2007 Professional Engineer's Guide to the ENERGY STAR ® Label for Commercial Buildings

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Introduction

Since January 1999, the U. S. Environmental Protection Agency (US EPA) has provided the public with the means to quickly and easily assess, *or benchmark*, the energy performance of commercial buildings relative to similar buildings in the United States. Accounting for the most significant drivers of energy intensity such as weather and operating characteristics, a building whose performance is among the nation's top 25 percent (equal to an energy performance rating of 75 or greater on a 1 to 100 scale) and prove to maintain a healthy and productive indoor environment can qualify as an ENERGY STAR building.

EPA's Portfolio Manager is an on-line, interactive, software tool that makes benchmarking energy performance simple and accessible. Portfolio Manager is based on statistical models developed by the US EPA that correlates energy data to operational characteristics for each building to identify the key drivers of energy use[1]. Based on your building's physical and operating characteristics, such as size, number of workers, operating hours per week, number of PCs, etc., the rating system evaluates and communicates the energy performance of a building relative to other buildings with similar characteristics in the United States.

After the building's energy performance is assessed, users can apply for the ENERGY STAR label by completing an Application Letter and a Statement of Energy Performance (See **Appendix C**). The Statement of Energy Performance is a stand-alone document designed to communicate not only a building's energy performance, but also its physical characteristics, operating characteristics, and conformance to current indoor environmental standards. Once validated by a professional engineer (PE), the Statement of Energy Performance becomes an official document that can be used to apply for the ENERGY STAR label. The role of the PE is essential to certify true superior energy performance in conjunction with an indoor environment conforming to industry accepted standards.

Professional Engineers provide unbiased engineering services and are legally bound to uphold standards of ethics. Because of this high level of professionalism, experience, and expertise, a PE is required to validate each Statement of Energy Performance that is used to apply for the ENERGY STAR label. Namely, the PE's key role is to verify that all data supplied to EPA is correct and the building is fully functional in accordance with industry standards. The PE is not obligated to count up each individual building attribute, but should be able to use his/her professional judgment to assess whether a healthy and comfortable work environment exists in the building (and has not been compromised in pursuit of energy conservation). Additionally, the PE must verify that all information provided in the Statement of Energy Performance and within Portfolio Manager is accurate. Services performed by PEs in connection with the ENERGY STAR label shall in no way be construed to diminish or otherwise modify the responsibilities or liability of the original designer or operator of the building.

Validating a Statement of Energy Performance requires the PE to review two categories of user-provided information. These verifications by the PE are one step in the rigorous review process of a label application. For more on the on the labeling application process, which is at the responsibility of the building owner/manager, see **Appendix F**.

I. The PE must verify that the data entered about the building are accurate. This includes verifying the building's physical characteristics, operating characteristics, and energy consumption. The building characteristics are displayed on the Statement of Energy Performance and must be verified through a site visit by the PE. Checklists of these items are also provided at the end of modules 1, 2, and 3.
II. During the site visit the PE must also verify that it conforms to current industry standards for indoor environment including temperature and humidity, illumination, outside air ventilation, and control of indoor air pollutants. These standards are meant to provide general guidance for a comfortable and healthy work environment. Given nuances in the feasibility of some buildings to renovate and conform to these strict standards, it us up to the PE's professional judgment as to whether the

[1] EPA conducts statistical analysis on the data gathered by the Department of Energy's Energy Information Administration during its quadrennial Commercial Building Energy Consumption Survey (CBECS). For more information on how the rating is calculated and supporting documents on the statistical models, please visit our supporting documents page http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager_docs

building as a whole provides a suitable work environment for those subject to the respective working conditions.

This document, *The Professional Engineer's Guide to the ENERGY STAR Label for Buildings*, is intended to assist the PE community in understanding the requirements of the Statement of Energy Performance and the expectations and limitations of their role. Each module covers a single topic and contains a purpose, background, expectations, hints and tips, and questions and answers. Where needed, industry standards are referenced and detailed tables are given. EPA is committed to continually improving the content of this document, and welcomes all comments that may help us do so. All applicable contact information is provided in **Appendix A**.

EPA thanks you for choosing to take part in this process. We hope you find this experience professionally rewarding and are able to forge new or expand existing business relationships. In so doing, you can be assured that you are helping to mitigate society's impact on the environment and climate change.

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Module 1: Physical Characteristics

1.1 Objective:

All recorded physical characteristics displayed on a building's Statement of Energy Performance must be verified when applying for the ENERGY STAR label.

1.2 Background and Expectations of PE:

To assess the energy performance of a building, all physical characteristics must be accurately portrayed by the user. The PE is expected to verify the accuracy of the building's recorded physical characteristics which include building floor area in square feet (ft^2), building name, location, etc. A checklist of these items to be verified is provided at the end this module. These items must be verified to be true and accurately displayed on the Statement of Energy Performance.

1.3 Building Designation Requirement:

The information needed to complete a Statement of Energy Performance and/or to apply for the ENERGY STAR label varies by building type and is given below. Currently there are eleven eligible building space types. Definitions of all building and space types are provided in **Appendix D**. At least 50% of your building's gross floor area (excluding parking lots and garages) must be defined by one of the following space types:

- Bank / Financial Institution
- Courthouse
- Dormitory
- Hospital (acute and children's)
- Hotel (5) (includes: upper upscale, upscale, mid-scale with food & beverage, mid-scale without food & beverage, and economy & budget)
- K-12 School
- Medical Office
- Office
- Retail Store
- Supermarket / Grocery Store
- Warehouse (refrigerated and non-refrigerated)

1.4 Physical Characteristics Requirements:

All buildings must meet the following requirements pertaining to gross square foot, location, parking structures and pools.

- The gross floor area of the building (excluding garage and parking lot) must be at least 5,000 square feet, with two exceptions:
    a. Bank / Financial Institutions must be at least 1,000 square feet
    b. Hospitals must be at least 20,000 square feet
- The building must be located within the United States of America or its territories. Buildings owned by the United States government that are located in foreign lands are also eligible. A 5-digit ZIP code must be recorded for buildings located in the USA or its territories. For buildings owned by the United States government that are located in foreign lands, the location most

closely related to the building in terms of climate must be indicated. Typically, this is the location nearest that of the building. Choices of location are by major city that has an international airport. In some cases there may be only one location for an entire country.

- The presence of a swimming pool on the same utility meter must be recorded.
- Total square foot of parking structures, data centers, and any space marked as "other" must be verified and are subject to the following restrictions.
    a. The combined floor area of all the Parking Garages or Parking Lots cannot exceed the total gross floor area of the building (where the gross floor area of the building excludes the parking garage/parking lot). Additionally, The presence of an attached parking structure on the same utility meter(s) must be recorded.
    b. The combined floor area of all Computer Data Centers cannot exceed 10% of the total gross floor area of the building (where the gross floor area of the building excludes the parking garage/parking lot).
    c. The combined floor area of any space classified as "Other" cannot exceed 10% of the total gross floor area of the building (where gross floor area of the building excludes the parking garage/parking lot).
- If the peer group of comparison is Hospital (i.e. if Hospital accounts for more than 50% of your space), no other unique spaces should be entered except for parking garages, parking lots, and raised floor computer data centers.
- The building being evaluated must be a single structure and not a campus or plaza (except if the building is identified as a hospital)

Specific building types have additional physical characteristic requirements that must also be met and they are as follows.

- **Hotel/Motels**

Limited to only Upper Upscale, Upscale, Mid-scale with Food and Beverage, Mid-scale without Food and Beverage, and Economy & Budget. Specifically excluded are Resort and Extended Stay hotels. See **Appendix D** for definitions and examples of each eligible hotel/ motel type. The average annual room occupancy must be at least 45 percent.

- **Hospitals**

This is limited to only Acute Care and Children's Hospitals. Specifically excluded are all hospitals primarily used as out-patient facilities, cancer centers, skilled nursing centers, psychiatric care hospitals, rehabilitation centers, or veterinary clinics. See **Appendix D** for definitions.

1.5 Hints & Tips:

Original specifications, design documents, and "as-built" drawings can be used to confirm certain physical characteristics. However, because the actual physical characteristics of the building can vary significantly from these plans and records, any review of documentation should always be combined with a physical inspection of the building.

1.6 Physical Characteristics Q& A:

- ***Are buildings that are owned by U. S. based companies or by the Federal Government but that are located outside of the United States eligible to apply for the ENERGY STAR label?***

Buildings located on foreign lands but owned by U.S.-based companies are not eligible to apply for the ENERGY STAR label. However, buildings that are located on foreign lands but that are owned and occupied by the United States government and that meet U.S. construction codes are eligible.

- ***Are common areas to be included when determining the floor area of the building or a given space (for example, office space)?***

Yes, the user-entered value for area must be the gross interior area of the building, or in the case of a user-specified office block, the gross interior area of the office block. This includes all principal exterior surfaces of the enclosing fixed walls and includes all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc.
Additionally, the following must be noted:

- Existing atriums should only include the base floor area that it occupies.
- Interstitial (plenum) space between floors should not be included in total.
- Gross floor area is not the same as leasable space. Leasable space is a subset of a building's gross floor area.

