AUSLEY MCMULLEN

ATTORNEYS AND COUNSELORS AT LAW

123 SOUTH CALHOUN STREET
P.O. BOX 391 (ZIP 32302)
TALLAHASSEE, FLORIDA 32301
(850) 224-9115 FAX (850) 222-7560

March 17, 2017

**VIA: ELECTRONIC FILING**

Ms. Carlotta S. Stauffer
Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Docket No. 170014-EI – Petition of Tampa Electric Company for Approval of ENERGY STAR Program for New Multi-Family Residences

Dear Ms. Stauffer:

Attached for filing in the above docket is Tampa Electric Company's Responses to Staff's First Data Request (Nos. 1-6) dated February 24, 2017. The Excel portions of these answers are included on a CD which will be hand delivered to Staff under separate cover.

Thank you for your assistance in connection with this matter.

Sincerely,

James D. Beasley

JDB/pp
Attachment

cc: Takira Thompson (w/attachment)

**1.** Please describe how the $325 rebate was determined, include all supporting work papers.

**A.** Tampa Electric evaluated the proposed credit for the ENERGY STAR Program for new Multi-Family Residences through discussions with the Program Manager who covers the ENERGY STAR Program for New Homes. In these discussions, the following discussion points were evaluated and considered:

- The incremental costs for meeting the ENERGY STAR requirements
  - This is an incremental increase of construction costs per residential unit of $1,250
- The annual savings a customer would receive within these qualifying units
  - This annual savings was determined through the analysis as shown in Response No. 4 of this set. The annual electric customer bill savings is approximately $135 per year
- The simple payback from looking at the current cost less the rebate and calculating in the annual savings
  - The simple payback of this measure is 6.85 years.
- The cost-effectiveness test results
  - This is shown in Response No. 5 of this set
- The newness of the Program
- The amount of facilities in Florida that carry the ENERGY STAR for Multi-family Residences designation
  - Currently there are an estimated 325 low rise units in Florida that carry the ENERGY STAR certification, of these

units only 85 are in the Tampa-St Petersburg-Clearwater metro area as reported by the United States Environmental Protection Agency.

The Company chose the $325 rebate level because it believes the amount of the rebate will attract builders into constructing multi-family residences that otherwise would be constructed just to meet the Florida Building Code.

**2.** Please identify who the direct recipient of the $325 rebate will be.

**A.** The direct recipient of the $325 rebate will be the owner that is constructing the multi-family housing facility.

**3.** Please provide what requirements qualify a residence as ENERGY STAR.

**A.** Within the State of Florida, commercial buildings are required to be constructed more energy efficient than the 2012 International Energy Conservation Code and ASHRAE 90.1-2010. Since the State of Florida uses these codes which exceed ASHRAE 90.1-2007, the National Performance Path Requirements for meeting the ENERGY STAR Multi-family program must be used. On the following pages give the requirements that would qualify a new multi-family residence for the ENERGY STAR using the performance path approach.

# ENERGY STAR Multifamily High Rise National Performance Path Requirements, Version 1.0

**ENERGY STAR MFHR Performance Path Requirements:**

To earn the ENERGY STAR using this performance approach, a building must meet the requirements specified below, the Performance Target, and be verified and field-tested in accordance with the *ENERGY STAR MFHR Testing and Verification Protocols*. Note that compliance with these guidelines is not intended to imply compliance with all local code requirements that may be applicable to the building to be built.[1]

To meet the certification guidelines, the developer of a project participating in the program must provide EPA or its designated agent with program specific submittals. These submittals, which must be validated by a licensed professional (registered architect or professional engineer), are used to demonstrate that the program's performance target has been met, that all prerequisites are included, and that each energy conservation measure chosen by the design team is installed to specification.

**Performance Target:**

The Performance Target is 15% energy cost savings over the ASHRAE 90.1 Standard (2007 or 2010) equivalent to the state energy code under which the building is permitted, using the Appendix G protocols and the *ENERGY STAR MFHR Simulation Guidelines*. Energy cost savings associated with on-site power generation, including cogeneration, photovoltaics, and wind turbines, may not be used to meet the Performance Target of 15%.

