Q	3.3	22.18
Building Not Heated.....	63.4	Q	33.0	9.2	Q	32.96
<b>Main Space-Heating Energy Source</b>						
Electricity.....	33.2	10.7	10.0	5.6	7.0	16.51
Natural Gas.....	57.2	38.4	7.9	3.1	7.7	6.34
Fuel Oil.....	12.3	4.0	Q	2.0	1.1	20.40
District Heat .....	37.7	Q	3.1	23.8	Q	30.92
Other.....	21.0	Q	Q	Q	Q	39.84
<b>Water-Heating Energy Source</b>						
Natural Gas.....	56.0	33.9	12.3	3.9	5.9	5.93
Other Excluding Natural Gas.....	40.7	23.4	NC	Q	9.6	12.92
Water Heating Not Performed.....	41.7	34.7	NC	Q	6.4	15.03
<b>HEATING AND COOLING</b>						
<b>Percent Heated</b>						
Not Heated .....	56.8	Q	29.7	7.8	9.4	27.51
1 to 50 .....	21.4	13.4	3.1	.8	4.1	15.30
51 to 99 .....	46.1	28.5	7.5	3.1	7.0	16.28
100.....	57.2	35.1	8.5	5.9	7.6	5.78
<b>Percent Cooled</b>						
Not Cooled .....	65.5	49.3	7.9	1.6	6.7	16.40
1 to 50 .....	46.6	34.1	3.5	1.3	7.8	13.34
51 to 99 .....	46.3	23.9	10.5	6.1	5.9	10.16
100.....	51.8	26.2	10.0	8.3	7.2	8.57

See footnotes at end of table.

**Table B8. Energy End-Use Intensities for Natural Gas, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Natural Gas (thousand Btu per sq. ft.)					RSE Row Factor
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>	
	1.0	NF	NF	NF	NF	
<b>Heating Equipment (Solely or in Combination)</b>						
Furnaces.....	54.3	36.3	6.7	3.0	8.3	9.16
Boilers.....	64.0	40.9	10.9	3.4	8.8	7.63
Individual Space Heaters.....	48.3	27.9	6.3	Q	9.1	10.28
Packaged Heating Units.....	49.5	28.1	7.0	4.7	9.8	10.39
Heat Pumps.....	50.6	24.0	8.9	3.9	13.7	19.19
Air Ducts.....	50.4	28.4	8.1	5.9	8.0	7.20
Heating or Reheating Coils.....	55.2	26.6	9.9	Q	10.3	10.94
Fan-Coil Units.....	56.9	29.0	10.2	Q	8.3	9.84
Steam or Hot Water Radiators or Baseboards.....	62.7	36.6	8.6	Q	9.4	11.87
Other.....	76.5	32.0	8.8	2.8	Q	27.31
<b>Cooling Equipment (Solely or in Combination)</b>						
Central Chillers.....	51.9	22.8	10.6	9.9	8.6	11.23
Individual Air Conditioners.....	49.6	31.4	8.4	3.6	6.2	12.42
Packaged Cooling Units.....	47.6	28.7	7.2	5.9	5.8	8.07
Heat Pumps.....	52.6	25.0	7.9	4.8	14.9	16.86
Air Ducts.....	50.4	28.2	8.6	6.3	7.4	7.27
Fan-Coil Units.....	54.8	22.6	11.9	11.8	8.6	11.97
Other.....	71.2	11.3	Q	46.6	Q	16.81
<b>ENERGY MANAGEMENT</b>						
<b>Occupant Control</b>						
Any Control of Heating.....	46.9	28.0	8.0	4.1	6.8	9.26
With Thermostats.....	47.2	27.7	8.2	4.0	7.2	9.69
Any Control of Cooling.....	45.7	26.8	8.3	4.2	6.4	9.70
With Thermostats.....	45.5	26.2	8.0	4.3	6.9	10.05
<b>Reduced Use During Off-Hours</b>						
Heating Only.....	63.6	47.5	7.3	2.3	6.6	14.68
Cooling Only.....	62.5	30.5	6.5	Q	Q	26.27
Heating and Cooling.....	42.9	27.1	5.2	4.5	6.0	8.07
<b>Computerized Energy Management and Control System</b>						
Present in Building.....	46.6	22.8	7.7	Q	8.2	10.11
Controls Heating and Cooling.....	47.3	23.4	7.6	Q	8.3	9.93
Controls Lighting.....	45.5	15.7	4.6	Q	Q	19.83
Controls Other.....	62.1	25.6	8.5	3.9	24.1	25.24
<b>Other Energy Management</b>						
Regular HVAC Maintenance.....	54.7	32.3	8.7	5.4	8.3	6.21
Participated in Utility Conservation Program.....	55.7	32.5	10.2	5.1	8.0	12.22

<sup>a</sup> Includes cooling.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B9. End-Use Consumption Percentages for Natural Gas, 1989**

Building Characteristics	Percent of Natural Gas Consumption				
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>
<b>All Buildings</b> .....	100	61	15	10	14
<b>Building Floorspace (Square Feet)</b>					
1,001 to 5,000 .....	100	61	20	12	8
5,001 to 10,000 .....	100	65	16	4	14
10,001 to 25,000 .....	100	72	15	4	9
25,001 to 50,000 .....	100	67	10	5	18
50,001 to 100,000 .....	100	75	12	5	8
100,001 to 200,000 .....	100	64	18	12	7
200,001 to 500,000 .....	100	48	19	7	26
Over 500,000 .....	100	26	13	34	27
<b>Year Constructed</b>					
1899 or Before .....	100	81	10	4	4
1900 to 1919 .....	100	60	10	6	Q
1920 to 1945 .....	100	64	8	8	20
1946 to 1959 .....	100	57	17	Q	11
1960 to 1969 .....	100	67	14	5	14
1970 to 1979 .....	100	59	20	11	10
1980 to 1983 .....	100	52	18	9	22
1984 to 1986 .....	100	56	21	10	14
1987 to 1989 .....	100	59	17	12	12
<b>BUILDING USE</b>					
<b>Principal Building Activity</b>					
Assembly .....	100	78	7	10	5
Education .....	100	73	5	Q	6
Food Sales .....	100	49	3	45	2
Food Service .....	100	29	34	32	5
Health Care .....	100	24	38	16	Q
Lodging .....	100	42	45	9	5
Mercantile and Service .....	100	66	11	5	18
Office .....	100	72	11	2	15
Parking Garage .....	100	75	Q	Q	Q
Public Order and Safety .....	100	88	5	Q	5
Warehouse .....	100	76	2	*	22
Other .....	100	56	6	Q	34
Vacant .....	100	63	12	Q	23
<b>Weekly Operating Hours</b>					
39 or Fewer .....	100	85	8	2	5
40 to 48 .....	100	80	7	2	11
49 to 60 .....	100	75	7	4	14
61 to 84 .....	100	62	14	10	14
85 to 167 .....	100	53	12	24	10
168 (Open Continuously) .....	100	40	31	10	19
<b>Workers</b>					
4 or Fewer .....	100	73	17	4	5
5 to 9 .....	100	67	17	8	8
10 to 19 .....	100	63	16	7	13
20 to 49 .....	100	69	15	6	10
50 to 99 .....	100	71	8	5	16
100 to 249 .....	100	60	11	8	21
250 or More .....	100	33	23	24	20

See footnotes at end of table.

**Table B9. End-Use Consumption Percentages for Natural Gas, 1989 (Continued)**

Building Characteristics	Percent of Natural Gas Consumption				
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>
<b>Ownership and Occupancy</b>					
Nongovernment Owned .....	100	59	16	8	16
Owner Occupied.....	100	58	16	8	18
Single Establishment.....	100	57	17	8	18
Multiple Establishment.....	100	61	15	10	15
Nonowner Occupied.....	100	65	14	9	12
Single Establishment.....	100	70	10	9	11
Multiple Establishment.....	100	61	20	12	7
Vacant.....	100	54	16	Q	30
Government Owned.....	100	67	13	Q	6
Federal.....	100	23	Q	68	Q
State.....	100	70	16	Q	10
Local.....	100	76	14	6	5
<b>Multibuilding Facility</b>					
Not on Multibuilding Facility.....	100	66	15	7	13
Part of Multibuilding Facility.....	100	55	16	13	16
On Facility with Central Plant.....	100	43	16	20	21
<b>Percent Vacant at Least Three Months</b>					
0.....	100	63	16	8	13
1 to 50.....	100	55	13	9	23
51 to 99.....	100	45	5	47	4
100.....	100	64	20	1	15
<b>Months in Use Out of Past 12 Months</b>					
0 to 8.....	100	59	23	13	6
9 to 11.....	100	77	11	1	11
12.....	100	60	15	10	15
<b>LOCATION</b>					
<b>Census Region</b>					
Northeast.....	100	66	15	9	10
Midwest.....	100	70	12	6	13
South.....	100	53	17	9	22
West.....	100	48	21	20	11
<b>Census Division</b>					
Northeast					
New England.....	100	49	30	9	11
Middle Atlantic.....	100	69	13	8	10
Midwest					
East North Central.....	100	71	13	6	10
West North Central.....	100	67	11	4	19
South					
South Atlantic.....	100	53	12	7	27
East South Central.....	100	51	20	7	22
West South Central.....	100	54	19	11	16
West					
Mountain.....	100	49	14	Q	7
Pacific.....	100	47	28	11	14
<b>Metropolitan Status</b>					
Metropolitan.....	100	58	16	11	15
Nonmetropolitan.....	100	70	14	5	11

See footnotes at end of table.

**Table B9. End-Use Consumption Percentages for Natural Gas, 1989 (Continued)**

Building Characteristics	Percent of Natural Gas Consumption				
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>
<b>Climate Zone: 45-Year Average</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	100	70	15	4	10
5,500-7,000 HDD.....	100	68	11	11	9
4,000-5,499 HDD.....	100	55	16	9	19
Under 4,000 HDD.....	100	54	19	9	18
2,000 CDD or More and --					
Under 4,000 HDD.....	100	45	25	10	20
<b>1989 Degree-Days</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	100	74	12	5	9
5,500-7,000 HDD.....	100	62	13	10	15
4,000-5,499 HDD.....	100	59	19	15	7
Under 4,000 HDD.....	100	54	19	8	18
2,000 CDD or More and --					
Under 4,000 HDD.....	100	43	26	10	21
<b>STRUCTURE</b>					
<b>Floors</b>					
1.....	100	66	14	7	12
2.....	100	64	13	5	17
3.....	100	76	10	4	9
4 to 6.....	100	49	21	Q	10
7 or More.....	100	35	23	17	25
<b>Wall Materials</b>					
Masonry.....	100	62	16	8	14
Siding or Shingles.....	100	61	22	8	9
Metal Panels.....	100	70	8	2	21
Concrete Panels.....	100	41	12	30	16
Window Glass.....	100	58	Q	13	8
Other.....	100	57	27	Q	Q
<b>Roof Materials</b>					
Built-Up.....	100	60	16	12	13
Shingles (Not Wood).....	100	65	17	8	11
Metal Surfacing.....	100	71	7	3	19
Synthetic or Rubber.....	100	60	19	8	13
Slate or Tile.....	100	59	17	18	6
Concrete.....	100	53	37	5	4
Wooden Materials.....	100	66	16	Q	8
Other.....	100	34	Q	Q	49
<b>Building Shell Conservation</b>					
<b>Features (Solely or in Combination)</b>					
Roof or Ceiling Insulation.....	100	60	16	10	13
Wall Insulation.....	100	57	16	12	15
Storm or Multiple Glazing.....	100	60	19	9	12
Tinted, Reflective, or Shading					
Glass.....	100	54	15	14	17
Exterior or Interior Shadings					
or Awnings.....	100	57	16	14	14
Weather Stripping or Caulking.....	100	61	16	11	11
None of the Above.....	100	53	16	6	Q

See footnotes at end of table.

**Table B9. End-Use Consumption Percentages for Natural Gas, 1989 (Continued)**

Building Characteristics	Percent of Natural Gas Consumption				
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>
<b>ENERGY SOURCES AND END USES</b>					
<b>Energy Sources</b> (Solely or in Combination)					
Electricity .....	100	61	15	10	14
Natural Gas.....	100	61	15	10	14
Fuel Oil.....	100	48	22	10	20
District Heat .....	100	25	7	42	26
Other.....	100	47	10	Q	14
<b>Energy End Uses</b> (Solely or in Combination)					
Heated Buildings.....	100	61	15	9	14
Air-Conditioned Buildings.....	100	59	16	11	15
Buildings with Water Heating.....	100	60	16	10	14
Buildings with Cooking.....	100	49	20	20	10
Buildings with Manufacturing.....	100	50	4	Q	28
<b>Space-Heating Energy Source</b>					
Natural Gas.....	100	67	14	6	14
Main.....	100	67	14	6	13
With Secondary .....	100	57	18	5	21
Electricity Only.....	100	64	11	3	Q
Other Energy Sources or Combinations.....	100	53	22	6	19
With No Secondary.....	100	72	12	6	10
Secondary .....	100	52	Q	6	29
Other Excluding Natural Gas .....	100	13	26	47	13
Building Not Heated.....	100	16	52	14	17
<b>Main Space-Heating Energy Source</b>					
Electricity .....	100	32	30	17	21
Natural Gas.....	100	67	14	6	13
Fuel Oil.....	100	32	44	16	9
District Heat .....	100	Q	8	63	10
Other.....	100	60	Q	Q	Q
<b>Water-Heating Energy Source</b>					
Natural Gas.....	100	60	22	7	11
Other Excluding Natural Gas .....	100	58	NC	19	24
Water Heating Not Performed.....	100	83	NC	Q	15
<b>HEATING AND COOLING</b>					
<b>Percent Heated</b>					
Not Heated .....	100	17	52	14	17
1 to 50 .....	100	63	15	4	19
51 to 99 .....	100	62	16	7	15
100 .....	100	61	15	10	13
<b>Percent Cooled</b>					
Not Cooled .....	100	75	12	2	10
1 to 50 .....	100	73	7	3	17
51 to 99 .....	100	52	23	13	13
100 .....	100	51	19	16	14
<b>Heating Equipment</b> (Solely or in Combination)					
Furnaces.....	100	67	12	6	15
Boilers.....	100	64	17	5	14
Individual Space Heaters .....	100	58	13	Q	19
Packaged Heating Units.....	100	57	14	9	20
Heat Pumps .....	100	48	18	8	27
Air Ducts .....	100	56	16	12	16
Heating or Reheating Coils .....	100	48	18	15	19
Fan-Coil Units.....	100	51	18	16	15
Steam or Hot Water Radiators or Baseboards.....	100	58	14	13	15
Other.....	100	42	11	4	43

See footnotes at end of table.