- ***Can parking garage or surface parking be excluded from the analysis?***

Yes, if the energy consumption for a parking garage or surface parking is included on the same meter as the building then it should be accounted for in Portfolio Manager. The tool will calculate the energy consumption of the parking structure and subtract the energy use of the parking structure from the actual reported energy consumption. If the parking structure is separately metered and not included in other utility bill data in Portfolio Manager, the user can exclude the parking structure from Portfolio Manager.

1.7 Checklist: Verification of Physical Characteristics of a Building

During the site visit, the PE must verify the following items on the Statement of Energy Performance to be true and accurate.

- Gross square foot (without parking)
- Gross square foot of parking
- Presence of a swimming pool and or computer data center
- Location of building

Module 2: Operating Characteristics

2.1 Objective:

All recorded operating characteristics displayed on a building's Statement of Energy Performance must be verified when applying for the ENERGY STAR label.

2.2 Background and Expectations of PE:

To assess the energy performance of a building, all building operating characteristics must be accurately portrayed by the user. Operating characteristics include rates of occupancy and vacancy among other pertinent characteristics specific to each building type. The PE is expected to verify the accuracy of the building's recorded operating characteristics displayed on the Statement of Energy Performance and verify that the building meets the eligibility requirements for the ENERGY STAR label. A checklist of the items to be verified is provided at the end this module.

2.3 Operating Characteristic Requirements:

Eligibility requirements must be met before a building can qualify for the ENERGY STAR label. In Portfolio Manager, users are asked to enter data for key operating characteristics of their building. There are minimum and maximum thresholds for these values. These limits are designed to make sure that their building falls into an operation pattern consistent with that of the peer group of buildings used for comparison. In order to be eligible to receive a national energy performance rating and qualify for the ENERGY STAR label, these threshold values must be met. The following requirements must be verified by the PE.

- All buildings must be in operation at least 30 hours per week.
- All office, bank, courthouse, and K-12 school spaces must contain at least 1 Personal Computer (PC). Retail stores must contain at least 1 register but can have 0 personal computers.
- Each space must contain at least 1 worker during the main shift (does not apply for hospitals or hotels)
- The user must enter at least 11 consecutive months of data for all of the operating characteristics.
- All buildings characterized as Office must have at least 75% occupancy. Hotels and motels must have an average annual occupancy rate greater than 45%.
- If the building is a K-12 School, it must be in operation at least 8 out of 12 calendar months.
- If the facility is a hospital, it must include:
  - At least 16 licensed beds but no more than 1,510 beds and
  - No more than 40 floors
- If the facility is a supermarket, it must include:
  - No more than 3 floors
  - At least 1 refrigerator or 1 freezer case
- Residence halls/Dormitories must be at least 5,000 square feet and should contain at least 5 rooms.
- If the facility is a hotel/motel the room limits are dependent upon the hotel type.
  - Upper upscale must have at least 20 rooms and no more than 2,500 rooms
  - Upscale must have at least 30 rooms and no more than 2,000 rooms
  - Mid-scale with food and beverage must have at least 50 rooms and no more than 665 rooms.
  - Mid-scale without food and beverage must have at least 40 rooms and no more than 320 rooms

- Economy and budget must have at least 20 rooms and no more than 700 rooms.

2.4 Hints & Tips:

- For office buildings, it can be useful to contact the building's local area network (LAN) manager or the equivalent to find out the average number of workers and number of PCs throughout the year, and the typical weekly operating hours.

- For K-12 schools, the administrative office typically has information on the building's seating capacity, average weekly occupancy hours, whether cooking facilities are present and in use, and the extent and use of air-conditioning.

- Because HVAC systems are often scheduled to operate for a period of time before and after the typical period of occupancy, using data from an automated environmental management system can substantially overstate the weekly operating hours as defined in Portfolio Manager. "Weekly operating hours" is defined by the number of hours during the week the building is 75% occupied.

2.5 Operating Characteristics Q& A:

- ***Are the weekly operating hours the same as the hours that the HVAC system is operating, including start-up and shut-down periods?***

No. Weekly operating hours are defined as the number of hours per week in which the majority of the primary tenants (workers for office buildings, customers for grocery stores/ supermarkets, and students for K-12 schools) are within the confines of the building. Note: Typically the operating hours of hotel/ motels and hospitals are 168 hours per week.

- ***Does an employee kitchen or galley count as a cooking facility*?**

No. In Portfolio Manager this question is used to determine whether it contains a cooking facility, such as a cafeteria, where food is prepared and served to the primary occupants, customers, or guests. Employee kitchens and galleys are outside the intent of this question. Cafeterias that serve only to keep food warm that was prepared elsewhere should not be considered cooking facilities.

- ***How should office buildings that have a large (for example, one half of one full floor), full-service cafeteria within the main office building structure be handled? Is this space considered part of the primary office space or is it considered another space type, such as restaurant?***

Yes, if the space serves the office building, then it is considered part of the office space and should not be separated out. If this cafeteria space is unrelated to the office building and is considered an independent operation such as a separate restaurant or catering service, than it should be entered into Portfolio Manager as "other". In this case, if the space is sub-metered and less than 10% of the total square foot of the building, then the energy consumption can be separated out.

- ***Is the PE expected to count each required input such as occupants, PCs, or rooms to verify the quantity in a given space****?*

No. The PE may verify this information by asking credible parties who have a detailed knowledge of the building or cross-checking information within a Portfolio Manager account. However, it is good practice to verify in person any questionable information. Additionally, all physical and operating characteristics of the building must be verified in some form. To aid this process, please see the checklist provided at the end of the document.

2.6 Checklist: Verification of Operating Characteristics of a Building

During the site visit, the PE must verify the following items on the Statement of Energy Performance to be true and accurate.

- Number of workers on main shift and number of personal computers must be verified.
- If the building is a residence hall, number of dorm rooms
- If the building is a hotel, number of hotel rooms
- If the building is a supermarket, the number of floors, refrigerator and freezer cases and registers must be verified
- If the building is a hospital, the number of rooms and floors must be verified
- If the building is a retail store, the number of refrigerator and freezer cases and registers must be verified
- The percent occupancy of banks, offices and courts must be at least 75%, the average annual occupancy rate of a hotel/motel must be at least 45%
- If the building is a warehouse, the number of walk-in coolers must be verified
- Operating hours per week must be verified. Note, that some buildings may contain more than one space in which each space may have different operating hours and characteristics that need to be verified.

Module 3: Energy Consumption

3.1 Objective:

All recorded energy consumption for each type of fuel used within a building must be verified on a Statement of Energy Performance for a building applying for the ENERGY STAR label.

3.2 Background and Expectations of PE:

To assess the performance of a building, all sources of energy within the building must be entered and verified through Portfolio Manager. Currently, acceptable fuel sources include the following: electricity, natural gas, fuel oil, diesel fuel, district steam or hot water, district chilled water, propane, coal, coke, kerosene and wood.

On-site electricity production and on-site renewable energy should be treated from the perspective of the curb. That is, only energy that crosses the curb and enters the building should be included. On-site generation of electricity typically consumes either natural gas or diesel fuel. In this case, include the consumption of natural gas or diesel fuel, but do NOT include the amount of electricity generated on-site. Renewable energy generated on-site would not be included because no energy flows across the curb. Effectively, renewable energy acts to offset the consumption of energy that would otherwise cross the curb.

Buildings or facilities that distribute energy produced on-site to other buildings or onto the electricity grid should remove the impact of this additional energy use. To accomplish this, a meter should be included in the Portfolio Manger record as having negative monthly values for each fuel type that is leaving the building for consumption off-site at another location. Similarly, if a building shares fuel with an adjacent building (e.g. district heat or cooling), that fuel must be apportioned and metered according to each building's actual consumption.

The PE is expected to review energy consumption documentation for each energy source used in the building to validate the energy consumption values entered in Portfolio Manager. Documentation must include monthly energy consumption for each energy source spanning the most recent 12 months including dates of each entry. The PE must also verify that no fuel was excluded. A checklist is provided at the end of this module. Each item must be verified to be true and accurate on the Statement of Energy Performance.

3.3 Hints & Tips:

First, review actual monthly energy bills provided by the management or owners. Other sources of energy consumption data, such as spreadsheet tracking and Energy Management Control System (EMCS) output, might be incomplete or not record all fuels or meters within the building.

Before reviewing the building record in Portfolio Manager or performing the building walk-through you should do the following:

- Get copies of actual energy bills and any record of monthly EMCS output.
- Determine the number of energy sources used within the building.
- Ask about the energy sources for any equipment that uses something other than electricity (for example, domestic water heaters and back-up electrical generators).

3.4 Energy Consumption Q& A:

- ***To verify the monthly energy consumption, must monthly bills from the utility***

company be independently obtained?

