



# Commercial Buildings Energy Consumption Survey (CBECS)

User's Guide to the Public Use Microdata File

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## Overview

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We publish a public use microdata file for each CBECS survey cycle. The 2018 data file is a valuable tool for users conducting detailed analysis of energy use in commercial buildings. It contains about 620 survey variables and about 630 imputation flags and weighting variables. This document provides some background on the CBECS design, as well as useful tips and examples that will guide users through the proper statistical use of the CBECS microdata.

### CBECS sample design

The CBECS uses a multi-stage, multi-frame area probability design to select a sample of buildings to estimate energy characteristics, consumption, and expenditures for the national stock of commercial buildings. For detailed information on how we selected the sample, see [How Were Buildings Selected for the 2018 CBECS?](#) To produce population estimates, we use sampling weights to allow the selected cases to represent all commercial buildings, including those omitted from the sample.

Base sampling weights, which are the reciprocal of the probability of being selected for the CBECS sample, were first calculated for each sampled building. We then adjusted the base weights to account for survey nonresponse. The variable FINALWT in the data file represents the final sampling weight, accounting for different probabilities of selection and rates of participation in the survey. FINALWT is the number of buildings in the population that the observation represents. For example, if FINALWT for a building is 1,000, that building represents itself and 999 other non-sampled and non-responding buildings.

### Sampling error

Statistical estimates from a sample survey like CBECS are not exact but have an associated sampling error as a result of generating estimates based on a sample rather than collecting information from the entire population. An estimate's standard error provides a measure of the precision of the estimate based on its prevalence and variability in the population, given a particular sample size.

We use standard errors with survey estimates to measure sampling error, construct confidence intervals, or perform hypothesis tests. Relative standard error (RSE) is the standard error (square root of the variance) of a survey estimate, divided by the survey estimate, and multiplied by 100. In other words, the RSE is the standard error expressed as a percentage of the survey estimate on a scale from zero to 100. The larger the RSE, the less precise the survey estimate. An RSE is shown for each estimate in the CBECS tables (on a separate tab in the Excel tables or in separate tables following the estimates tables in the Appendix of this documentation). The *CBECS Examples* section includes instructions for calculating estimates and RSEs in SAS and R using the microdata file.

## Jackknife method of estimating standard error

CBECS uses the jackknife method for estimating standard errors. This method uses replicate weights to repeatedly estimate the statistic of interest from each of multiple replicate samples generated from the full sample and calculates the differences between these estimates and the full-sample estimate. See Wolter (2007), Rust (1985), and Shao and Tu (1995) for technical details.

If  $\theta$  is a population parameter of interest, let  $\hat{\theta}$  be the estimate from the full sample for  $\theta$ . Let  $\hat{\theta}_r$  be the estimate from the  $r$ -th replicate,  $R$  be the number of replicate samples, and  $\alpha_r$  be a constant.

The variance of  $\hat{\theta}$  is estimated by:

$$\hat{V}(\hat{\theta}) = \sum_{r=1}^R \alpha_r (\hat{\theta}_r - \hat{\theta})^2$$

For the 2018 CBECS,  $R=151$  (the number of replicate subsamples), and  $\alpha_r = 1$  for each replicate. The standard error is the square root of the variance. The formula for calculating the RSE is:

$$\left( \frac{\sqrt{\hat{V}(\hat{\theta})}}{\hat{\theta}} \right) \times 100$$

---

## CBECS Examples: Using Excel, SAS, or R to Calculate Estimates and RSEs

---

The following instructions are examples for calculating any CBECS estimate using the final weights (FINALWT) and the associated RSE using the replicate weights (FINALWT1 to FINALWT151). We have provided instructions for Excel, SAS, and R users. Statistical software packages such as SAS/STAT, R, Stata, SUDAAN, and WesVar can process replicate weights to calculate RSEs. Although EXCEL can calculate point estimates, it cannot process replicate weights to calculate RSEs for CBECS or other complex sample designs with varying probabilities of selection.

We recommend calculating standard errors or RSEs in conjunction with estimates to account for sampling error, which signal whether the results from the sample are highly variable over all possible samples of the same design. We also consider the number of buildings for which data were reported in the survey, along with RSEs, in our publication standards.

### Using the *Variable and response codebook*

Along with the SAS and CSV microdata files, we publish a *Variable and response codebook* that provides information about each variable in the file. As shown in the example screenshot below, we provide the variable order, the variable name, the variable type (numeric or character), a label (description of the variable), the values/format codes (the range of values for continuous variables and a key to what each value means for categorical variables), and the question text from the survey.

In addition to variables from the questionnaire, the data file includes variables from other sources, as indicated in the label column, when applicable.

- Variables that we have derived using questionnaire data are labeled *Derived variable* in the label column.
- Variables that we added to the file using external data sources are labeled *Third-party data* in the label column.
- Some energy consumption data variables come from data records that originate from either the CBECS Buildings Survey or the Energy Supplier Survey. These are indicated by labels beginning with *Building/energy supplier variable*.
- Other energy consumption data variables are based on models that we have developed using the CBECS data. These are indicated by labels beginning with *Modeled variable*.

## 2018 Commercial Buildings Energy Consumption Survey (CBECS) public use microdata file: variable and response codebook

Variable order	Variable name	Variable type	Label	Values/Format codes	Question text
10	RFCOOL	Num	Derived variable: Cool roof	1=Yes 2=No	
11	RFTILT	Num	Roof tilt	1=Flat 2=Shallow pitch 3=Steeper pitch	Which one of these images best represents the tilt or pitch of the roof of this building?
12	BLDSHP	Num	Building shape	1=Square 2=Wide rectangle 3=Narrow rectangle 4=Rectangle or square with an interior courtyard 5="H" shaped 6="U" shaped 7="E" shaped 8="T" shaped 9="L" shaped 10="+ " or cross shaped 11=Other shape	Which one of these shapes best resembles the floorplan of this building at ground level? This is sometimes called the "footprint" of the building.
13	GLSSPC	Num	Percent exterior glass	1=1% or less 2=2 to 10% 3=11 to 25% 4=26 to 50% 5=51 to 75% 6=76 to 100%	Which of these ranges best describes the percentage of the exterior wall surface of this building that is covered with window glass or glass doors?
14	NFLOOR	Num	Number of floors	1 - 9 994=10 to 14 995=15 or more	How many floors are in the tallest section of the building? Include basements, parking levels, or any other floors below ground level. Exclude attics, half-floors, mezzanines, balconies, and lofts. If you're not sure, please provide your best estimate.

## For Excel users (estimates only, no RSEs)

Since Excel users cannot calculate RSEs, we recommend they consider how many building records remain after filters are applied. We do not publish CBECS estimates where the number of buildings in the reporting sample used for a calculation is fewer than 20.

### *Excel Example 1: Calculate the number of commercial buildings that are 5,000 square feet or smaller (Table B1)*

You can estimate the total number of buildings using the sum of FINALWT for a specified subset of building records within the CBECS data file. For this example, filter the file for all building records where the square footage category is 1,001 to 5,000 square feet (SQFTC=2). The file contains 1,006 such building records. By adding the FINALWT column for these building records, the result is that the estimated number of buildings that are 5,000 square feet or smaller is 2,832,884.62 (or 2,833 thousand buildings as reported in Table B1). This amount equals 48% of all commercial buildings, or  $2,832,885 \div 5,918,212$  (the sum of FINALWT for all buildings in the CBECS reporting sample).

### *Excel Example 2: Calculate the total square footage of commercial buildings in the Northeast Census region (Table B1)*

To calculate total square footage, create a new column for weighted square footage by multiplying SQFT by FINALWT for each building record. Then filter the file for the Northeast (REGION='1'). There are 1,136 such building records. Sum the new weighted square footage column (for the Northeast only) to get 15,986,079,825 square feet (or 15,986 million square feet as reported in Table B1).



***Excel Example 3: Calculate the weighted average size (mean square feet per building) of office buildings (Table B1)***

To calculate total square footage, create a new column for weighted square footage by multiplying SQFT by FINALWT for each building record. Then filter the file for office buildings (PBA=2). There are 1,329 such building records. Sum the new weighted square footage column (for office buildings only) to get 16,578,416,219 square feet. Sum FINALWT for office buildings to get 970,302.56 (estimate for the number of office buildings). To calculate mean square feet for office buildings, divide the weighted square footage total by the estimated number of office buildings. The result is 17,085.82 square feet (or 17.1 thousand as reported in Table B1).

***Excel Example 4: Calculate the total electricity consumption for office buildings in the Midwest (Table C15)***

Begin by filtering the file for all building records where the Census region is Midwest (REGION=2). There are 1,487 such building records. Next, limit the building records further to only those that are office buildings (PBA=2). There should be 269 building records left. Total electricity consumption is reported in the variable ELCNS. For each building record, create the weighted electricity consumption by multiplying consumption by the weight (ELCNS  $\times$  FINALWT). Sum these weighted consumption numbers to find that office buildings in the Midwest consume a combined 52,022,151,378 kilowatthours (kWh) of electricity annually, or 52 billion kWh as reported in Table C15.

***Excel Example 5: Calculate energy intensity for the sum of major fuels for buildings that are 10,001 to 25,000 square feet (Table C4)***

To find the energy intensity for the sum of major fuels for buildings with a floorspace of 10,001 to 25,000 square feet, first filter the file for the appropriate building records (SQFTC=4). There should be 641 building records in this category. In a new column, calculate the weighted square footage (SQFT  $\times$  FINALWT) for each building record and sum the column to get 15,840,043,524 (the total square footage for all buildings in this size category combined). In a separate column, calculate the weighted major fuel consumption (MFBTU  $\times$  FINALWT) for each building record and sum the column to get 920,067,622,560.75 (the total major fuel consumption for all buildings in this size category). Divide the sum of the weighted major fuel consumption by the sum of the weighted square footage. You should obtain an energy use intensity of 58.08 thousand Btu per square foot for all major fuels combined for buildings with a floorspace of 10,001 to 25,000 square feet, or 58.1 thousand Btu per square foot as reported in Table C4.

***Excel Example 6: Calculate total major fuel consumption used for refrigeration in food service buildings (Table E1)***

Start by filtering the file for building records where the principal building activity is food service (PBA=15). There should be 218 building records in this category. In a new column, calculate the weighted consumption of all major fuels for refrigeration (MFRFBTU  $\times$  FINALWT). Sum this new column to find that food service buildings consume 56,454,721,666 Btu annually for refrigeration, or 56 trillion Btu as reported in Table E1.

## For SAS users

### *SAS Example 1: Calculate the number of commercial buildings that are 5,000 square feet or smaller and the associated RSE (Table B1)*

To calculate the standard error associated with the square footage categories (SQFTC), use PROC SURVEYFREQ to process the replicate weights (FINALWT1-FINALWT151).

```
proc surveyfreq data=cbeecs varmethod=jackknife;
  repweights finalwt1-finalwt151 / jkcoefs=1;
  weight finalwt;
  tables sqftc;
run;
```

Based on the output shown below, the **weighted estimate of number of buildings in the 1,001 to 5,000 square foot category** (SQFTC=2) is 2,832,884 buildings. The **standard error of the estimate** is 139,667, and the calculation for the RSE is  $(139,667 \div 2,832,884) \times 100 = 4.93$ . As a result, the standard error is about 5% of the estimate.

#### The SURVEYFREQ Procedure

Data Summary	
Number of Observations	6436
Sum of Weights	5918211.61

  

Variance Estimation	
Method	Jackknife
Replicate Weights	CBECS
Number of Replicates	151

SQFTC	Square footage category				
	Frequency	Weighted Frequency	Std Err of Wgt Freq	Percent	Std Err of Percent
2	1006	2832884	139667	47.8672	1.0257
3	533	1359072	80278	22.9642	0.9313
4	641	980905	54685	16.5744	0.7137
5	638	386086	21433	6.5237	0.3969
6	875	217643	11494	3.6775	0.1730
7	1015	92772	5177	1.5676	0.0898
8	1279	40072	2015	0.6771	0.0405
9	324	6665	619.97195	0.1126	0.0116
10	125	2112	255.02510	0.0357	0.0046
<b>Total</b>	6436	5918212	232830	100.000	

### *SAS Example 2: Calculate the total square footage of commercial buildings in the Northeast Census region and the associated RSE (Table B1)*

To calculate the total square feet (SQFT) by census region (REGION), use SQFT in the VAR statement and REGION in the DOMAIN statement within PROC SURVEYMEANS. PROC SURVEYMEANS is used to process the replicate weights (FINALWT1-FINALWT151).

```
proc surveymeans data=cbeecs varmethod=jackknife sum cvsum;
  repweights finalwt1-finalwt151 / jkcoefs=1;
  weight finalwt;
  var sqft;
  domain region;

run;
```

From the output shown below, **the total weighted square footage of commercial buildings in the Northeast** (REGION=1) is 15,986,179,532 square feet. The **standard error of the total** is 1,141,430,249, and the calculation for the RSE is  $(1,141,430,249 \div 15,986,179,532) \times 100 = 7.14$ . As a result, the standard error is 7% of the estimate.

#### The SURVEYMEANS Procedure

Domain Statistics in REGION					
Census region	Variable	Label	Sum	Std Error of Sum	Coeff of Variation for Sum
1	SQFT	Square footage	15986179532	1141430249	0.071401
2	SQFT	Square footage	25967204740	1918896102	0.073897
3	SQFT	Square footage	34941893117	2119012885	0.060644
4	SQFT	Square footage	19632548323	1383312428	0.070460

### *SAS Example 3: Calculate the weighted average size (mean square feet per building) of office buildings and the associated RSE (Table B1)*

To calculate the average building size (SQFT) by principal building activity (PBA), use PBA in the DOMAIN statement and use mean as an option in the PROC SURVEYMEANS statement. PROC SURVEYMEANS is used to process the replicate weights (FINALWT1-FINALWT151).

```
proc surveymeans data=cbeecs varmethod=jackknife mean stderr cv;
  repweights finalwt1-finalwt151 / jkcoefs=1;
  weight finalwt;
  var sqft;
  domain pba;

run;
```

From the output shown below, the **weighted mean square feet per building for office buildings** (PBA=2) is 17,086 square feet. The **standard error of the mean** is 1,163.449832, and the calculation for the RSE is  $(1,163.449832 \div 17,086) \times 100 = 6.81$ . The RSE can also be calculated

by multiplying the figure in the coefficient of variation column by 100:  $0.068093 \times 100 = 6.81$ . As a result, the standard error is about 7% of the estimate.

### The SURVEYMEANS Procedure

Domain Statistics in PBA					
Principal building activity	Variable	Label	Mean	Std Error of Mean	Coeff of Variation
1	SQFT	Square footage	7846.000480	971.570916	0.123830
2	SQFT	Square footage	<b>17086</b>	<b>1163.449832</b>	0.068093
4	SQFT	Square footage	65822	27416	0.416513
5	SQFT	Square footage	17373	1242.887246	0.071540
6	SQFT	Square footage	6171.820106	796.790200	0.129101
7	SQFT	Square footage	18893	3262.436072	0.172683
8	SQFT	Square footage	13696	1146.969093	0.083747
11	SQFT	Square footage	94870	31361	0.330566
12	SQFT	Square footage	12478	796.698454	0.063846
13	SQFT	Square footage	14554	1010.951603	0.069464
14	SQFT	Square footage	31173	2133.746699	0.068449
15	SQFT	Square footage	4833.042262	275.472132	0.056998
16	SQFT	Square footage	268883	49525	0.184188
17	SQFT	Square footage	40612	3804.115474	0.093671
18	SQFT	Square footage	31460	3561.779743	0.113216
23	SQFT	Square footage	29593	2621.976479	0.088601
24	SQFT	Square footage	819195	99415	0.121357
25	SQFT	Square footage	14821	1106.864955	0.074680
26	SQFT	Square footage	7203.799650	470.128632	0.065261
91	SQFT	Square footage	16901	3011.168190	0.178163

### SAS Example 4: Calculate the weighted median operating hours per week (Table B2)

To calculate a weighted median, use a weight statement within PROC MEANS. In this example, weekly operating hours (WKHRS) goes in the VAR statement. We have not calculated standard errors for medians in our current publications, so this example provides code for a weighted median estimate and no RSE is calculated.

```
proc means data=cbeecs median;
  var wkhrs;
  weight finalwt;
run;
```

The output provides the weighted median weekly operating hours at 50 hours per week.

### The MEANS Procedure

Analysis Variable : WKHRS Total hours open per week	Median
	50.0000000

Version 14.2 of SAS/STAT implemented a smoothing method for calculating quantile standard errors, as described in Fuller (2009). This method has not been implemented in the CBECS tables that contain median estimates, but for data users with SAS/STAT versions 14.2 and later who wish to calculate the standard error of the median, the SAS code is:

```
proc surveymeans data=cbeecs VARMETHOD=jackknife median;
  repweights finalwt1-finalwt151 / jkcoefs=1;
  weight finalwt;
  var wkhrs;
run;
```

### *SAS Example 5: Calculate the total electricity consumption for office buildings in the Midwest and the associated RSE (Table C15)*

To calculate the total electricity consumption in kWh (ELCNS) by principal building activity (PBA) and Census region (REGION), use PBA and REGION in a DOMAIN statement within PROC SURVEYMEANS. In this example, ELCNS goes in the VAR statement. PROC SURVEYMEANS is used to process the replicate weights (FINALWT1-FINALWT151).

```
proc surveymeans data=cbeecs varmethod=jackknife cvsum;
  repweights finalwt1-finalwt151 / jkcoefs=1;
  weight finalwt;
  var elcns;
  domain pba * region;
run;
```

From the output shown below, the **total annual electricity consumption in kWh for all office buildings (PBA=2) in the Midwest** (REGION=2) is 52,023,260,331 (52 billion kWh). The **standard error of the total** is 6,842,890,331. The RSE is calculated as  $(6,842,890,331 \div 52,023,260,331) \times 100 = 13.2$ . As a result, the standard error is about 13% of the estimate.

## The SURVEYMEANS Procedure

Domain Statistics in PBA*REGION						
Principal building activity	Census region	Variable	Label	Sum	Std Error of Sum	Coeff of Variation for Sum
1	1	ELCNS	Annual electricity consumption (kWh)	374165541	111739912	0.298638
	2	ELCNS	Annual electricity consumption (kWh)	1920271153	716339709	0.373041
	3	ELCNS	Annual electricity consumption (kWh)	2327628210	576436877	0.247650
	4	ELCNS	Annual electricity consumption (kWh)	201208873	133954832	0.665750
2	1	ELCNS	Annual electricity consumption (kWh)	44308599830	5152717381	0.116292
	2	ELCNS	Annual electricity consumption (kWh)	<b>52023260331</b>	<b>6842890331</b>	0.131535
	3	ELCNS	Annual electricity consumption (kWh)	87922667796	9402756745	0.106943
	4	ELCNS	Annual electricity consumption (kWh)	42908671915	4431522667	0.103278

(Output truncated to save space)

*SAS Example 6: Calculate energy intensity for the sum of major fuels by building floorspace category and the associated RSE (Table C4)*

The CBECs includes all buildings, including those that do not use any energy, in the calculation of energy intensity for all major fuels<sup>1</sup>. The SURVEYMEANS procedure excludes building records with missing values when calculating ratios. Therefore, it is necessary to first create a new variable (MFTAB, below) where missing values are set to zero:

```
data cbeecs;
  set cbeecs;
  mftab=mfbtu;
  if mftab=. then mftab=0;
run;
```

Next, use this new variable to compute the overall energy intensity for the sum of major fuels, defined here as total major fuel consumption in thousand Btu (MFTAB) per square foot (SQFT). Use MFTAB and SQFT in a VAR statement as well as a RATIO statement within PROC SURVEYMEANS. Further divide the data into building floorspace categories by using SQFTC in a DOMAIN statement. PROC SURVEYMEANS is used to process the replicate weights (FINALWT1-FINALWT151).

<sup>1</sup> For energy source-specific intensities, CBECs does not include buildings that don't use the energy source in the calculation, so the extra step of creating a new variable is not necessary in the calculation of electricity, natural gas, fuel oil, or district heat intensities.

```
proc surveymeans data=cbecs varmethod=jackknife sum;
  repweights finalwt1-finalwt151 / jkcoefs=1;
  weight finalwt;
  var mftab sqft;
  domain SQFTC;
  ratio mftab/sqft;
run;
```

In the output shown below, the total energy intensity for all major fuels in thousand Btu for buildings 10,001 to 25,000 square feet (SQFTC=4) is 58.08. The standard error for the intensity is 3.198612. The RSE for the intensity—thousand Btu per square foot—is  $(3.198612 \div 58.084906) \times 100 = 5.51$ . As a result, the standard error is about 6% of the estimate.