**Table B9. End-Use Consumption Percentages for Natural Gas, 1989 (Continued)**

Building Characteristics	Percent of Natural Gas Consumption				
	Total	Space Heating	Water Heating	Cooking	Other <sup>a</sup>
<b>Cooling Equipment</b>					
<b>(Solely or in Combination)</b>					
Central Chillers .....	100	44	20	19	17
Individual Air Conditioners .....	100	63	17	7	12
Packaged Cooling Units.....	100	60	15	12	12
Heat Pumps .....	100	48	15	9	28
Air Ducts .....	100	56	17	12	15
Fan-Coil Units.....	100	41	22	21	16
Other .....	100	16	Q	65	Q
<b>ENERGY MANAGEMENT</b>					
<b>Occupant Control</b>					
Any Control of Heating .....	100	60	17	9	14
With Thermostats .....	100	59	17	8	15
Any Control of Cooling.....	100	59	18	9	14
With Thermostats .....	100	58	18	9	15
<b>Reduced Use During Off-Hours</b>					
Heating Only .....	100	75	11	4	10
Cooling Only .....	100	49	10	11	30
Heating and Cooling .....	100	63	12	11	14
<b>Computerized Energy Management and Control System</b>					
Present in Building.....	100	49	16	17	18
Controls Heating and Cooling .....	100	49	16	17	18
Controls Lighting .....	100	35	10	41	14
Controls Other .....	100	41	14	6	39
<b>Other Energy Management</b>					
Regular HVAC Maintenance.....	100	59	16	10	15
Participated in Utility Conservation Program.....	100	58	18	9	14

<sup>a</sup> Includes cooling.

\* = Value rounds to zero in the units displayed.

NC = No cases in responding sample.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B10. Consumption of Fuel Oil by End Use, 1989**

Building Characteristics RSE Column Factor:	Fuel Oil Consumption (trillion Btu)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
All Buildings .....	357	301	26	30	13.28
<b>Building Floorspace (Square Feet)</b>					
1,001 to 10,000 .....	101	91	9	Q	23.83
10,001 to 25,000 .....	69	61	5	Q	17.35
25,001 to 50,000 .....	47	44	2	Q	19.69
50,001 to 100,000 .....	54	47	Q	Q	46.65
100,001 to 200,000 .....	46	31	Q	Q	39.53
Over 200,000 .....	40	27	Q	Q	29.27
<b>Year Constructed</b>					
1945 or Before .....	112	101	8	Q	13.63
1946 to 1959 .....	77	73	3	Q	24.41
1960 to 1969 .....	73	60	6	Q	36.42
1970 to 1979 .....	61	40	6	Q	30.29
1980 to 1989 .....	34	27	Q	Q	33.98
<b>BUILDING USE</b>					
<b>Principal Building Activity</b>					
Assembly .....	31	29	2	Q	20.25
Education .....	71	68	Q	Q	24.77
Food Sales and Service .....	18	15	Q	Q	28.86
Health Care .....	17	7	Q	Q	42.28
Lodging .....	10	6	4	Q	33.61
Mercantile and Service .....	75	68	4	Q	22.11
Office .....	43	38	2	Q	27.63
Warehouse .....	53	39	Q	Q	38.96
Other .....	30	24	Q	Q	44.52
Vacant .....	7	7	Q	Q	34.88
<b>Weekly Operating Hours</b>					
39 or Fewer .....	26	25	1	Q	23.63
40 to 48 .....	65	63	1	Q	19.31
49 to 60 .....	54	49	3	Q	18.95
61 to 84 .....	68	61	6	Q	20.54
85 to 167 .....	80	67	Q	Q	32.60
168 (Open Continuously) .....	65	37	11	Q	30.29
<b>Workers</b>					
4 or Fewer .....	83	75	7	Q	19.56
5 to 9 .....	35	29	3	Q	21.87
10 to 19 .....	38	37	1	Q	25.85
20 to 49 .....	72	66	4	Q	17.57
50 to 99 .....	34	30	Q	Q	27.13
100 to 249 .....	57	42	Q	Q	42.47
250 or More .....	39	21	Q	Q	35.13
<b>Ownership and Occupancy</b>					
Nongovernment Owned .....	242	197	19	Q	14.28
Owner Occupied .....	200	165	17	Q	17.06
Single Establishment .....	176	144	15	Q	18.40
Multiple Establishment .....	24	21	1	Q	15.14
Nonowner Occupied .....	42	32	2	Q	29.37
Single Establishment .....	Q	11	Q	Q	NF
Multiple Establishment .....	19	17	2	Q	29.73
Vacant .....	Q	Q	Q	NC	NF
Government Owned .....	115	103	Q	Q	22.24
Federal .....	Q	Q	Q	Q	NF
State .....	31	25	Q	Q	42.68
Local .....	79	75	3	Q	23.52

See footnotes at end of table.

**Table B10. Consumption of Fuel Oil by End Use, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Fuel Oil Consumption (trillion Btu)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>Multibuilding Facility</b>					
Not on Multibuilding Facility.....	234	206	15	Q	12.66
Part of Multibuilding Facility.....	123	95	11	Q	26.40
On Facility with Central Plant.....	60	Q	Q	Q	43.90
<b>Percent Vacant at Least Three Months</b>					
0.....	284	237	20	27	15.68
1 to 50.....	48	41	Q	4	18.10
51 to 99.....	14	13	Q	Q	43.43
100.....	11	10	Q	Q	32.28
<b>Months in Use Out of Past 12 Months</b>					
0 to 8.....	13	12	Q	Q	40.56
9 to 11.....	36	34	Q	Q	29.37
12.....	309	254	24	30	14.01
<b>LOCATION</b>					
<b>Census Region</b>					
Northeast.....	237	198	21	Q	17.86
Midwest.....	61	58	Q	Q	22.29
South.....	50	38	Q	Q	27.59
West.....	Q	Q	Q	Q	NF
<b>Census Division</b>					
Northeast					
New England.....	92	79	6	Q	16.02
Middle Atlantic.....	145	119	14	Q	28.19
Midwest					
East North Central.....	38	37	Q	*	26.22
West North Central.....	23	21	Q	Q	42.98
South					
South Atlantic.....	42	32	Q	Q	30.87
East South Central.....	Q	Q	Q	Q	NF
West South Central.....	Q	Q	NC	Q	NF
West					
Mountain.....	Q	Q	NC	Q	NF
Pacific.....	Q	Q	Q	Q	NF
<b>Climate Zone: 45-Year Average</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	65	61	Q	2	16.38
5,500-7,000 HDD.....	137	113	11	Q	25.82
4,000-5,499 HDD.....	127	111	11	5	15.52
Under 4,000 HDD.....	Q	10	Q	Q	NF
2,000 CDD or More and --					
Under 4,000 HDD.....	Q	Q	Q	Q	NF
<b>1989 Degree-Days</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	100	85	Q	Q	33.27
5,500-7,000 HDD.....	148	129	10	Q	18.83
4,000-5,499 HDD.....	84	73	9	Q	17.67
Under 4,000 HDD.....	Q	Q	Q	Q	NF
2,000 CDD or More and --					
Under 4,000 HDD.....	Q	Q	Q	Q	NF
<b>STRUCTURE</b>					
<b>Floors</b>					
1.....	101	87	4	Q	21.69
2.....	108	94	6	Q	26.90
3.....	75	63	10	Q	22.75
4 to 6.....	52	42	3	Q	23.21
7 or More.....	21	14	Q	3	36.40

See footnotes at end of table.

**Table B10. Consumption of Fuel Oil by End Use, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Fuel Oil Consumption (trillion Btu)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>Wall Materials</b>					
Masonry.....	285	242	20	Q	13.73
Siding or Shingles.....	31	27	Q	Q	32.51
Metal Panels.....	17	17	Q	Q	30.93
Concrete Panels.....	Q	10	Q	Q	NF
Window Glass.....	Q	Q	Q	Q	NF
Other.....	Q	Q	Q	Q	NF
<b>Roof Materials</b>					
Built-Up.....	175	152	11	Q	16.50
Shingles (Not Wood).....	72	63	7	2	22.28
Metal Surfacing.....	34	27	Q	Q	32.32
Synthetic or Rubber.....	59	46	2	Q	38.41
Slate or Tile.....	Q	Q	Q	Q	NF
Concrete.....	Q	Q	Q	Q	NF
Wooden Materials.....	Q	Q	Q	Q	NF
Other.....	Q	Q	Q	Q	NF
<b>Building Shell Conservation Features (Solely or in Combination)</b>					
Roof or Ceiling Insulation.....	254	210	21	Q	14.36
Wall Insulation.....	148	117	14	Q	18.03
Storm or Multiple Glazing.....	160	133	17	Q	17.57
Tinted, Reflective, or Shading Glass.....	75	56	8	Q	18.83
Exterior or Interior Shadings or Awnings.....	130	111	13	Q	15.90
Weather Stripping or Caulking.....	244	209	21	Q	12.32
None of the Above.....	Q	34	Q	Q	NF
<b>ENERGY SOURCES AND END USES</b>					
<b>Energy Sources (Solely or in Combination)</b>					
Electricity.....	355	299	26	30	13.36
Natural Gas.....	149	117	11	Q	17.74
Fuel Oil.....	357	301	26	30	13.28
District Heat.....	Q	Q	Q	3	NF
Other.....	81	66	Q	Q	31.96
<b>Energy End Uses (Solely or in Combination)</b>					
Heated Buildings.....	356	301	25	30	13.28
Air-Conditioned Buildings.....	260	212	20	28	17.06
Buildings with Water Heating.....	321	266	26	30	14.20
Buildings with Cooking.....	150	119	14	Q	20.91
Buildings with Manufacturing.....	Q	Q	Q	Q	NF
<b>Space-Heating Energy Source</b>					
Fuel Oil.....	344	301	20	Q	13.65
Main.....	287	253	20	Q	15.27
With Secondary.....	59	48	Q	Q	24.61
Electricity Only.....	27	24	Q	Q	33.78
Other Energy Sources or Combinations.....	32	24	2	Q	31.81
With No Secondary.....	228	206	15	Q	18.34
Secondary.....	57	47	Q	Q	38.94
Other Excluding Fuel Oil.....	Q	NC	Q	Q	NF
Building Not Heated.....	Q	NC	Q	Q	NF
<b>Main Space-Heating Energy Source</b>					
Electricity.....	4	Q	Q	Q	45.39
Natural Gas.....	44	32	Q	Q	38.74
Fuel Oil.....	287	253	20	Q	15.27
District Heat.....	Q	Q	Q	Q	NF
Other.....	Q	Q	Q	Q	NF

See footnotes at end of table.

**Table B10. Consumption of Fuel Oil by End Use, 1989 (Continued)**

Building Characteristics RSE Column Factor:	Fuel Oil Consumption (trillion Btu)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>HEATING AND COOLING</b>					
<b>Percent Heated</b>					
Not Heated .....	Q	Q	Q	Q	NF
1 to 50 .....	27	25	Q	Q	26.51
51 to 99 .....	62	45	2	Q	35.05
100 .....	264	228	22	Q	12.05
<b>Percent Cooled</b>					
Not Cooled .....	97	89	6	2	10.68
1 to 50 .....	146	119	9	Q	23.47
51 to 99 .....	65	52	6	Q	26.17
100 .....	50	40	5	Q	23.02
<b>Heating Equipment (Solely or in Combination)</b>					
Furnaces.....	99	85	5	Q	21.30
Boilers.....	282	235	20	27	14.83
Individual Space Heaters .....	113	89	7	Q	26.89
Packaged Heating Units.....	28	18	Q	Q	43.40
Heat Pumps .....	16	12	Q	3	30.08
Air Ducts .....	181	143	11	27	21.00
Heating or Reheating Coils .....	89	63	Q	Q	32.68
Fan-Coil Units.....	78	60	Q	Q	19.99
Steam or Hot Water Radiators or Baseboards.....	216	174	18	24	17.38
Other.....	Q	Q	Q	Q	NF
<b>ENERGY MANAGEMENT</b>					
<b>Occupant Control</b>					
Any Control of Heating .....	157	137	10	Q	12.55
With Thermostats .....	143	125	9	Q	13.87
Any Control of Cooling.....	134	116	10	Q	17.02
With Thermostats .....	104	89	8	Q	17.67
<b>Reduced Use During Off-Hours</b>					
Heating Only .....	83	78	4	Q	12.39
Cooling Only .....	24	20	3	Q	33.78
Heating and Cooling .....	172	143	14	Q	16.04
<b>Computerized Energy Management and Control System</b>					
Present in Building.....	51	31	Q	Q	27.14
Controls Heating and Cooling .....	50	31	Q	Q	27.24
Controls Lighting .....	Q	Q	Q	Q	NF
Controls Other.....	Q	Q	Q	Q	NF
<b>Other Energy Management</b>					
Regular HVAC Maintenance.....	283	235	20	28	14.16
Participated in Utility Conservation Program.....	64	53	2	Q	25.62

<sup>a</sup> Includes cooking and cooling.