No. If the PE is confident based on his/her walk-through that all of the energy sources and meters are accounted for, than independently obtained monthly utility bills are not required. In all but the rarest of cases, the review of existing monthly energy bills that have been provided by the building management or owner is sufficient.

- ***Are monthly utility bills needed to verify the monthly energy consumption of each fuel?***

No. Based upon the judgment of the PE, a building-wide, energy-tracking tool that fully tracks consumption of all fuels (such as an EMCS) may be used instead of utility bills.

- ***Are simulated or calculated values for monthly energy consumption acceptable?***

No. Simulated or calculated values for monthly energy consumption are not acceptable when applying for the ENERGY STAR label.

- ***Should the electrical outputs of on-site renewable sources or co-generation units be included as part of the building's monthly energy consumption?***

No. Full credit is given for the use of on-site renewables. The energy input required by the co-generation unit must be accounted for in Portfolio Manager, but not the electricity that is generated.

- ***What if the facility sells or distributes energy to other buildings (that is, the benchmarked building makes and distributes hot water, steam, chilled water, or electricity to adjacent buildings)?***

Portfolio Manager is able to account for energy consumed by the building and distributed to other entities. This is accomplished by creating a meter with negative values for each fuel type that is leaving the building for consumption off-site.

3.5 Checklist: Verification of Energy Consumption

During the site visit, the PE must verify the following items on the Statement of Energy Performance to be true and accurate.

- Total energy consumption is true and accurate
- Every fuel type used by the building is accounted for in the reported total energy consumption of the building.

Module 4: Thermal Comfort

4.1 Objective:

The PE must verify that the thermal conditions in a building conform to industry standards as part of the review for the ENERGY STAR label. This module helps to ensure that a healthy and comfortable work environment exists in the building (and has not been sacrificed to reduce energy use). Thermal comfort is evaluated by observing indoor conditions including temperature and relative humidity.

4.2 Technology Standard:

ANSI/ASHRAE Standard 55-2004: Thermal Environmental Conditions for Human Occupancy. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. Atlanta Georgia. www.ashrae.org

4.3 Background and Expectations of PE:

According to ASHRAE Standard 55, acceptable thermal environment of indoor spaces designed for human occupancy is dependent upon temperature, thermal radiation, relative humidity, air speed, building activity, and clothing insulation. Thermal comfort may also vary from person to person; however, extensive laboratory and field data have been collected to provide necessary statistical data to define conditions that a specified percentage of occupants will find thermally comfortable. The majority of data collected is thermal comfort data that pertains to sedentary or near sedentary physical activity levels typical of office work. The PE is expected to verify on the Statement of Energy Performance that thermal comfort conditions of the building are met given the standards outlined in ANSI/ASHRAE Standard 55-2004. It is the responsibility of the PE to consider all measured data and observations at the time of the site visit and to determine, in his/ her professional opinion, whether the building meets the letter and spirit of ASHRAE Standard 55.

4.4 Acceptable Thermal Environmental Conditions:

There are two methods for determining acceptable thermal conditions in occupied spaces as outlined by ASHRAE Standard 55-2004. One method is based on a typical indoor environment with set conditions, and the other method assesses thermal conditions in naturally conditioned spaces. Naturally conditioned spaces are those spaces controlled by occupants through the opening and closing of windows. Given these different methods, the PE is expected to give a professional opinion about the capability of the building to provide acceptable thermal environment conditions per guidelines provided by ASHRAE Standard 55-2004. The PE should measure the temperature, thermal radiation, relative humidity, air speed, and draft of a representative sample of the occupied interior spaces of the building during occupied hours. Please refer to ASHRAE Standard 55-2004 for guidance on acceptable limits of these conditions that are expected to be maintained within a functioning building.

4.5 Hints & Tips:

Reviewing previous indoor air quality reports or testing, adjusting, and balancing (TAB) reports is generally not acceptable as a sole source of information when giving a professional opinion about whether the building can provide acceptable thermal environmental conditions.

It is highly recommended that the PE, as part of the evaluation of the occupied spaces, observe and record such signs of possible occupant thermal discomfort as:

- Oscillating table fans, window fans, or other personal fans

- Personal space heaters
- Open windows (unless it is an occupant-controlled, naturally conditioned space)
- Window or through-the-wall style room air-conditioners
- Covered or otherwise occupant-modified supply air diffusers
- Altered or broken thermostats

In addition to observing the conditions, the PE should take temperature and humidity measurements in occupied areas that have the highest concentration of the items listed above. This is a good way to check the most problematic occupied areas in the building. Again, it is up to the PE's professional judgment as to whether the building as a whole provides a suitable work environment for those subject to the respective working conditions. The outlined standards for acceptable conditions are meant to provide general guidance.

For hotels/motels having individual room units for comfort air and a separate system for outdoor air, make sure that the systems can simultaneously provide comfort AND proper ventilation.

4.6 Thermal Comfort Q& A:

- ***Must the building be assessed as it operates in both heating and cooling modes?***

No. The capability of the building to meet ASHRAE Standard 55, for the purposes of the Statement of Energy Performance, should be determined based on the mode of the HVAC system at the time of the assessment. However, the presence and prevalence of personal comfort items noted above should always factor into the decision of the PE as to whether or not both heating and cooling systems are operating as intended.

- ***Are temperature and humidity measurements required for every occupied space within the building?***

No. The PE should take a representative sample of the occupied spaces. Several factors might influence a PE's decision or require further measurement. For example, if many of the spaces measured are barely meeting the temperature and humidity conditions, then more measurements may be needed. Similarly, if there are a significant number of personal comfort devices (for example, fans, heaters and window a/ c units) or damaged and/ or occupant-altered HVAC equipment (for example, diffusers and thermostats), the PE should consider additional measurements in these areas.

- ***If the measured temperature and/ or humidity of a single occupied space are outside the acceptable thermal conditions listed in ASHRAE Standard 55, is that in and of itself grounds to "fail" the thermal comfort check?***

Generally, no. The assessment of thermal comfort should take into account all measurements and observations, and does not depend upon one occupied space not meeting the temperature and humidity requirements. After considering all measured data and observations, it is the responsibility of the PE to determine whether the building meets the letter and spirit of ASHRAE Standard 55.

- ***Why are TAB reports and Indoor Air Quality (IAQ) assessments generally not acceptable to assess whether acceptable thermal environmental conditions are being met?***

There are two reasons: 1) the assessment is intended to be a professional opinion at the time of the site visit; and 2) the assessment is intended to be based on the measurements and observations of the PE hired to perform the assessment. TAB reports and IAQ assessments can be useful for the PE to review because they may give confirmation of the PE's measurements and observations as well as indicate problem areas that need further assessment or measurement.

Module 5: Illumination

5.1 Objective:

Appropriate illumination of interior occupied spaces and the generally unoccupied exterior spaces (for example, parking garages and parking lots) associated with the building must be verified as part of review for the ENERGY STAR label. Appropriate illumination is defined by current industry standards for commercial illumination.

5.2 Technology Standard:

IESNA, Lighting Handbook: Reference & Application, 9th Edition. Illuminating Engineering Society of North America (IESNA) 120 Wall Street, 17th Floor, New York, NY 10005.

5.3 Background and Expectations of PE:

According to the Illuminance Selection Procedure of the IESNA Lighting Handbook, illuminance levels for specific applications are based on best practices for a "typical" application. While illuminance is not the sole, or in many cases the most important lighting design criteria, it is a useful indicator to determine if the lighting system performance has been compromised in pursuit of energy conservation.

The PE is expected to give a professional opinion about the capability of the building to provide minimum recommended illumination levels of both occupied spaces (that is, interior spaces) and generally unoccupied spaces (that is, parking garages and parking lots) based on guidance provided by the Illuminance Selection Procedure in the IESNA Lighting Handbook. In doing so, the PE should measure the illumination levels in a representative sample of the occupied interior spaces of the building as well as any associated parking facilities. It is the responsibility of the PE to decide, based on his/ her professional opinion, whether the building meets the minimum recommended illumination levels considering all measured data and observations at the time of the site visit.

5.4 Acceptable Illumination Levels:

The IESNA Lighting Handbook recommends horizontal and/ or vertical task illuminances for a wide variety of locations and tasks. The recommended values throughout the IESNA Lighting Handbook represent consensus values formally obtained by the appropriate application committee. IESNA recognizes that illuminance is not the sole lighting design criterion and that other criteria may be more important than illuminance. In these instances, the lighting designer may deviate from the recommended illuminance. In general, IESNA believe that a dramatic difference between actual and a recommended illuminance (i.e. a difference of two standard deviations or more) is characterized as 1/3 more or 1/3 less than the recommended value. Any dramatic deviations from the recommended value should be carefully documented just in case the design is ever challenged. Additionally, it should be kept in mind that while a single instance is not alarming, a number of dramatic deviations should be questioned and challenged against the design illuminance. A sample of the minimum recommended illumination levels in foot-candles (FC) are given in the table below. Please refer to the IESNA Lighting Handbook for a complete list of recommended illumination levels of interior spaces.