#### The SURVEYMEANS Procedure

Domain Ratio in SQFTC				
Square footage category	Numerator	Denominator	Ratio	Std Err
2	mftab	SQFT	71.830461	3.043709
3	mftab	SQFT	58.585502	3.420636
4	mftab	SQFT	58.084906	3.198612
5	mftab	SQFT	68.765055	2.482092
6	mftab	SQFT	70.242451	2.499577
7	mftab	SQFT	73.675380	2.325628
8	mftab	SQFT	85.326403	3.429724
9	mftab	SQFT	82.347417	4.978287
10	mftab	SQFT	83.591398	8.316641

#### *SAS Example 7: Calculate building-level energy intensities and find the median for different categories of operating hours (Table C4)*

First, create a new variable equal to the building-level energy intensity for each building record (BLEUI, below). Here we are looking at the intensity for the sum of all major fuels (MFBTU):

```
data cbecs;
  set cbecs;
  if mfbtu=. then mfbtu=0;
  BLEUI=mfbtu/sqft;
run;
```

Then, use the newly-created variable in the VAR statement of a MEANS procedure to find the median value. It is not recommended to calculate RSEs for medians with jackknife replicate weights, so it is not necessary to use the SURVEYMEANS procedure. Use a class statement to separate the output by weekly operating hours categories (WKHRSC).

```
proc means data=cbecs median;
  weight finalwt;
  var BLEUI;
  class WKHRSC;
run;
```

The output below shows that the **median building-level intensity for the sum of all major fuels for buildings open 40-48 hours** (WKHRSC=3) is 44.13 thousand Btu per square foot. For **buildings open 49 to 60 hours** (WKHRSC=4), the median is slightly higher, 47.49 thousand Btu per square foot.

#### The MEANS Procedure

Analysis Variable : BLEUI		
Weekly hours category	N Obs	Median
1	129	8.9841509
2	580	33.4360000
3	1114	<b>44.1266667</b>
4	1467	<b>47.4947500</b>
5	985	72.6894400
6	673	106.3886667
7	1488	61.5419048

#### *SAS Example 8: Calculate total major fuel consumption used for refrigeration in food service buildings (Table E1)*

To calculate energy consumed from all major fuel for the refrigeration end use (MFRFBTU) by principal building activity (PBA), use MFRFBTU in the VAR statement of PROC SURVEYMEANS. Put PBA in a DOMAIN statement. PROC SURVEYMEANS is used to process the replicate weights (FINALWT1-FINALWT151).

```
proc surveymeans data=cbecs varmethod=jackknife sum;
  repweights finalwt1-finalwt151 / jkcoefs=1;
  weight finalwt;
  var MFRFBTU;
  domain pba;
run;
```

From the output shown below, the **total major fuel consumption used for the refrigeration end use for food service buildings** (PBA=15) is 56,454,681,444 Btu (56 trillion Btu).



## The SURVEYMEANS Procedure

## Domain Statistics in PBA

Principal building activity	Variable	Label	Sum	Std Error of Sum	
	1	MFRFBTU	Major fuel refrigeration use (thous Btu)	114420366	46893471
	2	MFRFBTU	Major fuel refrigeration use (thous Btu)	21845676335	1984438610
	4	MFRFBTU	Major fuel refrigeration use (thous Btu)	3132241238	923957028
	5	MFRFBTU	Major fuel refrigeration use (thous Btu)	13100916582	2603285778
	6	MFRFBTU	Major fuel refrigeration use (thous Btu)	87597672029	13803610357
	7	MFRFBTU	Major fuel refrigeration use (thous Btu)	2924475217	834430285
	8	MFRFBTU	Major fuel refrigeration use (thous Btu)	2927361531	369586232
	11	MFRFBTU	Major fuel refrigeration use (thous Btu)	22497115830	7599784357
	12	MFRFBTU	Major fuel refrigeration use (thous Btu)	5498809997	852518503
	13	MFRFBTU	Major fuel refrigeration use (thous Btu)	19033275142	2319279133
	14	MFRFBTU	Major fuel refrigeration use (thous Btu)	21649568242	1641967634
	15	MFRFBTU	Major fuel refrigeration use (thous Btu)	<b>56454681444</b>	5575642618

(Output truncated to save space)

## For R users

Because R software and package versions may differ between users and may produce varying results, we are providing code, but not output, for the examples. Please use the output from the SAS examples and the sample tables in the appendix to verify your results.

Before running the examples below in R, install the *survey*, *spatstat*, and *dplyr* packages:

```
install.packages("survey")
install.packages("spatstat")
install.packages("dplyr")
```

```
library(survey)
library(spatstat)
library(dplyr)
```

Read in the public use file:

```
cbecs2018 <- read_csv(file="<your local file location>")
```

Now, set up the final weights and sample design to run the examples:

```
samp_wts <- cbecs2018$FINALWT
rep_wts <- cbecs2018[, grep1("^FINALWT", names(cbecs2018))]
rep_wts$FINALWT <- NULL

samp_design <- svrepdesign(weights=samp_wts, repweights=rep_wts,
                          type="JK2", mse=TRUE, data=cbecs2018)
```

The variable FINALWT is final weight for the sampled building, while FINALWT1 to FINALWT151 are the replicate weights. The svrepdesign function is used because of the replicate weights. As mentioned earlier, the CBECS uses the jackknife method for estimating standards errors. Therefore, for survey design type = "JK2" is used in the function. Lastly, *mse = TRUE* means that the variances are computed based on the sum of squares around a point, rather than by the mean of the replicates.

***R Example 1: Calculate the number of commercial buildings that are 5,000 square feet or smaller and the associated RSE (Table B1)***

Square footage category (SQFTC) is a numeric variable on the microdata file, but it needs to be converted to a factor variable so that the number of buildings is calculated for each square footage category.

```
sqftc <- factor(cbecs2018$SQFTC)
```

Now run the following code:

```
examp1<-as.data.frame(svytotal(~sqftc, samp_design))
examp1$rse<- (examp1$SE/examp1$total)*100
examp1
```

The svytotal function works similarly to the count function, but it allows for the use of survey weights and replicate weights. Use *as.data.frame()* to set the results to a data frame, which allows for manipulation of the results to find the RSE.

***R Example 2: Calculate the total square footage of commercial buildings in the Northeast Census Region and the associated RSE (Table B1)***

To calculate the total square footage of commercial buildings in the Northeast (REGION=1), the svyby function is used from the survey package, and it allows for the results of one variable (in this case, SQFT) to be grouped by another variable (REGION). The svyby function does require another function to be specified, and for this example, svytotal is used.

```
examp2<-as.data.frame(svyby(~SQFT, by=~REGION, samp_design, svytotal))
examp2$rse<- (examp2$se/examp2$SQFT)*100
examp2
```

***R Example 3: Calculate the weighted average size (mean square feet per building) of office buildings and the associated RSE (Table B1)***

The `svyby` function is also used to calculate the weighted average size of office buildings (PBA=2), but instead of using the `svytotal` function, the `svymean` function is used.

```
examp3<-as.data.frame(svyby(~SQFT, by=~PBA, samp_design,svymean))
examp3$rse<- (examp3$se/examp3$SQFT)*100
examp3
```

***R Example 4: Calculate the weighted median operating hours per week (Table B2)***

To calculate a weighted median, use the `weighted.median` function and specify the variable (WKHRS) and weight (FINALWT).

```
weighted.median(cbecs2018$WKHRS, cbecs2018$FINALWT)
```

***R Example 5: Calculate the total electricity consumption for office buildings in the Midwest and the associated RSE (Table C15)***

To calculate the total electricity consumption (ELCNS) of office buildings (PBA=2) in the Midwest (REGION=2), the `svyby` function is used to group the results by PBA and REGION and `svytotal` is used to calculate the estimates. The ELCNS variable has some missing values, so we set `na.rm=TRUE` to remove the missing values from the calculation.

```
examp5<-as.data.frame(svyby(~ELCNS, by=~PBA+REGION, samp_design,
svytotal, na.rm=TRUE))
examp5$rse<- (examp5$se/examp5$ELCNS)*100
examp5
```

***R Example 6: Calculate energy intensity for the sum of major fuels by building floorspace category and the associated RSE (Table C4)***

The CBECs includes all buildings, including those that do not use any energy. Buildings with missing total energy (MFBTU) values are set to zero in a new variable (MFTAB):

```
cbecs2018$mftab<-cbecs2018$MFBTU
cbecs2018$mftab[is.na(cbecs2018$mftab)]<-0
```

Next use MFTAB to compute the overall energy intensity, which is the ratio of total energy consumption to square footage (MFTAB/SQFT). Because the `svyratio` function created non-standard column names, it is important when specifying names to use the `` around them. This is different than the standard quotation marks or apostrophes. If using Rstudio, when typing out `examp6$`, scroll down to see the column names.

```

examp6<-as.data.frame(svyby(cbecs2018$mftab, by=~SQFTC,
denominator=~SQFT, samp_design, svyratio))
examp6$rse<-(examp6$`se.numerator/SQFT`/examp6$`numerator/SQFT`)*100
examp6

```

***R Example 7: Calculate building-level energy intensities and find the median for different categories of operating hours (Table C4)***

Since CBECs includes buildings that may not use any energy, buildings with missing total energy (MFBTU) values are set to zero in a new variable (MFTAB):

```

cbecs2018$mftab<-cbecs2018$MFBTU
cbecs2018$mftab[is.na(cbecs2018$mftab)]<-0

```

Create a new variable equal to the building-level energy intensity for each building record (BLEUI).

```

cbecs2018$bleui<-cbecs2018$mftab/cbecs2018$SQFT

```

Next, use `dplyr`'s `group_by` function to get the median of building-level energy intensity by the working hours category.

```

cbecs2018%>%
  group_by(WKHRSC)%>%
  summarise(bleui_med=weighted.median(bleui, FINALWT, na.rm = TRUE))

```

***R Example 8: Calculate total major fuel consumption used for refrigeration in food service buildings (Table E1)***

To calculate the total major fuel consumption used for refrigeration (MFRBTU) in food service buildings (PBA=15), use the `svyby` and `svytotal` to calculate estimates by principal building activity.

```

examp8<-as.data.frame(svyby(~MFRFBTU, by=~PBA, samp_design, svytotal,
na.rm=TRUE))
examp8

```

---

## Notes to Consider When Using the Microdata File and Replicate Weights

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### Publication standards

We do not publish CBECS estimates where the RSE is higher than 50 or the count of buildings used for the calculation is less than 20 (indicated by a *Q* in the data tables). We follow the same recommended guidelines for custom analysis using the public use microdata file.

### Imputation variables

Most variables were imputed for *Don't know* and *Refused* responses. The Z variables, also referred to as imputation flags, are included in the public use microdata file. Each variable that was imputed has a corresponding Z variable; the Z variable name is the name of the variable that was imputed with the letter Z in front of it (for example, the Z variable for the variable SQFT is ZSQFT). The imputation flags provide information on the source of the data for the corresponding non-Z variable.

The CBECS imputation flags and their meanings are:

- Reported (Z variable=0)—indicates that the variable was reported by the building respondent or the energy supplier
- Imputed (Z variable=1)—indicates building characteristics data that were imputed using hot-deck imputation methods or consumption and/or expenditures data that were imputed using regression models
- Estimated for strip center (Z variable=2)—applies to energy consumption and expenditures data for strip shopping center buildings for which the value was estimated using data from establishment interviews within the building
- Inapplicable (Z variable=9)—indicates that the variable was not on the questionnaire path for that particular building. In the CBECS, non-Z variables are displayed as missing when they are inapplicable

When a variable in the file lacks a corresponding Z variable, it means that either no data are missing or the variable was not imputed (in such cases, *Don't know* or *Refused* values will be remaining in the data file). The modeled end-use consumption variables also do not have corresponding Z variables.

We recommend using the imputed data where available to avoid biased estimation.

## Confidentiality and Masking Procedures

The 2018 CBECS was collected under the authority of the 2018 Confidential Information Protection and Statistical Efficiency Act (CIPSEA). EIA project staff and its contractors and agents are personally accountable for protecting the identity of individual respondents and the data that they report in the survey. We took the following steps to avoid disclosure of information that would reveal the identity of a building on the public use microdata file.

- We removed all **building identification information** such as building name, address, city, state, and ZIP code.
- We omitted variables indicating **unique building features** that might lead to building identification from the file. Examples include: wind turbines, indoor ice rinks, cool roof characteristics, electric vehicle charging stations, and trading floors.
- We have adopted new **climate zone** designations (PUBCLIM) – based on groups of county-level American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) climate zones as designated in [ANSI/ASHRAE Standard 169-2021, Climatic Data for Building Design Standards](#). To preclude disclosure risk on the public file, climate zones were combined as follows:

<b>Climate zone for 2018 CBECS</b>	<b>ASHRAE climate zones</b>
Very cold or cold	6A, 6B, 7, 8
Cool	5A, 5B, 5C
Mixed mild	4A, 4B, 4C
Warm	3A, 3B, 3C
Hot or very hot	1A, 1B, 2A, 2B

Climate zone was suppressed for buildings larger than a million square feet and for buildings in the following PBPLUS categories: college/university, hospital/inpatient health, hotel/resort, enclosed mall, and courthouse/probation office. Since climate zone was suppressed for some cases on the public-use data file, we recommend not producing climate zone estimates for any aggregate.

- For buildings over one million square feet, we replaced the numeric **square footage** (SQFT) with the weighted average square footage of all responding buildings over one million square feet. We calculated separate weighted means for each of the four census regions. For buildings one million square feet or less, we rounded the numeric square footage to within 5% of the upper limit of the buildings' square footage categories. If the rounded value fell below the lower limit of the category, we coded the value at the lower limit. For example, we rounded buildings in the range of 5,001 to 12,000 square feet to the nearest 500 square feet (except that buildings rounding to 5,000 were coded as 5,001.)
- We replaced the upper values for **number of floors** (NFLOOR) with two categories: 10 to 14 floors (coded as 994 on the file) and 15 or more floors (coded as 995 on the file).
- We coded any building with a **number of underground floors** (BASEMNT) equaling five or more floors as 995.

- We replaced upper values of **floor-to-ceiling height** (FLCEILHT) with a category for more than 50 feet (coded as 995 on the file).
- We replaced the **number of elevators and escalators** (NELVTR, NESLTR) with categories for more than 30 elevators (coded as 995 on the file) and more than 10 escalators (coded as 995 on the file).
- We omitted the exact **year of construction**. In **year of construction category** (YRCONC), the oldest buildings were combined into a category for *before 1946* and the *2000 to 2009* and *2010 to 2012* categories were combined into a category for *2000 to 2012*.
- We placed **data center buildings** into the *Other* principal building activity.
- We included seven **special measures of occupancy** (RWSEAT, PBSEAT, EDSEAT, FDSEAT, HCBED, NRSBED, LODGRM) in the 2018 CBECS (seating capacity for religious worship buildings, public assembly buildings, education buildings, and food service buildings; licensed bed capacity for inpatient health care and skilled nursing buildings; and number of guest rooms for lodging buildings). These numbers were rounded to the following:

Number of units	Rounding method
Fewer than 25 units	No rounding performed for RWSEAT, PBSEAT, EDSEAT, FDSEAT, or LODGRM; rounded to the nearest 5 for HCBED and NRSBED
25–49 units	Rounded to nearest 5
50–99 units	Rounded to nearest 12
120–249 units	Rounded to nearest 25
250–499 units	Rounded to nearest 50
500–999 units	Rounded to nearest 120
1,000–2,499 units	Rounded to nearest 250
2,500–4,999 units	Rounded to nearest 500
5,000 or more units	Rounded to nearest 1,000

In addition, we condensed public assembly buildings with more than 15,000 seats into one category (coded as 999995). We also condensed religious worship buildings with more than 2,000 seats into one category (coded as 99995) as well as for lodging buildings with more than 1,000 guest rooms (coded as 99995). For inpatient health care and skilled nursing buildings, buildings with over 250 beds have been put into one category (coded as 9995).

- For inpatient health care buildings and courthouses that are government owned, we withheld the **type of government ownership** (GOVTYP, OWNTYPE) (federal, state, or local).
- For buildings where the number of businesses was between 50 and 100, we rounded the reported number to the nearest 5. For buildings where the **number of businesses** (NOCC) was between 101 and 200, we rounded the reported number to the nearest 10. For buildings with more than 200 businesses, we condensed the number of businesses into one category (coded as 995). For enclosed malls, we withheld the number of buildings and coded them as 996.
- For buildings where the **number of workers** (NWKER) was between 2,500 and 4,999, we rounded the reported number to the nearest 250. For buildings where the number of workers was 5,000 or more, we replaced the reported number of workers with the national weighted average number of workers of all responding buildings with 5,000 or more workers.

- For buildings with more than 20 X-ray machines, the number of X-rays machines is represented in one category (coded as 995). For the number of CT scan machines, the number of MRI machines, and the number of linear accelerators, we have provided an indicator variable, instead of the number, to show the presence or absence of this **medical equipment** (XRAYN, CTSCAN, MRI, LINACC) within a building.
- We rounded the value of the **number of compact refrigerators** (RFGCOMPN) in the same manner as described for special measures of occupancy above. In addition, we condensed the number of buildings with more than 1,000 compact refrigerators into one category (coded as 99995).
- We addressed the numbers of **computers, servers, and tablets** (PCTERMN, PCTRMC, LAPTPN, LAPTPC, SERVERN, SERVERC, TABLETN) as follows:
  - For buildings with 2,500 or more computers, we replaced the reported number of computers with the weighted average number of computers (calculated separately by regions) of all responding buildings with 2,500 or more computers. In addition, we combined the categories for the highest- and second-highest amount of computers.
  - For buildings with 1,000 or more laptop computers, we replaced the reported number of laptops with the weighted average number of laptops of all responding buildings with 1,000 or more laptops. In addition, we combined the categories for the highest- and second-highest amount of laptops.
  - For buildings with 500 or more servers, we condensed the number of servers into one category (coded as 9995).
  - For buildings where the number of tablets was 1,000 or more, we replaced the reported number of tablets with the weighted average number of tablets of all responding buildings with 1,000 or more tablets.
- We condensed **data center square footage** (DCNTRSFC) within buildings into five categories: 500 square feet or less; 501 to 1,500 square feet; 1,501 to 3,000 square feet; 3,001 to 10,000 square feet; and Over 10,000 square feet.
- We condensed the number of buildings with more than 200 **TVs or video displays** (TVVIDEON) into one category (coded as 995).
- We rounded the **food areas square footage** (SNACKSF, FASTFDSF, CAFSF, FDPREPSF), depending on the size of the area, as follows:

<b>Food area square footage</b>	<b>Rounding level</b>
Less than or equal to 1,000 square feet	Rounded to the nearest 10
1,001–5,000 square feet	Rounded to the nearest 50
5,001–10,000 square feet	Rounded to the nearest 100
10,001–25,000 square feet	Rounded to the nearest 250
25,001–50,000 square feet	Rounded to the nearest 500
50,001–100,000 square feet	Rounded to the nearest 1,000
100,001–200,000 square feet	Rounded to the nearest 2,000



- **Number of parking spaces (PKLTN):** Depending on the number of spaces, the value was rounded as follows:

Number of parking spaces	Rounding level
Less than 5	Rounded to 5
5–1,000	Rounded to the nearest 10
1,001–5,000	Rounded to the nearest 50
5,001–10,000	Rounded to the nearest 100
10,001–25,000	Rounded to the nearest 250

- For **office devices and interactive whiteboards** (LGOFFDEVN, SMOFFDEVN, WBOARDSN), we coded buildings with more than 500 large or small office devices as 9995. For buildings with more than 200 interactive whiteboards, we coded the number of interactive whiteboards as 9995.
- We combined 3 or more **number of ATMs** (ATMN) into one category.
- For each building, the annual **heating degree-days** (HDD) and **cooling degree-days** (CDD) were randomly perturbed by using a normal distribution, with the reported degree-days randomly higher or lower than the actual data. For a few buildings in areas with extreme weather, the total amount of perturbation was increased to further disguise the building's location. As a result, each case has degree-day data that could have plausibly come from more than one geographic area.
- We randomly perturbed the **total consumption and expenditures for each fuel** (e.g. MFBTU, ELCNS, NGEXP, FKHTBTU) by a small percentage so that the reported annual totals would not exactly match the actual billing records, and the building would not be identifiable by anyone with access to those records. The end use consumption variables were rescaled to add to the new totals.

## Changes Since the 2012 CBECS

The 2018 CBECS public use file departs from the earlier 2012 CBECS in some aspects. Some variables have been modified, some are no longer provided, and some have been added. The heating and cooling equipment sections of the questionnaire were restructured significantly, so variables in those sections have changed significantly. The next two tables outline these changes.