\* = Value rounds to zero in the units displayed.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B11. Energy End-Use Intensities for Fuel Oil, 1989**

Building Characteristics RSE Column Factor:	Energy Intensity for Fuel Oil (thousand Btu per sq. ft.)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
All Buildings .....	28.3	23.9	2.0	2.4	11.84
<b>Building Floorspace (Square Feet)</b>					
1,001 to 10,000 .....	66.1	59.9	5.6	Q	14.22
10,001 to 25,000 .....	45.9	40.8	3.6	Q	13.54
25,001 to 50,000 .....	35.5	33.0	Q	Q	16.34
50,001 to 100,000 .....	32.5	27.8	Q	Q	47.93
100,001 to 200,000 .....	20.7	13.9	Q	Q	35.67
Over 200,000 .....	9.2	6.3	Q	Q	26.37
<b>Year Constructed</b>					
1945 or Before .....	30.4	27.4	2.1	Q	11.98
1946 to 1959 .....	37.3	35.3	1.5	Q	16.67
1960 to 1969 .....	32.0	26.2	2.4	Q	39.13
1970 to 1979 .....	25.4	16.9	2.5	Q	29.64
1980 to 1989 .....	15.7	12.4	Q	Q	30.76
<b>BUILDING USE</b>					
<b>Principal Building Activity</b>					
Assembly .....	29.4	27.2	2.0	Q	16.41
Education .....	32.1	30.8	1.1	Q	22.62
Food Sales and Service .....	Q	43.2	Q	Q	NF
Health Care .....	12.2	5.1	Q	Q	40.09
Lodging .....	17.4	Q	7.1	Q	44.71
Mercantile and Service .....	46.7	42.1	2.7	Q	16.22
Office .....	14.8	13.1	.8	Q <sup>9</sup>	27.57
Warehouse .....	37.3	27.2	Q	Q	39.10
Other .....	41.3	32.6	Q	Q	38.51
Vacant .....	22.3	21.7	Q	Q	40.94
<b>Weekly Operating Hours</b>					
39 or Fewer .....	33.7	32.6	1.1	Q	13.51
40 to 48 .....	24.5	23.6	.5	Q	25.32
49 to 60 .....	22.8	20.8	1.2	Q	17.77
61 to 84 .....	38.0	34.1	3.4	Q	17.97
85 to 167 .....	36.1	30.3	Q	Q	21.88
168 (Open Continuously) .....	22.9	12.9	3.7	Q	28.19
<b>Workers</b>					
4 or Fewer .....	47.9	43.3	4.0	Q	14.17
5 to 9 .....	31.9	27.1	3.2	Q	16.14
10 to 19 .....	42.9	41.5	1.3	Q	22.75
20 to 49 .....	47.8	44.2	2.9	Q	16.52
50 to 99 .....	18.6	16.6	Q	Q	35.92
100 to 249 .....	33.7	24.6	Q	Q	38.58
250 or More .....	10.0	5.5	Q	Q	31.74
<b>Ownership and Occupancy</b>					
Nongovernment Owned .....	27.6	22.5	2.1	Q	12.91
Owner Occupied .....	28.8	23.8	2.4	Q	14.00
Single Establishment .....	31.7	25.9	2.8	Q	15.84
Multiple Establishment .....	17.5	15.3	.9	Q	14.94
Nonowner Occupied .....	22.9	17.5	1.2	Q	28.05
Single Establishment .....	17.5	10.1	Q	Q	47.37
Multiple Establishment .....	30.8	28.0	2.6	Q	17.28
Vacant .....	33.9	33.1	Q	NC	40.46
Government Owned .....	29.9	26.9	Q	Q	19.04
Federal .....	Q	Q	Q	Q	NF
State .....	32.5	Q	Q	Q	25.35
Local .....	31.6	30.0	1.2	Q	22.93

See footnote at end of table.

**Table B11. Energy End-Use Intensities for Fuel Oil, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Fuel Oil (thousand Btu per sq. ft.)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>Multibuilding Facility</b>					
Not on Multibuilding Facility.....	30.0	26.4	1.9	Q	11.27
Part of Multibuilding Facility.....	25.6	19.7	2.3	Q	25.11
On Facility with Central Plant.....	26.2	Q	Q	Q	43.16
<b>Percent Vacant at Least Three Months</b>					
0.....	31.7	26.4	2.3	3.0	13.89
1 to 50.....	19.3	16.5	Q	1.4	16.96
51 to 99.....	19.6	17.4	2.1	Q	32.38
100.....	25.4	24.8	Q	Q	38.99
<b>Months in Use Out of Past 12 Months</b>					
0 to 8.....	23.2	22.2	Q	Q	26.40
9 to 11.....	40.1	38.6	Q	Q	33.23
12.....	27.6	22.8	2.2	2.7	12.73
<b>LOCATION</b>					
<b>Census Region</b>					
Northeast.....	46.1	38.6	4.0	3.5	13.01
Midwest.....	19.0	18.3	Q	Q	26.27
South.....	17.7	13.5	Q	Q	32.63
West.....	Q	Q	Q	Q	NF
<b>Census Division</b>					
Northeast					
New England.....	48.5	41.6	3.4	Q	11.05
Middle Atlantic.....	44.7	36.9	4.4	Q	21.59
Midwest					
East North Central.....	19.5	19.0	Q	Q	33.26
West North Central.....	18.2	Q	Q	Q	48.24
South					
South Atlantic.....	20.8	15.5	Q	Q	39.11
East South Central.....	16.5	Q	Q	Q	49.69
West South Central.....	Q	Q	NC	Q	NF
West					
Mountain.....	Q	Q	NC	Q	NF
Pacific.....	Q	Q	Q	Q	NF
<b>Climate Zone: 45-Year Average</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	35.0	32.6	Q	1.1	15.35
5,500-7,000 HDD.....	34.9	28.8	2.7	Q	23.26
4,000-5,499 HDD.....	29.8	25.9	2.7	1.3	10.81
Under 4,000 HDD.....	Q	Q	Q	Q	NF
2,000 CDD or More and --					
Under 4,000 HDD.....	10.6	Q	Q	Q	49.99
<b>1989 Degree-Days</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	39.0	33.0	Q	Q	28.27
5,500-7,000 HDD.....	28.8	25.2	1.9	Q	14.97
4,000-5,499 HDD.....	32.3	28.1	3.4	Q	17.07
Under 4,000 HDD.....	Q	Q	Q	Q	NF
2,000 CDD or More and --					
Under 4,000 HDD.....	Q	Q	Q	Q	NF
<b>STRUCTURE</b>					
<b>Floors</b>					
1.....	44.4	38.4	1.6	Q	18.11
2.....	35.3	30.7	1.8	Q	25.45
3.....	36.7	30.9	4.8	Q	20.50
4 to 6.....	19.3	15.7	1.0	Q	21.14
7 or More.....	8.3	5.4	Q	1.2	36.46

See footnote at end of table.

**Table B11. Energy End-Use Intensities for Fuel Oil, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Fuel Oil (thousand Btu per sq. ft.)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>Wall Materials</b>					
Masonry.....	30.4	25.8	2.1	Q	11.59
Siding or Shingles.....	43.9	37.9	Q	Q	24.19
Metal Panels.....	26.0	25.0	Q	Q	21.54
Concrete Panels.....	13.0	7.8	Q	Q	46.24
Window Glass.....	13.9	Q	Q	Q	45.23
Other.....	Q	Q	Q	Q	NF
<b>Roof Materials</b>					
Built-Up.....	26.7	23.1	1.7	Q	14.49
Shingles (Not Wood).....	33.7	29.5	3.1	1.1	19.54
Metal Surfacing.....	41.0	32.8	Q	Q	15.56
Synthetic or Rubber.....	33.2	25.7	1.2	Q	37.48
Slate or Tile.....	Q	Q	Q	Q	NF
Concrete.....	7.3	5.1	Q	Q	36.98
Wooden Materials.....	Q	Q	Q	Q	NF
Other.....	Q	Q	Q	Q	NF
<b>Building Shell Conservation Features (Solely or in Combination)</b>					
Roof or Ceiling Insulation.....	26.5	21.9	2.2	Q	11.81
Wall Insulation.....	23.2	18.3	2.1	Q	15.56
Storm or Multiple Glazing.....	23.9	19.7	2.5	Q	14.28
Tinted, Reflective, or Shading Glass.....	15.6	11.6	1.7	Q	18.14
Exterior or Interior Shadings or Awnings.....	22.6	19.2	2.3	Q	13.38
Weather Stripping or Caulking.....	25.9	22.2	2.2	Q	10.91
None of the Above.....	Q	29.5	Q	Q	NF
<b>ENERGY SOURCES AND END USES</b>					
<b>Energy Sources (Solely or in Combination)</b>					
Electricity.....	28.2	23.8	2.1	Q	12.46
Natural Gas.....	18.9	14.9	1.4	Q	14.78
Fuel Oil.....	28.3	23.9	2.0	2.4	11.84
District Heat.....	Q	Q	Q	Q	NF
Other.....	35.8	29.2	2.5	Q	19.32
<b>Energy End Uses (Solely or in Combination)</b>					
Heated Buildings.....	28.4	24.0	2.0	2.4	11.87
Air-Conditioned Buildings.....	24.8	20.2	1.9	2.7	15.79
Buildings with Water Heating.....	27.1	22.5	2.2	2.5	12.43
Buildings with Cooking.....	24.1	19.0	2.3	Q	20.01
Buildings with Manufacturing.....	Q	Q	Q	Q	NF
<b>Space-Heating Energy Source</b>					
Fuel Oil.....	32.7	28.6	1.9	Q	12.21
Main.....	51.3	45.3	3.5	Q	11.80
With Secondary.....	51.5	41.7	4.2	Q	16.14
Electricity Only.....	57.6	51.8	Q	Q	23.48
Other Energy Sources or Combinations.....	47.4	34.9	3.5	Q	18.81
With No Secondary.....	51.3	46.2	3.3	Q	13.83
Secondary.....	11.5	9.6	Q	Q	32.89
Other Excluding Fuel Oil.....	Q	NC	Q	Q	NF
Building Not Heated.....	14.6	NC	10.8	Q	11.75
<b>Main Space-Heating Energy Source</b>					
Electricity.....	3.8	1.5	Q	Q	45.19
Natural Gas.....	9.3	6.7	Q	Q	35.62
Fuel Oil.....	51.3	45.3	3.5	Q	11.80
District Heat.....	Q	Q	Q	Q	NF
Other.....	61.6	59.5	Q	Q	12.98

See footnote at end of table.

**Table B11. Energy End-Use Intensities for Fuel Oil, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for Fuel Oil (thousand Btu per sq. ft.)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>HEATING AND COOLING</b>					
<b>Percent Heated</b>					
Not Heated .....	35.5	Q	9.2	Q	11.75
1 to 50 .....	27.5	25.2	Q	1.0	19.91
51 to 99 .....	25.7	18.6	.7	Q	35.54
100 .....	29.0	25.1	2.4	Q	10.76
<b>Percent Cooled</b>					
Not Cooled .....	45.3	41.6	2.8	.9	12.82
1 to 50 .....	39.3	32.2	2.5	Q	20.72
51 to 99 .....	18.9	15.2	1.7	Q	27.93
100 .....	14.9	12.1	1.4	Q	22.46
<b>Heating Equipment (Solely or in Combination)</b>					
Furnaces.....	35.4	30.5	1.7	Q	17.31
Boilers.....	34.1	28.4	2.5	3.3	13.81
Individual Space Heaters .....	23.9	18.9	1.5	Q	26.31
Packaged Heating Units.....	14.8	9.7	Q	Q	31.50
Heat Pumps .....	10.7	7.9	Q	1.7	29.65
Air Ducts .....	22.4	17.6	1.4	3.4	19.51
Heating or Reheating Coils .....	17.2	12.2	Q	Q	31.32
Fan-Coil Units.....	17.7	13.6	1.7	Q	18.64
Steam or Hot Water Radiators or Baseboards.....	33.5	27.0	2.7	3.7	15.71
Other.....	6.4	5.0	Q	Q	35.35
<b>ENERGY MANAGEMENT</b>					
<b>Occupant Control</b>					
Any Control of Heating .....	33.0	28.9	2.2	Q	11.18
With Thermostats .....	33.3	29.1	2.1	Q	13.06
Any Control of Cooling.....	31.0	26.8	2.2	Q	15.11
With Thermostats .....	26.4	22.6	2.0	Q	15.22
<b>Reduced Use During Off-Hours</b>					
Heating Only .....	40.2	37.8	2.0	Q	11.04
Cooling Only .....	30.7	25.3	4.1	Q	24.46
Heating and Cooling .....	22.3	18.5	1.8	Q	14.15
<b>Computerized Energy Management and Control System</b>					
Present in Building.....	12.1	7.4	Q	Q	26.91
Controls Heating and Cooling .....	12.7	7.8	Q	Q	25.20
Controls Lighting .....	Q	Q	Q	Q	NF
Controls Other.....	Q	Q	Q	Q	NF
<b>Other Energy Management</b>					
Regular HVAC Maintenance.....	27.2	22.6	1.9	2.7	13.45
Participated in Utility Conservation Program.....	18.4	15.3	.7	Q	23.31

<sup>a</sup> Includes cooking and cooling.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B12. Consumption of District Heat by End Use, 1989**

Building Characteristics RSE Column Factor:	District Heat Consumption (trillion Btu)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
All Buildings .....	585	355	129	101	21.30
<b>Building Floorspace (Square Feet)</b>					
1,001 to 10,000 .....	Q	Q	Q	Q	NF
10,001 to 25,000 .....	63	42	Q	Q	44.51
25,001 to 50,000 .....	Q	Q	Q	Q	NF
50,001 to 100,000 .....	119	58	Q	25	49.81
100,001 to 200,000 .....	106	71	Q	Q	38.40
Over 200,000 .....	209	120	Q	31	36.55
<b>Year Constructed</b>					
1945 or Before .....	161	96	Q	20	42.01
1946 to 1959 .....	Q	Q	15	Q	NF
1960 to 1969 .....	156	86	Q	26	39.95
1970 to 1979 .....	110	67	15	28	33.59
1980 to 1989 .....	Q	24	Q	Q	NF
<b>BUILDING USE</b>					
<b>Principal Building Activity</b>					
Assembly .....	49	44	Q	Q	35.38
Education .....	Q	Q	Q	Q	NF
Food Sales and Service .....	Q	Q	Q	Q	NF
Health Care .....	92	23	Q	Q	48.56
Lodging .....	Q	Q	Q	Q	NF
Mercantile and Service .....	6	Q	Q	Q	46.28
Office .....	167	127	15	26	22.80
Warehouse .....	Q	Q	Q	Q	NF
Other .....	49	33	Q	Q	41.02
Vacant .....	Q	Q	Q	Q	NF
<b>Weekly Operating Hours</b>					
39 or Fewer .....	Q	Q	Q	Q	NF
40 to 48 .....	105	79	Q	20	34.46
49 to 60 .....	66	55	3	8	25.76
61 to 84 .....	60	39	Q	Q	38.50
85 to 167 .....	Q	Q	Q	Q	NF
168 (Open Continuously) .....	272	124	90	59	33.33
<b>Workers</b>					
4 or Fewer .....	Q	Q	Q	Q	NF
5 to 9 .....	Q	Q	Q	Q	NF
10 to 19 .....	16	10	Q	Q	32.36
20 to 49 .....	Q	87	Q	Q	NF
50 to 99 .....	Q	51	Q	Q	NF
100 to 249 .....	99	54	Q	Q	34.67
250 or More .....	225	127	Q	38	34.30
<b>Ownership and Occupancy</b>					
Nongovernment Owned .....	284	141	Q	65	27.16
Owner Occupied .....	263	130	Q	58	28.65
Single Establishment .....	228	108	Q	53	33.34
Multiple Establishment .....	35	21	Q	4	23.86
Nonowner Occupied .....	Q	Q	Q	Q	NF
Single Establishment .....	Q	Q	Q	Q	NF
Multiple Establishment .....	Q	5	Q	Q	NF
Vacant .....	Q	Q	NC	Q	NF
Government Owned .....	301	214	51	36	28.07
Federal .....	Q	Q	Q	Q	NF
State .....	201	146	Q	21	35.62
Local .....	35	19	Q	Q	42.67

See footnotes at end of table.