Recommended Illumination Levels for Interior Spaces

Note this list is not all inclusive. For a complete list of recommended illumination levels of interior spaces, see Interior 1-16 of the IESNA Lighting Design Guide.

Space Type	Horizontal (FC)	Vertical (FC)
Offices		
Meeting Rooms	30	5
Video Conference Rooms	50	30
Copy Rooms	10	3
Mail Sorting	50	3
Private Offices	50	5
Open Plan Offices	30 to 50	5
Lobbies/ Reception Areas	10	3
Stairways and Corridors	5	-
Restrooms	5	3
Educational Facilities		
Reading -- white boards	-	5
Reading – chalk boards	-	50
Reading – pen/ typed print/# 2 pencil	30	-
Reading -- keyboard	30	-
Science Labs	50	30
Art Rooms	50	30
Lecture Halls	100	50
Health Care Facilities		
Anesthetizing	50	10
Autopsy, general	50	10
Cardiac function laboratory	50	10
Work areas, general	30	5
Operating areas, delivery, recovery, & lab suite and service	50	3
Critical care areas	5	3
Recovery room, general	10	3
Emergency outpatient general	50	10
Occupational therapy	30	5
Patient rooms, observation	5	3
Surgical Suite, general	300-1000	50
Surgical Holding Room	50	10

Space Type*	Horizontal (FC)	Vertical (FC)
Hotels		
Guest rooms – general	10	-
Bathrooms	30	5
Corridors, elevators, stairs	5	-
Front desk	50	-
Lobby – general lighting	10	-
Linen room – general	10	-
Retail		
Fitting areas	100	30
Stocks rooms, wrapping, packaging	30	5
General merchandise display	50	10
Supermarkets		
Shelving	50	10
Meat - processed	50	10
Meat -fresh	50	10
Produce	50	10
Dairy	50	10

Parking Facilities and Enclosed Parking Garages:

The illuminance requirements for all parking facilities depend largely on pedestrian needs and perceived personal security issues. Lighting for parking lots should provide not only the recommended minimum illuminance levels but also good color, rendition, uniformity, and minimal glare. From a security standpoint, lighting for parking garages need higher illuminances than open parking facilities. Good lighting uniformity is most important in parking garages since access aisles are used by pedestrians for walking between cars, stairways and elevators. The recommended maintained illuminance levels for both open parking lots and enclosed garages are noted below.

Recommended Maintained Illuminance Values for Parking

	Minimum Horizontal (fc)	Minimum Vertical (fc)
Open parking lots		
Basic	0.2	0.1
Enhanced Security	0.5	0.25
Parking garages		
Basic	1.0	0.5
Ramps		
Day	2.0	1.0
Night	1.0	0.5
Entrance Areas		
Day	50.0	25.0
Night	1.0	0.5
Stairways	2.0	1.0

5.5 Hints & Tips:

- When measuring illuminance, remember to position the light meter at the proper height on the work surface at the task location (either vertical or horizontal). Avoid shadowing the meter with your body, and avoid reflections off of clothing.
- Allow thirty minutes between system switch-on and the first measurement to ensure that the lighting system has reached a stable condition.
- Daylight effects should be eliminated by performing the lighting survey after dark, or with the blinds closed and measuring the day lighting contribution with the lights off and subtracting its contribution to the electric lighting.
- Illumination should be checked both directly under the fixture and between fixtures (both laterally and longitudinally).
- Uniformity should also be evaluated, particularly next to walls, in corners, and parking garages where security and safety might be of question.
- Areas with occupant-supplied task lights, de-lamped fixtures, or numerous burned-out lamps should receive additional scrutiny as these are areas that may be under lit.
- The PE should be able to make a professional judgment on whether appropriate illumination exists through a subset of measurements in a representative sample of spaces within the building.

5.6 Illumination Q& A:

- ***If the measured illumination levels of a single occupied space are below the minimum recommended levels as defined in the IESNA Lighting Handbook, is that, in and of itself, sufficient grounds to "fail" the building for inadequate illumination?***

Generally no, the assessment of illumination should take into account measurements and observations of all spaces, and is not necessarily contingent upon one occupied space meeting the minimum recommended levels. Based on observations at the time of the site visit, the PE must determine whether the building lighting system meets the minimum recommended illumination levels for the current occupancy.

Module 6: Ventilation for Acceptable Indoor Air Quality

6.1 Objective:

Appropriate quantities of outside air ventilation and indoor air quality for interior occupied spaces or enclosed spaces that people occupy (for example, parking garages) within the building must be verified as part of review for the ENERGY STAR label. The purpose is to specify minimum ventilation rates and indoor air quality that will be acceptable to human occupants and to minimize the potential for adverse health effects. Release of moisture in residential kitchens, bathrooms, locker rooms, and swimming pools are included in the scope of this module.

6.2 Technology Standard:

ANSI/ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality. *Note: Healthcare facilities may use either ASHRAE Standard 62 or AIA 2001Guideline for Design and Construction of Hospital and Healthcare Facilities.*

6.3 Background and Expectations of PE:

According to ASHRAE Standard 62.1 - 2004, acceptable ventilation rates and measure of indoor air quality is a function of the type of building space, building floor area, and number of occupants. There are two different compliance paths that can be followed, one system is based on ventilation rates and the other is based on analysis of contaminant sources. Given proper measurements and observations, the PE is expected to give a professional opinion about the capability of the building to supply acceptable ventilation rates for the maintenance of healthy indoor air quality. Both paths of design compliance can be referenced in the ASHRAE Standard 62.1-2004 for specifics on procedure techniques and contaminant concentration guidelines. Ultimately, it is the responsibility of the PE to determine, based on his/ her professional opinion, whether the building meets the letter and spirit of industry standards considering all measured data and observations at the time of the site visit.

6.4 Acceptable Indoor Air Quality and Ventilation Rates:

As mentioned above, ASHRAE Standard 62.1-2004 provides details on two ventilation system design paths, each subject to their own restrictions. The first ventilation system design path is based on a *Ventilation Rate Procedure*. This is a prescriptive procedure in which outdoor air intake rates are determined based on space type/application, occupancy level, and floor area. Minimum ventilation rates are based on contaminant sources and source strengths that are typical for the listed space types. Minimum ventilation rates for specific space types are summarized in Table 6.1 below and are detailed in the body of ASHRAE Standard 62.1-2004, Section 6.2.

The second type of design compliance is based on the Indoor Air Quality Procedure (IAQ) in which outdoor air intake rates and other system design parameters are based on an analysis of contaminant sources, contaminant concentration targets, and air quality acceptability targets. In other words, controls that remove contaminants (ex. air cleaning devices) or controls that can reliably demonstrate the maintenance of acceptable indoor air quality (resulting in indoor contaminant concentrations equal to or lower than those achieved using the Ventilation Rate Procedure) are given credit. For each contaminant of concern, a target concentration limit and corresponding exposure period should be specified. Section 6.3.1.4 of ASHRAE Standards 62.1-2004 outlines what design approaches can be used to determine or validate the acceptability of minimum space and system outdoor airflow rates and other relevant design parameters. Other specifics on the IAQ Procedure can be referenced in Section 6.3 of ASHRAE Standard 62.1 2004. Furthermore, guidelines for contaminant concentrations can be found in Appendix B of ASHRAE Standard 62.1 -2004.

A sample of the required outdoor air supply rates, in units of cubic feet per minute (CFM), for various indoor spaces (for example, office, classrooms, computer rooms, etc.) are given in **Table 6.1** below. Please refer to ASHRAE Standard 62.1 for the outdoor air supply rates of interior functional spaces not given below. Many of the spaces shown below may also have minimum exhaust rates that need to be met. Minimum exhaust rates for the spaces shown in **Table 6.1** may be found in **Table 6.2**. For healthcare facilities using the AIA 2006 Guideline in place of ASHRAE Standard 62, see **Appendix E** for outdoor air supply rates of various healthcare space functions.

Table 6.1 Minimum Ventilation Rates in Breathing Zone (ASHRAE Standard 62.1-2004).

These values are defined as the default combined outdoor air rate (per person). These rates are based on the default occupant density.