Table 1. Variables modified or no longer provided in the 2018 CBECS public use microdata file

Variable	Label	Status
PUBCLIM	ASHRAE climate zone	We have adopted new climate zone designations based on groups of county-level American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) climate zones.
NFLOOR	Number of floors	Number of floors 10–14 was coded as 994, and 15 or more floors was coded as 995.
NELVTR	Number of elevators	More than 30 elevators was coded as 995.
NESLTR	Number of escalators	More than 10 escalators was coded as 995.
YRCON	Year of construction	Withheld for disclosure avoidance
YRCONC	Year of construction category	The <i>Before 1920</i> and <i>1920 to 1945</i> categories were combined.
ONEACT	One activity in building	Removed for data quality or disclosure risk concerns
ACT1	First activity in building	Removed for data quality or disclosure risk concerns
ACT2	Second activity in building	Removed for data quality or disclosure risk concerns
ACT3	Third activity in building	Removed for data quality or disclosure risk concerns
ACT1PCT	Percent used for first activity	Removed for data quality or disclosure risk concerns
ACT2PCT	Percent used for second activity	Removed for data quality or disclosure risk concerns
ACT3PCT	Percent used for third activity	Removed for data quality or disclosure risk concerns
MONCON	Month ready for occupancy	No longer available
FREESTN	Freestanding building	No longer available
EQGLSS	Equal glass on all sides	Question no longer asked

<b>Variable</b>	<b>Label</b>	<b>Status</b>
SUNGLS	Glass sides most sunlight	Question no longer asked
RENWLL	Exterior wall replacement	Question no longer asked
CUBE	Open plan office space	Question no longer asked
CUBEC	Percentage open plan	Question no longer asked
CUBELOC	Location of open plan	Question no longer asked
GENR	Energy used for electricity generation	Use electricity generation capability (CAPGEN) instead
FURNP	Percentage heated by furnace	Replaced with energy source specific variables
PKGHP	Percentage heated by packaged heating	Replaced with energy source specific variables
BOILP	Percentage heated by boiler	Replaced with energy source specific variables
STHWP	Percentage heated by district steam or hot water	Replaced with energy source specific variables
HTPHP	Percentage heated by heat pumps	Replaced with energy source specific variables
SLFCNP	Percentage heated by individual space heaters	Replaced with energy source specific variables
OTHTP	Percentage heated by other heating equipment	Replaced with energy source specific variables
PKGHTTYP	Type of packaged heating	Question no longer asked
PKGFURN	Packaged heating component: furnace	Question no longer asked
PKGHTP	Packaged heating component: heat pump	Use heat pump in packaged unit (PKGHPH)
PKGCOIL	Packaged heating component: heating coil	Question no longer asked
PKGPIU	Packaged heating component: powered induction unit	Question no longer asked
PKGDUCT	Packaged heating component: duct reheat	Duct reheat is now collected as separate equipment or energy source combinations
BLRINDC	Boiler system: induction units	Collected as part of boiler heat distribution: fan coil or induction units (BLRFNCL)
BLRLOOP	Boiler system: water loop heat pump	Collected as part of boiler heat distribution (BLRWTLPL)
BLRPKG	Boiler system: packaged unit	Question no longer asked

<b>Variable</b>	<b>Label</b>	<b>Status</b>
DHRAD	District heat system: radiators	Collected as part of district heat distribution (RADIATR_ST and RADIATR_HW)
DHFNCL	District heat system: fan coil units in rooms	Collected as part of district heat distribution: fan coil or induction units (FANCOIL_ST and FANCOIL_HW)
DHINDC	District heat system: induction units	Collected as part of district heat distribution: fan coil or induction units (FANCOIL_ST and FANCOIL_HW)
DHLOOP	District heat system: water loop heat pump	Collected as part of district heat distribution (WTLOOP_ST and WTLOOP_HW)
DHAIR	District heat system: central air handler	Collected as part of district heat distribution (AIRHAND_ST and AIRHAND_HW)
DHPKG	District heat system: packaged unit	Question no longer asked
DHDUCT	District heat system: duct reheat	Collected as part of district heat distribution (REHEAT_ST and REHEAT_HW)
HPHPKG	Heat pump heating system: packaged unit	Question no longer asked
HPHSPLT	Heat pump heating system: split system	Question has been replaced by one that distinguishes split systems from packaged terminal heat pumps (HPHPTHP)
HPHROOM	Heat pump heating system: individual room heat pump	Question no longer asked
HPHMINI	Heat pump heating system: ductless mini-split	Question no longer asked
HPHBKUP	Heat pump backup energy source	Question no longer asked
SHRDNT	Individual heater: infrared radiant	Question no longer asked
SHBBRD	Individual heater: baseboard	Question no longer asked
SHPORT	Individual heater: portable space heater	Question no longer asked
SHWALL	Individual heater: wall heater	Question no longer asked
SHFURN	Individual heater: individual furnace	Question no longer asked
SHUNIT	Individual heater: unit heater	Question no longer asked

<b>Variable</b>	<b>Label</b>	<b>Status</b>
SHPTAC	Individual heater: heating element in PTAC	Question no longer asked
OTSTRP	Other heat component: heating coil or heat strip	Question no longer asked
OTDUCT	Other heat component: duct or electric reheat	Duct reheat is now collected as separate equipment or energy source combinations
OTPIU	Other heat component: powered induction units	Question no longer asked
HTVCAV	Heating ventilation: central air handling with constant air volume (CAV)	Question no longer asked
HTVVAV	Heating ventilation: central air handling with variable air volume (VAV)	Collected as part of airflow control question (VAV)
HTVFLR	Heating ventilation: underfloor air distribution	Question no longer asked
HTVOAS	Heating ventilation: dedicated outside air system	Collected as part of airflow control question (DOAS)
HTVDEM	Heating ventilation: demand controlled ventilation	Collected as part of airflow control question (DCV)
HTVNON	Heating ventilation: none of these	Question no longer asked
HWCOOL	District hot water used for cooling	Question no longer asked
RCACP	Percentage cooled by central A/C	Replaced with energy source specific variables
PKGCP	Percentage cooled by packaged A/C units	Replaced with energy source specific variables
CHILP	Percentage cooled by central chillers	Replaced with energy source specific variables
CHWTP	Percentage cooled by district chilled water	Replaced with energy source specific variables
HTPCP	Percentage cooled by heat pumps	Replaced with energy source specific variables
ACWNWP	Percentage cooled by individual room A/C	Replaced with energy source specific variables
EVAPP	Percentage cooled by swamp coolers	Replaced with energy source specific variables
OTCLP	Percentage cooled by other cooling equipment	Replaced with energy source specific variables
PKGCLTYP	Type of packaged cooling	Question no longer asked
HTRCHLR	Heater chiller	Question no longer asked

<b>Variable</b>	<b>Label</b>	<b>Status</b>
CHLINDC	Chiller system: induction units	Collected as part of chiller distribution: fan coil or induction units (CHLFNCL)
CHLLOOP	Chiller system: water loop heat pump	Collected as part of chiller distribution (CHLWTLP)
CHLPKG	Chiller system: packaged unit	Question no longer asked
CHLDUCT	Chiller system: duct reheat	Collected as part of chiller distribution: fan coil or induction units (CWFNCL)
DCWAIR	District chilled water (CW) system: central air handler	Collected as part of district chilled water distribution (CWAIR)
DCWFNCL	District CW system: fan coil units in rooms	Collected as part of district chilled water distribution: fan coil or induction units (CWFNCL)
DCWINDC	District CW system: induction units	Collected as part of district chilled water distribution: fan coil or induction units (CWFNCL)
DCWLOOP	District CW system: water loop heat pump	Collected as part of district chilled water distribution (CWWTLP)
DCWBEAM	District CW system: chilled beam	Collected as part of district chilled water distribution (CWBEAM)
DCWPKG	District CW system: packaged unit	Question no longer asked
DCWDUCT	District CW system: duct reheat	Question no longer asked
HPCPKG	Heat pump cooling system: packaged unit	Question no longer asked
HPCSPLT	Heat pump cooling system: split system	Question has been replaced by one that distinguishes split systems from packaged terminal heat pumps (HPCPTH)
HPCROOM	Heat pump cooling system: individual room heat pump	Question no longer asked
HPCMINI	Heat pump cooling system: ductless mini-split	Question no longer asked
HPCVRF	Heat pump cooling system: variable refrigerant flow	Collected in VRF system question (VRF)
CLVCAV	Cooling ventilation: central air-handling unit with CAV	Question no longer asked
CLVVAV	Cooling ventilation: central air-handling unit with VAV	Collected as part of airflow control question (VAV)
CLVFLR	Cooling ventilation: underfloor air distribution	Question no longer asked

<b>Variable</b>	<b>Label</b>	<b>Status</b>
CLVOAS	Cooling ventilation: dedicated outside air system	Collected as part of airflow control question (DOAS)
CLVDEM	Cooling ventilation: demand controlled ventilation	Collected as part of airflow control question (DCV)
CLVNON	Cooling ventilation: none of these types	Question no longer asked
RDHTNF	Heating reduced during 24-hour period	Collected as part of how reduce heating (HWRDHT)
RDCLNF	Cooling reduced during 24-hour period	Collected as part of how reduce cooling (HWRDCL)
ECNTYPE	Type of economizer	Question no longer asked
INSTWT	Instant hot water	Question no longer asked
SOCOOK	Solar used for cooking	Question no longer asked
SOMANU	Solar used for manufacturing	Question no longer asked
TOGRID	Deliver electricity to grid	Question no longer asked
ELLOCUT	Electricity from local utility	Question no longer asked
ELNONLU	Electricity from independent power producer or non-local utility	Question no longer asked
ELOTSRC	Electricity from some other source	Question no longer asked
ELCPLT	Electricity from central plant	Question no longer asked
ELLUPCT	Percentage of electricity from local utility	Question no longer asked
NGSRC	How purchase natural gas	Question no longer asked
AMIMETER	Advanced metering infrastructure smart metering	Question no longer asked
FLATC	Flat screen category	Question no longer asked
PRNTRN	Number of printers	Questionnaire updated to ask about large and small combination office devices
PRNTYP	Type of printers	Question no longer asked
COPIER	Photocopiers	Questionnaire updated to ask about large and small combination office devices
COPIERN	Number of photocopiers	Questionnaire updated to ask about large and small combination office devices
FAX	Fax machines	Questionnaire updated to ask about large and small combination office devices

Variable	Label	Status
RDLTNF	Lighting reduced during off hours	This variable is no longer derived, but all the percentage lighting variables are available

Note: All associated imputation variables for variables no longer provided were dropped from the 2018 public use file as well.

**Table 2. Variables added to the 2018 CBECS public use microdata file**

Variable	Label
DRVTHRU	Drive-thru window
EGYUSED	Energy used in building
SOPANEL	Solar panels used to generate electricity
SOTHERM	Solar thermal energy used
REHEAT	Duct reheat used for heating
FIREPLC	Fireplaces used for heating
PKGHT_EL	Packaged central units powered by electricity
BOILER_EL	Boilers powered by electricity
HTPMPH_EL	Heat pumps powered by electricity
FURNAC_EL	Furnaces powered by electricity
SLFCON_EL	Individual space heaters powered by electricity
FIREPLC_EL	Fireplaces powered by electricity
REHEAT_EL	Duct reheat powered by electricity
OTHTEQ_EL	Other heating equip powered by electricity
PKGHT_NG	Packaged central units fueled by natural gas
BOILER_NG	Boilers fueled by natural gas
HTPMPH_NG	Heat pumps fueled by natural gas
FURNAC_NG	Furnaces fueled by natural gas
SLFCON_NG	Individual space heaters fueled by natural gas
FIREPLC_NG	Fireplaces fueled by natural gas
OTHTEQ_NG	Other heating equip fueled by natural gas
BOILER_FK	Boilers fueled by fuel oil
FURNAC_FK	Furnaces fueled by fuel oil
SLFCON_FK	Individual space heaters fueled by fuel oil
OTHTEQ_FK	Other heating equip fueled by fuel oil
PKGHT_PR	Packaged central units fueled by propane
BOILER_PR	Boilers fueled by propane
HTPMPH_PR	Heat pumps fueled by propane
FURNAC_PR	Furnaces fueled by propane
SLFCON_PR	Individual space heaters fueled by propane
FIREPLC_PR	Fireplaces fueled by propane
OTHTEQ_PR	Other heating equip fueled by propane



<b>Variable</b>	<b>Label</b>
DIST_ST	District steam system
AIRHAND_ST	Central air handlers for steam distribution
FANCOIL_ST	Fan coil or induction units for steam distribution
REHEAT_ST	Duct reheat for steam distribution
RADIATR_ST	Radiators for steam distribution
RADFLR_ST	Radiant floor or ceiling panels for steam distribution
WTLOOP_ST	Water loop heat pump for steam distribution
OTDIST_ST	Other type of steam distribution
DIST_HW	District hot water system
AIRHAND_HW	Central air handlers for hot water distribution
FANCOIL_HW	Fan coil or induction units for hot water distribution
REHEAT_HW	Duct reheat for hot water distribution
RADIATR_HW	Radiators for hot water distribution
RADFLR_HW	Radiant floor or ceiling panels for hot water distribution
WTLOOP_HW	Water loop heat pump for hot water distribution
OTDIST_HW	Other type of hot water distribution
FURNAC_WO	Furnaces fueled by wood
SLFCON_WO	Individual space heaters fueled by wood
FIREPLC_WO	Fireplaces fueled by wood
OTHTEQ_WO	Other heating equip fueled by wood
BOILER_CO	Boilers fueled by coal
FURNAC_CO	Furnaces fueled by coal
OTHTEQ_CO	Other heating equip fueled by coal
SOTHERM_SO	Solar thermal heating equipment
PKGHT_OT	Packaged central units fueled by other source
BOILER_OT	Boilers fueled by other source
FURNAC_OT	Furnaces fueled by other source
SLFCON_OT	Individual space heaters fueled by other source
OTHTEQ_OT	Other heating equip fueled by other source
BLRAIR_HT1	Central air handlers for boiler distribution
BLRFNCL_HT1	Fan coil or induction units for boiler distribution
BLRDUCT_HT1	Duct reheat for boiler distribution
BLRRAD_HT1	Radiators for boiler distribution
BLRRDFL_HT1	Radiant floor or ceiling panels for boiler distribution
BLRWTLP_HT1	Water loop heat pump for boiler distribution
BLROTD_HT1	Other type of boiler distribution
BLRAIR_EL2	Central air handlers for electric boiler distribution
BLRFNCL_EL2	Fan coil or induction units for electric boiler distribution
BLRDUCT_EL2	Duct reheat for electric boiler distribution
BLRRAD_EL2	Radiators for electric boiler distribution

<b>Variable</b>	<b>Label</b>
BLRRDFL_EL2	Radiant floor or ceiling panels for electric boiler distribution
BLRWTLF_EL2	Water loop heat pump for electric boiler distribution
BLROTD_EL2	Other type of electric boiler distribution
BLRAIR_NG2	Central air handlers for natural gas boiler distribution
BLRFNCL_NG2	Fan coil or induction units for natural gas boiler distribution
BLRDUCT_NG2	Duct reheat for natural gas boiler distribution
BLRRAD_NG2	Radiators for natural gas boiler distribution
BLRRDFL_NG2	Radiant floor or ceiling panels for natural gas boiler distribution
BLRWTLF_NG2	Water loop heat pump for natural gas boiler distribution
BLROTD_NG2	Other type of natural gas boiler distribution
BLRAIR_FK2	Central air handlers for fuel oil boiler distribution
BLRFNCL_FK2	Fan coil or induction units for fuel oil boiler distribution
BLRDUCT_FK2	Duct reheat for fuel oil boiler distribution
BLRRAD_FK2	Radiators for fuel oil boiler distribution
BLRRDFL_FK2	Radiant floor or ceiling panels for fuel oil boiler distribution
BLRWTLF_FK2	Water loop heat pump for fuel oil boiler distribution
BLROTD_FK2	Other type of fuel oil boiler distribution
BLRAIR_PR2	Central air handlers for propane boiler distribution
BLRFNCL_PR2	Fan coil or induction units for propane boiler distribution
BLRDUCT_PR2	Duct reheat for propane boiler distribution
BLRRAD_PR2	Radiators for propane boiler distribution
BLRRDFL_PR2	Radiant floor or ceiling panels for propane boiler distribution
BLRWTLF_PR2	Water loop heat pump for propane boiler distribution
BLROTD_PR2	Other type of propane boiler distribution
BLRAIR_CO2	Central air handlers for coal boiler distribution
BLRFNCL_CO2	Fan coil or induction units for coal boiler distribution
BLRDUCT_CO2	Duct reheat for coal boiler distribution
BLRRAD_CO2	Radiators for coal boiler distribution
BLRRDFL_CO2	Radiant floor or ceiling panels for coal boiler distribution
BLRWTLF_CO2	Water loop heat pump for coal boiler distribution
BLROTD_CO2	Other type of coal boiler distribution
BLRAIR_OT2	Central air handlers for other source boiler distribution
BLRFNCL_OT2	Fan coil or induction units for other source boiler distribution
BLRDUCT_OT2	Duct reheat for other source boiler distribution
BLRRAD_OT2	Radiators for other source boiler distribution
BLRRDFL_OT2	Radiant floor or ceiling panels for other source boiler distribution
BLRWTLF_OT2	Water loop heat pump for other source boiler distribution
BLROTD_OT2	Other type of other source boiler distribution
BLROTD	Other type of boiler distribution
BLRRDFL	Radiant floor or ceiling panels for boiler distribution

<b>Variable</b>	<b>Label</b>
BLRWTLP	Water loop heat pump for boiler distribution
PKGHPH	Heat pump in packaged unit
HPHPTHP	Heat pumps are PTHPs
SPHTPTHP	Space heaters are PTHPs
FURNP_EL	Pct heated by electric furnace
PKGHP_EL	Pct heated by electric packaged unit
BOILP_EL	Pct heated by electric boiler
HTPHP_EL	Pct heated by electric heat pump
SLFCNP_EL	Pct heated by electric space heater
FIREPLP_EL	Pct heated by electric fireplace
REHEATP_EL	Pct heated by electric duct reheat
OTHTP_EL	Pct heated by electric heating equipment
FURNP_NG	Pct heated by natural gas furnace
PKGHP_NG	Pct heated by natural gas packaged unit
BOILP_NG	Pct heated by natural gas boiler
HTPHP_NG	Pct heated by natural gas heat pump
SLFCNP_NG	Pct heated by natural gas space heater
FIREPLP_NG	Pct heated by natural gas fireplace
OTHTP_NG	Pct heated by other natural gas heating equipment
FURNP_FK	Pct heated by fuel oil furnace
BOILP_FK	Pct heated by fuel oil boiler
SLFCNP_FK	Pct heated by fuel oil space heater
OTHTP_FK	Pct heated by other fuel oil heating equipment
FURNP_PR	Pct heated by propane furnace
PKGHP_PR	Pct heated by propane packaged unit
BOILP_PR	Pct heated by propane boiler
HTPHP_PR	Pct heated by propane heat pump
SLFCNP_PR	Pct heated by propane space heater
FIREPLP_PR	Pct heated by propane fireplace
OTHTP_PR	Pct heated by propane heating equipment
STHWP_ST	Pct heated by district steam heating system
STHWP_HW	Pct heated by district hot water heating system
FURNP_WO	Pct heated by wood furnace
SLFCNP_WO	Pct heated by wood space heater
FIREPLP_WO	Pct heated by wood fireplace
OTHTP_WO	Pct heated by other wood heating equipment
FURNP_CO	Pct heated by coal furnace
BOILP_CO	Pct heated by coal boiler
OTHTP_CO	Pct heated by other coal heating equipment
SOTHERMP_SO	Pct heated by solar thermal heating