**Table B12. Consumption of District Heat by End Use, 1989 (Continued)**

Building Characteristics RSE Column Factor:	District Heat Consumption (trillion Btu)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>Multibuilding Facility</b>					
Not on Multibuilding Facility.....	58	38	Q	7	30.76
Part of Multibuilding Facility.....	527	317	116	94	24.33
On Facility with Central Plant.....	476	277	108	91	25.31
<b>Percent Vacant at Least Three Months</b>					
0.....	412	261	75	75	22.89
1 to 50.....	131	67	Q	17	38.91
51 to 99.....	Q	Q	Q	Q	NF
100.....	Q	Q	Q	Q	NF
<b>Months in Use Out of Past 12 Months</b>					
0 to 8.....	Q	Q	Q	Q	NF
9 to 11.....	Q	Q	Q	Q	NF
12.....	555	335	121	99	21.28
<b>LOCATION</b>					
<b>Census Region</b>					
Northeast.....	179	111	39	29	34.50
Midwest.....	159	70	Q	30	39.48
South.....	126	90	Q	21	44.55
West.....	121	84	17	Q	39.73
<b>Census Division</b>					
Northeast					
New England.....	Q	Q	Q	Q	NF
Middle Atlantic.....	127	87	22	18	27.22
Midwest					
East North Central.....	88	42	Q	Q	46.67
West North Central.....	Q	Q	Q	12	NF
South					
South Atlantic.....	Q	Q	Q	Q	NF
East South Central.....	Q	Q	Q	Q	NF
West South Central.....	Q	Q	Q	Q	NF
West					
Mountain.....	Q	55	7	Q	NF
Pacific.....	Q	Q	9	Q	NF
<b>Climate Zone: 45-Year Average</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	Q	Q	Q	Q	NF
5,500-7,000 HDD.....	199	120	Q	43	34.35
4,000-5,499 HDD.....	152	84	Q	24	40.29
Under 4,000 HDD.....	83	Q	Q	Q	46.05
2,000 CDD or More and --					
Under 4,000 HDD.....	Q	Q	Q	Q	NF
<b>1989 Degree-Days</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	Q	74	Q	Q	NF
5,500-7,000 HDD.....	254	136	Q	53	32.06
4,000-5,499 HDD.....	84	55	16	Q	29.91
Under 4,000 HDD.....	Q	Q	12	Q	NF
2,000 CDD or More and --					
Under 4,000 HDD.....	Q	Q	Q	Q	NF
<b>STRUCTURE</b>					
<b>Floors</b>					
1.....	Q	Q	Q	Q	NF
2.....	70	48	Q	Q	44.61
3.....	Q	68	Q	26	NF
4 to 6.....	168	109	Q	Q	40.67
7 or More.....	177	96	Q	27	37.46

See footnotes at end of table.

**Table B12. Consumption of District Heat by End Use, 1989 (Continued)**

Building Characteristics RSE Column Factor:	District Heat Consumption (trillion Btu)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>Wall Materials</b>					
Masonry.....	385	226	107	52	27.08
Siding or Shingles.....	Q	Q	Q	Q	NF
Metal Panels.....	Q	Q	Q	Q	NF
Concrete Panels.....	113	73	11	29	41.24
Window Glass.....	23	15	Q	Q	37.95
Other.....	Q	Q	Q	Q	NF
<b>Roof Materials</b>					
Built-Up.....	309	190	59	60	21.20
Shingles (Not Wood).....	Q	Q	Q	Q	NF
Metal Surfacing.....	Q	Q	Q	Q	NF
Synthetic or Rubber.....	Q	70	Q	23	NF
Slate or Tile.....	40	33	3	Q	25.53
Concrete.....	Q	Q	Q	Q	NF
Wooden Materials.....	Q	Q	Q	NC	NF
Other.....	Q	Q	Q	Q	NF
<b>Building Shell Conservation Features (Solely or in Combination)</b>					
Roof or Ceiling Insulation.....	459	267	109	83	26.14
Wall Insulation.....	265	139	Q	52	31.63
Storm or Multiple Glazing.....	212	95	Q	40	33.22
Tinted, Reflective, or Shading Glass.....	246	150	Q	40	34.57
Exterior or Interior Shadings or Awnings.....	331	199	Q	63	27.28
Weather Stripping or Caulking.....	495	289	112	94	24.03
None of the Above.....	Q	Q	Q	Q	NF
<b>ENERGY SOURCES AND END USES</b>					
<b>Energy Sources (Solely or in Combination)</b>					
Electricity.....	585	355	129	101	20.66
Natural Gas.....	290	158	Q	44	34.05
Fuel Oil.....	143	55	Q	Q	45.15
District Heat.....	585	355	129	101	21.30
Other.....	192	115	Q	Q	41.83
<b>Energy End Uses (Solely or in Combination)</b>					
Heated Buildings.....	584	355	128	101	21.30
Air-Conditioned Buildings.....	506	312	109	85	20.96
Buildings with Water Heating.....	580	350	129	101	21.30
Buildings with Cooking.....	298	171	Q	52	28.83
Buildings with Manufacturing.....	Q	Q	Q	26	NF
<b>Space-Heating Energy Source</b>					
District Heat.....	520	355	76	89	19.83
Main.....	511	346	76	89	20.34
With Secondary.....	134	79	Q	28	40.97
Electricity Only.....	Q	Q	Q	Q	NF
Other Energy Sources or Combinations.....	60	34	13	13	39.13
With No Secondary.....	377	267	49	61	25.57
Secondary.....	Q	Q	Q	Q	NF
Other Excluding District Heat.....	Q	Q	Q	Q	NF
Building Not Heated.....	Q	NC	Q	NC	NF
<b>Main Space-Heating Energy Source</b>					
Electricity.....	Q	Q	Q	Q	NF
Natural Gas.....	Q	Q	Q	Q	NF
Fuel Oil.....	4	Q	Q	Q	11.54
District Heat.....	511	346	76	89	20.34
Other.....	Q	Q	Q	Q	NF

See footnotes at end of table.

**Table B12. Consumption of District Heat by End Use, 1989 (Continued)**

Building Characteristics RSE Column Factor:	District Heat Consumption (trillion Btu)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>HEATING AND COOLING</b>					
<b>Percent Heated</b>					
Not Heated .....	Q	Q	Q	NC	NF
1 to 50 .....	Q	Q	Q	Q	NF
51 to 99 .....	59	48	8	Q	32.59
100 .....	519	304	119	96	22.47
<b>Percent Cooled</b>					
Not Cooled .....	Q	Q	Q	Q	NF
1 to 50 .....	113	75	16	Q	33.77
51 to 99 .....	137	100	22	Q	25.15
100 .....	256	137	Q	47	28.59
<b>Heating Equipment (Solely or in Combination)</b>					
Furnaces .....	Q	Q	Q	NC	NF
Boilers .....	50	Q	Q	Q	49.84
Individual Space Heaters .....	189	114	Q	30	40.89
Packaged Heating Units .....	Q	Q	Q	Q	NF
Heat Pumps .....	Q	Q	Q	Q	NF
Air Ducts .....	430	265	101	65	25.56
Heating or Reheating Coils .....	339	208	Q	53	27.57
Fan-Coil Units .....	267	156	Q	48	36.14
Steam or Hot Water Radiators or Baseboards .....	378	218	85	75	26.62
Other .....	Q	Q	Q	Q	NF
<b>ENERGY MANAGEMENT</b>					
<b>Occupant Control</b>					
Any Control of Heating .....	206	92	Q	40	37.85
With Thermostats .....	203	89	Q	40	38.28
Any Control of Cooling .....	223	113	Q	42	33.97
With Thermostats .....	216	108	Q	42	34.76
<b>Reduced Use During Off-Hours</b>					
Heating Only .....	Q	39	Q	Q	NF
Cooling Only .....	Q	19	Q	27	NF
Heating and Cooling .....	289	203	Q	33	33.27
<b>Computerized Energy Management and Control System</b>					
Present in Building .....	272	166	Q	35	32.90
Controls Heating and Cooling .....	271	165	Q	34	32.98
Controls Lighting .....	Q	Q	5	Q	NF
Controls Other .....	Q	12	Q	Q	NF
<b>Other Energy Management</b>					
Regular HVAC Maintenance .....	530	319	117	95	21.97
Participated in Utility Conservation Program .....	154	96	Q	Q	38.56

<sup>a</sup> Includes cooking and cooling.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

**Table B13. Energy End-Use Intensities for District Heat, 1989**

Building Characteristics RSE Column Factor:	Energy Intensity for District Heat (thousand Btu per sq. ft.)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
All Buildings .....	89.0	54.0	19.6	15.4	16.89
<b>Building Floorspace (Square Feet)</b>					
1,001 to 10,000 .....	Q	Q	23.6	Q	NF
10,001 to 25,000 .....	117.3	77.5	Q	Q	37.13
25,001 to 50,000 .....	Q	Q	Q	Q	NF
50,001 to 100,000 .....	142.0	69.6	Q	29.7	42.63
100,001 to 200,000 .....	89.6	60.1	Q	12.8	24.64
Over 200,000 .....	61.9	35.5	17.3	9.1	18.00
<b>Year Constructed</b>					
1945 or Before .....	94.5	56.5	26.3	11.7	21.71
1946 to 1959 .....	76.8	52.3	9.2	15.3	17.41
1960 to 1969 .....	128.3	70.9	35.7	21.8	32.88
1970 to 1979 .....	89.4	54.3	12.3	22.8	28.76
1980 to 1989 .....	44.0	27.7	13.0	Q	23.52
<b>BUILDING USE</b>					
<b>Principal Building Activity</b>					
Assembly .....	59.5	53.3	4.4	Q	18.37
Education .....	82.3	55.0	Q	8.3	18.33
Food Sales and Service .....	55.8	Q	11.7	Q	49.57
Health Care .....	135.1	34.2	68.8	32.2	11.83
Lodging .....	Q	59.8	Q	Q	NF
Mercantile and Service .....	56.2	Q	2.7	Q	34.98
Office .....	72.1	Q	6.3	11.0	44.69
Warehouse .....	172.5	95.6	.3	Q	45.53
Other .....	109.7	74.4	Q	Q	30.63
Vacant .....	20.9	14.8	Q	Q	17.30
<b>Weekly Operating Hours</b>					
39 or Fewer .....	Q	Q	Q	Q	NF
40 to 48 .....	113.3	84.8	Q	21.7	32.72
49 to 60 .....	56.0	46.6	2.9	6.5	24.14
61 to 84 .....	Q	Q	Q	Q	NF
85 to 167 .....	62.3	44.0	7.8	10.5	6.27
168 (Open Continuously) .....	126.6	57.4	41.7	27.5	22.14
<b>Workers</b>					
4 or Fewer .....	50.4	29.1	10.5	Q	16.88
5 to 9 .....	79.4	47.1	Q	Q	46.17
10 to 19 .....	86.4	55.2	Q	Q	23.94
20 to 49 .....	Q	96.0	Q	Q	NF
50 to 99 .....	Q	80.7	8.8	Q	NF
100 to 249 .....	110.0	59.9	29.9	20.2	12.83
250 or More .....	69.2	39.0	18.5	11.7	22.59
<b>Ownership and Occupancy</b>					
Nongovernment Owned .....	84.3	42.0	23.1	19.2	23.52
Owner Occupied .....	85.2	42.1	24.5	18.7	23.27
Single Establishment .....	112.8	53.7	32.6	26.5	16.71
Multiple Establishment .....	33.0	20.1	9.0	Q	24.53
Nonowner Occupied .....	74.4	40.8	Q	Q	34.14
Single Establishment .....	110.9	63.3	Q	Q	7.82
Multiple Establishment .....	59.6	30.9	Q	Q	38.89
Vacant .....	Q	Q	NC	Q	NF
Government Owned .....	93.8	66.6	15.9	11.3	21.48
Federal .....	58.4	43.0	3.8	11.6	4.51
State .....	121.3	88.3	Q	Q	31.38
Local .....	80.8	44.8	30.9	Q	27.05

See footnote at end of table.