	Default Values			
Functional Space	**Occupant Density[1] (#/1000 ft^2 or #/100 m^2)**	**Outdoor Air Supply Rate[2] (cfm/person)**	**Air Class[3]**	**Notes**
Office				
Office space	5	17	1	
Reception areas	30	7	1	
Conference/meeting	50	6	1	
Main entry lobbies	10	11	1	
K-12 School				
Classrooms (ages 5-8)	25	15	1	
Classrooms (age 9 +)	35	13	1	
Science laboratories	25	17	-	Also See Minimum Exhaust Rates Table
Auditorium seating area	150	5	1	
Multi-use assembly areas	100	8	1	
Libraries	10	17	1	
Music/theater/dance	35	12	1	
Computer lab	25	15	1	
Art classroom	20	19	2	Also See Minimum Exhaust Rates Table
Locker rooms	-	-	2	See Minimum Exhaust Rates Table
Wood/metal shop	20	19	2	Also See Minimum Exhaust Rates Table
Supermarket				
Supermarkets (customer space)	8	15	1	
Hotel/Motel				
Bedrooms/living rooms	10	11	1	
Bathrooms	-	-	2	See Minimum Exhaust Rates Table
Lobbies	30	10	1	
Multi-purpose assembly	120	6	1	
Bars/ cocktail lounges	100	9	2	Supplemental smoke removal
Coin-operated laundries		15	2	
Hospital (If using AIA 2001 Guidelines see Appendix F, If using ASHRAE Standard 62.1-2004 see Appendix E)				
Other space				
Cafeterias/Dining rooms	100	9	2	
Kitchens (commercial)	-	-	2	See Minimum Exhaust Rates Table
Computer rooms (not printing)	4	20	1	
Corridors	-	0.06 (cfm/sqft)	1	
Public restrooms (per toilet fixture	-	-	2	See Minimum Exhaust Rates Table
Swimming pools (pool & deck area)		0.48 (cfm/sqft)	2	Rate does not take into account humidity control

[1]The default occupant density shall be used when actual occupant density is not known

[2] This rate is based on the default occupant density.

[3] Class 1 air is characterized by low contaminant concentrations, low sensory-irritation intensity & inoffensive odor. It may be recirculated or transferred to any space.
Class 2 air is characterized by moderate contaminant concentrations. It is not necessarily harmful but it is inappropriate for transfer or recirculation to spaces used for different purposes. However, it may be recirculated within the space of origin.

Table 6.2 Minimum Exhaust Rates.
Exhaust makeup air may be any combination of outdoor air, recirculated air and transfer air.

Functional Space	Exhaust Rate (cfm/ft^2)	Air Class	Notes
Science laboratories	1.00	-	No class of air ahs been established for this occupancy category
Art classrooms	0.70	2	
Locker Rooms	0.50	2	
Wood/metal shop	0.50	2	
Bathrooms (private)	25/50	2	Exhaust rate is cfm/unit and is intended for toilet room intended to be occupied by 1 person at a time.For continuous use during normal operating hrs. use lower #
Bathrooms (public)	50/70	2	Rate is per water closet &/or Urinal. Provide the higher rate when periods of heavy use are expected.
Kitchens (commercial)	0.70	2	

Additionally, conformance to the following requirements must be verified:

- *Ventilation in Smoking Areas*: Smoking areas should have more ventilation and/or air cleaning than comparable non-smoking areas. Specific ventilation rate requirements cannot be determined until authorities determine the concentration of smoke that achieves an acceptable level of risk. Air from smoking areas shall not be reciruclated or transferred to non-smoking areas. Table 6.1 of the PE Guide refers only to ventilation rates of non-smoking areas.

- *Microbiological Sources*: The building should be free of visible signs of microbiological sources such as mold and mildew.

- *Water Intrusion:* Water intrusion or accumulation in ventilation system components such as ducts, plenums, and air handlers should be investigated and rectified.

6.5 Hints & Tips:

- Reviewing the most current, written, preventative maintenance plan can provide useful insight about the level of concern placed upon the control of indoor air pollutants. A well written preventive maintenance plan should document the procedures used in the building to monitor, inspect, and clean all HVAC components for proper operation.

- Reviewing previous indoor air quality reports or testing, adjusting, and balancing (TAB) reports is generally not acceptable as the sole means to give a professional opinion about the capability of the building to provide acceptable outside air.

- The PE should make an effort to measure the outdoor airflow directly. If this is not feasible due to air-handling unit design or configuration, the PE should calculate the percentage of outdoor air by mass balance equations.

- In buildings having repetitive occupant and HVAC configurations, direct measurement of a sampling of air-handling units may be acceptable. Each air-handling unit, however, should be inspected to determine if it is operating properly.

- Central energy management control systems (EMCS) or direct digital control (DDC) systems can provide real-time information about an air-handling unit's operating status. PEs may use this information at their discretion as a means to give an opinion about the ability of the building to meet ASHRAE Standard 62.1-2004.

6.6 Ventilation for Acceptable Indoor Air Quality Q& A:

- ***Is the building required to be mechanically ventilated to meet ASHRAE Standard 62.1-2004?***

Generally, yes. However, some buildings (for example, K-12 schools) were designed to be naturally ventilated. Use of natural ventilation systems designed in accordance with Section 5.1 of ASHRAE Standard 62.1-2004, is permitted in lieu of or in conjunction with mechanical ventilation systems. Natural ventilation must be approved by the authority having jurisdiction. Determining whether such buildings meet mechanical ventilation requirements of ASHRAE 62.1 would necessitate a calculation by the PE.

- ***Are outside air measurements or calculations required for every occupied space within the building?***

No. It is expected that the PE will take a representative sample of the occupied spaces to be able to give his/ her decision. There are several factors that might influence a PE's decision or warrant further measurement. For example, if a significantly sized space is marginally meeting the minimum requirements, then more measurements may be warranted. Similarly, if there are a significant number of personal fans, indicating stagnate air, or damaged and/ or occupied-altered HVAC equipment (for example, diffusers and thermostats), the PE may want to consider additional measurements in these areas.

- ***If the measured outdoor air supply of a single occupied space is below the acceptable supply rates given in ASHRAE Standard 62.1, is that sufficient grounds to give an opinion of "Fail" for the ventilation requirement?***

The answer depends upon the space itself, compliance design path chosen (IAQ or Ventilation Rate Procedure), and is ultimately the judgment of the PE. For Example, if the ventilation rate in an open office plan within a given building does not meet ASHRAE Standard 62.1-2004, then it would be expected that the PE would give the building a “fail” grade for the ventilation requirement. However, if the outdoor supply rate or contaminant concentration for a single private office within a whole building does not meet ASHRAE Standard 62.1-2004 and the remainder of the building is deemed to meet the standard, than one could reasonably expect that the PE would give the building a "pass" for the ventilation requirement. Generally the outdoor air supply assessment and contaminant concentration guideline should take in to account all measurements and observations, and is not necessarily contingent upon one occupied space meeting the ventilation requirements. It is the responsibility of the PE to determine whether the building meets the letter and spirit of ASHRAE Standard 62.1-2004 after considering all measured data and observations.

- ***Why are TAB reports and Indoor Air Quality assessments generally not acceptable for assessing whether acceptable outside air ventilation is being provided?***

The principal reasons are two-fold: 1) the assessment is intended to be a professional opinion at the time of the site visit; and 2) the assessment is intended to be based upon the measurements and observations of the PE hired to perform the assessment. TAB reports and IAQ assessments can be quite useful for the PE to review though as they may provide confirmation of the PE's measurements and observations as well as indicate problematic areas worthy of the PE's attention.

- ***Is the use of other standards or guidelines acceptable in evaluating “outside air ventilation” requirements?***

All building types are subject to ASHRAE Standard 62.1-2004 with one exception. Healthcare facilities may use either ASHRAE Standard 62.1-2004 OR AIA 2001 Guideline for Design and Construction of Hospital and Healthcare Facilities.

- ***If a single private office is not preventing the involuntary exposure to secondhand smoke, is this ground for failure?***

Yes. The policy of the building must be to allow smoking only in designated smoking lounges that are both directly exhausted to the outdoors and under negative pressure relative to the occupied spaces.

Appendix A: Contact Information

Mailing Address:

ENERGY STAR Label for Buildings
U. S. Environmental Protection Agency (6202J)
1200 Pennsylvania Avenue, NW
Washington, DC 20004

Contact information for questions:

- **Hotline**: 1-888-STAR-YES (1-888-782-7937)
- **E-mail:** energystarbuildings@epa.gov
- **Web-site:** www.energystar.gov (Go to *Buildings and Plants*)
    - More on Portfolio Manager: http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager
    - Applying for the ENERGY STAR Label: http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager_intro

Technology Standards Referenced in The Guide:

- American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) Publication Sales Department 1791 Tullie Circle, NE Atlanta, GA 30329 Tel: (404) 636-8400 Web URL: www.ashrae.org
    - ANSI/ASHRAE Standard 55-2004: Thermal Environmental Conditions for Human Occupancy. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. Atlanta Georgia. www.ashrae.org
    - ANSI/ASHRAE Standard 62.1-2004: Ventilation for Acceptable Indoor Air Quality. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. Atlanta Georgia. www.ashrae.org