**ENERGY STAR MFHR Simulation Guidelines (Simulation Guidelines):**

The *Simulation Guidelines* is a companion document to ASHRAE 90.1-2007/2010 and ASHRAE 90.1 - Appendix G and contains program guidance to assist energy modelers in developing the Baseline Building, Proposed Design, and As-Built models for each project. The intent of these guidelines is to:

- Facilitate consistent modeling among different modelers;
- Facilitate consistent modeling of baseline components not mentioned in Appendix G;
- Establish modeling protocols for measures that ASHRAE 90.1 leaves to the rating authority to determine; and
- Ensure that modeling results are used to drive the energy-efficient design process.

If an energy conservation measure is included in the model that is not addressed in the *Simulation Guidelines* or ASHRAE 90.1-2007/2010 - Appendix G, the energy modeler is required to clearly document their assumptions and calculations. Each measure not included in the guidelines is subject to approval by EPA or its designated agent.

**ENERGY STAR MFHR Testing and Verification Protocols (T&V Protocols):**

The *T&V Protocols* are mandatory requirements for the inspection, testing, and verification of components related to the building's energy performance. All inspections and diagnostic tests described within these protocols are required for each of the energy-related components and systems that exist in the participating building. Results of inspections must be documented and kept on record with the building file by a licensed professional and submitted to EPA, or its designated agent, at the completion of construction. These inspections shall be conducted throughout the project construction phase at a time that is best suited to determine whether the energy efficiency element is installed to specification.

**ENERGY STAR MFHR Submittal Requirements:**

To meet the certification guidelines, EPA or its designated agent must approve a complete Proposed Design Submittal and a complete As-Built Submittal. EPA or its designated agent will not approve incomplete submittals, but will communicate with Developer Partners and licensed professionals on which requirements must be met to bring the submittal into compliance with program requirements.

# ENERGY STAR Multifamily High Rise National Performance Path Requirements, Version 1.0

**Proposed Design Submittal (Submitted prior to construction)**

The Proposed Design Submittal is used to ensure that the project design meets the Performance Target and that the mandatory requirements of the program have been included in the construction documents. The licensed professional is responsible for submitting a Proposed Design Submittal, with an *ENERGY STAR MFHR Submittal Validation Form* to EPA, or its designated agent for approval, prior to beginning construction. The Proposed Design Submittal includes the following:

- Proposed Design Performance Path Calculator[2]
  The *Proposed Design Performance Path Calculator* summarizes the modeling results of the proposed building design, and is used to demonstrate achievement of the Performance Target.

- Testing and Verification Worksheets
  A full review of all construction documents must be conducted prior to construction and documented using the *T&V Worksheets.* The *Prerequisites Checklist* is used at this stage to demonstrate that prerequisites and energy conservation measures chosen by the design team have been properly specified within the construction documents. The checklist is included as part of the *T&V Worksheets* and is automatically completed if the other *T&V Worksheets* are used to document the review process.

Developer partners may not promote the units within their project as ENERGY STAR until all program requirements are met and confirmed by EPA or their designated agent. Eligible projects may use the Designed to Earn the ENERGY STAR mark after the design phase of the project if they have an approved Proposed Design Submittal and the design receives a score of 75 or higher, using EPA's Portfolio Manager. More information is available in the *Designed to Earn the ENERGY STAR for MFHR* document available on the Guidance Documents page.

**As-Built Submittal (Submitted post construction)**

The As-Built Submittal is used to ensure that the energy conservation measures chosen by the design team are installed to specification. After the final inspection, the licensed professional is responsible for submitting an As-Built Submittal, with an *ENERGY STAR MFHR Submittal Validation Form* to EPA, or its designated agent for approval. Once EPA has determined that the project has fulfilled all of the program requirements, the Developer Partner will be notified that the building has earned the ENERGY STAR and that it can be marketed and promoted per the *ENERGY STAR Logo Identity Guidelines*. The As-Built Submittal includes the following:

- As-Built Performance Path Calculator
  The *As-Built Performance Path Calculator* summarizes the modeling results of the completed building, and is used to demonstrate achievement of the Performance Target. Any modifications to the project's energy conservation measures during construction must be reflected in the *As-Built Performance Path Calculator*.

- Testing and Verification Worksheets and Photo Template
  The *T&V Worksheets* and *Photo Template* are used to demonstrate that prerequisites and energy conservation measures chosen by the design team are included in the completed building and meet all requirements of the *ENERGY STAR MFHR Testing and Verification Protocols*. (Note, once a licensed professional or Developer Partner has successfully certified 3 buildings, submission of a Photo Template as a component of the Testing and Verification Protocols is no longer required.)