**Table B13. Energy End-Use Intensities for District Heat, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for District Heat (thousand Btu per sq. ft.)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>Multibuilding Facility</b>					
Not on Multibuilding Facility.....	44.9	29.6	9.8	5.5	34.61
Part of Multibuilding Facility.....	99.7	59.9	22.0	17.8	16.93
On Facility with Central Plant.....	107.3	62.4	24.2	20.6	17.80
<b>Percent Vacant at Least Three Months</b>					
0.....	102.8	65.3	18.7	18.8	19.78
1 to 50.....	71.4	36.7	25.5	9.2	25.75
51 to 99.....	66.2	42.3	Q	16.0	7.15
100.....	36.4	19.8	Q	2.1	17.77
<b>Months in Use Out of Past 12 Months</b>					
0 to 8.....	35.7	15.1	13.0	Q	17.02
9 to 11.....	66.6	Q	Q	Q	37.09
12.....	92.2	55.6	20.1	16.5	16.69
<b>LOCATION</b>					
<b>Census Region</b>					
Northeast.....	80.1	49.5	17.5	Q	36.85
Midwest.....	105.3	46.6	38.7	20.0	12.36
South.....	Q	Q	Q	13.4	NF
West.....	97.1	67.2	Q	16.4	13.69
<b>Census Division</b>					
Northeast					
New England.....	Q	Q	Q	Q	NF
Middle Atlantic.....	68.3	46.6	12.0	Q	27.89
Midwest					
East North Central.....	104.0	49.6	33.4	21.0	16.02
West North Central.....	106.9	42.7	45.4	18.8	14.36
South					
South Atlantic.....	Q	Q	Q	Q	NF
East South Central.....	Q	Q	Q	Q	NF
West South Central.....	Q	Q	Q	Q	NF
West					
Mountain.....	99.1	74.8	Q	14.1	12.73
Pacific.....	94.4	56.4	18.3	Q	22.50
<b>Climate Zone: 45-Year Average</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	206.3	117.8	Q	Q	43.76
5,500-7,000 HDD.....	90.4	54.7	Q	19.3	15.92
4,000-5,499 HDD.....	71.8	39.8	20.6	Q	28.13
Under 4,000 HDD.....	70.6	Q	13.2	Q	40.97
2,000 CDD or More and --					
Under 4,000 HDD.....	Q	Q	Q	Q	NF
<b>1989 Degree-Days</b>					
Under 2,000 CDD and --					
Over 7,000 HDD.....	Q	91.1	Q	Q	NF
5,500-7,000 HDD.....	92.5	49.4	23.7	19.3	15.79
4,000-5,499 HDD.....	63.0	Q	12.3	Q	33.84
Under 4,000 HDD.....	67.2	Q	11.3	Q	46.66
2,000 CDD or More and --					
Under 4,000 HDD.....	Q	Q	Q	Q	NF
<b>STRUCTURE</b>					
<b>Floors</b>					
1.....	Q	111.7	Q	Q	NF
2.....	82.8	56.2	Q	Q	27.67
3.....	Q	59.3	Q	22.6	NF
4 to 6.....	101.2	65.8	Q	13.4	15.37
7 or More.....	67.9	36.6	21.1	10.2	24.83

See footnote at end of table.

**Table B13. Energy End-Use Intensities for District Heat, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for District Heat (thousand Btu per sq. ft.)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>Wall Materials</b>					
Masonry.....	98.4	57.9	27.3	13.2	18.73
Siding or Shingles.....	Q	Q	Q	66.2	NF
Metal Panels.....	104.7	Q	Q	Q	11.99
Concrete Panels.....	87.1	56.2	8.1	22.8	19.80
Window Glass.....	Q	Q	9.5	Q	NF
Other.....	Q	Q	Q	Q	NF
<b>Roof Materials</b>					
Built-Up.....	92.1	56.6	17.6	18.0	13.19
Shingles (Not Wood).....	Q	83.6	Q	Q	NF
Metal Surfacing.....	103.2	96.7	5.5	Q	33.13
Synthetic or Rubber.....	Q	51.2	Q	16.7	NF
Slate or Tile.....	118.2	96.8	9.2	12.2	19.74
Concrete.....	26.5	Q	Q	Q	10.27
Wooden Materials.....	71.4	37.4	Q	NC	20.16
Other.....	107.3	Q	93.1	9.4	8.42
<b>Building Shell Conservation Features (Solely or in Combination)</b>					
Roof or Ceiling Insulation.....	88.2	51.3	20.9	16.0	15.71
Wall Insulation.....	90.4	47.4	25.3	17.8	13.78
Storm or Multiple Glazing.....	90.2	40.4	32.8	17.0	14.80
Tinted, Reflective, or Shading Glass.....	77.1	46.8	17.8	12.5	25.91
Exterior or Interior Shadings or Awnings.....	75.8	45.6	15.8	14.4	19.76
Weather Stripping or Caulking.....	87.3	51.0	19.7	16.6	17.94
None of the Above.....	Q	69.9	12.8	Q	NF
<b>ENERGY SOURCES AND END USES</b>					
<b>Energy Sources (Solely or in Combination)</b>					
Electricity.....	89.0	54.0	19.6	15.4	18.75
Natural Gas.....	85.0	46.2	25.7	13.0	20.68
Fuel Oil.....	101.2	38.9	Q	Q	36.54
District Heat.....	89.0	54.0	19.6	15.4	16.89
Other.....	87.0	52.0	Q	15.6	15.37
<b>Energy End Uses (Solely or in Combination)</b>					
Heated Buildings.....	89.0	54.1	19.4	15.4	16.89
Air-Conditioned Buildings.....	84.9	52.4	18.3	14.3	15.57
Buildings with Water Heating.....	89.8	54.3	19.9	15.6	17.01
Buildings with Cooking.....	76.4	43.9	19.3	13.3	17.88
Buildings with Manufacturing.....	64.5	41.2	3.0	20.3	15.33
<b>Space-Heating Energy Source</b>					
District Heat.....	85.7	58.6	12.5	14.7	18.25
Main.....	85.7	58.1	12.7	14.9	17.86
With Secondary.....	116.0	68.7	Q	24.0	42.07
Electricity Only.....	Q	94.1	Q	Q	NF
Other Energy Sources or Combinations.....	88.7	50.8	Q	Q	39.57
With No Secondary.....	78.4	55.6	10.1	12.7	14.50
Secondary.....	Q	Q	Q	Q	NF
Other Excluding District Heat.....	129.1	Q	104.5	24.6	13.41
Building Not Heated.....	Q	NC	Q	NC	NF
<b>Main Space-Heating Energy Source</b>					
Electricity.....	52.3	Q	24.7	Q	47.59
Natural Gas.....	127.6	Q	83.8	18.6	11.34
Fuel Oil.....	88.2	Q	Q	Q	45.92
District Heat.....	85.7	58.1	12.7	14.9	17.86
Other.....	Q	Q	Q	Q	NF

See footnote at end of table.

**Table B13. Energy End-Use Intensities for District Heat, 1989 (Continued)**

Building Characteristics  RSE Column Factor:	Energy Intensity for District Heat (thousand Btu per sq. ft.)				RSE Row Factor
	Total	Space Heating	Water Heating	Other <sup>a</sup>	
	1.0	NF	NF	NF	
<b>HEATING AND COOLING</b>					
<b>Percent Heated</b>					
Not Heated .....	Q	Q	Q	NC	NF
1 to 50 .....	46.9	Q	6.4	Q	41.52
51 to 99 .....	50.2	40.8	6.9	Q	28.01
100 .....	98.8	57.9	22.6	18.3	18.75
<b>Percent Cooled</b>					
Not Cooled .....	Q	69.7	Q	Q	NF
1 to 50 .....	104.1	68.6	15.1	Q	35.07
51 to 99 .....	77.6	56.7	12.2	8.7	15.35
100 .....	82.4	44.2	22.9	15.3	28.04
<b>Heating Equipment (Solely or in Combination)</b>					
Furnaces.....	Q	Q	Q	NC	NF
Boilers.....	Q	Q	Q	Q	NF
Individual Space Heaters .....	84.9	51.3	Q	13.6	16.32
Packaged Heating Units.....	82.9	51.3	Q	Q	37.04
Heat Pumps .....	73.9	62.0	9.2	Q	27.99
Air Ducts .....	76.8	47.2	18.0	11.6	17.11
Heating or Reheating Coils .....	72.8	44.7	16.6	11.4	18.14
Fan-Coil Units.....	85.9	50.1	20.3	15.4	13.52
Steam or Hot Water Radiators or Baseboards.....	96.9	55.9	21.7	19.2	19.24
Other.....	128.7	Q	73.9	Q	22.08
<b>ENERGY MANAGEMENT</b>					
<b>Occupant Control</b>					
Any Control of Heating .....	106.9	47.6	38.6	20.8	25.14
With Thermostats .....	107.8	47.2	39.4	21.2	25.26
Any Control of Cooling.....	99.5	50.4	30.3	18.8	17.32
With Thermostats .....	100.1	49.9	30.6	19.5	17.60
<b>Reduced Use During Off-Hours</b>					
Heating Only .....	Q	71.7	Q	Q	NF
Cooling Only .....	130.1	46.9	Q	66.4	47.68
Heating and Cooling .....	69.6	48.7	Q	7.9	20.28
<b>Computerized Energy Management and Control System</b>					
Present in Building.....	72.5	44.1	19.1	9.3	21.37
Controls Heating and Cooling .....	72.7	44.4	19.2	9.1	21.50
Controls Lighting .....	72.4	45.7	5.8	20.9	22.10
Controls Other.....	88.9	20.7	57.7	10.5	14.93
<b>Other Energy Management</b>					
Regular HVAC Maintenance.....	87.7	52.7	19.3	15.7	17.26
Participated in Utility Conservation Program.....	92.3	57.5	Q	13.6	35.95

<sup>a</sup> Includes cooking and cooling.

NC = No cases in responding sample.

NF = No applicable RSE row/column factor.

Q = Data withheld because the Relative Standard Error (RSE) was greater than 50 percent, or data were reported for fewer than 20 buildings.

Notes: • To obtain the RSE percentage for any table cell, multiply the corresponding RSE column and RSE row factors. • See Glossary for explanation of abbreviations and definitions of terms used in this report. • Because of rounding, data may not sum to totals.

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-871A through F of the 1989 Commercial Buildings Energy Consumption Survey.

Appendix C

**U.S. Climate Zones and  
Census Regions and Divisions Maps**

# Glossary

**Active Solar:** As an energy source, energy from the sun collected and stored using mechanical pumps or fans to circulate heat-laden fluids or air between solar collectors and the building. Examples include the use of solar collectors for water or space heating. The 1989 CBECS did not gather consumption and expenditures data for active solar. Data on the passive collection of solar energy, such as by trombe walls, were not collected on the 1989 CBECS. (See **Energy Source**.)

**Air Conditioning:** See **Cooling**.

**Air Ducts or Air-Handling Units:** A vehicle for channeling warm or cool air to different parts of a building. The process of moving the conditioned air often involves passing air over heating or cooling coils and forcing it from a central location through ducts or air-handling units. Air-handling units are hidden in the walls or ceilings, where they use steam or hot water to heat the air or chilled water to cool the air, inside the duct work. (See **Cooling, Duct,** and **Space Heating**.)

**Authorization Form:** A form signed by the respondent from a building, authorizing energy supplier companies that serve the building to release information on the amounts and costs of energy consumed in the building during a specified period. (See **Energy Supplier**.)

**Ballast:** See **High-Efficiency Ballast**.

**Barrel:** A volumetric unit of measure for crude oil and petroleum products equivalent to 42 U.S. gallons. (See **Gallon**.)

**Baseboard:** As a type of heating equipment, a system in which either electric resistance coils or finned tubes carrying steam or hot water are mounted behind shallow panels along baseboards. Baseboards rely on passive convection to distribute heated air in the space. Electric baseboards are an example of an "Individual Space Heater." (See **Individual Space Heater**.)

**Boiler:** A type of space-heating equipment consisting of a vessel or tank where heat produced from the combustion of fuels such as natural gas, fuel oil, or coal is used to generate hot water or steam. Many buildings have their own boilers, while other buildings have steam or hot water piped in from a central plant. For this survey, only boilers inside the building (or serving only that particular building) are counted as part of the building's heating system. Steam or hot water piped into a building from a central plant is considered district heat. (See **Furnace, HVAC,** and **District Heat**.)

**Bottled Gas:** See **Liquefied Petroleum Gas (LPG)** and **Propane**.

**British Thermal Unit:** A unit of energy consumed by or delivered to a building. A Btu is defined as the amount of energy required to increase the temperature of 1 pound of water by 1 degree Fahrenheit, at normal atmospheric pressure. Energy consumption is expressed in Btu in this report to allow for consumption comparisons among fuels that are measured in different units. (See **Metric Conversion Factors**.)

**Btu:** See **British Thermal Unit**.

**Btu Conversion Factors:** The Btu conversion factors for this survey are as follows:

	Btu Equivalent	Unit
Electricity	3,412	kilowatthour
Natural Gas	1,030	cubic foot
Distillate Fuel Oils (Nos. 1,2, and 4)	138,690	gallon
Residual Fuel Oils (Nos. 5 and 6)	149,690	gallon
Kerosene	135,000	gallon
District Heat (Steam and Hot Water)	1,000	pound

Note: Btu of district hot water have been converted into equivalent pounds of steam by using the conversion 1,000 Btu hot water  $\approx$  1 pound steam.

Sources: Energy Information Administration, *Monthly Energy Review* (June 1991), pp. 125-129, for electricity, natural gas, distillate, residual, and kerosene; and *Methodological Issues In the Nonresidential Buildings Energy Consumption Survey* (September 1983), pp. 173-175, for district steam.

These are the Btu conversion factors for site energy consumption. For primary energy consumption, kilowatthours were converted to Btu at the rate of 10,236 Btu per kilowatthour, three times the site energy Btu. For district heat, pounds were converted to primary energy at the rate of 1,500 Btu per pound.

**Building:** For this survey, a structure totally enclosed by walls extending from the foundation to the roof, containing over 1,000 square feet of floorspace, and intended for human occupancy. Structures that were included in the survey as a specific exception were parking garages not totally enclosed by walls and a roof, as well as structures erected on pillars to elevate the first fully enclosed level, but leaving the sides at ground level open.