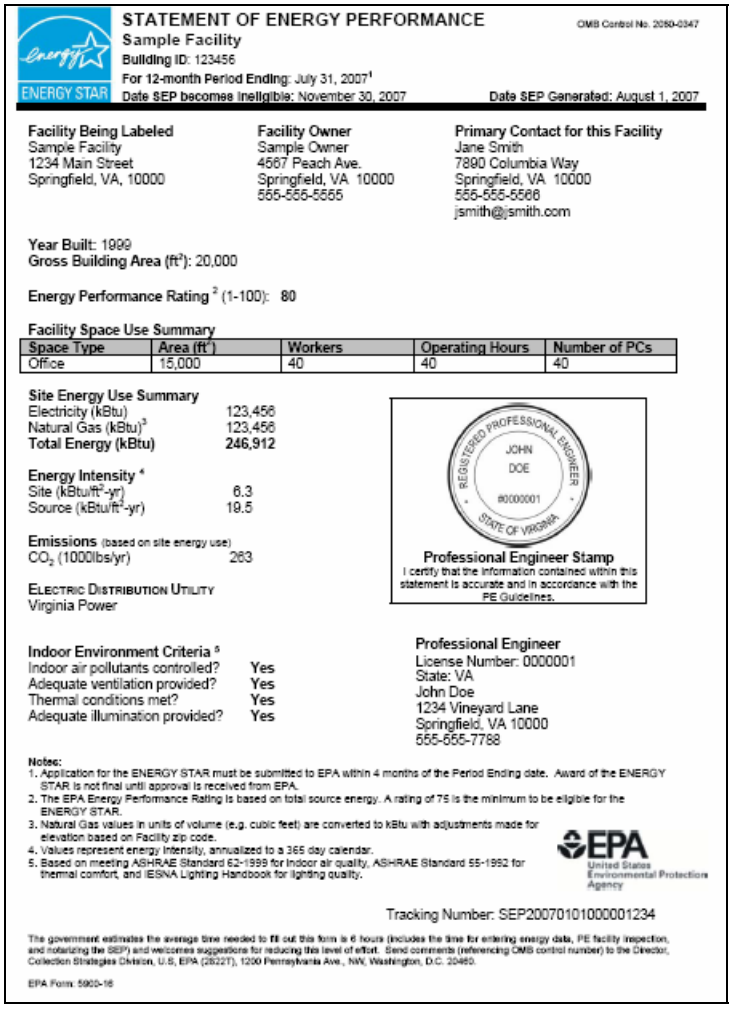
    Note: Healthcare facilities may use either ASHRAE Standard 62 or AIA 2001 Guideline for Design and Construction of Hospital and Healthcare Facilities.
- IESNA, Lighting Handbook: Reference & Application, 9th Edition Illuminating Engineering Society of North America (IESNA) 120 Wall Street, 17th Floor New York, NY 10005 Tel: (212) 248-5000 Web URL: www.iesna.org E-mail: iesna@iesna.org

Appendix B: Professional Engineer Qualifications

In addition to having a current registration as a Professional Engineer (PE) and being in good standing, a PE must have the following qualifications to validate the Statement of Energy Performance that is used to apply for the ENERGYSTAR Label.

- A current license in the state where the building is located or a license in a state that has a reciprocal agreement with the state where the building is located.
    - Exception: Professional engineers employed by the Federal government may evaluate any buildings located in the United States that are owned or primarily occupied by the Federal government. Contractors and consultants to the Federal government, however, are not covered by this exception.
- A license in a discipline related to commercial building systems, such as mechanical or electrical engineering.
- Working knowledge of ASHRAE Standard 55-2004, ASHRAE Standard 62.1-2004, and IESNA Lighting Handbook.

Appendix C. Example Copy of a Statement of Energy Performance



STATEMENT OF ENERGY PERFORMANCE

OMB Control No. 2060-0347

Sample Facility

Building ID: 123456

For 12-month Period Ending: July 31, 2007[1]

Date SEP becomes ineligible: November 30, 2007 **Date SEP Generated:** August 1, 2007

Facility Being Labeled
Sample Facility
1234 Main Street
Springfield, VA, 10000

Facility Owner
Sample Owner
4567 Peach Ave.
Springfield, VA 10000
555-555-5555

Primary Contact for this Facility
Jane Smith
7890 Columbia Way
Springfield, VA 10000
555-555-5566
jsmith@jsmith.com

Year Built: 1999
Gross Building Area (ft²): 20,000

Energy Performance Rating[2] (1-100): **80**

Facility Space Use Summary

Space Type	Area (ft²)	Workers	Operating Hours	Number of PCs
Office	15,000	40	40	40

Site Energy Use Summary

Electricity (kBtu)	123,456
Natural Gas (kBtu)[3]	123,456
Total Energy (kBtu)	**246,912**

Energy Intensity[4]

Site (kBtu/ft²-yr)	6.3
Source (kBtu/ft²-yr)	19.5

Emissions (based on site energy use)

CO_2 (1000lbs/yr)	263

Electric Distribution Utility
Virginia Power

Professional Engineer Stamp
I certify that the information contained within this statement is accurate and in accordance with the PE Guidelines.

Professional Engineer
License Number: 0000001
State: VA
John Doe
1234 Vineyard Lane
Springfield, VA 10000
555-555-7788

Indoor Environment Criteria[5]

Indoor air pollutants controlled?	Yes
Adequate ventilation provided?	Yes
Thermal conditions met?	Yes
Adequate illumination provided?	Yes

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
4. Values represent energy intensity, annualized to a 365 day calendar.
5. Based on meeting ASHRAE Standard 62-1999 for Indoor air quality, ASHRAE Standard 55-1992 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

Tracking Number: SEP20070101000001234

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, PE facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S. EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

Appendix D. List of Building Type Definitions

Bank/Financial Institution
Bank/Financial Institution applies to facility space used for financial services. Relevant businesses include bank branches, bank headquarters, securities and brokerage firms. The total gross floor area should include all supporting functions such as vaults, kitchens used by staff, lobbies, atria, conference rooms and auditoria, fitness areas for staff, storage areas, stairways, elevator shafts, etc.

Computer Data Center

Computer Data Center applies to spaces specifically designed and equipped to meet the needs of high density computing equipment such as server racks, used for data storage and processing. Typically these are raised floor spaces that maintain controlled temperatures and/or humidity. The air-conditioning system for this type of space is usually separate from that used to control the space environment in other parts of the building and is usually separated by walls and doors.

If an entire facility is listed as a Computer Data Center, it is not eligible to receive a National Energy Performance Rating. However, if the majority of the building space use falls into an eligible category and the Computer Data Center accounts for 10% or less of total floor area, the facility is eligible to receive an National Energy Performance Rating.

Courthouse
Courthouse applies to facility space used for federal, state, or local courts and associated office space. The total gross floor area should include all supporting functions such as temporary holding cells, kitchens used by staff, lobbies, atria, conference rooms and auditoria, fitness areas for staff, storage areas, stairways, elevator shafts, etc.

Dormitory / Residence Hall
Dormitory/Residence Hall applies to buildings associated with educational institutions or military facilities which offer multiple accommodations for long-term residents. The total gross floor area should include all supporting functions such as food service facilities, laundry facilities, meeting spaces, exercise rooms, health club/spas, lobbies, elevator shafts, storage areas stairways, etc.

Hospital (Acute Care and Children's)
Hospital applies to facility space of least 20,000 square feet in total gross floor area used as Acute Care and Children's Hospitals. These facilities typically provide a variety of services within the same facility or among multiple facilities on a campus, including emergency medical care, physician's office services, diagnostic care, ambulatory care, and surgical care.

At least 50% of the total gross floor area must be used for acute care. Facilities that use more than 50% of the gross floor area for long-term care, skilled nursing, and/or ambulatory surgical centers are not eligible for a rating at this time. Note: the entirety of the facility and/or campus should be entered as a single Hospital space use. The total floor area should include all supporting functions such as: stairways, connecting corridors between buildings, medical offices, exam rooms, laboratories, lobbies, atria, cafeterias, storage areas, elevator shafts, and any space affiliated with emergency medical care, or diagnostic care.

No unique space uses should be entered other than surface parking lots, garage parking, and raised floor data centers.

Additional guidance: **Healthcare Classification Document** (446KB)

Hotel / Motel
Hotel/Motel applies to buildings that rent overnight accommodations on a room/suite basis, with a bath/shower and other facilities in most guest rooms. The total gross floor area should include all supporting functions such as food preparation and restaurant space, laundry facilities, exercise rooms, health club/spas, lobbies, atria, elevator shafts, stairways, storage areas, etc.

Amenities including meeting and conference facilities, recreational space, and retail establishments should be used to place your Hotel into the appropriate amenity category; these spaces should be included in the total floor area. Hotel/motel categories currently eligible for benchmarking include: economy, midscale, upscale, and upper upscale. Resort and extended stay categories are not eligible for a rating at this time.

Please refer to the Amenity and Category Definitions.

K-12 School
K-12 School applies to facility space used as a school building for Kindergarten through 12th grade students. This does *not* include college or university classroom facilities and laboratories, or vocational, technical, and trade schools. The total gross floor area should include all supporting functions such as administrative space, conference rooms, kitchens used by staff, lobbies, cafeterias, gymnasiums, auditoriums, laboratory classrooms, greenhouses, stairways, atria, elevator shafts, small landscaping sheds, storage areas, etc.

Medical Office
Medical Office applies to facility space used to provide diagnosis and treatment for medical, dental, or psychiatric outpatient care. The total gross floor area should include all supporting functions such as kitchens used by staff, laboratories, lobbies, atria, conference rooms and auditoria, fitness areas for staff, storage areas, stairways, elevator shafts, etc.