**ENERGY STAR MFHR Prerequisites[3]:**

| | |
|---|---|
| **Appliances** | When provided in common areas and/or apartments, refrigerators, dishwashers, clothes washers, ceiling fans and vending machines must be ENERGY STAR certified. |
| **Heating and Cooling Equipment** | ▪ The heating and cooling systems must comply with ASHRAE 90.1-2007, Section 6.4.<br>▪ Load sizing calculations must reflect the design[4]. The installed capacity cannot exceed design by more than 20%, except when smaller sizes are not available.<br>▪ Atmospherically vented gas furnaces and boilers shall not be specified. |

# ENERGY STAR Multifamily High Rise National Performance Path Requirements, Version 1.0

| | |
|---|---|
| **Heating and Cooling Distribution**[5,6,7,8,9,10,11,12] | ▪ Total duct leakage for in-unit systems shall be ≤8 CFM25 per 100 ft$^2$ of conditioned floor area[6]. Sampling procedures and tolerances are described in the *T&V Protocols*.<br>▪ Heating and cooling supply and return ductwork shall be insulated to a minimum R-6 in unconditioned space. |
| **Envelope**[13,14,15] | ▪ The envelope components must comply with ASHRAE 90.1-2007, Section 5.4. Assembly U-value determinations must follow ASHRAE 90.1-2007, Appendix A[16].<br>▪ The building plans shall demonstrate a continuous, unbroken air barrier separating the conditioned space of the building from the following spaces:<br>- the exterior,<br>- unconditioned spaces within the building,<br>- commercial spaces,<br>- mechanical rooms vented with unconditioned air,<br>- mechanical chases opening to unconditioned spaces,<br>- elevator shafts, and<br>- garages or other vehicle/equipment storage facilities.<br>▪ All roof, wall, floor, and slab insulation shall achieve RESNET-defined Grade I installation or, alternatively, Grade II for surfaces that contain a layer of continuous, air impermeable insulation (≥R-3 in CZ 1-4 and ≥R-5 in CZ 5-8).<br>▪ For steel-framed and metal building walls, continuous exterior insulation (≥R-3) is required on above grade walls[17]. For mass or masonry walls with metal framing, continuous interior or exterior insulation (≥R-3) is required on above grade walls.<br>▪ Specified windows must be double or triple-pane, with low-emissivity glass or coatings. |
| **Garages and Sidewalks**[18,19] | Attached garages shall be fully compartmentalized from the rest of the building through air sealing. All pipe and conduit penetrations shall be sealed with material compatible with the surface and resilient to temperature fluctuations. |
| **Ventilation and Infiltration**[20] | ▪ Apartments shall be sealed to reduce air exchange between the apartment and outside as well as the apartment and other adjacent spaces. A maximum air leakage rate of 0.30 CFM50 per square feet of enclosure is allowed. Sampling procedures and tolerances are described in the *T&V Protocols*. Specific apartment air leakage paths to be sealed are listed in the *T&V Worksheets*.<br>▪ Common area ventilation systems shall be designed and tested to satisfy minimum requirements of ASHRAE 62.1-2007. Apartment ventilation and local exhaust systems shall be designed and tested to satisfy minimum requirements of ASHRAE 62.2-2007, without reliance on natural ventilation[21]. Apartment in-line and ceiling exhaust fans must be ENERGY STAR certified. |
| **Domestic Water Heating**[22,23] | ▪ Domestic water heating systems must comply with ASHRAE 90.1-2007, Section 7.4.<br>▪ Atmospherically vented gas water heaters, tankless coils and side-arm water heaters shall not be specified. Indirect water heaters, with or without storage, are acceptable. If storage is provided, the maximum storage tank capacity shall be specified based on occupancy.<br>▪ The average flow rate for all faucets must be ≤ 2.0 gallons per minute (as rated at 80 psi)[24].<br>▪ All showerheads must be WaterSense® labeled<br>▪ All tank-type toilets must be WaterSense® labeled. |