Excluded from the survey as nonbuildings were the following: structures (other than the exceptions just noted) that were not totally enclosed by walls and a roof (such as oil refineries, steel mills, and water towers); street lights, pumps, billboards, bridges, swimming pools, and construction sites; mobile homes and trailers, even if they housed commercial activity; and oil storage tanks. (See **Commercial Building**.)

**Building Floorspace:** See **Floorspace**.

**Building Shell (Envelope):** The thermal envelope of the building, that is, the roof, exterior walls, and bottom floors that enclose conditioned space through which thermal energy may be transferred to or from the exterior.

**Building Shell Conservation Feature:** A building feature designed to reduce the energy loss or gain through the shell or envelope of the building. The 1989 CBECS collected data on the following specific building shell energy conservation features: roof, ceiling or wall insulation; storm windows or double- or triple-paned glass (multiple glazing); tinted or reflective glass or shading films; exterior or interior shadings or awnings; and weather stripping or caulking. (See **Roof or Ceiling Insulation, Wall Insulation, Reflective or Shading Glass or Film, Storm or Multiple Glazing, Building Shell (Envelope), Exterior or Interior Shadings or Awnings, and Weather Stripping or Caulking**.)

**Built-Up Roof:** A roof covering consisting of several successive layers (each of which is called a ply) usually of roofing felt with moppings of hot asphalt between layers and topped by a mineral-surfaced layer or by gravel embedded in a heavy coat of asphalt.

**Caulking:** See **Weather Stripping or Caulking**.

**CDD:** See **Cooling Degree-Days (CDD)**.

**Census Division:** A geographic area consisting of several States defined by the U.S. Department of Commerce, Bureau of the Census. (See the Census Regions and Divisions map in Appendix C.) The States are grouped into nine divisions and four regions:

<b>Region</b>	<b>Division</b>	<b>States</b>
Northeast	New England	Connecticut, Maine, Massachusetts, New Hampshire, Vermont, and Rhode Island
	Middle Atlantic	New Jersey, New York, and Pennsylvania
Midwest	East North Central	Illinois, Indiana, Michigan, Ohio, and Wisconsin
	West North Central	Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota
South	South Atlantic	Delaware, the District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia
	East South Central	Alabama, Kentucky, Mississippi, and Tennessee
	West South Central	Arkansas, Louisiana, Oklahoma, and Texas
West	Mountain	Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming
	Pacific	Alaska, California, Hawaii, Oregon, and Washington

**Census Region:** See **Census Division** and the Census Regions and Divisions map in Appendix C of this report.

**Central Chiller:** Any centrally located air-conditioning system that produces chilled water in order to cool air. The chilled water or cold air is then distributed throughout the building by using pipes or air ducts, or both. These systems are also commonly known as "chillers," "centrifugal chillers," "reciprocating chillers," or "absorption chillers." Chillers are generally located in or just outside the building they serve. Buildings receiving district chilled water are served by chillers located at central physical plants. (See **Cooling, District Chilled Water, Central Physical Plant**, and **HVAC**.)

**Central Physical Plant:** A plant that is owned by, and on the grounds of, a multibuilding facility and that provides district heating, district cooling, or electricity to other buildings on the same facility. To qualify as a central plant for this survey, the plant must provide district heat, district chilled water, or electricity to at least one other building. The central physical plant may be by itself in a separate building or may be located in a building where other activities occur. (See **Multibuilding Facility; District Heat; and District Chilled Water**.)

**Chiller:** See **Central Chiller**.

**Climate Zone:** One of five climatically distinct areas defined by long-term weather conditions affecting the heating and cooling loads in buildings. The zones were developed by the Energy End Use and Integrated Statistics Division

(EEUUSD) from seven distinct climate categories originally identified by the American Institute of Architects (AIA) for the U.S. Department of Energy and the U.S. Department of Housing and Urban Development.

The zones were determined according to the 45-year average (1931-1975) of the annual heating and cooling degree-days (base 65 degrees Fahrenheit). An individual building was assigned to a climate zone according to the 45-year average annual degree-days for its NOAA Division. (See **Heating Degree-Days (HDD)**, **Cooling Degree-Days (CDD)**, **Degree-Days 45-Year Average** and **NOAA Division**.)

The zones are defined as follows:

<u>Climate Zone</u>	<u>Average Annual Cooling Degree-Days</u>	<u>Average Annual Heating Degree-Days</u>
1	Less than 2,000	More than 7,000
2	Less than 2,000	5,500 to 7,000
3	Less than 2,000	4,000 to 5,499
4	Less than 2,000	Less than 4,000
5	2,000 or more	Less than 4,000

**Coal:** In this report, the term includes anthracite, bituminous, and subbituminous coal, as well as the derivative of coal known as coke. The 1989 CBECS determined if coal was used in the commercial building but did not collect consumption and expenditure data on the use of coal as an energy source. (See **Energy Source**.)

**Commercial:** Neither residential, manufacturing, nor agricultural. (See **Commercial Building**.)

**Commercial Building:** A building with more than 50 percent of its floorspace used for commercial activities. Commercial buildings include, but are not limited to, stores, offices, schools, churches, gymnasiums, libraries, museums, hospitals, clinics, warehouses, and jails. Government buildings were included except for buildings on site with restricted access, such as some military bases or reservations. Farms and buildings located on farms (such as silos, grain elevators, and barns) were excluded from the survey. (See **Building, Commercial**, and **Principal Building Activity**.)

**Commercial Freezer:** See **Refrigeration Equipment**.

**Commercial Refrigeration Unit:** See **Refrigeration Equipment**.

**Computer Area with Separate Air-Conditioning System:** In this survey, this term is used to denote space specifically designed and equipped to meet the needs of computer equipment for controlled temperatures and/or humidity. The air-conditioning system for this area is separate from that used to control the environment in other parts of the building.

**Computerized Energy Management and Control System:** See **Energy Management and Control System (EMCS)**.

**Concrete Panel:** A wall construction panel made of concrete, which is either prefabricated in a factory or poured at the site and then hoisted onto the structure.

**Concrete Roof:** For this survey, a poured concrete roof, often intended to bear the load of a parking garage that occupies the roof area of a building.

**Conservation Feature:** A feature in the building designed to reduce the usage of energy. (See **Building Shell Conservation Feature**, **HVAC Conservation Feature**, and **Lighting Conservation Feature**.)

**Consumption:** The amount of energy used by, or delivered to, a building during a given period of time. For this report, all consumption statistics, unless otherwise noted, are site energy consumption, which excludes electrical system and district heat energy losses. In contrast, primary energy consumption takes into account the fuels that are required to produce and distribute electricity and district heat. Statistics for this report are presented on an annual basis for the 365-day period of calendar year 1989. Data on energy consumption were not collected by end uses separately. For example, although it might be known that electricity was used in some buildings for heating, the consumption of electricity reported for those buildings would typically include other uses of electricity as well (such as lighting and water heating). (See **Btu**, **Energy Supplier**, and **Expenditures**.)

**Conversion Factors:** See **Btu Conversion Factors** and **Metric Conversion Factors**.

**Cooking:** In this report, the use of energy for commercial or institutional food preparation. The 1989 CBECS asked specifically about "commercial or institutional cooking," which was intended to include any kitchen facility that was not part of a residence. (See **Energy End Use**.)

**Cooling:** Conditioning of room air for human comfort by a refrigeration unit (such as an air-conditioner or heat pump) or by circulating chilled water through a central cooling or district cooling system. Use of fans or blowers by themselves, without chilled air or water, is not included in this definition of cooling. (See **Energy End Use**, **Central Cooling**, **Heat Pump**, and **HVAC**.)

**Cooling Degree-Days (CDD):** A measure of how hot a location was over a period of time, relative to a base temperature. In this report, the base temperature is 65 degrees Fahrenheit (approximately 18 degrees Celsius), and the period of time is 1 year. The cooling degree-days for a single day is the difference between that day's average temperature and the base temperature if the daily average is greater than the base and zero if the daily average temperature is less than or equal to the base temperature. The cooling degree-days for a longer period of time is the sum of the daily cooling degree-days for the days in that period. One cooling degree-day Fahrenheit equals five-ninths of a degree-day Celsius. (See **Heating Degree-Days (HDD)** and **Climate Zone**.)

**Cubic Foot:** As a natural gas measure, the volume of gas contained in a cube with an edge that is 1 foot long at standard temperature and pressure (60 degrees Fahrenheit and 14.73 pounds standard per square inch.) The thermal content varies by the composition of the gas. (See **Natural Gas** and **Btu**.)

**Decorative or Construction Glass:** An exterior building wall material of glass decorative coverings such as glass blocks or spandrels, that are not window or vision (see-through) glass. Structural glass or glass curtain walls used on the outside of buildings are also included in this category. For this report, decorative or construction glass was included in the "Other" exterior wall material category. (See **Window or Vision Glass**.)

**Degree-Days 1989:** The total annual heating and cooling degree-days (base 65 degrees Fahrenheit) during calendar year 1989. For this report, each building was assigned to a National Oceanic and Atmospheric Administration (NOAA) Division, and the division's daily temperature averages were used to compute degree-days for 1989. The daily temperature data were obtained from NOAA. (See **Heating Degree-Days (HDD)**, **Cooling Degree-Days (CDD)**, **Degree-Days 45-Year Average**, and **NOAA Division**.)

**Degree-Days 45-Year Average:** The average of the 45 total annual heating and cooling degree-days (base, 65 Degrees Fahrenheit) in each NOAA Division, for the years 1931 through 1975. Computed from the Division's daily temperature averages for each year in question. Used to assign individual buildings to climate zones. (See **Heating Degree-Days (HDD)**, **Cooling Degree-Days (CDD)**, **Degree-Days 1989**, **NOAA Division**, and **Climate Zone**.)

**Demand-Side Management (DSM) Programs:** These are organized utility-sponsored activities that are intended to affect the amount and timing of customer electricity use.

**District Chilled Water:** Chilled water from an outside source used as an energy source for cooling in a building. The water is chilled in a central plant and piped into the building. Chilled water may be purchased from a utility or provided by a central physical plant in a separate building that is part of the same multibuilding facility (for

example, a hospital complex or university). (See **Energy Source, Central Physical Plant, and Multibuilding Facility.**)

**District Heat:** Steam or hot water from an outside source used as an energy source for space heating or another end use in a building. The steam or hot water is produced in a central plant and piped into the building. The district heat may be purchased from a utility or provided by a central physical plant in a separate building that is part of the same multibuilding facility (for example, a hospital complex or university). For this report, district steam and district hot water are usually reported together as district heat. (See **Energy Source, Central Physical Plant, and Multibuilding Facility.**)

**District Hot Water:** District heat in the form of hot water. (See **District Heat.**)

**District Steam:** District heat in the form of steam. (See **District Heat.**)

**DSM:** See **Demand-Side Management Programs.**

**Duct:** A passageway made of sheet metal or other suitable material to convey air from the heating, ventilating, and cooling systems to and from the point of utilization.

**Electric Baseboard:** An individual space heater with electric resistance coils mounted behind shallow panels along baseboards. Electric baseboards rely on passive convection to distribute heated air to the space. (See **Individual Space Heater and Baseboard.**)

**Electricity:** Electric energy, usually measured in kilowatthours. As an energy source for this report, electric energy supplied to a building by a central utility via power lines or from a central physical plant in a separate building that is part of the same multibuilding facility. Electric power generated within a building for exclusive use in that building is specifically excluded from the definition of electricity as an energy source. (See **Energy Source, Central Physical Plant, and Multibuilding Facility.**)

**Electricity Generation:** The onsite production of electricity using electricity generators on either a regular or emergency basis. (See **Electricity.**)

**EMCS:** See **Energy Management and Control System (EMCS)**

**Energy End Use:** A use for which energy is consumed in a building. End-use estimates for nine end uses are provided in this report. The 1989 CBECS also collected data on the whether any manufacturing or electricity generation took place in the building, but separate energy consumption estimates are not available for these two end uses. (See **Cooking, Cooling, Space Heating, Electricity Generation, Lighting, Manufacturing, Refrigeration, Ventilation and Water Heating.**)

**Energy Intensity:** The ratio of energy consumption to some measure of the demand for services provided by energy. In this report, energy intensity is usually given on an aggregate basis, as the ratio of the total consumption for a set of buildings to the total service demand in those buildings. This report uses both floorspace and more complicated measures, such as floorspace-hours, to measure the demand for energy services. Energy intensities are calculated to adjust the amount of energy consumed for the effects of various building characteristics, such as size of the building, number of workers, or number of operating hours, to facilitate comparisons of energy across time, fuels, and buildings. (See **Consumption.**)

**Energy Management and Control System (EMCS):** An energy conservation feature that uses mini/microcomputers, instrumentation, control equipment, and software to manage a building's use of energy for heating, ventilation, air conditioning, lighting, and/or business-related processes. These systems can also manage fire control, safety, and security. Not included as EMCS are time-clock thermostats. (See **Occupant Control of Heating and Occupant Control of Cooling.**)

**Energy Source:** A type of energy or fuel consumed in the building. For this report, the energy sources for which consumption and expenditures statistics are presented are electricity, natural gas, fuel oil, district heat, and district chilled water. The 1989 CBECS also collected information on the use, but not on the amounts consumed of, or spent for, these energy sources: propane, wood, coal, and active solar. (See **Electricity, Natural Gas, Fuel Oil, District Heat, District Chilled Water, Liquefied Petroleum Gas (LPG), Propane, Wood, Coal, and Active Solar.**)

**Energy Supplier:** A company that provides electricity, natural gas, fuel oil, or other sources of energy to a building. In the 1989 CBECS, only suppliers of electricity, natural gas, fuel oil, and district heat or chilled water were sent the Supplier Survey. (See **Energy Source.**)

**Envelope:** See **Building Shell (Envelope).**

**Establishment:** As defined by the Standard Industrial Classification Manual developed by the Office of Management and Budget, "an economic unit, generally, at a single physical location where business is conducted or where services or industrial operations are performed." However, "establishment" is not synonymous with "building." In this survey, respondents were asked how many establishments or organizations occupy the building (i.e., hold or lease space in it on a full-time basis).