<b>Variable</b>	<b>Label</b>
FURNP_OT	Pct heated by other source furnace
PKGHP_OT	Pct heated by other source packaged unit
BOILP_OT	Pct heated by other source boiler
SLFCNP_OT	Pct heated by other source space heater
OTHTP_OT	Pct heated by other source other heating equipment
RCAC_EL	Residential-type split system electric A/C
PKGCL_EL	Packaged electric A/C units (rooftop units)
CHILLR_EL	Central chillers powered by electricity
HTPMPC_EL	Heat pumps for A/C (electric)
ACWNWL_EL	Individual room or portable A/C (electric)
EVAPCL_EL	Swamp or evaporative A/C (electric)
OTCLEQ_EL	Other type of A/C powered by electricity
HPCPTHP	Heat pumps (for A/C) are PTHPs
ACVRF	VRF system
RMACPTHP	Individual A/Cs are PTHPs
CHILLR_NG	Central chillers fueled by natural gas
OTCLEQ_NG	Other type of A/C fueled by natural gas
CHILLR_FK	Central chillers fueled by fuel oil
OTCLEQ_FK	Other type of A/C fueled by fuel oil
CHILLR_PR	Central chillers fueled by propane
OTCLEQ_PR	Other type of A/C fueled by propane
CHILLR_ST	Central chillers fueled by district steam
OTCLEQ_ST	Other type of A/C fueled by district steam
OTCLEQ_OT	Other type of A/C powered by other source
DIST_CW	District chilled water system
CWAIR	Central air handlers for chilled water distribution
CWFNCL	Fan coil or induction units for chilled water distribution
CWBEAM	Chilled beam for chilled water distribution
CWWTLP	Water loop heat pump for chilled water distribution
CWOTD	Other type of chilled water distribution
CHLWTLP	Water loop heat pump for central chiller distribution
CHLOTD	Other type of central chiller distribution
RCACP_EL	Pct cooled by electric residential-type split system A/C
PKGCP_EL	Pct cooled by electric packaged A/C units
CHILP_EL	Pct cooled by electric central chillers
HTPCP_EL	Pct cooled by electric heat pumps
ACWNWP_EL	Pct cooled by electric individual A/C
EVAPP_EL	Pct cooled by electric swamp coolers
OTCLP_EL	Pct cooled by electric other type of A/C
CHILP_NG	Pct cooled by natural gas central chillers

<b>Variable</b>	<b>Label</b>
OTCLP_NG	Pct cooled by natural gas other type of A/C
CHILP_FK	Pct cooled by fuel oil central chillers
OTCLP_FK	Pct cooled by fuel oil other type of A/C
CHILP_PR	Pct cooled by propane central chillers
OTCLP_PR	Pct cooled by propane other type of A/C
CHILP_ST	Pct cooled by district steam central chillers
OTCLP_ST	Pct cooled by district steam other type of A/C
CHWTP_CW	Pct cooled by district chilled water system
OTCLP_OT	Pct cooled by other source A/C equipment
EMCSHT	BAS controls heating
EMCSCL	BAS controls A/C
SMRTTHRM	Smart thermostats
VAV	Variable air volume (VAV) system
DOAS	Dedicated outside air system (DOAS)
DCV	Demand controlled ventilation (DCV)
OTGENTECH	Other type of generation technology
GENGT1MW	1MW generator capacity
SNACKSF	Snack bar square footage
FASTFDSF	Fast food square footage
CAFSE	Cafeteria square footage
FDPREPSF	Commercial kitchen square footage
OUTHOSPCT	Percent of outpatient space in hospital
LAPTOP	Laptops
TABLET	Tablets
TABCHRG	Tablets charged in building
TABLETN	Number of tablets
SRVUNIT	Server units
SRVRCLST	Server closet
LGOFFDEV	Large floor-standing office devices
SMOFFDEV	Smaller desktop office devices
LGOFFDEVN	Number of large office devices
SMOFFDEVN	Number of small office devices
WBOARDSN	Number of interactive whiteboards
ATMN	Number of ATMs
LTZHRP	Percent lit no hours
LZHRPC	Lit no hours category
LIT	Lighting used in building
PKLTINOUT	Indoor or outdoor lighted parking
PKLTN	Vehicle parking capacity

## References

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## Appendix

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### Detailed tables created with the public use data: B1 and C1

Estimates calculated from the public use microdata file will not exactly match those published in CBECS data tables, which use unmasked data. For public data users who wish to verify their estimates, select tables are available that use the masked, public use data. We provide Tables B1 and C1 in this document, starting on the next page, each followed by its RSE table. Tables B1 and C1 and additional sample tables with public use data are also available in Excel format on the [CBECS Public Use Microdata File web page](#).

**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Building floorspace (square feet)</b>						
1,001 to 5,000	2,833	8,026	9,717	2.8	676	57
5,001 to 10,000	1,359	10,208	9,085	7.5	982	61
10,001 to 25,000	981	15,840	12,244	16.1	1,225	65
25,001 to 50,000	386	13,959	10,744	36.2	1,279	78
50,001 to 100,000	218	15,304	12,846	70.3	1,166	79
100,001 to 200,000	93	13,015	11,428	140.3	1,124	84
200,001 to 500,000	40	11,775	10,508	293.8	1,109	96
Over 500,000	9	8,401	9,229	957.1	904	115
<b>Principal building activity</b>						
Education	437	13,638	10,370	31.2	1,315	51
Food sales	163	1,005	917	6.2	1,096	110
Food service	286	1,385	2,884	4.8	480	81
Health care	137	4,054	6,778	29.6	598	60
Inpatient	9	2,293	3,718	268.9	617	168
Outpatient	129	1,760	3,059	13.7	575	52
Lodging	207	6,856	2,764	33.1	2,388	165
Mercantile	517	10,865	8,882	21.0	1,223	64
Retail (other than mall)	350	5,193	3,251	14.8	1,597	66
Enclosed and strip malls	167	5,673	5,631	34.0	1,007	61
Office	970	16,579	32,727	17.1	507	54
Public assembly	488	7,105	3,337	14.6	2,056	51
Public order and safety	81	1,534	1,587	18.9	951	131
Religious worship	439	5,473	1,948	12.5	2,657	28
Service	867	6,245	4,736	7.2	1,244	53
Warehouse and storage	1,004	17,717	7,081	17.6	2,255	71
Other	113	2,444	1,598	21.6	1,366	82
Vacant	208	1,628	Q	7.8	Q	5
<b>Year constructed</b>						
Before 1946	709	9,163	8,079	12.9	1,075	49
1946 to 1959	517	6,950	5,487	13.4	1,204	53
1960 to 1969	685	10,413	8,516	15.2	1,163	60
1970 to 1979	831	13,046	10,745	15.7	1,178	59
1980 to 1989	794	13,442	14,684	16.9	880	61
1990 to 1999	921	15,518	13,555	16.8	1,082	65
2000 to 2012	1,104	20,544	18,445	18.6	1,061	69
2013 to 2018	357	7,451	6,290	20.9	1,119	83



**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Census region and division</b>						
Northeast	793	15,986	15,262	20.2	1,009	64
New England	275	3,760	3,616	13.7	986	75
Middle Atlantic	518	12,226	11,646	23.6	1,016	59
Midwest	1,719	25,967	19,755	15.1	1,238	62
East North Central	1,110	17,480	13,753	15.7	1,206	62
West North Central	609	8,487	6,002	13.9	1,309	60
South	2,143	34,942	30,884	16.3	1,088	60
South Atlantic	1,034	17,935	16,464	17.4	1,058	58
East South Central	347	5,428	3,923	15.6	1,295	59
West South Central	762	11,579	10,497	15.2	1,059	63
West	1,264	19,633	19,899	15.5	934	64
Mountain	484	7,588	8,120	15.7	875	69
Pacific	780	12,044	11,780	15.4	974	61
<b>Number of floors</b>						
1	4,106	43,808	34,034	10.7	1,195	61
2	1,286	23,381	18,268	18.2	1,235	61
3	370	10,535	8,316	28.5	1,235	64
4 to 9	142	13,011	15,327	91.9	834	88
10 or more	16	5,793	9,857	366.8	585	109
<b>Elevators and escalators (more than one may apply)</b>						
Any elevators	503	36,367	40,526	72.3	883	79
1 elevator	366	14,257	11,669	39.0	1,199	74
2 to 5 elevators	121	13,313	15,469	110.1	844	92
6 or more elevators	16	8,797	13,388	535.2	653	108
Any escalators	14	3,572	4,184	264.4	841	126
<b>Number of workers (main shift)</b>						
Fewer than 5	3,270	21,083	5,726	6.4	2,899	57
5 to 9	1,116	10,328	7,303	9.3	1,414	62
10 to 19	713	11,353	9,062	15.9	1,253	70
20 to 49	492	16,138	14,185	32.8	1,138	74
50 to 99	201	12,972	12,788	64.6	1,014	73
100 to 249	90	12,654	13,183	140.3	960	82
250 or more	37	12,002	23,553	325.8	510	88

**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Weekly operating hours</b>						
Fewer than 40	1,370	10,770	5,897	7.9	1,418	14
40 to 48	1,483	18,834	16,706	12.7	1,113	42
49 to 60	1,250	22,802	24,676	18.2	918	54
61 to 84	645	14,897	14,676	23.1	999	74
85 to 167	465	10,155	7,655	21.9	1,286	109
Open continuously	705	19,070	16,190	27.0	1,107	168
<b>Ownership and occupancy</b>						
Nongovernment owned	4,982	74,909	66,514	15.0	1,068	63
Owner occupied	3,249	45,382	37,114	14.0	1,168	62
Leased to tenant or tenants	1,581	28,521	29,400	18.0	942	70
Unoccupied	152	1,005		6.6	N	
Government owned	937	21,619	19,286	23.1	1,089	58
<b>Party responsible for operation of energy systems</b>						
Building owner	4,872	79,248	70,394	16.3	1,069	61
Business owner or tenant	831	12,925	10,650	15.5	1,186	62
Property management	97	2,023	2,341	21.0	841	76
Other	118	2,332	2,415	19.7	914	71
<b>Provider of direct input on energy-related equipment purchases</b>						
Building owner	5,127	82,822	73,200	16.2	1,076	61
Business owner or tenant	483	7,687	6,390	15.9	1,165	60
Property management	49	1,079	1,201	22.1	883	76
Other	260	4,940	5,010	19.0	952	71
<b>Number of establishments</b>						
1	4,719	65,495	50,340	13.9	1,240	64
2 to 5	811	16,437	16,006	20.3	1,016	60
6 to 10	135	5,472	7,286	40.5	743	67
11 to 20	63	3,901	5,725	61.8	680	83
More than 20	19	4,039	6,444	208.7	627	76
Currently unoccupied	170	1,183		6.9	N	

**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Campus or complex activity</b>						
Not part of a campus or complex	3,622	56,602	50,291	15.6	1,087	60
Primary or secondary school	247	5,108	3,681	20.7	1,377	42
College or university	103	3,768	2,700	36.6	1,341	85
Office complex	141	3,818	8,516	27.2	439	64
Retail complex	250	4,624	4,171	18.5	1,074	55
Storage complex	418	5,840	1,933	14.0	2,400	91
Religious campus or complex	253	3,211	1,692	12.7	1,819	30
Health care complex	60	2,896	4,515	48.0	640	80
Lodging or resort complex	102	1,505	758	14.7	1,804	120
Transportation complex	36	767	599	21.4	1,079	93
Government complex	124	1,714	1,676	13.8	941	61
Other	563	6,677	5,270	11.9	1,188	62
<b>Predominant exterior wall material</b>						
Brick, stone, or stucco	2,490	46,181	43,806	18.5	1,022	61
Concrete (block or poured)	935	19,283	14,998	20.6	1,249	65
Concrete panels	137	8,477	8,022	61.7	1,049	63
Siding or shingles	948	6,009	5,220	6.3	1,049	57
Metal panels	1,250	12,284	6,584	9.8	1,590	64
Window glass	19	2,178	4,629	112.8	465	72
Other	139	2,117	2,541	15.2	795	61
<b>Predominant roof material</b>						
Metal surfacing	2,198	21,019	12,924	9.6	1,430	59
Synthetic or rubber	940	31,613	31,636	33.6	986	68
Built-up	708	19,287	19,619	27.2	962	63
Slate or tile shingles	376	3,994	3,749	10.6	990	61
Wooden materials (including shingles)	166	1,568	1,496	9.5	939	78
Asphalt, fiberglass, or other shingles	1,311	14,071	11,506	10.7	1,177	58
Concrete	83	1,979	1,931	23.8	1,015	88
Other	136	2,996	2,939	22.0	979	61
<b>Roof tilt</b>						
Flat	1,914	54,195	55,716	28.3	952	67
Shallow pitch	2,313	27,758	19,617	12.0	1,303	64
Steeper pitch	1,691	14,574	10,467	8.6	1,283	53

**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Renovations since 2000 (more than one may apply)</b>						
Any type of renovation	2,032	45,065	44,932	22.2	983	63
Addition or annex	327	10,914	9,526	33.3	1,135	63
Reduction in floorspace	35	1,745	2,319	50.0	753	63
Roof replacement	847	20,768	20,292	24.5	996	62
Interior wall reconfiguration	709	21,127	25,711	29.8	813	59
Window replacement	484	10,652	11,272	22.0	935	63
HVAC equipment upgrade	1,006	27,398	28,597	27.2	942	62
Lighting upgrade	1,012	28,953	30,391	28.6	942	66
Electrical upgrade	565	15,610	16,976	27.6	906	62
Plumbing system upgrade	584	15,353	17,029	26.3	888	65
Insulation upgrade	307	7,664	8,372	25.0	897	62
Fire, safety, or security upgrade	570	19,806	20,816	34.7	943	71
Structural upgrade	147	4,030	5,053	27.4	782	65
Other	43	1,172	1,027	27.4	1,109	81
No renovations	3,530	44,012	34,579	12.5	1,181	59
Buildings constructed 2013 or later	357	7,451	6,290	20.9	1,119	83
<b>Energy sources (more than one may apply)</b>						
Electricity	5,613	94,949	85,698	16.9	1,070	62
Natural gas	2,974	67,743	60,658	22.8	1,097	64
Fuel oil	583	21,120	24,351	36.2	856	71
District heat	86	6,685	7,615	77.4	865	79
District chilled water	55	4,189	4,621	75.7	893	74
Propane	676	10,049	6,976	14.9	1,397	61
Wood	105	758	671	7.2	1,047	50
Coal	Q	Q	Q	Q	Q	Q
Solar	99	3,754	3,895	37.9	955	84
Other	79	1,322	1,067	16.8	1,219	74
<b>Space-heating energy sources (more than one may apply)</b>						
Electricity	2,563	45,412	45,560	17.7	981	63
Natural gas	2,587	57,993	50,519	22.4	1,128	62
Fuel oil	266	4,144	3,709	15.6	1,088	60
District heat	83	6,470	7,357	78.4	867	80
Propane	431	3,858	2,736	8.9	1,325	51
Wood	85	422	222	4.9	1,645	49
Coal	Q	Q	Q	Q	Q	Q
Solar	Q	Q	Q	Q	Q	Q
Other	40	443	273	11.1	1,626	54

**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Primary space-heating energy source</b>						
Electricity	1,856	27,651	28,922	14.9	937	64
Natural gas	2,344	50,160	42,703	21.4	1,153	61
Fuel oil	222	2,228	1,652	10.0	1,283	62
District heat	78	6,008	6,884	77.0	859	79
Propane	338	2,295	1,692	6.8	1,243	47
Wood	Q	Q	Q	Q	Q	Q
Coal	Q	Q	Q	Q	Q	Q
Solar	N	N	N	N	N	N
Other	Q	Q	Q	Q	Q	Q
<b>Cooling energy sources (more than one may apply)</b>						
Electricity	4,584	84,671	79,756	18.5	1,043	63
Natural gas	4	404	306	92.0	1,320	55
District chilled water	55	4,189	4,621	75.7	893	74
<b>Water-heating energy sources (more than one may apply)</b>						
Electricity	2,785	47,314	46,401	17.0	1,003	59
Natural gas	1,885	46,558	42,123	24.7	1,091	69
Fuel oil	72	1,821	1,889	25.3	954	87
District heat	38	4,140	5,016	107.9	821	83
Propane	145	1,948	1,855	13.4	1,034	69
<b>Cooking energy sources (more than one may apply)</b>						
Electricity	1,216	30,412	29,365	25.0	1,020	74
Natural gas	727	27,604	26,317	38.0	1,047	80
Propane	159	3,051	2,430	19.2	1,234	75
<b>Energy end uses (more than one may apply)</b>						
Buildings with space heating	4,901	88,722	82,083	18.1	1,058	61
Buildings with cooling	4,631	87,610	82,840	18.9	1,039	63
Buildings with water heating	4,595	87,798	82,240	19.1	1,051	63
Buildings with cooking	1,738	43,404	41,394	25.0	1,035	74
Buildings with manufacturing	322	6,845	4,922	21.3	1,385	56
Buildings with electricity generation	706	29,437	32,525	41.7	897	82
Buildings with lighting	5,503	94,208	85,622	17.1	1,066	61

**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Percentage of floorspace heated</b>						
Not heated	1,017	7,806	3,718	7.7	1,402	64
1 to 50%	693	10,615	6,403	15.3	1,604	56
51 to 99%	905	20,030	20,221	22.1	979	62
100%	3,303	58,077	55,459	17.6	1,024	62
<b>Percentage of floorspace cooled</b>						
Not cooled	1,288	8,918	2,961	6.9	2,022	57
1 to 50%	1,111	19,868	10,727	17.9	1,796	56
51 to 99%	998	26,304	26,614	26.4	984	67
100%	2,522	41,438	45,498	16.4	892	65
<b>Percentage lit when open</b>						
0%	Q	Q	Q	Q	Q	Q
1 to 50%	1,280	14,248	6,476	11.1	2,093	60
51 to 99%	1,784	38,817	38,064	21.8	1,008	64
100%	2,272	39,921	41,031	17.6	956	64
Building never open or electricity not used	513	3,013	183	5.9	2,909	39
<b>Percentage lit during off hours</b>						
0%	2,062	15,585	10,347	7.6	1,377	49
1 to 50%	3,246	69,846	67,190	21.5	1,019	66
51 to 100%	240	7,270	6,388	30.3	1,071	82
Building always open with no off hours	64	2,248	1,773	34.9	1,233	168
Electricity not used	305	1,579	103	5.2	Q	66
<b>Heating equipment (more than one may apply)</b>						
Packaged heating units	2,187	48,060	44,325	22.0	1,074	67
Furnaces	1,621	17,261	13,510	10.7	1,214	53
Individual space heaters	1,246	21,031	17,143	16.9	1,206	59
Boilers	703	28,686	28,104	40.8	1,010	71
Heat pumps	673	15,054	14,705	22.4	1,009	67
District heat	83	6,470	7,357	78.4	867	80
Duct reheat	134	7,366	9,765	54.8	748	61
Other	17	824	704	48.9	1,170	87

**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Cooling equipment (more than one may apply)</b>						
Packaged air-conditioning units	2,565	56,520	53,392	22.0	1,047	66
Residential-type central air conditioners	1,309	18,249	16,457	13.9	1,080	58
Individual air conditioners	735	13,705	10,104	18.6	1,337	69
Central chillers	202	17,828	21,604	88.4	820	75
Heat pumps	492	11,190	11,717	22.7	936	65
District chilled water	55	4,189	4,621	75.7	893	74
Swamp coolers	85	2,117	2,103	25.0	975	59
Other	Q	Q	Q	Q	Q	Q
<b>HVAC features (more than one may apply)</b>						
Economizer cycle	747	34,045	37,090	45.6	912	76
Variable air volume (VAV) system	698	29,227	34,865	41.9	830	70
Dedicated outside air system (DOAS)	249	8,966	9,488	36.1	932	72
Demand controlled ventilation (DCV)	349	10,487	9,917	30.1	1,042	67
Regular HVAC maintenance	3,554	78,114	75,324	22.0	1,020	66
Building automation system (BAS) controls heating or cooling	933	40,488	44,384	43.4	905	69
Internet-connected or smart thermostat	325	5,907	4,778	18.2	1,199	68
Programmable thermostat	1,545	21,015	17,370	13.6	1,189	62
<b>Main equipment replaced since 2000 (more than one may apply)</b>						
Heating	1,937	32,455	29,362	16.8	1,084	58
Cooling	1,269	22,885	21,868	18.0	1,030	61
<b>Water-heating equipment</b>						
Centralized system	3,538	59,156	52,648	16.7	1,103	64
Distributed system	782	14,515	14,217	18.6	1,006	60
Combination of centralized and distributed systems	274	14,127	15,374	51.5	912	67
<b>Generation technologies (more than one may apply)</b>						
Reciprocating engine generators	580	25,119	28,245	43.3	881	81
Solar panels	94	3,685	3,828	39.2	953	80
Other generation technology	43	2,124	2,260	49.4	932	97