Additional guidance: **Healthcare Classification Document** (446KB)

Office
Office applies to facility spaces used for general office, professional, and administrative purposes. The total gross floor area should include all supporting functions such as kitchens used by staff, lobbies, atria, conference rooms and auditoria, fitness areas for staff, storage areas, stairways, elevator shafts, etc.

Parking
The Parking space type is intended for any area connected to the building that is used for parking vehicles. This includes parking lots, fully enclosed parking structures, and unenclosed parking structures that are open on all sides and may or may not include roof parking. All parking areas should be combined into one parking space. The purpose of combining all of these areas into one space is to avoid double counting and simplify the process. By apportioning the square foot of the parking area into these three categories, Portfolio Manager can properly assign lighting and ventilation allowances.

Retail Store
This space type applies to stores of at least 5,000 square feet in gross floor area used to conduct the retail sale of consumer products goods. The total gross floor area should include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators,

stairwells, atria, etc. Stores must be free standing or located in strip centers. Stores located in enclosed malls are not eligible, with the exception of mall anchors. Retail segments typically eligible for benchmarking include: Department Store, Discount Store, Supercenter, Warehouse Club, Drug Store, Dollar Store, Home Center/Hardware, and Apparel/Hard Line Specialty (i.e. books, clothing, office products, toys, home goods). Retail segments not eligible for benchmarking include Electronics Stores.

Supermarket

The Supermarket/Grocery Store space type applies to facility space used for the retail sale of food and beverage products. It should not be used by restaurants, which are not eligible for a rating at this time. The total gross floor area should include all supporting functions such as kitchens and break rooms used by staff, storage areas (refrigerated and non-refrigerated), administrative areas, stairwells, atria, lobbies, etc.

Swimming Pool

Swimming Pool applies to heated swimming pools that operate on the premises and on the same energy-use meter as the primary facility. This category applies to any heated swimming pools located inside or outside of the facility. Swimming pools are categorized by size, application, and usage.

Warehouse (Refrigerated or Unrefrigerated)

The warehouse space type is intended to define facility space that is *only used to store* goods, manufactured products, merchandise or raw materials. Space types defined as Warehouse (Refrigerated or Unrefrigerated) must not contain any onsite manufacturing. If the space is part of an industrial campus, the space defined as warehouse must be a separate structure that is separately metered from any adjacent processing plants. Refrigerated warehouse specifically denotes space designed to store perishable goods or merchandise under refrigeration at temperatures below 50 degrees Fahrenheit. Unrefrigerated warehouse specifically denotes space designed to store non-perishable goods and merchandise. The total gross floor area should include all supporting functions such as offices, lobbies, stairways, rest rooms, equipment storage areas, elevator shafts, etc.

Appendix E: Outdoor Air Ventilation Rates for Health Care Facilities

(Healthcare facilities using the AIA 2006 Guideline in place of ASHRAE Standard 62.1-2004)

Table 2.1-2

Ventilation Requirements for Areas Affecting Patient Care in Hospitals and Outpatient Facilities[1]

Area designation	*Air movement relationship to adjacent area[2]*	*Minimum air changes of outdoor air per hour[3]*	*Minimum total air changes per hour[4,5]*	*All air exhausted directly to outdoors[6]*	*Recirculated by means of room units[7]*	*Relative humidity[8] (%)*	*Design temperature[9] (degrees F/C)*
NURSING UNITS							
Patient room	–	2	6[10]	–	–	–	70-75 (21-24)
Toilet room	In	–	10	Yes	–	–	–
Newborn nursery suite	–	2	6	–	No	30-60	72-78 (22-26)
Protective environment room[11]	Out	2	12	–	No	–	75 (24)
Airborne infection isolation room[11]	In	2	12	Yes[12]	No	–	75 (24)
Isolation alcove or anteroom	In/Out	–	10	Yes	No	–	–
Patient corridor	–	–	2	–	–	–	–
OBSTETRICAL FACILITIES							
Delivery room[13]	Out	3	15	–	No	30-60	68-73 (20-23)
Labor/delivery/recovery	–	2	6[10]	–	–	–	70-75 (21-24)
Labor/delivery/recovery/postpartum	–	2	6[10]	–	–	–	70-75 (21-24)
EMERGENCY, SURGERY, AND CRITICAL CARE							
Operating/surgical cystoscopic rooms[11, 13]	Out	3	15	–	No	30-60	68-73 (20-23)[14]
Recovery room[13]	–	2	6	–	No	30-60	70-75 (21-24)
Critical and intensive care	–	2	6	–	No	30-60	70-75 (21-24)
Intermediate care	–	2	6[10]	–	–	–	70-75 (21-24)
Newborn intensive care	–	2	6	–	No	30-60	72-78 (22-26)
Treatment room[15]	–	–	6	–	–	–	75 (24)
Trauma room[15]	Out	3	15	–	No	30-60	70-75 (21-24)
Bronchoscopy[11]	In	2	12	Yes	No	30-60	68-73 (20-23)
Triage	In	2	12	Yes[16]	–	–	70-75 (21-24)
ER waiting rooms	In	2	12	Yes[12, 16]	–	–	70-75 (21-24)
Procedure room	Out	3	15	–	No	30-60	70-75 (21-24)
Laser eye room	Out	3	15	–	No	30-60	70-75 (21-24)
X-ray (surgical/critical care and catheterization)	Out	3	15	–	No	30-60	70-75 (21-24)
Anesthesia gas storage	In	–	8	Yes	–	–	–
SUPPORT AREAS							
Medication room	Out	–	4	–	–	–	–
Clean workroom or clean holding	Out	–	4	–	–	–	–
Soiled workroom or soiled holding	In	–	10	Yes	No	–	–
DIAGNOSTIC AND TREATMENT AREAS							
Examination room	–	–	6	–	–	–	75 (24)
Treatment room	–	–	6	–	–	–	75 (24)
Physical therapy and hydrotherapy	In	–	6	–	–	–	75 (24)
Gastrointestinal endoscopy room	–	2	6	–	No	30-60	68-73 (20-23)
Endoscopic instrument processing room[17]	In	–	10	Yes	No	–	–
Imaging[18]							
X-ray (diagnostic & treatment)	–	–	6	–	–	–	75 (24)
Darkroom	In	–	10	Yes	No	–	–
Imaging waiting rooms	In	2	12	Yes[12, 16]	–	–	70-75 (21-24)
Laboratory[19]							
General[18]	–	–	6	–	–	–	75 (24)
Biochemistry[18]	In	–	6	Yes	No	–	75 (24)
Cytology	In	–	6	Yes	No	–	75 (24)
Glass washing	In	–	10	Yes	–	–	–

Table 2.1-2 (continued)
Ventilation Requirements for Areas Affecting Patient Care in Hospitals and Outpatient Facilities[1]

Area designation	*Air movement relationship to adjacent area[2]*	*Minimum air changes of outdoor air per hour[3]*	*Minimum total air changes per hour[4, 5]*	*All air exhausted directly to outdoors[6]*	*Recirculated by means of room units[7]*	*Relative humidity[8] (%)*	*Design temperature[9] (degrees F/C)*
Histology	In	–	6	Yes	No	–	75 (24)
Microbiology[18]	In	–	6	Yes	No	–	75 (24)
Nuclear medicine	In	–	6	Yes	No	–	75 (24)
Pathology	In	–	6	Yes	No	–	75 (24)
Serology	In	–	6	Yes	No	–	75 (24)
Sterilizing	In	–	10	Yes	–	–	–
Autopsy room[11]	In	–	12	Yes	No	–	–
Nonrefrigerated body-holding room	In	–	10	Yes	–	–	70 (21)
SERVICE AREAS							
Pharmacy	Out	–	4	–	–	–	–
Food preparation center	–	–	10	–	No	–	–
Warewashing	In	–	10	Yes	No	–	–
Dietary day storage	In	–	2	–	–	–	–
Laundry, general	–	–	10	Yes	–	–	–
Soiled linen (sorting and storage)	In	–	10	Yes	No	–	–
Clean linen storage	Out	–	2	–	–	–	–
Soiled linen and trash chute room	In	–	10	Yes	No	–	–
Bedpan room	In	–	10	Yes	–	–	–
Bathroom	In	–	10	–	–	–	75 (24)
Housekeeping room	In	–	10	Yes	No	–	–
STERILIZING AND SUPPLY							
ETO-sterilizer room	In	–	10	Yes	No	30-60	75 (24)
Sterilizer equipment room	In	–	10	Yes	–	–	–
Central medical and surgical supply							
Soiled or decontamination room	In	–	6	Yes	No	–	68-73 (20-23)
Clean workroom	Out	–	4	–	No	30-60	75 (24)
Sterile storage	Out	–	4	–	–	(Max) 70	–

[1] The ventilation rates in this table cover ventilation for comfort, as well as for asepsis and odor control in areas of acute care hospitals that directly affect patient care and are determined based on healthcare facilities being predominantly "No Smoking" facilities. Where smoking may be allowed, ventilation rates will need adjustment. Areas where specific ventilation rates are not given in the table shall be ventilated in accordance with ASHRAE Standard 62, *Ventilation for Acceptable Indoor Air Quality*, and *ASHRAE Handbook–HVAC Applications*. Specialized patient care areas, including organ transplant units, burn units, specialty procedure rooms, etc., shall have additional ventilation provisions for air quality control as may be appropriate. OSHA standards and/or NIOSH criteria require special ventilation requirements for employee health and safety within health care facilities.