**Evaporative Cooler ("Swamp" Cooler):** A type of cooling equipment using the evaporation of water to cool air. This type of equipment is commonly found in warm, dry climates. In this report, evaporative coolers are included under "Other Cooling Equipment." (See **Cooling.**)

**Expenditures:** Funds spent for the energy consumed in, or delivered to, a building during a given period of time. For this report, all expenditure statistics are presented on an annual basis, for calendar year 1989. The total dollar amount includes State and local taxes, fuel adjustment charges, system charges, and demand charges. The total dollar amount excludes merchandise, repair charges, and service charges. (See **Consumption, and Energy Supplier.**)

**Exterior or Interior Shadings or Awnings:** A covering designed to reduce the flux of light into a building. Exterior shadings or awnings include any type of shading (including architectural) or awning on the outside of the building designed to limit solar penetration. Interior shadings are drapes, venetian blinds, shades or any other means of covering a window from the inside to limit the amount of solar or thermal penetration. (See **Building Shell Conservation Feature.**)

**Fan-Coil Unit:** A type of heating and cooling distribution equipment using circulating hot or chilled water with fans. Fan-coil units have thermostatically controlled built-in fans that draw air from the room and then across finned tubes containing hot water, steam, or chilled water. The hot water, steam or chilled water can be produced by equipment within the building or be piped into the building as part of a district heating or cooling system. (See **Space Heating and Cooling.**)

**Floors:** The number of levels in the tallest section of a building, including parking areas, basements, or other floors below ground level.

**Floorspace:** All the area enclosed by the exterior walls of a building, including indoor parking facilities, basements, hallways, lobbies, stairways, and elevator shafts. (See **Energy Source-Specific Floorspace, Gross Floorspace, and Square Footage.**)

**Fluorescent Lamp:** A lamp made of a glass tube coated on the inside with fluorescent material. The lamp produces light by passing electricity through mercury vapor, which causes the fluorescent coating to glow or fluoresce. (See **Lamp.**)

**Fuel:** See **Energy Source.**

**Fuel Oil:** A liquid petroleum product less volatile than gasoline, used as an energy source. In this report, fuel oil includes distillate fuel oil (No. 1, No. 2, and No. 4.), residual fuel oil (No. 5 and No. 6), and kerosene. (See **Energy Source**.)

**Furnace:** Space heating equipment consisting of an enclosed chamber where fuel is burned or electrical resistance is used to heat air directly, without using steam or hot water. The warm air is for heating, which is distributed throughout the building, typically by air ducts. (See **Boiler, Ducts, Space Heating, and HVAC**.)

**Gallon:** A volumetric measure equal to 4 quarts (231 cubic inches) used to measure fuel oil. One barrel equals 42 gallons. (See **Barrel**.)

**Government Owned:** Owned by a Federal, State, or local government agency. The building may be occupied by agencies of more than one government and may also be shared with nongovernment establishments.

**HDD:** See **Heating Degree-Days (HDD)**.

**Heat Pump:** Heating and/or cooling equipment that, during the heating season, draws heat into a building from outside and, during the cooling season, ejects heat from the building to the outside. Heat pumps are vapor-compression refrigeration systems whose indoor/outdoor coils are used reversibly as condensers or evaporators, depending on the need for heating or cooling. (See **Cooling, Space Heating, Central Cooling, and HVAC**.)

**Heating:** See **Space Heating**.

**Heating or Reheating Coils:** See **Reheating Coils**.

**Heating Degree-Days (HDD):** A measure of how cold a location was over a period of time, relative to a base temperature. In this report, the base temperature used is 65 degrees Fahrenheit (approximately 18 degrees Celsius), and the period of time is 1 year. The heating degree-days for a single day is the difference between the base temperature and the day's average temperature if the daily average is less than the base, and zero if the daily average temperature is greater than or equal to the base temperature. The heating degree-days for a longer period of time is the sum of the daily heating degree-days for days in that period. One degree-day Fahrenheit equals five-ninths of a degree-day Celsius. (See **Cooling Degree-Days (CDD), Climate Zone, and NOAA Division**.)

**HID:** See **High-Intensity Discharge (HID) Lamp**.

**High-Efficiency Ballast:** A lighting conservation feature consisting of an energy-efficient version of a conventional electromagnetic ballast. The ballast is the transformer for fluorescent and HID lamps providing the necessary current, voltage, and wave-form conditions to operate the lamp. A high-efficiency ballast requires lower power input than a conventional ballast to operate HID and fluorescent lamps.

**High-Efficiency Lighting:** As used in this report, lighting provided by high-intensity discharge (HID) lamps and/or fluorescent lamps. (See **High-Intensity Discharge (HID) Lamp** and **Fluorescent Lamp**.)

**High-Intensity Discharge (HID) Lamp:** A lamp that produces light by passing electricity through gas, which causes the gas to glow. Examples of HID lamps are mercury vapor lamps, metal halide lamps, and high-pressure sodium lamps. (See **Lamp**.)

**Hours of Operation:** See **Weekly Operating Hours**.

**HVAC:** An abbreviation for the heating, ventilation, and air-conditioning system; the system or systems that condition air in a building.

**HVAC Conservation Feature:** A building feature designed to reduce the amount of energy consumed by the heating, cooling, and ventilating equipment. The 1989 Building Characteristics Survey collected data on the presence

of two HVAC conservation features: preventive maintenance program for the heating and cooling equipment and energy management and control systems. (See **Preventive Maintenance Program for the Heating and/or Cooling Equipment, Occupant Control of Heating, Occupant Control of Cooling, Reduced Use--Off Hours, and Energy Management and Control System (EMCS).**)

**Ice-Making Machines:** See **Refrigeration Equipment.**

**Incandescent Lamp:** A lamp that produces light by electrically heating a filament so that it glows. Included in this category are the familiar household light bulbs which screw into sockets, as well as energy-efficient incandescent bulbs such as Tungsten Halogen (spotlights), Reflector or R-Lamps (accent and task lighting), Parabolic Aluminized Reflector (PAR) lamps (flood and spot lighting), and Ellipsoidal Reflector (ER) lamps (recessed lighting). (See **Lamp.**)

**Individual Air Conditioners in Walls or Windows:** Self-contained air-conditioning units installed in either walls or windows (with heat-radiating condensers exposed to the outdoor air). These units are characterized by a lack of pipes or duct work for distributing the cool air; the units condition air only in the room or areas where they are located. (See **Cooling.**)

**Individual Space Heater:** A free-standing or self-contained unit that generates and delivers heat to a local zone within the building. The heater may be permanently mounted in a wall or floor, or may be portable. Examples of individual space heaters include electric baseboards, electric radiant or quartz heaters, heating panels, gas- or kerosene-fired unit heaters, wood stoves, and infrared radiant heaters. These heaters are characterized by a lack of pipes or duct work for distributing hot water, steam, or warm air through the building. (See **Electric Baseboard.**)

**Insulation:** A building shell conservation feature consisting of material placed between the interior of a building and the outdoor environment to reduce the rate of heat loss to the environment or heat gain from the environment. Examples include glass-wool fill and foam board. (See **Roof or Ceiling Insulation, Wall Insulation, and Building Shell Conservation Feature.**)

**Intensity:** See **Energy Intensity.**

**Kerosene:** A petroleum distillate with properties similar to those of No. 1 fuel oil, used primarily in space heaters, cooking stoves, and water heaters. In this report, no distinction is made between kerosene and fuel oil. (See **Fuel Oil.**)

**Kilowatthour (kWh):** A unit of work or energy, measured as 1 kilowatt (1,000 watts) of power expended for 1 hour. (See **Btu, Electricity, and Consumption.**)

**Lamp:** A term generally used to describe a manmade source of light. The term is often used when referring to a "bulb" or "tube." The CBECS collects data only about lamps that use electricity. (See **Incandescent Lamp, Fluorescent Lamp, and High-Intensity Discharge (HID) Lamp.**)

**Lighting:** The illumination of the interior of a building by use of artificial sources of light. (See **Energy End Use.**)

**Lighting Conservation Feature:** A building feature or practice designed to reduce the amount of energy consumed by the lighting system. The 1989 CBECS collected data on one lighting conservation feature--high-efficiency ballasts. (See **High-Efficiency Ballast.**)

**Liquefied Petroleum Gas (LPG):** Gas fuel in liquid form supplied to a building as an energy source. The fuel is usually delivered by tank trucks and stored near the building in a tank or cylinder until used. LPG contains mostly propane, but can contain such gases as butane, propylene, butylene, or ethane. For this report, any LPG reported was assumed to be propane. The 1989 CBECS did not collect consumption and expenditures data for LPG. (See **Energy Source, Propane, and Natural Gas.**)

**LPG:** See **Liquefied Petroleum Gas (LPG)**.

**Major Energy Sources:** The energy sources or fuels for which consumption and expenditures data were collected on the 1989 CBECS. These fuels or energy sources are electricity, fuel oil, natural gas, district steam, district hot water, and district chilled water. District chilled water is not included in any totals for the sum of major energy sources or fuels; all other major fuels are included in these totals.

**Manufacturing:** As an energy end use, any of the energy-using operations required for manufacturing/industrial processes. (See **Energy End Use**.)

**Masonry:** A general term covering wall construction using masonry materials such as brick, concrete block, stone, and tile that are set in mortar; also included in this category is stucco. This category does not include concrete panels because use of concrete panels represents a different method of constructing buildings. Concrete panels are reported separately. (See **Concrete Panel**.)

**Metal Panel:** An exterior wall construction material made of aluminum or galvanized steel panels fabricated in factories and fastened to the frame of the building to form outside walls. Pre-engineered metal buildings are also included in this category.

**Metal Surfacing:** Light-gauge metal sheets used for roofing.

**Metric Conversion Factors:** In this report, estimates are presented in customary U.S. units. Floorspace estimates may be converted to metric units by using the relationship, 1 square foot is approximately equal to .0929 square meters. Energy estimates may be converted to metric units by using the relationship, 1 Btu is approximately equal to 1,055 joules. (See **Btu**.)

**Metropolitan:** Buildings located within Metropolitan Statistical Areas (MSA's) as defined in the 1980 Census. Except in New England, an MSA is a county or a group of contiguous counties that contains at least one city of 50,000 inhabitants or more, or "twin cities" with a combined population of at least 50,000. The contiguous counties are included in an MSA if they are essentially metropolitan in character and are socially and economically integrated with the central city. In New England, MSA's consist of towns and cities rather than counties. (See **Nonmetropolitan**.)

**Metropolitan Status:** A building classification, either metropolitan or nonmetropolitan. (See **Metropolitan** and **Nonmetropolitan**.)

**MSA:** See **Metropolitan**.

**Multibuilding Facility:** A group of two or more buildings on the same site owned or operated by a single organization, business, or individual. Examples include university campuses and hospital complexes. (See **Building**.)

**Multistage Area Probability Sample:** A sample design executed in stages with geographic "clusters" of sampling units selected at each stage. This procedure reduces survey expense while maintaining national coverage.

**Natural Gas:** Hydrocarbon gas (mostly methane) supplied as an energy source to individual buildings by pipelines from a central utility company. Natural gas does not refer to liquefied petroleum gas or to privately owned gas wells operated by a building owner. (See **Energy Source**, **Liquefied Petroleum Gas (LPG)**, and **Propane**.)

**NOAA Division:** One of the 356 weather divisions designated by the National Oceanic and Atmospheric Administration (NOAA), encompassing the United States and the District of Columbia. These divisions usually follow county borders to encompass counties with similar weather conditions. However, the NOAA Division does not follow county borders when weather conditions vary considerably within a county, as is likely to be the case when a county borders the ocean or contains high mountains. (See **Climate Zone**, **Cooling Degree-Days (CDD)**, and **Heating Degree-Days (HDD)**.)

**Nonmetropolitan:** Buildings not located within Metropolitan Statistical Areas as defined in the 1980 Census. (See **Metropolitan.**)

**Number of Workers in the Building:** The number of people working in a building during the main shift on a typical workday during the year. Included in this definition are self-employed workers and volunteers. Excluded from this definition are customers, patients, and students, unless they are working for establishments in the building. Also excluded are employees who work out of the office, such as salespeople who report in, delivery people with routes, and messengers.

**Occupant Control of Cooling:** Control by individuals, other than maintenance personnel, of the cooling equipment in a building.

**Occupant Control of Heating:** Control by individuals, other than maintenance personnel, of the heating equipment in a building.

**Office Equipment:** A class of energy-using equipment including typewriters, copiers, cash registers, computer terminals, personal computers, printers, mainframe computer systems, and other miscellaneous office equipment. (See **Energy End Use.**)

**Other End Uses:** All energy end uses other than those specifically mentioned. (See **Energy End Use.**)

**Owner Occupied:** Having the owner or the owner's business represented at the site. A building is considered owner occupied if an employee or representative of the owner (such as a building engineer or building manager) maintains office space in the building. Similarly, a chain store is considered owner occupied even though the actual owner may not be in the building but headquartered elsewhere. Other examples of the owner's business occupying a building include State-owned university buildings, elementary and secondary schools owned by a public school district, and a post office where the building is owned by the U.S. Postal Service.