**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Lighting equipment types (more than one may apply)</b>						
Incandescent	1,100	21,033	20,164	19.1	1,013	59
Standard fluorescent	4,012	73,068	67,299	18.2	1,056	60
Compact fluorescent	1,130	33,766	35,101	29.9	948	70
High-intensity discharge (HID)	238	11,292	9,626	47.4	1,153	65
Halogen	552	14,995	15,070	27.2	984	65
LED	2,593	61,883	61,181	23.9	997	68
Other	Q	Q	Q	Q	Q	Q
<b>Refrigeration equipment (more than one may apply)</b>						
Any refrigeration	3,850	77,646	73,302	20.2	1,047	64
Walk-in units	706	29,297	29,907	41.5	978	92
Cases or cabinets	837	28,476	29,482	34.0	965	82
Large cold storage areas	69	3,454	2,812	50.1	1,225	102
Commercial ice makers	872	34,607	34,993	39.7	984	82
Residential-type or compact units	3,321	64,772	62,261	19.5	1,027	61
Vending machines	800	42,084	42,189	52.6	994	81
No refrigeration	2,068	18,882	12,499	9.1	1,226	58
<b>Office equipment (more than one may apply)</b>						
Desktop computers	3,804	82,128	78,809	21.6	1,037	66
With multiple monitors	1,504	50,852	56,473	33.8	897	65
Laptop computers	2,786	69,484	70,098	24.9	982	64
Dedicated servers	1,400	51,587	56,722	36.8	908	69
Tablets charged in building	1,556	48,749	51,637	31.3	939	68
Large floor-standing office devices <sup>b</sup>	1,456	54,103	58,121	37.2	930	65
Smaller desktop office devices <sup>b</sup>	3,560	74,523	71,352	20.9	1,040	65
Interactive whiteboards	262	16,640	18,547	63.5	896	65
Televisions or video displays	2,451	63,641	63,783	26.0	989	71
Point-of-sale devices or cash registers	1,420	33,483	35,939	23.6	930	74



**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62
<b>Food preparation or serving areas in non-food service buildings (more than one may apply)</b>						
Snack bar, concession stand, or coffee shop	144	10,112	10,557	70.0	958	88
Fast food or small restaurant	160	9,514	10,719	59.3	888	87
Cafeteria or large restaurant	129	14,313	15,113	110.7	947	67
Commercial kitchen or food preparation area	284	17,451	15,217	61.4	1,146	88
Small kitchen area	1,018	20,266	18,568	19.9	1,062	70
<b>Separate computer areas (more than one may apply)</b>						
Server closet	1,237	48,679	52,027	39.3	933	67
Data center	116	11,244	14,422	97.1	780	88
Computer-based training room	228	16,504	17,122	72.4	964	72
Student or public computer center	236	12,460	9,809	52.8	1,270	64
<b>Window and interior lighting features (more than one may apply)</b>						
Multipaned windows	3,527	72,805	68,951	20.6	1,033	62
Tinted window glass	1,679	44,426	46,860	26.5	932	61
Reflective window glass	497	17,726	20,929	35.7	838	71
External overhangs or awnings	1,513	28,666	26,673	18.9	1,059	61
Skylights or atriums	509	19,844	18,371	39.0	1,063	67
Light scheduling	910	33,376	36,429	36.7	907	71
Occupancy sensors	1,025	44,361	46,618	43.3	943	71
Multilevel lighting or dimming	332	14,282	15,646	43.0	908	63
Daylight harvesting	138	7,124	9,584	51.7	737	69
Plug-load control	58	1,934	2,152	33.6	891	67
Demand responsive lighting	98	2,053	2,035	20.9	990	63
Building automation system (BAS) for lighting	317	16,512	18,670	52.1	882	76

**Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	Number of buildings (thousand)	Total floorspace (million square feet)	Total workers (thousand)	Mean square feet per building (thousand)	Mean square feet per worker <sup>a</sup>	Mean operating hours per week
<b>All buildings</b>	5,918	96,528	85,801	16.3	1,073	62

Data source: U.S. Energy Information Administration, Form EIA-871A of the 2018 *Commercial Buildings Energy Consumption Survey*

Notes: Because of rounding, data may not sum to totals. The *Guide to the 2018 CBECS Tables* and *CBECS Terminology* contain definitions of terms used in these tables and comparisons between previous CBECS tables. You can access both references from <http://www.eia.gov/consumption/commercial/data/2018/>.

Data are sample survey estimates with relative standard errors published in a tab on the Excel worksheet for this table.

<sup>a</sup>Buildings with zero workers are excluded from this column.

<sup>b</sup>*Office devices* refers to any combination of printers, copiers, scanners, or FAX machines.

Q = Data withheld either because the relative standard error was greater than 50% or the reporting sample had fewer than 20 buildings.

N = No buildings in reporting sample.

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Building floorspace (square feet)</b>						
1,001 to 5,000	4.9	5.3	5.7	1.9	4.4	3.2
5,001 to 10,000	5.9	5.8	5.6	1.3	5.7	4.9
10,001 to 25,000	5.6	6.1	7.9	1.6	5.4	4.3
25,001 to 50,000	5.6	5.6	6.6	0.9	5.6	3.4
50,001 to 100,000	5.3	5.3	6.9	1.0	4.7	2.6
100,001 to 200,000	5.6	5.5	7.0	0.9	5.6	2.5
200,001 to 500,000	5.0	5.0	6.2	1.0	5.0	2.2
Over 500,000	7.8	8.1	7.8	3.4	6.5	3.0
<b>Principal building activity</b>						
Education	7.8	5.3	5.9	6.8	3.1	2.7
Food sales	14.3	17.0	16.1	12.9	11.4	4.6
Food service	7.7	8.5	9.4	5.7	5.8	3.5
Health care	9.8	5.5	6.1	8.7	3.7	4.1
Inpatient	19.4	7.2	8.2	18.4	5.0	0.0
Outpatient	10.3	8.0	8.9	8.4	5.9	3.7
Lodging	9.4	8.1	10.5	9.3	6.4	1.7
Mercantile	7.3	5.9	6.7	6.7	3.5	3.6
Retail (other than mall)	10.1	8.6	10.0	7.5	5.9	5.1
Enclosed and strip malls	7.6	7.6	7.6	8.5	4.4	3.3
Office	7.2	5.4	5.5	6.8	2.3	2.5
Public assembly	9.1	5.8	9.2	7.0	7.5	6.1
Public order and safety	20.2	15.8	20.4	17.3	12.8	8.7
Religious worship	9.5	9.3	12.4	6.4	9.6	14.7
Service	7.4	8.1	8.4	6.5	6.6	3.3
Warehouse and storage	7.4	7.3	7.2	7.2	6.3	6.1
Other	17.1	15.2	22.5	15.3	13.7	13.8
Vacant	17.2	14.1	56.7	12.4	101.3	28.2
<b>Year constructed</b>						
Before 1946	8.6	7.6	10.1	6.6	5.4	5.7
1946 to 1959	8.1	7.6	9.7	6.6	7.3	6.0
1960 to 1969	6.4	5.2	5.3	5.4	4.8	4.4
1970 to 1979	7.4	6.0	6.6	5.6	5.5	6.6
1980 to 1989	7.0	5.8	5.5	6.1	4.2	4.4
1990 to 1999	7.5	6.6	6.7	4.7	4.3	5.4
2000 to 2012	7.8	5.9	7.0	5.3	4.2	4.6
2013 to 2018	11.9	8.4	11.5	10.2	8.7	6.9

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Census region and division</b>						
Northeast	9.9	7.1	6.8	7.0	3.9	4.0
New England	17.8	10.8	9.4	9.7	7.5	5.0
Middle Atlantic	12.0	8.8	8.3	8.5	4.6	4.3
Midwest	10.9	7.4	7.0	6.6	4.8	4.9
East North Central	13.1	10.4	9.7	6.3	6.5	5.8
West North Central	21.0	8.2	6.5	16.5	6.0	9.0
South	7.7	6.1	6.7	4.1	3.4	3.3
South Atlantic	11.0	6.8	8.3	6.8	4.6	4.0
East South Central	18.0	20.2	14.0	3.5	9.0	6.2
West South Central	14.7	11.6	13.7	8.3	5.5	7.1
West	8.1	7.1	7.0	5.7	4.2	3.9
Mountain	15.9	13.0	14.7	12.0	5.6	6.2
Pacific	9.0	8.1	6.1	5.1	5.7	4.6
<b>Number of floors</b>						
1	4.3	4.5	4.7	2.7	2.8	2.8
2	5.8	4.4	5.5	3.9	4.4	4.7
3	10.5	7.6	8.8	6.9	6.4	5.4
4 to 9	9.4	6.3	7.1	7.3	4.5	5.0
10 or more	9.8	10.5	9.2	6.9	5.7	4.2
<b>Elevators and escalators (more than one may apply)</b>						
Any elevators	6.5	4.4	5.0	4.2	2.7	3.3
1 elevator	7.7	6.0	7.8	4.5	4.8	4.7
2 to 5 elevators	6.7	5.2	6.8	3.5	4.7	3.5
6 or more elevators	7.8	7.9	7.4	4.1	4.2	3.2
Any escalators	28.9	13.3	15.0	35.7	10.1	12.6
<b>Number of workers (main shift)</b>						
Fewer than 5	5.5	5.9	6.0	3.1	4.3	3.6
5 to 9	6.1	6.9	6.1	4.4	4.6	3.0
10 to 19	6.5	7.4	6.5	5.3	5.0	3.8
20 to 49	6.3	4.8	6.1	4.3	3.9	3.4
50 to 99	6.7	5.9	6.6	4.4	4.2	2.8
100 to 249	7.1	5.7	7.1	4.4	4.6	2.4
250 or more	7.2	6.1	6.2	5.3	3.4	3.1

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Weekly operating hours</b>						
Fewer than 40	6.1	6.6	10.0	4.9	8.4	5.4
40 to 48	6.2	5.1	5.4	4.4	4.4	0.4
49 to 60	5.2	4.3	4.5	4.0	3.4	0.4
61 to 84	7.6	5.3	6.5	5.9	4.8	0.6
85 to 167	8.6	6.3	6.8	7.6	5.5	1.2
Open continuously	8.1	4.9	5.1	7.1	3.9	0.0
<b>Ownership and occupancy</b>						
Nongovernment owned	3.8	3.3	3.2	2.9	2.4	2.0
Owner occupied	4.3	3.3	3.3	3.5	2.8	2.4
Leased to tenant or tenants	5.5	4.8	4.9	4.4	3.6	3.4
Unoccupied	20.3	19.2	0.0	15.2	0.0	0.0
Government owned	9.5	6.0	8.2	5.9	3.9	5.1
<b>Party responsible for operation of energy systems</b>						
Building owner	4.4	3.1	3.6	2.9	2.3	2.4
Business owner or tenant	6.5	7.3	7.6	5.7	5.5	4.1
Property management	20.7	11.6	13.3	18.5	9.0	15.4
Other	18.8	11.3	17.1	16.0	13.1	21.4
<b>Provider of direct input on energy-related equipment purchases</b>						
Building owner	4.4	3.1	3.6	2.8	2.3	2.2
Business owner or tenant	8.9	9.0	9.1	7.2	6.7	4.9
Property management	25.5	16.2	17.0	25.4	11.5	15.6
Other	10.5	8.2	10.1	9.0	8.3	10.6
<b>Number of establishments</b>						
1	4.6	3.7	4.5	2.8	3.0	2.3
2 to 5	6.0	5.2	5.8	5.4	4.4	3.4
6 to 10	11.5	7.9	9.5	8.6	6.7	5.6
11 to 20	17.9	8.7	10.3	14.8	4.7	9.4
More than 20	18.6	9.7	11.4	14.2	6.3	5.2
Currently unoccupied	18.7	16.5	0.0	13.8	0.0	0.0

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Campus or complex activity</b>						
Not part of a campus or complex	4.3	3.7	3.9	3.1	2.7	2.0
Primary or secondary school	12.1	9.4	11.1	8.0	6.1	5.0
College or university	21.8	15.9	17.1	19.6	9.0	16.6
Office complex	12.7	10.0	11.7	12.6	5.0	11.2
Retail complex	13.2	9.1	10.7	11.2	6.5	6.9
Storage complex	14.4	11.2	17.9	10.5	14.7	8.2
Religious campus or complex	11.5	12.0	21.0	7.3	18.9	12.2
Health care complex	18.0	8.2	8.9	16.0	5.3	10.5
Lodging or resort complex	15.1	14.3	20.4	16.0	17.9	8.7
Transportation complex	34.3	33.9	31.7	44.1	23.2	17.0
Government complex	18.1	16.9	15.3	17.8	14.5	14.0
Other	9.2	7.3	9.2	8.6	7.0	9.5
<b>Predominant exterior wall material</b>						
Brick, stone, or stucco	5.3	3.8	5.0	3.3	2.6	3.0
Concrete (block or poured)	5.3	4.7	4.5	5.0	4.2	3.3
Concrete panels	12.1	8.5	10.8	11.5	8.6	7.0
Siding or shingles	7.3	9.3	10.5	6.5	8.3	5.3
Metal panels	7.6	6.1	8.5	5.6	6.5	5.8
Window glass	21.3	11.0	13.9	20.7	6.8	5.6
Other	14.7	13.1	14.2	11.4	10.1	11.6
<b>Predominant roof material</b>						
Metal surfacing	6.2	5.6	6.6	3.6	4.3	4.1
Synthetic or rubber	6.0	4.0	5.4	4.7	3.2	3.0
Built-up	7.7	4.7	4.7	6.3	3.5	4.0
Slate or tile shingles	10.1	10.1	11.0	7.3	8.9	5.5
Wooden materials (including shingles)	12.9	17.8	16.1	12.6	12.7	9.3
Asphalt, fiberglass, or other shingles	6.2	5.6	7.1	4.1	5.2	5.0
Concrete	20.6	11.9	12.6	17.5	10.9	14.8
Other	15.6	10.2	13.1	11.4	9.4	10.4
<b>Roof tilt</b>						
Flat	4.9	3.2	3.9	4.0	2.3	3.0
Shallow pitch	5.0	4.8	4.8	3.8	3.3	3.4
Steeper pitch	7.5	5.7	7.4	4.1	6.0	3.9

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Renovations since 2000 (more than one may apply)</b>						
Any type of renovation	5.0	3.4	3.5	3.6	2.7	3.0
Addition or annex	9.4	5.8	5.4	7.5	4.8	4.8
Reduction in floorspace	22.2	12.5	16.5	20.2	11.6	12.7
Roof replacement	6.8	4.3	4.7	5.1	3.7	4.9
Interior wall reconfiguration	6.0	4.0	4.4	4.7	3.0	3.3
Window replacement	9.5	5.5	6.0	8.2	4.1	6.6
HVAC equipment upgrade	7.0	4.1	3.9	5.3	2.8	4.9
Lighting upgrade	5.9	3.9	3.7	4.4	2.7	3.0
Electrical upgrade	7.1	5.4	5.2	5.9	3.6	4.3
Plumbing system upgrade	7.8	4.8	5.1	6.6	3.2	4.8
Insulation upgrade	9.2	7.2	8.5	9.0	4.9	6.7
Fire, safety, or security upgrade	6.2	4.3	4.6	5.1	3.2	3.6
Structural upgrade	13.9	8.8	10.6	12.9	7.5	8.5
Other	29.5	14.9	15.3	27.4	10.5	24.5
No renovations	4.3	3.9	4.8	2.9	2.4	3.0
Buildings constructed 2013 or later	11.9	8.4	11.5	10.2	8.7	6.9
<b>Energy sources (more than one may apply)</b>						
Electricity	3.9	3.0	3.3	2.6	2.1	2.0
Natural gas	4.8	3.4	3.4	3.2	2.4	2.4
Fuel oil	9.7	5.2	5.9	9.0	3.4	5.1
District heat	14.7	11.2	10.4	11.9	5.5	5.6
District chilled water	20.1	14.2	13.5	15.6	7.2	6.1
Propane	10.0	7.5	8.4	8.1	4.8	5.8
Wood	24.8	21.4	21.8	16.1	15.5	11.9
Coal	78.7	76.5	69.2	100.5	78.6	166.2
Solar	15.5	11.2	13.0	13.6	6.4	10.0
Other	22.9	18.1	21.0	16.5	15.7	15.1

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Space-heating energy sources (more than one may apply)</b>						
Electricity	4.7	3.7	4.1	3.5	2.8	2.6
Natural gas	5.2	3.6	3.7	3.4	2.6	2.5
Fuel oil	13.9	11.6	14.6	12.2	9.6	6.9
District heat	15.4	11.4	10.4	12.6	5.7	5.9
Propane	13.5	12.6	14.4	10.3	8.4	9.1
Wood	27.2	27.3	26.5	12.1	18.8	10.7
Coal	62.8	64.2	62.8	6.3	6.3	0.0
Solar	90.2	61.7	69.1	361.9	109.2	49.3
Other	34.5	31.7	26.8	18.7	21.0	10.8
<b>Primary space-heating energy source</b>						
Electricity	6.4	5.5	5.5	4.2	4.3	3.4
Natural gas	5.5	4.1	4.0	3.7	2.8	2.7
Fuel oil	16.1	15.2	14.7	13.2	9.3	7.4
District heat	15.8	12.4	12.5	13.5	6.1	5.8
Propane	17.5	16.9	19.2	11.5	11.7	14.1
Wood	33.4	32.9	38.7	14.2	35.2	9.0
Coal	62.8	64.2	62.8	6.3	6.3	0.0
Solar	0.0	0.0	0.0	0.0	0.0	0.0
Other	42.1	51.1	38.7	20.9	29.2	7.8
<b>Cooling energy sources (more than one may apply)</b>						
Electricity	3.9	3.0	3.2	2.7	2.1	1.9
Natural gas	37.3	24.2	20.6	46.6	18.4	28.6
District chilled water	20.1	14.2	13.5	15.6	7.2	6.1
<b>Water-heating energy sources (more than one may apply)</b>						
Electricity	4.0	3.6	3.7	3.2	2.8	2.8
Natural gas	5.5	3.8	4.1	3.8	2.5	2.4
Fuel oil	24.0	15.2	22.2	22.0	15.0	15.7
District heat	17.4	12.1	12.7	13.2	6.5	8.4
Propane	15.8	14.7	17.5	12.1	11.2	10.1
<b>Cooking energy sources (more than one may apply)</b>						
Electricity	5.7	3.8	4.3	4.1	2.7	3.1
Natural gas	5.4	3.4	4.2	4.8	2.9	3.5
Propane	14.8	11.9	13.8	12.0	9.3	7.6



**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Energy end uses (more than one may apply)</b>						
Buildings with space heating	4.1	3.0	3.3	2.8	2.2	1.8
Buildings with cooling	3.9	3.0	3.3	2.6	2.1	1.9
Buildings with water heating	3.9	2.9	3.3	2.5	2.1	1.9
Buildings with cooking	5.0	3.0	3.6	3.7	2.2	2.9
Buildings with manufacturing	11.3	7.9	9.1	10.5	5.8	4.7
Buildings with electricity generation	7.4	4.3	4.9	6.6	3.0	4.7
Buildings with lighting	3.9	3.0	3.3	2.7	2.1	1.9
<b>Percentage of floorspace heated</b>						
Not heated	8.2	10.0	13.0	5.8	9.5	7.2
1 to 50%	8.5	7.1	8.8	7.1	7.1	4.9
51 to 99%	6.7	5.3	5.8	5.4	4.0	3.7
100%	4.1	3.2	3.7	2.9	2.7	2.1
<b>Percentage of floorspace cooled</b>						
Not cooled	7.1	8.0	10.8	5.9	9.9	7.3
1 to 50%	5.9	5.3	5.1	5.2	3.6	3.1
51 to 99%	6.6	5.0	5.5	5.0	3.1	3.1
100%	4.3	3.5	4.3	3.2	3.0	2.6
<b>Percentage lit when open</b>						
0%	35.1	38.5	48.3	25.5	41.5	13.4
1 to 50%	6.7	6.0	6.9	5.1	7.1	3.3
51 to 99%	4.8	3.6	4.3	3.7	2.5	2.7
100%	4.7	3.8	4.1	3.8	2.9	2.7
Building never open or electricity not used	11.6	12.1	21.4	7.2	16.0	17.9
<b>Percentage lit during off hours</b>						
0%	6.5	6.7	6.9	3.8	5.0	4.6
1 to 50%	3.8	3.0	3.6	2.7	2.4	2.0
51 to 100%	10.6	6.7	8.0	10.4	6.1	9.1
Building always open with no off hours	15.2	11.5	12.7	14.6	11.7	0.0
Electricity not used	16.0	17.6	29.5	10.1	23.1	15.1