[2] Design of the ventilation system shall provide air movement which is generally from clean to less clean areas. If any form of variable air volume or load shedding system is used for energy conservation, it must not compromise the corridor-to-room pressure balancing relationships or the minimum air changes required by the table.

[3] To satisfy exhaust needs, replacement air from the outside is necessary. Table 2.1-2 does not attempt to describe specific amounts of outside air to be supplied to individual spaces except for certain areas such as those listed. Distribution of the outside air, added to the system to balance required exhaust, shall be as required by good engineering practice. Minimum outside air quantities shall remain constant while the system is in operation. In variable volume systems, the minimum outside air setting on the air-handling unit shall be calculated using the ASHRAE 62 method.

[4] Number of air changes may be reduced when the room is unoccupied if provisions are made to ensure that the number of air changes indicated is reestablished any time the space is being utilized. Adjustments shall include provisions so that the direction of air movement shall remain the same when the number of air changes is reduced. Areas not indicated as having continuous directional control may have ventilation systems shut down when space is unoccupied and ventilation is not otherwise needed, if the maximum infiltration or exfiltration permitted in Note 2 is not exceeded and if adjacent pressure balancing relationships are not compromised. Air quantity calculations must account for filter loading such that the indicated air change rates are provided up until the time of filter change-out. The minimum total air change requirements for Table 2.1-2 shall be based on the supply air quantity in positive pressure rooms, and the exhaust air quantity in negative pressure rooms.

[5] Air change requirements indicated are minimum values. Higher values should be used when required to maintain indicated room conditions (temperature and humidity), based on the cooling load of the space (lights, equipment, people, exterior walls and windows, etc.).

Table 2.1-2 (continued)

Ventilation Requirements for Areas Affecting Patient Care in Hospitals and Outpatient Facilities[1]

[6] Air from areas with contamination and/or odor problems shall be exhausted to the outside and not recirculated to other areas. Note that individual circumstances may require special consideration for air exhaust to the outside, e.g., in intensive care units in which patients with pulmonary infection are treated, and rooms for burn patients.

*[7] Recirculating room HVAC units refers to those local units that are used primarily for heating and cooling of air, and not disinfection of air. Because of cleaning difficulty and potential for buildup of contamination, recirculating room units shall not be used in areas marked "No." However, for airborne infection control, air may be recirculated within individual isolation rooms if HEPA filters are used. Isolation and intensive care unit rooms may be ventilated by reheat induction units in which only the primary air supplied from a central system passes through the reheat unit. Gravity-type heating or cooling units such as radiators or convectors shall not be used in operating rooms and other special care areas. See footnote A7 (at the bottom of the page) for a description of recirculation units to be used in isolation rooms.

[8] The ranges listed are the minimum and maximum limits where control is specifically needed. The maximum and minimum limits are not intended to be independent of a space's associated temperature. The humidity is expected to be at the higher end of the range when the temperature is also at the higher end, and vice versa. See Figure 2.1-1 for a graphic representation of the indicated changes on a psychrometric chart. Shaded area is acceptable range.

[9] Where temperature ranges are indicated, the systems shall be capable of maintaining the rooms at any point within the range during normal operation. A single figure indicates a heating or cooling capacity of at least the indicated temperature. This is usually applicable when patients may be undressed and require a warmer environment. Nothing in these guidelines shall be construed as precluding the use of temperatures lower than those noted when the patients' comfort and medical conditions make lower temperatures desirable. Unoccupied areas such as storage rooms shall have temperatures appropriate for the function intended.

[10] Total air changes per room for patient rooms, intermediate care, labor/delivery/recovery rooms, and labor/delivery/recovery/postpartum rooms may be reduced to 4 when supplemental heating and/or cooling systems (radiant heating and cooling, baseboard heating, etc.) are used.

*[11] Differential pressure shall be a minimum of 0.01" water gauge (2.5 Pa). If alarms are installed, allowances shall be made to prevent nuisance alarms of monitoring devices.

[12] If it is not practical to exhaust the air from the airborne infection isolation room to the outside, the air may be returned through HEPA filters to the air-handling system exclusively serving the isolation room.

[13] National Institute for Occupational Safety and Health (NIOSH) Criteria Documents regarding Occupational Exposure to Waste Anesthetic Gases and Vapors, and Control of Occupational Exposure to Nitrous Oxide indicate a need for both local exhaust (scavenging) systems and general ventilation of the areas in which the respective gases are utilized.

[14] Some surgeons may require room temperatures that are outside of the indicated range. All operating room design conditions shall be developed in consultation with surgeons, anesthesiologists, and nursing staff.

[15] The term trauma room as used here is the operating room space in the emergency department or other trauma reception area that is used for emergency surgery. The first aid room and/or "emergency room" used for initial treatment of accident victims may be ventilated as noted for the "treatment room." Treatment rooms used for bronchoscopy shall be treated as bronchoscopy rooms. Treatment rooms used for cryosurgery procedures with nitrous oxide shall contain provisions for exhausting waste gases.

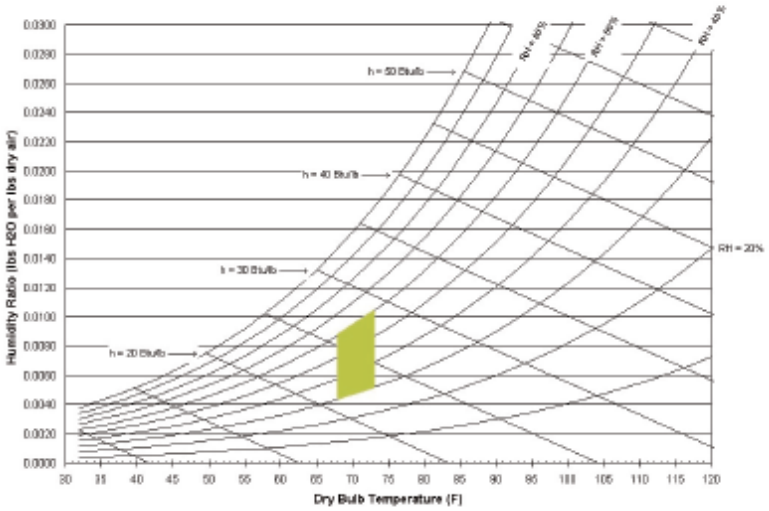
[16] In a ventilation system that recirculates air, HEPA filters can be used in lieu of exhausting the air from these spaces to the outside. In this application, the return air shall be passed through the HEPA filters before it is introduced into any other spaces.

[17] The endoscopic instrument processing room is a room adjacent to the gastrointestinal endoscopy room that is used for cleaning endoscopic equipment and instruments.

[18] When required, appropriate hoods and exhaust devices for the removal of noxious gases or chemical vapors shall be provided (see Section 2.1-10.2.4.5. (2) and NFPA 99).

[19] The air movement relationships for laboratories apply between laboratory and adjacent non-laboratory spaces. Reference DHHS publication "Biosafety in Microbiological and Biomedical Laboratories" (CDC and NIH) on the CDC Web site.

Psychrometric Chart



Appendix F: How to Apply for the ENERGY STAR Label

How to Apply for the ENERGY STAR Label

Follow the six steps below to qualify your building as ENERGY STAR.

1. Determine if the building meets the eligibility requirements.
2. Login to Portfolio Manager and enter the required energy and building information.
3. Determine if the building achieves a rating of 75 or above.
4. Determine if the building meets industry standards for comfort and indoor air quality. A Professional Engineer must verify the Statement of Energy Performance (SEP) (stamped/embossed and signed) that each of the indoor environment criteria requirements have been met and all information provided on the Statement of Energy Performance is true and accurate.
5. Read and understand the ENERGY STAR Identity Guidelines.
6. Mail the signed Letter of Agreement and signed and stamped Statement of Energy Performance (SEP) to EPA (postmarked within 120 days of the Period Ending Date). Please note: an official Letter of Agreement will be provided for download in Portfolio Manager. Do not mail to EPA a Letter of Agreement that displays a watermark that reads SAMPLE. Please do not use company letterhead to print the Letter of Agreement.

   NOTE: The ENERGY STAR is awarded for a specific year. A building that has earned the ENERGY STAR becomes eligible to reapply one year after the last energy data included in the SEP submitted as part of the previous year's application.

   ENERGY STAR Label Application for Buildings should be mailed to:
   c/o SRA International, Inc.
   3434 Washington Blvd.
   Arlington, VA 22201

Sample Building Plaques

Dimensions: width 10 inches, height 12 inches,

Cyan

Grey