**Packaged Cooling Units:** See **Packaged Units.**

**Packaged Heating Units:** See **Packaged Units.**

**Packaged Units:** Units built and assembled at a factory and installed as a self-contained unit to heat or cool all or portions of a building. Packaged units are in contrast to engineer-specified units built up from individual components for use in a given building. "Packaged Units" is a term that can apply to heating equipment, cooling equipment, or combined heating and cooling equipment. Some types of electric packaged units are also called "Direct Expansion" or DX units. (See **Cooling, HVAC, and Space Heating.**)

**Percent Cooled:** The percentage of the building's square footage that is cooled to meet the comfort requirements of the occupants. For the 1989 CBECS, the point of reference for the percent cooled was the cooling season during the 12 months prior to the interview. (See **Square Footage and Cooling.**)

**Percent Heated:** The percentage of the building's square footage designed to be heated to at least 50 degrees Fahrenheit. For the 1989 CBECS, the percent heated was for the heating season during the 12 months prior to the interview. (See **Total Square Footage and Space Heating.**)

**Percent Lit When Closed:** The percentage of the building's square footage that was lit electrically during all hours other than the usual operating hours during the 12 months prior to the interview. (See **Percent Lit When Open, Square Footage, and Weekly Operating Hours.**)

**Percent Lit When Open:** The percentage of the building's square footage that was lit electrically during usual operating hours during the 12 months prior to the interview. (See **Percent Lit When Closed, Square Footage, and Weekly Operating Hours.**)

**Pounds (District Heat):** A weight quantity of steam, also used in this report to denote a quantity of energy in the form of steam. The amount of usable energy obtained from a pound of steam depends on its temperature and pressure at the point of consumption and on the drop in pressure after consumption. (See **Btu, District Steam, and District Heat.**)

**Preventive Maintenance Program for Heating and/or Cooling Equipment:** As used in this report, a HVAC conservation feature consisting of a program of routine inspection and service for the heating and/or cooling equipment. The inspection is performed on a regular basis, even if there are no apparent problems. (See **HVAC Conservation Feature.**)

**Primary Electricity:** The energy embodied in site electricity. (See **Consumption.**)

**Primary Energy:** See **Consumption.**

**Primary Sampling Unit (PSU):** The sampling units selected at the first stage in a multistage area probability sample. A PSU typically consists of one to several contiguous counties--for example, a metropolitan area with surrounding suburban counties. (See **Multistage Area Probability Sample, and Metropolitan.**)

**Principal Building Activity:** The activity or function occupying the most floorspace in the building. The categories were designed to group buildings that have similar patterns of energy consumption. (See **Building and Floorspace.**)

The principal building activity categories used in this report are described below.

**Assembly:** signifies buildings used for the gathering of people for social, recreational, or religious activities whether in private or nonprivate meeting halls.

**Education:** refers to buildings that house academic or technical classroom instruction.

**Food Sales:** involves the retail or wholesale sale of food, such as grocery stores.

**Food Service:** activities that involve preparation and sale of food and beverages for consumption, such as restaurants.

**Health Care:** covers diagnostic and treatment facilities for both inpatient and outpatient care. Excluded from this group are skilled nursing or other residential care facilities (nursing homes). These buildings are classified as "Lodging" buildings.

**Lodging:** refers to buildings that offer multiple accommodations for short-term or long-term residents (including nursing homes).

**Mercantile and Service:** refers to buildings containing sales and displays of goods or services (excluding food).

**Office:** refers to buildings used for general office space, professional offices, and administrative offices.

**Other:** covers buildings that do not fit into any of the other named categories.

**Parking Garage:** refers to buildings used to park cars or other vehicles. Buildings in this category need not be totally enclosed by walls.

**Public Order and Safety:** describes buildings used in the preservation of law and order or safety.

**Warehouse:** describes buildings used to store goods, manufactured products, merchandise, or raw materials. This category includes both refrigerated and nonrefrigerated warehouses.

**Vacant:** designates buildings in which more floorspace was vacant than was used for any single activity (as defined above) at the time of interview. A vacant building may have some occupied floorspace.

In graphs presentations throughout this report, the category "other buildings" includes parking garages, public order and safety buildings, and vacant buildings.

**Propane:** A gaseous petroleum product that liquefies under pressure; propane is a major component in liquefied petroleum gas, or LPG. Any LPG usage reported in the CBECS was assumed to be propane. (See **Liquefied Petroleum Gas (LPG)**.)

**PSU:** See **Primary Sampling Unit (PSU)**.

**Quadrillion Btu:** Equivalent to 1,000,000,000,000,000 (10<sup>15</sup>) Btu. (See **Btu**.)

**Radiator:** Space-heating equipment that transfers heat from steam or hot water to air by a combination of direct radiation, conduction, and convection. Typically, a radiator is a freestanding, cast-iron fixture exposed in the space it heats. (See **Space Heating**.)

**Reduced Use--Off Hours:** A conservation feature consisting of manually or automatically reducing the amount of heating or cooling produced during the hours a building is not in full use. (See **Space Heating, Cooling, and Conservation Feature**.)

**Reflective or Shading Glass or Film:** A building shell energy conservation feature consisting of tinted or reflective glass or shading films installed on the exterior glazing of a building to reduce the rate of solar penetration into the building. (See **Building Shell Conservation Feature**.)

**Refrigerated Vending Machines:** See **Refrigeration Equipment**.

**Refrigeration:** The use of energy to maintain perishable goods at a cool temperature for sale or storage. (See **Energy End Use** and **Refrigeration Equipment**.)

**Refrigeration Equipment:** A type of equipment such as commercial refrigeration/freezer units for the sale or storage of perishable materials; residential-type refrigerators/freezers; ice-making machines; soda or any other refrigerated vending machines; water coolers; or any other refrigeration equipment, excluding air conditioning. Freezers are designed to keep their contents below the freezing point (32 degrees Fahrenheit), and refrigeration equipment is designed to maintain the stored items below room temperature, but above the freezing point. In the 1989 CBECS, data were collected on refrigeration/freezer equipment inside and/or adjacent to the building.

**Regular HVAC Maintenance:** See **Preventive Maintenance Program for Heating and/or Cooling Equipment**.

**Reheating Coils:** A part of some air-conditioning systems. Electric coils in air ducts used primarily to raise the temperature of circulated air after it was over cooled to remove moisture. Some buildings report reheating coils as their sole heating source. (See **Space Heating, Cooling, and Air Duct or Air-Handling Units**.)

**Relative Standard Error:** A measure of the reliability or precision of a survey statistic. The Relative Standard Error, or RSE, is defined as the standard error of a survey estimate, expressed as a percent of the estimate. For example, an RSE of 10 percent means that the standard error is one-tenth as large as the survey estimate. (See **Standard Error**.)

**Residential Freezers:** See **Refrigeration Equipment**.

**Residential Refrigerators:** See **Refrigeration Equipment**.

**Roof or Ceiling Insulation:** A building shell conservation feature consisting of insulation placed in the roof (below the waterproofing layer) or in the ceiling of the top floor in the building. (See **Insulation** and **Building Shell Conservation Feature**.)

**RSE:** See **Relative Standard Error**.

**RSE Column Factor:** An adjustment factor used to compute RSE's. For a survey estimate in a particular row and a column of a table (that is, a particular "cell"), the approximate RSE is obtained by multiplying the RSE row factor by the RSE column factor for that cell. (See **Relative Standard Error** and **RSE Row Factor**.)

**RSE Row Factor:** A factor used to compute RSE's. The row factor is equal to the geometric mean of the RSE's in a particular row of the main tables. For a survey estimate in a particular row and column of a table (that is, a particular "cell"), the approximate RSE is obtained by multiplying the RSE row factor by the RSE column factor for that cell. (See **Relative Standard Error** and **RSE Column Factor**.)

**Sampling:** The procedure used to select cases (in this survey, buildings) for interview from the population (commercial buildings in the United States). (See **Multistage Area Probability Sampling**.)

**Shadings or Awnings:** See **Exterior or Interior Shadings or Awning**.

**Shakes:** Flat pieces of weatherproof material laid with others in a series of overlapping rows as covering for roofs and sometimes the sides of buildings. Shakes are similar to wood shingles, but instead of having a cut and smoothly planed surface, shakes have textured grooves and a rough or "split" appearance to give a rustic feeling. (See **Shingles, Siding, and Wooden Materials**.)

**Shingles:** Flat pieces of weatherproof material laid with others in a series of overlapping rows as covering for roofs and sometimes the sides of buildings. Shingles are manufactured in a variety of materials including fiberglass, wood, plastic, baked clay, tile, asbestos, asphalt, and aluminum. (See **Siding, Shakes, and Wooden Materials**.)

**Siding:** An exterior wall covering material made of wood, plastic (including vinyl), or metal. Siding is generally produced in the shape of boards and is applied to the outside of a building in overlapping rows.

**Site Electricity:** The amount of electricity delivered to the site (building), without adjustment for the fuels consumed in generation. (See **Consumption**.)

**Site Energy:** The amount of energy delivered to the site (building); no adjustment was made for the fuels consumed to produce electricity or district sources. (See **Consumption**.)

**Slate or Tile:** A type of roofing material. Tile refers to any thin, square, or rectangular piece of baked clay, stone, or concrete used as a roofing material. Slate refers to a particular stone used for roofing.

**Solely or in Combination:** In the CBECS tables, a row stub accompanied by this phrase indicates overlapping categories, so that a particular building may be included in more than one line under this stub. In general, row stubs without this designation are exclusive; that is, they divide the population of buildings into distinct groups so that a particular building is represented in no more than one line under this stub.

**Space Conditioning:** See **Space Heating, Cooling, and Ventilation**.

**Space Heating:** The use of mechanical equipment (including wood stoves and active solar heating devices) to heat all, or part, of a building to at least 50 degrees Fahrenheit. (See **Energy End Use**.)

**Square Footage:** Floorspace, in units of square feet. One square foot is approximately equal to 0.0929 square meters. (See **Floorspace** and **Metric Conversion**.)

**Standard Error:** A measure of the precision of an estimate, equal to the square root of the variance. (See **Variance, Relative Standard Error (RSE)**, and Appendix B, "Detailed Tables.")

**Steam:** See **District Steam**.

**Steam or Hot Water Radiators:** See **Baseboard** and **Radiator**.

**Storm or Multiple Glazing:** A building shell conservation feature consisting of storm windows, storm doors, or double- or triple-paned glass that are placed on the exterior of the building to reduce the rate of heat loss. (See **Building Shell Conservation Feature**.)

**Synthetic or Rubber Roofing:** A layer (either single- or multi-ply) of heavy gauge plastic or rubber used for roofing.

**Thermostat:** A device that adjusts the amount of heating and cooling produced and/or distributed by automatically responding to the temperature in the environment.

**Tinted Glass:** See **Reflective or Shading Glass or Film**.

**Total Square Footage:** Square footage of floorspace summed or aggregated over all buildings in a category (such as all office buildings in the United States). In this survey, aggregate square footage was estimated by multiplying each building's square footage by its weight, then summing over all sample buildings of interest to represent nationwide totals. (See **Floorspace** and **Weight**.)

**Trillion Btu:** Equivalent to 1,000,000,000,000 ( $10^{12}$ ) Btu. (See **Btu**.)

**Utility-Sponsored Conservation Program:** Any program sponsored by an electric and/or natural gas utility to review operating practices, equipment and construction features in buildings and advise on ways to increase the energy efficiency of buildings. Also included are utility-sponsored demand-side management programs to encourage the use of more energy-efficient equipment or practices. Included in this survey were programs to improve the energy efficiency in the lighting system or building equipment, or the thermal efficiency of the building shell. (See **Demand-Side Management (DSM) Programs**.)

**Vacant:** As a principal building activity, the designation for a building in which most of the floorspace was not occupied by any tenant or establishment. A vacant building may contain occupants who are using up to 50 percent of the floorspace. The CBECS also measures vacancy in terms of the fraction of space vacant within an individual building and the fraction of time the building was in use. For all buildings, data were collected on the percent of floorspace vacant three or more months, and on the number of months the building was in use. (See **Principal Building Activity**.)

**Variance:** A measure of the variability of a set of observations that are subject to some chance variation, equal to the expected squared difference between a single observation and the average of all possible observations obtained in the same manner. The variance is the square of the standard error of estimates. For statistics presented in this report, the variance indicates the likely difference between the value computed from the CBECS sample and the average of the values that could have been computed from all possible samples that might have been obtained by the same sample selection process. (See **Standard Error** and Appendix B, "Detailed Tables.")

**Ventilation:** The circulation of air through a building to provide fresh air to the occupants, and to deliver heating and cooling to the occupied spaces.

**Vintage:** The year of origin or age. As used in the CBECS report, the year of construction for the building, as in "building vintage," or the age of the central chillers or packaged refrigeration units, as in "vintage of refrigeration equipment." (See **Year Constructed, Central Chillers**, and **Packaged Units**.)

**Wall Insulation:** A building shell conservation feature consisting of insulation placed between the exterior and interior walls of a building. (See **Insulation** and **Building Shell Conservation Feature**.)

**Warm-Air Furnace:** See **Furnace**.

**Water Coolers:** See **Refrigeration Equipment**.

**Water Heating:** The use of energy to heat water for purposes other than space heating. (See **Energy End Use**.)

**Weather Stripping or Caulking:** A building shell conservation feature that includes any material placed between the door or window and the door frame or window frame to reduce the rate of loss of heat or cold caused by air infiltration. (See **Building Shell Conservation Feature**.)

**Weekly Operating Hours:** The number of hours per week that a building is used, excluding hours when the building is occupied only by maintenance, security, or other support personnel. For buildings with a schedule that varied during the year, "weekly operating hours" refers to the total weekly hours for the schedule most often followed. If operating hours varied throughout a building, the usual operating hours of the largest business in the building (based on square footage) determined the operating hours for the building.

**Weight:** The number of buildings in the United States that a particular sample building represents. To estimate the total value of an attribute (such as square footage) in the U.S. commercial building population as a whole, each sample building's value is multiplied by the building's weight. Summing the weighted sample values provides an estimate of the nationwide total. (See **Multistage Area Probability Sample**.)

**Window or Vision Glass:** An exterior wall construction material made of glass that can be seen through from the inside of the building--the glass especially found in windows. Walls that are glass covered or constructed of glass material, but cannot be seen through, are excluded from this category. (See **Decorative or Construction Glass**.)

**Wood:** As an energy source, wood logs, chips, or wood products that are used as fuel. In the 1989 CBECS, information about the use of wood as fuel in commercial buildings was obtained, but consumption and expenditures data for wood were not collected. (See **Energy Source**.)

**Wooden Materials:** Wood shingles, wood shakes, or other wooden materials used as roofing materials. (See **Shingles** and **Shakes**.)

**Workers:** See **Number of Workers in the Building**.

**Year Constructed:** The year in which the major part or the largest portion of a building was constructed.