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Heating equipment (more than one may apply)</b>						
Packaged heating units	4.0	3.6	3.7	3.2	2.9	2.2
Furnaces	7.2	5.7	6.7	5.2	4.8	4.0
Individual space heaters	5.9	4.8	6.3	4.2	4.2	2.8
Boilers	6.2	3.9	4.6	5.2	2.9	3.5
Heat pumps	7.7	5.2	5.6	6.0	4.0	5.1
District heat	15.4	11.4	10.4	12.6	5.7	5.9
Duct reheat	12.6	6.9	8.0	11.3	5.1	9.2
Other	46.4	24.1	27.0	41.5	14.9	17.9
<b>Cooling equipment (more than one may apply)</b>						
Packaged air-conditioning units	4.3	3.5	3.6	3.4	2.6	2.3
Residential-type central air conditioners	7.6	5.3	6.0	4.9	3.9	4.6
Individual air conditioners	6.6	5.4	5.7	5.6	4.6	3.7
Central chillers	9.0	4.7	5.1	8.3	3.0	4.8
Heat pumps	11.0	6.6	7.3	9.4	5.2	6.7
District chilled water	20.1	14.2	13.5	15.6	7.2	6.1
Swamp coolers	12.8	13.2	14.2	11.3	10.0	11.2
Other	53.2	36.5	43.3	67.0	14.4	23.8
<b>HVAC features (more than one may apply)</b>						
Economizer cycle	5.6	3.9	4.5	5.1	2.8	3.3
Variable air volume (VAV) system	8.4	4.9	5.7	7.0	3.0	3.8
Dedicated outside air system (DOAS)	11.0	7.6	9.0	9.8	5.6	7.4
Demand controlled ventilation (DCV)	8.8	5.5	7.1	7.7	5.2	6.0
Regular HVAC maintenance	4.2	3.2	3.7	2.8	2.3	1.7
Building automation system (BAS) controls heating or cooling	6.4	3.6	4.5	5.0	2.5	2.9
Internet-connected or smart thermostat	12.2	10.3	13.9	8.1	8.9	6.5
Programmable thermostat	4.7	5.5	5.2	3.8	4.2	3.2
<b>Main equipment replaced since 2000 (more than one may apply)</b>						
Heating	4.9	3.8	3.9	3.7	3.0	3.3
Cooling	4.8	4.1	5.0	4.2	3.2	3.3

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Water-heating equipment</b>						
Centralized system	4.4	3.4	4.3	2.7	2.6	2.4
Distributed system	8.9	6.4	7.5	6.8	4.8	3.8
Combination of centralized and distributed systems	8.8	5.2	6.1	7.2	4.4	5.3
<b>Generation technologies (more than one may apply)</b>						
Reciprocating engine generators	8.8	4.7	5.0	8.1	3.4	5.6
Solar panels	15.4	11.3	13.3	13.3	6.5	9.8
Other generation technology	21.3	14.5	16.6	17.1	8.4	10.7
<b>Lighting equipment types (more than one may apply)</b>						
Incandescent	7.8	4.4	6.0	6.1	4.0	4.5
Standard fluorescent	4.2	3.4	3.6	2.8	2.4	2.3
Compact fluorescent	5.2	4.1	5.1	4.4	2.6	3.3
High-intensity discharge (HID)	9.8	6.9	8.1	8.9	5.4	7.7
Halogen	8.0	4.1	4.5	7.5	4.0	4.8
LED	3.6	2.9	3.6	2.9	2.3	2.1
Other	57.3	24.0	35.0	71.8	20.0	10.3
<b>Refrigeration equipment (more than one may apply)</b>						
Any refrigeration	4.1	3.0	3.5	2.8	2.2	1.8
Walk-in units	5.4	3.3	3.8	4.7	2.6	2.1
Cases or cabinets	5.8	3.7	4.1	4.6	2.8	3.0
Large cold storage areas	17.2	10.3	11.4	15.8	6.2	6.3
Commercial ice makers	5.5	3.4	4.5	4.6	2.9	2.6
Residential-type or compact units	4.3	3.1	3.8	3.0	2.5	2.1
Vending machines	6.1	3.7	4.5	4.9	2.9	2.5
No refrigeration	5.3	5.4	6.8	4.6	6.5	5.3

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Office equipment (more than one may apply)</b>						
Desktop computers	4.0	2.9	3.4	2.7	2.2	1.8
With multiple monitors	5.0	3.5	4.1	3.8	2.4	2.8
Laptop computers	4.0	3.0	3.6	2.9	2.3	2.0
Dedicated servers	4.9	3.2	3.7	4.0	2.5	2.3
Tablets charged in building	4.4	3.2	4.1	3.6	2.2	2.7
Large floor-standing office devices <sup>b</sup>	4.4	3.0	3.6	3.7	2.4	2.3
Smaller desktop office devices <sup>b</sup>	4.1	3.1	3.6	2.7	2.3	1.9
Interactive whiteboards	8.7	4.5	5.2	7.3	3.2	4.2
Televisions or video displays	3.8	3.0	3.6	3.0	2.4	1.8
Point-of-sale devices or cash registers	5.2	3.3	3.9	4.3	2.8	2.4
<b>Food preparation or serving areas in non-food service buildings (more than one may apply)</b>						
Snack bar, concession stand, or coffee shop	11.0	6.2	8.2	10.9	4.7	6.2
Fast food or small restaurant	9.4	5.6	6.4	9.6	4.5	5.1
Cafeteria or large restaurant	7.7	4.5	5.4	7.1	3.7	5.6
Commercial kitchen or food preparation area	8.5	4.2	5.1	7.1	3.2	5.1
Small kitchen area	6.5	4.6	5.7	4.9	3.7	4.3
<b>Separate computer areas (more than one may apply)</b>						
Server closet	5.3	3.3	3.7	4.3	2.4	2.2
Data center	13.1	6.4	6.3	13.5	4.5	10.0
Computer-based training room	8.4	4.5	4.9	7.6	3.1	4.2
Student or public computer center	8.0	4.4	5.2	8.3	3.2	4.7

**Relative Standard Errors (RSEs) for Table B1. Summary table: total and means of floorspace, number of workers, and hours of operation, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for number of buildings	RSEs for total floorspace	RSEs for total workers	RSEs for mean square feet per building	RSEs for mean square feet per worker <sup>a</sup>	RSEs for mean operating hours per week
<b>All buildings</b>	3.9	3.1	3.3	2.6	2.1	2.1
<b>Window and interior lighting features (more than one may apply)</b>						
Multipaned windows	4.2	3.2	3.7	2.9	2.4	2.1
Tinted window glass	4.2	3.4	3.9	3.5	2.7	2.9
Reflective window glass	7.0	5.5	5.5	5.5	3.5	4.1
External overhangs or awnings	5.0	4.5	4.2	3.6	2.5	3.2
Skylights or atriums	7.1	4.4	6.1	6.9	4.4	3.7
Light scheduling	5.2	4.0	4.9	4.5	2.9	3.2
Occupancy sensors	6.5	3.8	4.4	5.2	2.5	2.8
Multilevel lighting or dimming	10.0	6.5	7.8	7.6	4.3	5.9
Daylight harvesting	12.0	6.2	8.2	11.3	5.1	7.3
Plug-load control	18.4	11.8	14.4	19.2	9.3	12.4
Demand responsive lighting	30.7	15.1	14.4	23.2	11.5	20.6
Building automation system (BAS) for lighting	9.3	5.1	6.1	7.9	4.1	5.0

Data source: U.S. Energy Information Administration, Form EIA-871A of the 2018 Commercial Buildings Energy Consumption Survey

Note: RSE is a measure of the reliability or precision of a survey statistic. Variability occurs in survey statistics because the different samples that could be drawn would each produce different values for the survey statistics. *Estimation of Standard Errors* and *What is a Relative Standard Error (RSE)?* contain more information on how RSEs are estimated and used. Both references can be accessed from <https://www.eia.gov/consumption/commercial/survey-background-technical-information.php>.

<sup>a</sup>Buildings with zero workers are excluded from this column.

<sup>b</sup>*Office devices* refers to any combination of printers, copiers, scanners, or FAX machines.

**Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	All buildings		Total energy consumption (trillion British thermal units [Btu])					
	Number of buildings (thousand)	Total floorspace (million square feet)	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	5,918	96,528	6,789	11,840	4,083	2,301	101	304
<b>Building floorspace (square feet)</b>								
1,001 to 5,000	2,833	8,026	577	1,077	371	183	21	Q
5,001 to 10,000	1,359	10,208	598	1,065	367	209	14	Q
10,001 to 25,000	981	15,840	920	1,630	562	320	17	Q
25,001 to 50,000	386	13,959	960	1,658	572	366	7	16
50,001 to 100,000	218	15,304	1,075	1,818	627	386	10	53
100,001 to 200,000	93	13,015	959	1,688	582	321	11	45
200,001 to 500,000	40	11,775	1,005	1,733	598	320	14	73
Over 500,000	9	8,401	696	1,170	403	197	7	88
<b>Principal building activity</b>								
Education	437	13,638	854	1,268	437	328	29	60
Food sales	163	1,005	234	531	183	48	Q	N
Food service	286	1,385	365	602	208	151	Q	Q
Health care	137	4,054	581	947	327	207	8	39
Inpatient	9	2,293	436	644	222	170	8	36
Outpatient	129	1,760	144	303	105	36	(*)	Q
Lodging	207	6,856	599	992	342	225	6	26
Mercantile	517	10,865	953	1,786	616	333	4	Q
Retail (other than mall)	350	5,193	333	703	243	87	4	Q
Enclosed and strip malls	167	5,673	620	1,083	373	246	Q	N
Office	970	16,579	1,093	2,248	775	250	12	57
Public assembly	488	7,105	583	865	298	216	7	62
Public order and safety	81	1,534	133	212	73	47	Q	Q
Religious worship	439	5,473	193	263	91	94	6	Q
Service	867	6,245	318	443	153	145	15	Q
Warehouse and storage	1,004	17,717	528	941	325	199	Q	Q
Other	113	2,444	328	693	239	48	4	36
Vacant	208	1,628	27	48	16	10	Q	Q
<b>Year constructed</b>								
Before 1946	709	9,163	633	990	342	206	29	57
1946 to 1959	517	6,950	445	657	226	172	12	34
1960 to 1969	685	10,413	764	1,183	408	289	11	56
1970 to 1979	831	13,046	905	1,579	544	303	13	45
1980 to 1989	794	13,442	963	1,790	617	312	7	26
1990 to 1999	921	15,518	957	1,765	609	311	13	24
2000 to 2012	1,104	20,544	1,620	2,938	1,013	544	14	50
2013 to 2018	357	7,451	502	936	323	164	3	12

**Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	All buildings		Total energy consumption (trillion British thermal units [Btu])					
	Number of buildings (thousand)	Total floorspace (million square feet)	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	5,918	96,528	6,789	11,840	4,083	2,301	101	304
<b>Census region and division</b>								
Northeast	793	15,986	1,226	1,874	646	424	69	87
New England	275	3,760	277	428	148	78	31	19
Middle Atlantic	518	12,226	949	1,446	499	346	38	67
Midwest	1,719	25,967	1,931	2,945	1,016	817	11	88
East North Central	1,110	17,480	1,375	2,013	694	603	7	71
West North Central	609	8,487	557	932	321	214	4	18
South	2,143	34,942	2,349	4,721	1,628	616	13	91
South Atlantic	1,034	17,935	1,232	2,532	873	296	10	Q
East South Central	347	5,428	357	647	223	126	1	6
West South Central	762	11,579	761	1,542	532	194	Q	Q
West	1,264	19,633	1,284	2,299	793	444	Q	39
Mountain	484	7,588	571	940	324	231	Q	12
Pacific	780	12,044	713	1,359	469	212	Q	27
<b>Number of floors</b>								
1	4,106	43,808	2,855	5,205	1,795	1,012	30	18
2	1,286	23,381	1,438	2,446	843	529	34	31
3	370	10,535	749	1,254	432	270	13	34
4 to 9	142	13,011	1,184	1,942	670	353	18	143
10 or more	16	5,793	563	993	342	136	6	79
<b>Elevators and escalators (more than one may apply)</b>								
Any elevators	503	36,367	2,965	5,055	1,743	915	41	266
1 elevator	366	14,257	931	1,531	528	329	18	56
2 to 5 elevators	121	13,313	1,114	1,983	684	317	11	102
6 or more elevators	16	8,797	920	1,541	531	269	12	108
Any escalators	14	3,572	324	550	190	89	4	42
<b>Number of workers (main shift)</b>								
Fewer than 5	3,270	21,083	890	1,585	546	296	29	Q
5 to 9	1,116	10,328	665	1,199	414	224	8	20
10 to 19	713	11,353	779	1,266	437	312	11	19
20 to 49	492	16,138	1,232	2,166	747	437	16	32
50 to 99	201	12,972	1,013	1,745	602	349	14	49
100 to 249	90	12,654	1,033	1,783	615	367	10	41
250 or more	37	12,002	1,177	2,096	723	316	12	126
<b>Weekly operating hours</b>								
Fewer than 40	1,370	10,770	414	684	236	162	8	Q
40 to 48	1,483	18,834	947	1,679	579	328	22	18
49 to 60	1,250	22,802	1,265	2,237	771	440	15	39
61 to 84	645	14,897	1,183	1,985	685	411	21	67
85 to 167	465	10,155	976	1,707	589	338	Q	40
Open continuously	705	19,070	2,005	3,546	1,223	621	27	133

**Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	All buildings		Total energy consumption (trillion British thermal units [Btu])					
	Number of buildings (thousand)	Total floorspace (million square feet)	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	5,918	96,528	6,789	11,840	4,083	2,301	101	304
<b>Ownership and occupancy</b>								
Nongovernment owned	4,982	74,909	5,221	9,327	3,216	1,785	61	159
Owner occupied	3,249	45,382	3,191	5,570	1,921	1,090	43	138
Leased to tenant or tenants	1,581	28,521	2,019	3,741	1,290	690	18	21
Unoccupied	152	1,005	10	16	5	Q	Q	Q
Government owned	937	21,619	1,569	2,512	866	516	40	146
<b>Party responsible for operation of energy systems</b>								
Building owner	4,872	79,248	5,565	9,637	3,323	1,857	90	295
Business owner or tenant	831	12,925	915	1,607	554	352	7	Q
Property management	97	2,023	144	284	98	40	Q	Q
Other	118	2,332	165	312	107	52	Q	Q
<b>Provider of direct input on energy-related equipment purchases</b>								
Building owner	5,127	82,822	5,791	10,040	3,462	1,950	92	288
Business owner or tenant	483	7,687	586	1,025	353	223	4	Q
Property management	49	1,079	85	162	56	24	Q	Q
Other	260	4,940	327	613	211	104	Q	Q
<b>Number of establishments</b>								
1	4,719	65,495	4,472	7,691	2,652	1,526	82	212
2 to 5	811	16,437	1,205	2,104	726	420	14	46
6 to 10	135	5,472	437	791	273	155	1	9
11 to 20	63	3,901	341	619	213	116	1	10
More than 20	19	4,039	320	611	211	79	4	26
Currently unoccupied	170	1,183	15	23	8	7	Q	Q
<b>Predominant exterior wall material</b>								
Brick, stone, or stucco	2,490	46,181	3,594	6,011	2,073	1,292	52	178
Concrete (block or poured)	935	19,283	1,436	2,578	889	479	15	52
Concrete panels	137	8,477	534	951	328	174	2	30
Siding or shingles	948	6,009	385	735	253	105	21	Q
Metal panels	1,250	12,284	499	920	317	170	8	Q
Window glass	19	2,178	186	340	117	41	(*)	27
Other	139	2,117	156	306	106	40	Q	Q
<b>Predominant roof material</b>								
Metal surfacing	2,198	21,019	1,006	1,913	659	315	17	15
Synthetic or rubber	940	31,613	2,587	4,470	1,541	916	31	99
Built-up	708	19,287	1,545	2,610	900	511	20	113
Slate or tile shingles	376	3,994	273	448	155	98	3	17
Wooden materials (including shingles)	166	1,568	93	159	55	36	Q	N
Asphalt, fiberglass, or other shingles	1,311	14,071	916	1,526	526	331	24	35
Concrete	83	1,979	165	324	112	36	3	Q
Other	136	2,996	204	389	134	59	Q	10



**Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	All buildings		Total energy consumption (trillion British thermal units [Btu])					
	Number of buildings (thousand)	Total floorspace (million square feet)	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	5,918	96,528	6,789	11,840	4,083	2,301	101	304
<b>Roof tilt</b>								
Flat	1,914	54,195	4,398	7,654	2,639	1,468	46	244
Shallow pitch	2,313	27,758	1,557	2,753	949	548	24	36
Steeper pitch	1,691	14,574	834	1,433	494	286	31	24
<b>Renovations since 2000 (more than one may apply)</b>								
Any type of renovation	2,032	45,065	3,476	5,848	2,017	1,204	61	194
Addition or annex	327	10,914	934	1,467	506	364	13	51
Reduction in floorspace	35	1,745	154	265	91	46	Q	Q
Roof replacement	847	20,768	1,619	2,692	928	572	31	88
Interior wall reconfiguration	709	21,127	1,670	2,810	969	550	25	127
Window replacement	484	10,652	865	1,362	470	316	23	56
HVAC equipment upgrade	1,006	27,398	2,201	3,676	1,268	753	39	142
Lighting upgrade	1,012	28,953	2,336	3,918	1,351	800	38	147
Electrical upgrade	565	15,610	1,344	2,193	756	472	22	94
Plumbing system upgrade	584	15,353	1,292	2,130	734	443	20	94
Insulation upgrade	307	7,664	663	1,066	368	239	16	41
Fire, safety, or security upgrade	570	19,806	1,657	2,734	943	583	23	109
Structural upgrade	147	4,030	393	625	216	145	5	28
Other	43	1,172	102	198	68	32	Q	Q
No renovations	3,530	44,012	2,812	5,055	1,743	933	38	99
Buildings constructed 2013 or later	357	7,451	502	936	323	164	3	12
<b>Energy sources (more than one may apply)</b>								
Electricity	5,613	94,949	6,789	11,840	4,083	2,301	101	304
Natural gas	2,974	67,743	5,444	8,519	2,938	2,301	27	178
Fuel oil	583	21,120	1,958	3,483	1,201	541	101	115
District heat	86	6,685	786	1,124	388	91	2	304
District chilled water	55	4,189	477	731	252	64	1	160
Propane	676	10,049	598	1,179	407	155	28	9
Solar	99	3,754	295	484	167	96	1	30
Wood, coal, and other	180	2,075	145	246	85	56	2	Q
<b>Space-heating energy sources (more than one may apply)</b>								
Electricity	2,563	45,412	3,304	6,623	2,284	942	28	50
Natural gas	2,587	57,993	4,551	6,966	2,402	2,087	18	44
Fuel oil	266	4,144	321	449	155	72	90	Q
District heat	83	6,470	752	1,060	366	84	2	301
Propane	431	3,858	183	391	135	Q	7	Q
Other sources <sup>c</sup>	127	927	34	64	22	9	Q	Q

**Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	All buildings		Total energy consumption (trillion British thermal units [Btu])					
	Number of buildings (thousand)	Total floorspace (million square feet)	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	5,918	96,528	6,789	11,840	4,083	2,301	101	304
<b>Primary space-heating energy source</b>								
Electricity	1,856	27,651	1,745	4,143	1,429	306	7	Q
Natural gas	2,344	50,160	3,898	5,716	1,971	1,903	15	8
Fuel oil	222	2,228	138	166	57	5	76	N
District heat	78	6,008	707	991	342	71	2	293
Propane	338	2,295	73	206	71	Q	Q	N
Other sources <sup>c</sup>	63	380	8	22	8	Q	Q	N
<b>Cooling energy sources (more than one may apply)</b>								
Electricity	4,584	84,671	6,203	10,871	3,749	2,188	87	179
Natural gas	4	404	43	53	18	23	Q	Q
District chilled water	55	4,189	477	731	252	64	1	160
<b>Water-heating energy sources (more than one may apply)</b>								
Electricity	2,785	47,314	3,185	6,294	2,171	909	44	62
Natural gas	1,885	46,558	3,986	6,144	2,118	1,774	19	74
Fuel oil	72	1,821	158	211	73	32	46	Q
District heat	38	4,140	493	699	241	41	1	209
Propane	145	1,948	141	357	123	Q	Q	N
<b>Cooking energy sources (more than one may apply)</b>								
Electricity	1,216	30,412	2,767	4,735	1,633	980	38	116
Natural gas	727	27,604	2,841	4,319	1,489	1,235	17	101
Propane	159	3,051	227	444	153	49	21	Q
<b>Energy end uses (more than one may apply)</b>								
Buildings with space heating	4,901	88,722	6,570	11,244	3,877	2,287	101	304
Buildings with cooling	4,631	87,610	6,517	11,347	3,913	2,224	89	292
Buildings with water heating	4,595	87,798	6,592	11,374	3,922	2,269	99	302
Buildings with cooking	1,738	43,404	3,955	6,537	2,254	1,484	54	161
Buildings with manufacturing	322	6,845	484	849	293	174	2	15
Buildings with electricity generation	706	29,437	2,720	4,706	1,623	895	47	155
Buildings with lighting	5,503	94,208	6,776	11,817	4,075	2,295	101	304
<b>Percentage of floorspace heated</b>								
Not heated	1,017	7,806	220	596	205	14	1	Q
1% to 50%	693	10,615	441	932	321	114	5	Q
51% to 99%	905	20,030	1,597	2,726	940	537	26	94
100%	3,303	58,077	4,531	7,586	2,616	1,637	70	209

**Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	All buildings		Total energy consumption (trillion British thermal units [Btu])					
	Number of buildings (thousand)	Total floorspace (million square feet)	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	5,918	96,528	6,789	11,840	4,083	2,301	101	304
<b>Percentage of floorspace cooled</b>								
Not cooled	1,288	8,918	272	493	170	77	13	Q
1% to 50%	1,111	19,868	859	1,327	458	357	23	22
51% to 99%	998	26,304	2,200	3,753	1,294	736	42	129
100%	2,522	41,438	3,459	6,267	2,161	1,131	24	142
<b>Percentage lit when open</b>								
0%	Q	Q	Q	Q	Q	Q	N	N
1% to 50%	1,280	14,248	601	1,009	348	218	26	8
51% to 99%	1,784	38,817	3,117	5,344	1,843	1,068	41	166
100%	2,272	39,921	3,031	5,415	1,867	999	34	130
Building never open or electricity not used	513	3,013	32	53	18	13	Q	Q
<b>Percentage lit during off hours</b>								
0%	2,062	15,585	658	1,145	395	234	20	Q
1% to 50%	3,246	69,846	5,051	8,712	3,004	1,756	72	220
51% to 100%	240	7,270	826	1,531	528	233	9	57
Building always open with no off hours	64	2,248	254	452	156	78	1	19
Electricity not used	305	1,579	N	N	N	N	N	N
<b>Heating equipment (more than one may apply)</b>								
Packaged heating units	2,187	48,060	3,668	6,561	2,262	1,353	17	35
Furnaces	1,621	17,261	1,186	1,863	642	520	17	Q
Individual space heaters	1,246	21,031	1,521	2,562	883	586	23	29
Boilers	703	28,686	2,447	3,767	1,299	1,052	76	21
Heat pumps	673	15,054	1,159	2,210	762	374	8	16
District heat	83	6,470	752	1,060	366	84	2	301
Duct reheat	134	7,366	630	1,259	434	170	9	17
Other	17	824	143	300	103	36	Q	Q
<b>Cooling equipment (more than one may apply)</b>								
Packaged air-conditioning units	2,565	56,520	4,317	7,609	2,624	1,568	45	81
Residential-type central air conditioners	1,309	18,249	1,325	2,118	730	523	26	46
Individual air conditioners	735	13,705	1,065	1,729	596	402	29	38
Central chillers	202	17,828	1,678	2,844	981	556	28	113
Heat pumps	492	11,190	820	1,516	523	260	10	27
District chilled water	55	4,189	477	731	252	64	1	160
Swamp coolers	85	2,117	163	267	92	66	(*)	Q
Other	Q	Q	Q	Q	Q	Q	Q	N

**Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	All buildings		Total energy consumption (trillion British thermal units [Btu])					
	Number of buildings (thousand)	Total floorspace (million square feet)	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	5,918	96,528	6,789	11,840	4,083	2,301	101	304
<b>HVAC features (more than one may apply)</b>								
Economizer cycle	747	34,045	3,016	5,063	1,746	1,026	35	209
Variable air volume (VAV) system	698	29,227	2,521	4,328	1,492	786	26	216
Dedicated outside air system (DOAS)	249	8,966	882	1,512	521	287	15	59
Demand controlled ventilation (DCV)	349	10,487	851	1,396	481	293	28	48
Regular HVAC maintenance	3,554	78,114	6,027	10,468	3,609	2,039	90	289
Building automation system (BAS) controls heating or cooling	933	40,488	3,578	6,255	2,157	1,123	46	252
Internet-connected or smart thermostat	325	5,907	379	702	242	122	5	Q
Programmable thermostat	1,545	21,015	1,299	2,157	744	522	23	Q
<b>Main equipment replaced since 2000 (more than one may apply)</b>								
Heating	1,937	32,455	2,191	3,753	1,294	856	36	5
Cooling	1,269	22,885	1,634	2,655	916	621	37	60
<b>Water-heating equipment</b>								
Centralized system	3,538	59,156	4,420	7,454	2,570	1,558	74	217
Distributed system	782	14,515	1,039	1,900	655	336	16	31
Combination of centralized and distributed systems	274	14,127	1,134	2,021	697	375	8	54
<b>Generation technologies (more than one may apply)</b>								
Reciprocating engine generators	580	25,119	2,371	4,094	1,412	778	46	135
Solar panels	94	3,685	287	474	163	95	1	27
Other generation technology	43	2,124	209	379	131	68	1	9
<b>Lighting equipment types (more than one may apply)</b>								
Incandescent	1,100	21,033	1,838	3,079	1,062	652	33	91
Standard fluorescent	4,012	73,068	5,323	9,174	3,163	1,841	79	239
Compact fluorescent	1,130	33,766	2,916	4,922	1,697	982	46	191
High-intensity discharge (HID)	238	11,292	990	1,634	563	354	18	54
Halogen	552	14,995	1,364	2,291	790	495	18	61
LED	2,593	61,883	4,912	8,513	2,935	1,677	71	229
Other	Q	Q	Q	Q	Q	Q	Q	N
<b>Refrigeration equipment (more than one may apply)</b>								
Any refrigeration	3,850	77,646	6,023	10,382	3,580	2,091	88	264
Walk-in units	706	29,297	3,187	5,404	1,863	1,138	41	145
Cases or cabinets	837	28,476	2,900	4,939	1,703	1,054	37	106
Large cold storage areas	69	3,454	442	853	294	122	3	24
Commercial ice makers	872	34,607	3,354	5,628	1,941	1,206	36	172
Residential-type or compact units	3,321	64,772	4,792	8,153	2,811	1,693	67	220
Vending machines	800	42,084	3,551	6,053	2,087	1,214	49	201
No refrigeration	2,068	18,882	767	1,458	503	210	14	41

**Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	All buildings		Total energy consumption (trillion British thermal units [Btu])					
	Number of buildings (thousand)	Total floorspace (million square feet)	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	5,918	96,528	6,789	11,840	4,083	2,301	101	304
<b>Office equipment (more than one may apply)</b>								
Desktop computers	3,804	82,128	6,185	10,741	3,704	2,107	90	285
With multiple monitors	1,504	50,852	4,018	6,973	2,405	1,334	45	235
Laptop computers	2,786	69,484	5,217	8,994	3,101	1,772	73	271
Dedicated servers	1,400	51,587	4,118	7,200	2,483	1,392	52	192
Tablets charged in building	1,556	48,749	3,996	6,895	2,378	1,371	50	198
Large floor-standing office devices <sup>d</sup>	1,456	54,103	4,166	7,107	2,451	1,424	53	238
Smaller desktop office devices <sup>d</sup>	3,560	74,523	5,598	9,714	3,349	1,909	83	258
Interactive whiteboards	262	16,640	1,290	2,132	735	449	28	78
Televisions or video displays	2,451	63,641	5,060	8,762	3,021	1,745	63	230
Point-of-sale devices or cash registers	1,420	33,483	3,240	5,558	1,917	1,153	43	127
<b>Food preparation or serving areas in non-food service buildings (more than one may apply)</b>								
Snack bar, concession stand, or coffee shop	144	10,112	1,003	1,581	545	375	8	75
Fast food or small restaurant	160	9,514	1,023	1,734	598	367	7	50
Cafeteria or large restaurant	129	14,313	1,270	1,966	678	482	28	82
Commercial kitchen or food preparation area	284	17,451	1,741	2,830	976	665	20	80
Small kitchen area	1,018	20,266	1,507	2,442	842	575	24	66
<b>Separate computer areas (more than one may apply)</b>								
Server closet	1,237	48,679	3,775	6,490	2,238	1,304	43	190
Data center	116	11,244	1,061	1,828	630	346	14	71
Computer-based training room	228	16,504	1,401	2,282	787	489	21	104
Student or public computer center	236	12,460	1,008	1,520	524	395	22	68
<b>Window and interior lighting features (more than one may apply)</b>								
Multipaned windows	3,527	72,805	5,542	9,550	3,293	1,924	77	248
Tinted window glass	1,679	44,426	3,520	6,166	2,126	1,200	32	162
Reflective window glass	497	17,726	1,553	2,756	950	515	16	71
External overhangs or awnings	1,513	28,666	2,367	4,053	1,397	882	19	69
Skylights or atriums	509	19,844	1,486	2,541	876	507	18	85
Light scheduling	910	33,376	2,914	5,159	1,779	950	31	154
Occupancy sensors	1,025	44,361	3,526	6,056	2,088	1,161	40	237
Multilevel lighting or dimming	332	14,282	1,341	2,205	760	477	14	90
Daylight harvesting	138	7,124	643	1,174	405	195	4	39
Plug-load control	58	1,934	179	356	123	48	1	7
Demand responsive lighting	98	2,053	160	250	86	59	Q	8
Building automation system (BAS) for lighting	317	16,512	1,462	2,657	916	462	13	72

**Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

All buildings	Total energy consumption (trillion British thermal units [Btu])							
	Number of buildings (thousand)	Total floorspace (million square feet)	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
Primary <sup>a</sup>				Site <sup>b</sup>				
<b>All buildings</b>	5,918	96,528	6,789	11,840	4,083	2,301	101	304

Data source: U.S. Energy Information Administration, Forms EIA-871A, C, D, E, and F of the *2018 Commercial Buildings Energy Consumption Survey*

Notes: Because of rounding, data may not sum to totals. The *Guide to the 2018 CBECs Tables* and *CBECs Terminology* contain definitions of terms used in these tables and comparisons between previous CBECs tables. You can access both references from <http://www.eia.gov/consumption/commercial/data/2018/>.

Data are sample survey estimates with relative standard errors published in a tab on the Excel worksheet for this table.

Estimates in the *energy end uses* category represent total consumption in buildings that have the end use but not the consumption specifically for that end use.

HVAC = Heating, ventilation, and air conditioning.

<sup>a</sup>Primary electricity, which is not included in the sum of major fuels category, is site electricity plus the energy used to produce and deliver that electricity.

<sup>b</sup>Site electricity is the amount of electricity that enters a building.

<sup>c</sup>Other sources includes wood, coal, solar, and all other energy sources.

<sup>d</sup>Office devices refers to any combination of printers, copiers, scanners, or FAX machines.

Q = Data withheld either because the relative standard error was greater than 50% or the reporting sample had fewer than 20 buildings.

N = No buildings in reporting sample.

(\*) = Value rounds to zero in the units displayed

**Relative standard errors (RSEs) for Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for all buildings		RSEs for total energy consumption					
	Number of buildings	Total floorspace	Sum of major fuels	Electricity				
				Primary <sup>a</sup>	Site <sup>b</sup>	Natural gas	Fuel oil	District heat
<b>All buildings</b>	3.9	3.1	3.0	3.1	3.1	3.7	16.7	14.3
<b>Building floorspace (square feet)</b>								
1,001 to 5,000	4.9	5.3	5.6	6.1	6.1	8.4	31.9	104.2
5,001 to 10,000	5.9	5.8	6.0	6.1	6.1	9.3	33.3	43.6
10,001 to 25,000	5.6	6.1	7.6	10.1	10.1	8.0	28.2	35.2
25,001 to 50,000	5.6	5.6	6.0	7.0	7.0	6.7	30.1	34.0
50,001 to 100,000	5.3	5.3	5.7	6.0	6.0	6.9	26.1	28.0
100,001 to 200,000	5.6	5.5	5.8	5.7	5.7	7.0	32.9	29.7
200,001 to 500,000	5.0	5.0	6.6	7.3	7.3	6.1	34.6	21.4
Over 500,000	7.8	8.1	8.9	8.0	8.0	15.3	18.6	12.7
<b>Principal building activity</b>								
Education	7.8	5.3	6.1	5.9	5.9	6.9	29.8	29.4
Food sales	14.3	17.0	21.4	24.9	24.9	19.1	47.5	0.0
Food service	7.7	8.5	9.1	9.5	9.5	10.6	56.7	88.3
Health care	9.8	5.5	5.9	6.9	6.9	6.6	29.1	14.9
Inpatient	19.4	7.2	7.3	9.5	9.5	7.2	30.1	15.1
Outpatient	10.3	8.0	8.2	8.6	8.6	11.3	38.5	45.1
Lodging	9.4	8.1	10.1	10.3	10.3	12.5	37.9	29.7
Mercantile	7.3	5.9	6.8	6.6	6.6	8.1	44.9	70.4
Retail (other than mall)	10.1	8.6	9.0	8.8	8.8	13.1	46.2	70.4
Enclosed and strip malls	7.6	7.6	8.6	8.3	8.3	9.9	33.7	0.0
Office	7.2	5.4	5.5	5.6	5.6	7.2	32.7	15.1
Public assembly	9.1	5.8	7.3	8.3	8.3	8.5	36.9	18.8
Public order and safety	20.2	15.8	19.6	20.2	20.2	20.8	64.1	64.2
Religious worship	9.5	9.3	9.7	8.5	8.5	12.9	35.1	109.3
Service	7.4	8.1	9.4	8.4	8.4	13.7	35.5	81.5
Warehouse and storage	7.4	7.3	8.3	9.0	9.0	10.2	58.4	85.1
Other	17.1	15.2	15.3	15.5	15.5	22.7	31.0	35.7
Vacant	17.2	14.1	15.3	19.3	19.3	24.5	47.5	63.9
<b>Year constructed</b>								
Before 1946	8.6	7.6	8.1	9.0	9.0	9.0	26.2	27.1
1946 to 1959	8.1	7.6	8.7	9.5	9.5	9.6	37.0	22.3
1960 to 1969	6.4	5.2	6.8	6.4	6.4	6.9	28.4	29.9
1970 to 1979	7.4	6.0	6.3	7.2	7.2	7.4	30.5	18.2
1980 to 1989	7.0	5.8	7.2	6.2	6.2	11.2	27.0	23.4
1990 to 1999	7.5	6.6	5.2	5.3	5.3	7.4	37.3	20.5
2000 to 2012	7.8	5.9	6.2	7.2	7.2	6.6	26.4	21.3
2013 to 2018	11.9	8.4	8.4	9.3	9.3	9.9	39.4	32.9

**Relative standard errors (RSEs) for Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for all buildings		RSEs for total energy consumption					
	Number of buildings	Total floorspace	Electricity					
			Sum of major fuels	Primary <sup>a</sup>	Site <sup>b</sup>	Natural gas	Fuel oil	District heat
<b>All buildings</b>	3.9	3.1	3.0	3.1	3.1	3.7	16.7	14.3
<b>Census region and division</b>								
Northeast	9.9	7.1	5.7	7.1	7.1	6.5	23.2	11.0
New England	17.8	10.8	12.0	13.2	13.2	12.6	38.9	25.6
Middle Atlantic	12.0	8.8	6.6	8.4	8.4	7.3	27.9	12.5
Midwest	10.9	7.4	6.5	7.4	7.4	7.6	14.9	16.3
East North Central	13.1	10.4	8.7	9.5	9.5	9.8	19.1	20.2
West North Central	21.0	8.2	7.7	11.5	11.5	11.9	24.1	20.5
South	7.7	6.1	6.1	5.9	5.9	6.4	16.7	40.2
South Atlantic	11.0	6.8	8.5	8.2	8.2	6.8	15.9	51.0
East South Central	18.0	20.2	16.9	15.8	15.8	20.2	33.4	46.6
West South Central	14.7	11.6	10.5	10.4	10.4	11.4	57.6	78.2
West	8.1	7.1	7.7	6.0	6.0	12.3	60.9	30.4
Mountain	15.9	13.0	15.6	12.8	12.8	21.1	79.0	39.2
Pacific	9.0	8.1	6.1	4.8	4.8	11.9	86.3	40.2
<b>Number of floors</b>								
1	4.3	4.5	4.2	5.1	5.1	4.9	23.8	35.0
2	5.8	4.4	5.0	4.6	4.6	6.9	22.5	23.9
3	10.5	7.6	7.6	9.1	9.1	8.1	21.4	26.2
4 to 9	9.4	6.3	7.0	7.2	7.2	6.6	21.3	20.3
10 or more	9.8	10.5	11.5	10.9	10.9	20.0	39.5	17.1
<b>Elevators and escalators (more than one may apply)</b>								
Any elevators	6.5	4.4	4.9	4.9	4.9	5.1	22.7	15.9
One elevator	7.7	6.0	7.0	7.1	7.1	6.5	39.5	30.9
Two to five elevators	6.7	5.2	6.0	6.3	6.3	5.8	23.7	22.5
Six or more elevators	7.8	7.9	8.2	8.1	8.1	12.3	16.2	11.0
Any escalators	28.9	13.3	16.2	13.6	13.6	30.1	29.1	21.9
<b>Number of workers (main shift)</b>								
Fewer than 5	5.5	5.9	5.9	6.6	6.6	7.9	23.8	35.5
5 to 9	6.1	6.9	8.4	11.4	11.4	9.4	22.5	32.1
10 to 19	6.5	7.4	6.0	6.0	6.0	8.3	37.5	30.9
20 to 49	6.3	4.8	4.9	5.4	5.4	5.9	26.3	31.0
50 to 99	6.7	5.9	7.0	7.2	7.2	7.6	41.8	33.3
100 to 249	7.1	5.7	6.1	6.2	6.2	7.3	30.4	21.5
250 or more	7.2	6.1	6.5	6.3	6.3	10.1	15.0	13.0
<b>Weekly operating hours</b>								
Fewer than 40	6.1	6.6	8.1	9.0	9.0	10.0	33.5	30.6
40 to 48	6.2	5.1	6.4	8.6	8.6	7.0	26.1	30.1
49 to 60	5.2	4.3	5.0	4.9	4.9	7.1	20.8	21.8
61 to 84	7.6	5.3	6.1	6.0	6.0	6.4	30.1	36.3
85 to 167	8.6	6.3	5.8	6.0	6.0	7.9	61.3	20.8
Open continuously	8.1	4.9	5.1	5.2	5.2	6.2	15.0	14.8



**Relative standard errors (RSEs) for Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for all buildings		RSEs for total energy consumption					
			Electricity					
	Number of buildings	Total floorspace	Sum of major fuels	Primary <sup>a</sup>	Site <sup>b</sup>	Natural gas	Fuel oil	District heat
<b>All buildings</b>	3.9	3.1	3.0	3.1	3.1	3.7	16.7	14.3
<b>Ownership and occupancy</b>								
Nongovernment owned	3.8	3.3	3.1	3.2	3.2	4.0	18.2	17.5
Owner occupied	4.3	3.3	3.5	3.7	3.7	4.7	17.4	19.5
Leased to tenant or tenants	5.5	4.8	4.6	4.9	4.9	5.6	28.4	25.3
Unoccupied	20.3	19.2	26.7	29.9	29.9	42.2	93.4	51.6
Government owned	9.5	6.0	7.0	7.7	7.7	6.0	20.3	19.8
<b>Party responsible for operation of energy systems</b>								
Building owner	4.4	3.1	3.3	3.5	3.5	4.1	17.3	14.8
Business owner or tenant	6.5	7.3	6.6	6.7	6.7	8.6	31.3	27.0
Property management	20.7	11.6	13.3	13.5	13.5	16.7	64.2	43.4
Other	18.8	11.3	11.4	12.6	12.6	14.8	65.4	42.3
<b>Provider of direct input on energy-related equipment purchases</b>								
Building owner	4.4	3.1	3.3	3.4	3.4	4.1	17.0	15.0
Business owner or tenant	8.9	9.0	8.1	8.8	8.8	8.8	36.3	73.0
Property management	25.5	16.2	18.3	17.8	17.8	23.8	66.0	67.9
Other	10.5	8.2	8.8	8.7	8.7	11.4	79.9	54.1
<b>Number of establishments</b>								
1	4.6	3.7	3.6	4.0	4.0	4.1	19.4	18.6
2 to 5	6.0	5.2	6.4	6.0	6.0	9.1	22.7	16.2
6 to 10	11.5	7.9	7.6	7.5	7.5	9.9	35.5	26.5
11 to 20	17.9	8.7	10.4	10.1	10.1	13.1	43.7	48.8
More than 20	18.6	9.7	11.4	11.1	11.1	15.8	38.3	19.1
Currently unoccupied	18.7	16.5	21.1	25.6	25.6	33.0	89.9	74.6
<b>Predominant exterior wall material</b>								
Brick, stone, or stucco	5.3	3.8	4.6	4.7	4.7	4.6	25.5	20.4
Concrete (block or poured)	5.3	4.7	4.1	4.3	4.3	6.4	26.2	24.1
Concrete panels	12.1	8.5	8.5	8.3	8.3	12.7	33.7	25.1
Siding or shingles	7.3	9.3	12.2	17.1	17.1	10.8	22.6	48.0
Metal panels	7.6	6.1	7.0	7.3	7.3	10.1	28.1	39.0
Window glass	21.3	11.0	11.5	12.0	12.0	17.1	18.1	17.4
Other	14.7	13.1	14.2	15.2	15.2	18.2	53.5	59.9

**Relative standard errors (RSEs) for Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for all buildings		RSEs for total energy consumption					
	Number of buildings	Total floorspace	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
			Primary <sup>a</sup>	Site <sup>b</sup>				
<b>All buildings</b>	3.9	3.1	3.0	3.1	3.1	3.7	16.7	14.3
<b>Predominant roof material</b>								
Metal surfacing	6.2	5.6	6.7	8.4	8.4	7.6	24.2	29.4
Synthetic or rubber	6.0	4.0	4.2	4.8	4.8	4.4	26.4	15.0
Built-up	7.7	4.7	5.9	5.3	5.3	8.1	28.8	22.2
Slate or tile shingles	10.1	10.1	10.7	10.0	10.0	14.5	45.3	35.7
Wooden materials (including shingles)	12.9	17.8	15.8	17.3	17.3	19.3	99.4	0.0
Asphalt, fiberglass, or other shingles	6.2	5.6	6.0	6.8	6.8	7.3	23.0	18.9
Concrete	20.6	11.9	14.1	15.2	15.2	16.5	33.6	50.3
Other	15.6	10.2	10.0	13.0	13.0	12.2	51.2	19.6
<b>Roof tilt</b>								
Flat	4.9	3.2	3.6	3.5	3.5	4.4	20.1	14.0
Shallow pitch	5.0	4.8	4.7	5.4	5.4	5.7	31.2	32.8
Steeper pitch	7.5	5.7	6.7	9.0	9.0	7.0	24.1	22.1
<b>Renovations since 2000 (more than one may apply)</b>								
Any type of renovation	5.0	3.4	3.2	3.3	3.3	4.4	22.4	14.1
Addition or annex	9.4	5.8	5.2	5.0	5.0	7.3	26.9	18.5
Reduction in floorspace	22.2	12.5	15.1	15.0	15.0	19.5	72.0	36.9
Roof replacement	6.8	4.3	4.5	4.7	4.7	6.2	22.6	15.3
Interior wall reconfiguration	6.0	4.0	4.9	4.3	4.3	7.7	21.3	16.5
Window replacement	9.5	5.5	6.5	6.5	6.5	9.2	29.3	21.0
HVAC equipment upgrade	7.0	4.1	4.2	4.1	4.1	5.3	31.7	14.0
Lighting upgrade	5.9	3.9	4.0	4.0	4.0	5.5	28.5	14.0
Electrical upgrade	7.1	5.4	5.5	5.2	5.2	7.7	24.3	15.7
Plumbing system upgrade	7.8	4.8	5.5	5.3	5.3	7.5	20.0	15.1
Insulation upgrade	9.2	7.2	8.5	8.1	8.1	12.1	26.4	18.2
Fire, safety, or security upgrade	6.2	4.3	4.9	4.7	4.7	6.8	22.9	13.5
Structural upgrade	13.9	8.8	12.2	11.1	11.1	17.7	38.4	27.2
Other	29.5	14.9	13.2	13.0	13.0	19.3	75.3	63.0
No renovations	4.3	3.9	4.3	5.0	5.0	4.7	18.6	19.5
Buildings constructed 2013 or later	11.9	8.4	8.4	9.3	9.3	9.9	39.4	32.9
<b>Energy sources (more than one may apply)</b>								
Electricity	3.9	3.0	3.0	3.1	3.1	3.7	16.7	14.3
Natural gas	4.8	3.4	3.2	3.1	3.1	3.7	15.1	14.6
Fuel oil	9.7	5.2	5.6	6.3	6.3	7.5	16.7	13.2
District heat	14.7	11.2	12.0	12.7	12.7	11.8	27.9	14.3
District chilled water	20.1	14.2	15.7	15.6	15.6	19.1	36.7	20.0
Propane	10.0	7.5	10.7	12.3	12.3	17.4	27.4	30.0
Solar	15.5	11.2	11.6	10.9	10.9	13.5	45.9	29.3
Wood, coal, and other	17.3	14.0	14.9	15.6	15.6	19.3	39.0	68.1

**Relative standard errors (RSEs) for Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for all buildings		RSEs for total energy consumption					
	Number of buildings	Total floorspace	Electricity					
			Sum of major fuels	Primary <sup>a</sup>	Site <sup>b</sup>	Natural gas	Fuel oil	District heat
<b>All buildings</b>	3.9	3.1	3.0	3.1	3.1	3.7	16.7	14.3
<b>Space-heating energy sources (more than one may apply)</b>								
Electricity	4.7	3.7	3.9	4.4	4.4	5.1	20.4	18.9
Natural gas	5.2	3.6	3.4	3.3	3.3	4.0	11.9	17.7
Fuel oil	13.9	11.6	12.6	15.3	15.3	13.3	18.6	45.0
District heat	15.4	11.4	11.9	12.1	12.1	11.8	29.4	14.5
Propane	13.5	12.6	23.8	18.2	18.2	57.5	30.8	105.9
Other sources <sup>c</sup>	21.3	19.6	22.7	22.3	22.3	27.4	56.6	94.6
<b>Primary space-heating energy source</b>								
Electricity	6.4	5.5	5.9	6.4	6.4	6.4	21.2	54.4
Natural gas	5.5	4.1	3.9	3.8	3.8	4.3	12.6	32.7
Fuel oil	16.1	15.2	18.3	15.3	15.3	49.8	21.4	0.0
District heat	15.8	12.4	13.0	13.3	13.3	12.5	29.9	15.0
Propane	17.5	16.9	24.7	24.6	24.6	48.1	94.0	0.0
Other sources <sup>c</sup>	22.4	30.3	28.4	30.5	30.5	40.7	59.3	0.0
<b>Cooling energy sources (more than one may apply)</b>								
Electricity	3.9	3.0	2.9	3.1	3.1	3.6	18.1	14.6
Natural gas	37.3	24.2	21.4	18.8	18.8	26.9	63.2	62.7
District chilled water	20.1	14.2	15.7	15.6	15.6	19.1	36.7	20.0
<b>Water-heating energy sources (more than one may apply)</b>								
Electricity	4.0	3.6	3.8	4.5	4.5	4.5	21.3	15.0
Natural gas	5.5	3.8	3.6	3.5	3.5	4.3	15.0	16.4
Fuel oil	24.0	15.2	14.7	15.6	15.6	19.6	22.7	31.8
District heat	17.4	12.1	12.9	14.1	14.1	14.6	35.5	14.7
Propane	15.8	14.7	31.7	35.0	35.0	37.2	63.4	0.0
<b>Cooking energy sources (more than one may apply)</b>								
Electricity	5.7	3.8	4.5	4.9	4.9	5.4	19.6	14.8
Natural gas	5.4	3.4	3.6	3.5	3.5	4.1	17.2	12.2
Propane	14.8	11.9	12.3	14.4	14.4	20.1	34.3	42.3
<b>Energy end uses (more than one may apply)</b>								
Buildings with space heating	4.1	3.0	3.0	3.2	3.2	3.7	16.8	14.3
Buildings with cooling	3.9	3.0	3.0	3.1	3.1	3.6	17.9	14.7
Buildings with water heating	3.9	2.9	3.0	3.1	3.1	3.7	17.1	14.3
Buildings with cooking	5.0	3.0	3.4	3.8	3.8	4.1	17.3	13.2
Buildings with manufacturing	11.3	7.9	11.2	14.9	14.9	10.4	34.6	38.2
Buildings with electricity generation	7.4	4.3	4.4	4.9	4.9	5.3	17.1	14.2
Buildings with lighting	3.9	3.0	3.0	3.1	3.1	3.7	16.7	14.3

**Relative standard errors (RSEs) for Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for all buildings		RSEs for total energy consumption					
	Number of buildings	Total floorspace	Sum of major fuels	Electricity	Natural gas	Fuel oil	District heat	
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	3.9	3.1	3.0	3.1	3.1	3.7	16.7	14.3
<b>Percentage of floorspace heated</b>								
Not heated	8.2	10.0	11.1	10.9	10.9	27.7	31.7	54.9
1% to 50%	8.5	7.1	7.4	8.2	8.2	10.0	36.8	65.0
51% to 99%	6.7	5.3	5.4	5.2	5.2	6.0	29.6	23.0
100%	4.1	3.2	3.4	3.5	3.5	4.6	18.8	14.9
<b>Percentage of floorspace cooled</b>								
Not cooled	7.1	8.0	17.0	24.3	24.3	15.7	40.3	45.6
1% to 50%	5.9	5.3	5.3	5.5	5.5	7.6	27.7	39.9
51% to 99%	6.6	5.0	5.3	5.1	5.1	5.8	23.1	20.1
100%	4.3	3.5	3.5	3.6	3.6	4.7	17.3	18.5
<b>Percentage lit when open</b>								
0%	35.1	38.5	87.0	76.3	76.3	50.4	0.0	0.0
1% to 50%	6.7	6.0	6.1	6.5	6.5	8.2	29.7	31.9
51% to 99%	4.8	3.6	4.2	4.4	4.4	4.8	21.8	17.4
100%	4.7	3.8	3.8	4.0	4.0	4.9	18.0	18.8
Building never open or electricity not used	11.6	12.1	14.4	18.0	18.0	20.9	72.9	74.6
<b>Percentage lit during off hours</b>								
0%	6.5	6.7	7.2	8.2	8.2	9.1	23.4	35.1
1% to 50%	3.8	3.0	3.2	3.3	3.3	4.2	18.3	16.3
51% to 100%	10.6	6.7	7.1	8.7	8.7	6.7	22.7	19.0
Building always open with no off hours	15.2	11.5	11.4	12.8	12.8	13.0	29.1	32.8
Electricity not used	16.0	17.6	0.0	0.0	0.0	0.0	0.0	0.0
<b>Heating equipment (more than one may apply)</b>								
Packaged heating units	4.0	3.6	3.5	3.6	3.6	4.5	16.7	21.1
Furnaces	7.2	5.7	5.9	6.5	6.5	6.1	28.3	51.2
Individual space heaters	5.9	4.8	5.6	5.8	5.8	7.5	21.4	24.6
Boilers	6.2	3.9	4.3	5.2	5.2	5.0	18.3	22.2
Heat pumps	7.7	5.2	6.4	6.2	6.2	8.8	31.6	37.6
District heat	15.4	11.4	11.9	12.1	12.1	11.8	29.4	14.5
Duct reheat	12.6	6.9	7.0	7.2	7.2	8.6	47.2	27.2
Other	46.4	24.1	32.4	40.9	40.9	23.4	78.5	74.7

**Relative standard errors (RSEs) for Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for all buildings		RSEs for total energy consumption					
	Number of buildings	Total floorspace	Sum of major fuels	Primary <sup>a</sup>	Site <sup>b</sup>	Natural gas	Fuel oil	District heat
<b>All buildings</b>	3.9	3.1	3.0	3.1	3.1	3.7	16.7	14.3
<b>Cooling equipment (more than one may apply)</b>								
Packaged air-conditioning units	4.3	3.5	3.1	3.6	3.6	3.6	24.8	14.4
Residential-type central air conditioners	7.6	5.3	5.5	6.1	6.1	5.6	40.2	24.9
Individual air conditioners	6.6	5.4	5.8	6.4	6.4	6.7	19.8	21.3
Central chillers	9.0	4.7	5.0	5.1	5.1	4.7	22.0	20.8
Heat pumps	11.0	6.6	7.8	7.2	7.2	11.6	30.6	27.8
District chilled water	20.1	14.2	15.7	15.6	15.6	19.1	36.7	20.0
Swamp coolers	12.8	13.2	14.9	15.1	15.1	17.0	48.4	47.0
Other	53.2	36.5	38.2	41.3	41.3	50.3	41.2	0.0
<b>HVAC features (more than one may apply)</b>								
Economizer cycle	5.6	3.9	4.1	4.1	4.1	4.9	18.9	12.8
Variable air volume (VAV) system	8.4	4.9	5.5	5.4	5.4	5.9	13.7	17.4
Dedicated outside air system (DOAS)	11.0	7.6	9.6	11.4	11.4	11.4	34.8	19.2
Demand controlled ventilation (DCV)	8.8	5.5	5.3	5.8	5.8	6.4	36.3	21.8
Regular HVAC maintenance	4.2	3.2	3.3	3.3	3.3	3.9	18.9	14.9
Building automation system (BAS) controls heating or cooling	6.4	3.6	4.0	4.2	4.2	4.6	20.5	13.9
Internet-connected or smart thermostat	12.2	10.3	11.0	11.5	11.5	12.9	36.1	67.3
Programmable thermostat	4.7	5.5	5.5	5.4	5.4	7.2	30.0	48.0
<b>Main equipment replaced since 2000 (more than one may apply)</b>								
Heating	4.9	3.8	3.5	3.7	3.7	4.7	30.9	43.2
Cooling	4.8	4.1	5.1	4.8	4.8	6.6	20.6	21.0
<b>Water-heating equipment</b>								
Centralized system	4.4	3.4	4.0	4.2	4.2	4.7	14.4	18.6
Distributed system	8.9	6.4	6.1	7.0	7.0	7.3	42.8	18.1
Combination of centralized and distributed systems	8.8	5.2	5.6	5.8	5.8	6.6	27.3	18.8
<b>Generation technologies (more than one may apply)</b>								
Reciprocating engine generators	8.8	4.7	4.8	5.4	5.4	6.0	17.6	14.5
Solar panels	15.4	11.3	11.2	10.8	10.8	13.4	46.9	27.8
Other generation technology	21.3	14.5	16.9	18.8	18.8	21.1	31.9	28.6

**Relative standard errors (RSEs) for Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for all buildings		RSEs for total energy consumption					
	Number of buildings	Total floorspace	Electricity					
			Sum of major fuels	Primary <sup>a</sup>	Site <sup>b</sup>	Natural gas	Fuel oil	District heat
<b>All buildings</b>	3.9	3.1	3.0	3.1	3.1	3.7	16.7	14.3
<b>Lighting equipment types (more than one may apply)</b>								
Incandescent	7.8	4.4	4.9	5.1	5.1	6.1	21.4	18.2
Standard fluorescent	4.2	3.4	3.3	3.5	3.5	3.8	17.2	13.3
Compact fluorescent	5.2	4.1	4.5	4.5	4.5	4.9	25.2	18.0
High-intensity discharge (HID)	9.8	6.9	7.6	7.5	7.5	9.7	26.1	21.6
Halogen	8.0	4.1	5.2	4.7	4.7	7.3	27.7	19.3
LED	3.6	2.9	3.2	3.4	3.4	3.8	16.3	13.1
Other	57.3	24.0	28.9	27.3	27.3	39.7	70.9	0.0
<b>Refrigeration equipment (more than one may apply)</b>								
Any refrigeration	4.1	3.0	3.1	3.2	3.2	3.8	18.3	15.8
Walk-in units	5.4	3.3	3.8	4.2	4.2	4.6	24.8	13.4
Cases or cabinets	5.8	3.7	3.8	4.1	4.1	4.8	24.7	12.1
Large cold storage areas	17.2	10.3	15.0	17.0	17.0	20.7	28.9	31.6
Commercial ice makers	5.5	3.4	3.9	4.0	4.0	4.5	24.9	16.1
Residential-type or compact units	4.3	3.1	3.1	3.2	3.2	3.9	18.0	16.2
Vending machines	6.1	3.7	3.8	3.9	3.9	4.5	19.0	17.8
No refrigeration	5.3	5.4	5.9	6.7	6.7	8.4	21.8	22.8
<b>Office equipment (more than one may apply)</b>								
Desktop computers	4.0	2.9	3.0	3.2	3.2	3.7	17.1	15.0
With multiple monitors	5.0	3.5	3.9	3.9	3.9	4.5	13.7	16.8
Laptop computers	4.0	3.0	3.3	3.2	3.2	4.0	16.7	15.1
Dedicated servers	4.9	3.2	3.0	3.1	3.1	4.0	16.5	15.6
Tablets charged in building	4.4	3.2	4.0	3.9	3.9	4.4	14.5	19.5
Large floor-standing office devices <sup>d</sup>	4.4	3.0	3.4	3.4	3.4	4.1	18.6	16.0
Smaller desktop office devices <sup>d</sup>	4.1	3.1	3.1	3.3	3.3	3.9	17.7	15.6
Interactive whiteboards	8.7	4.5	5.8	6.0	6.0	8.0	28.6	12.2
Televisions or video displays	3.8	3.0	3.2	3.2	3.2	3.9	16.8	15.5
Point-of-sale devices or cash registers	5.2	3.3	3.8	3.8	3.8	5.0	21.3	12.3
<b>Food preparation or serving areas in non-food service buildings (more than one may apply)</b>								
Snack bar, concession stand, or coffee shop	11.0	6.2	6.9	6.4	6.4	8.9	14.9	17.3
Fast food or small restaurant	9.4	5.6	6.3	5.7	5.7	8.8	29.0	18.8
Cafeteria or large restaurant	7.7	4.5	5.5	5.2	5.2	7.5	27.9	13.4
Commercial kitchen or food preparation area	8.5	4.2	4.7	4.9	4.9	5.6	21.4	18.2
Small kitchen area	6.5	4.6	5.7	5.5	5.5	7.2	18.5	17.5

**Relative standard errors (RSEs) for Table C1. Total energy consumption by major fuel, 2018 – PUBLIC USE MICRODATA VERSION**

	RSEs for all buildings		RSEs for total energy consumption					
	Number of buildings	Total floorspace	Sum of major fuels	Electricity		Natural gas	Fuel oil	District heat
				Primary <sup>a</sup>	Site <sup>b</sup>			
<b>All buildings</b>	3.9	3.1	3.0	3.1	3.1	3.7	16.7	14.3
<b>Separate computer areas (more than one may apply)</b>								
Server closet	5.3	3.3	3.4	3.2	3.2	4.5	19.2	16.7
Data center	13.1	6.4	7.0	6.9	6.9	10.0	36.7	17.8
Computer-based training room	8.4	4.5	5.6	4.9	4.9	7.6	26.2	19.1
Student or public computer center	8.0	4.4	6.2	5.5	5.5	8.5	30.4	17.5
<b>Window and interior lighting features (more than one may apply)</b>								
Multipaned windows	4.2	3.2	3.2	3.4	3.4	4.0	19.7	14.6
Tinted window glass	4.2	3.4	3.7	3.8	3.8	4.5	29.5	12.6
Reflective window glass	7.0	5.5	6.3	5.8	5.8	7.9	39.0	34.7
External overhangs or awnings	5.0	4.5	4.4	4.7	4.7	5.2	19.5	15.7
Skylights or atriums	7.1	4.4	5.0	4.9	4.9	6.9	17.8	14.7
Light scheduling	5.2	4.0	4.6	4.5	4.5	5.5	21.1	19.8
Occupancy sensors	6.5	3.8	4.2	4.1	4.1	5.2	20.3	14.5
Multilevel lighting or dimming	10.0	6.5	8.2	8.1	8.1	8.9	38.4	24.0
Daylight harvesting	12.0	6.2	7.4	8.1	8.1	8.4	24.2	19.8
Plug-load control	18.4	11.8	16.9	20.7	20.7	13.0	46.2	30.4
Demand responsive lighting	30.7	15.1	13.3	12.8	12.8	20.7	72.7	35.7
Building automation system (BAS) for lighting	9.3	5.1	5.6	5.1	5.1	8.5	39.7	13.2

Data source: U.S. Energy Information Administration, Forms EIA-871A, C, D, E, and F of the 2018 Commercial Buildings Energy Consumption Survey

Note: RSE is a measure of the reliability or precision of a survey statistic. Variability occurs in survey statistics because the different samples that could be drawn would each produce different values for the survey statistics. *Estimation of Standard Errors* and *What is a Relative Standard Error (RSE)?* contain more information on how RSEs are estimated and used. Both references can be accessed from <https://www.eia.gov/consumption/commercial/survey-background-technical-information.php>.

<sup>a</sup>Primary electricity, which is not included in the sum of major fuels category, is site electricity plus the energy used to produce and deliver that electricity.

<sup>b</sup>Site electricity is the amount of electricity that enters a building.

<sup>c</sup>Other sources includes wood, coal, solar, and all other energy sources.

<sup>d</sup>Office devices refers to any combination of printers, copiers, scanners, or FAX machines.