# ENERGY STAR Multifamily High Rise National Performance Path Requirements, Version 1.0

| | |
|---|---|
| **Lighting**[25,26] | Occupancy Controls<br>All non-apartment spaces, except those intended for 24-hour operation or where automatic shutoff would endanger the safety of occupants, must have occupancy sensors or automatic bi-level lighting controls. |
| | Common Space Lighting<br>80% of installed light fixtures in common spaces must be ENERGY STAR certified or have ENERGY STAR certified lamps installed. Alternatively, 100% of installed light fixtures in common spaces must have high-efficacy lamps installed, as defined in Appendix B. Total specified lighting power for the combined common spaces must not exceed ASHRAE 90.1-2007 allowances for those combined spaces by more than 20%. |
| | In-Unit Lighting<br>80% of installed light fixtures within apartments must be ENERGY STAR certified or have ENERGY STAR certified lamps installed. Alternatively, 100% of installed light fixtures within apartments must have high-efficacy lamps installed, as defined in Appendix B. |
| | Exterior Lighting<br>▪ 80% of outdoor lighting fixtures shall be ENERGY STAR certified or have ENERGY STAR certified lamps installed. Alternatively, 100% of outdoor lighting fixtures must have high-efficacy lamps installed, as defined in Appendix B.<br>▪ Fixtures must include automatic switching on timers or photocell controls except fixtures intended for 24-hour operation, required for security, or located on apartment balconies. |
| | Exit Signs<br>All exit signs shall be specified as LED (not to exceed 5W per face) or photo-luminescent and shall conform to local building code; fixtures located above stairwell doors and other forms of egress shall contain a battery back-up feature. |
| **Pump Motor Efficiency**[27] | All three-phase pump motors 1 horse-power or larger shall meet or exceed efficiency standards for NEMA Premium™ motors, where available. |

**ENERGY STAR MFHR Benchmarking:**

Although eligible units in a multifamily high rise building may earn the ENERGY STAR based on the mandatory requirements listed above at completion of construction, building performance is as much a function of proper building management as the energy conservation measure incorporated into the structure. Therefore, after earning the ENERGY STAR, the developer/owner must commit to benchmarking their building in Portfolio Manager for a period of at least two years.

Portfolio Manager is a free, online, interactive energy management tool that allows developer/owner to measure and track their building's energy and water consumption, identify investment priorities, and verify improvements over time. Developers/owners can use Portfolio Manager to track weather-normalized energy use intensity (EUI), energy costs, greenhouse gas emissions, and water consumption. For more information on how to use Portfolio Manager, see the Portfolio Manager - Multifamily Housing Quick Reference Guide document.

To accomplish this goal, the developer/owner or an entity working on their behalf, must be capable of evaluating the utility consumption of the residential-associated spaces independent of any commercial/retail space. These nonresidential associated parts of the building shall be separately metered (or sub-metered) for electricity, gas, fuel oil, water, steam, and hot water for domestic and/or space heating purposes. Also, they should work with tenants to secure consumption information. If the building is direct-metered for utilities to the apartments, the building owner may need signed releases from individual apartment occupants to allow for benchmarking or find alternative methods to assessing whole building energy consumption such as a whole-building meter or asking the utility for aggregated data.

# ENERGY STAR Multifamily High Rise National Performance Path Requirements, Version 1.0

All data uploaded to Portfolio Manager is strictly confidential and only used to estimate the energy performance of the building as a whole, not of individual apartments.

**ENERGY STAR MFHR Website:**

More information on program requirements, submittals, processes, and benchmarking can be found at www.energystar.gov/mfhr, including our Current Policy Record, which contains policy issues that were received and have been resolved since the last revision of the program documents. Questions? Please email us at mfhr@energystar.gov.

# ENERGY STAR Multifamily High Rise National Performance Path Notes

1. Where requirements of the local codes, manufacturers' installation instructions, engineering documents, or regional ENERGY STAR programs overlap with the requirements of these guidelines, EPA offers the following guidance:

   a. In cases where the overlapping requirements exceed the ENERGY STAR guidelines, these overlapping requirements shall be met;

   b. In cases where overlapping requirements conflict with a requirement of these ENERGY STAR guidelines (e.g., slab insulation is prohibited to allow visual access for termite inspections), then the conflicting requirement within these guidelines shall not be met. Qualification shall only be allowed if the licensed professional has determined that no equivalent option is available that could meet the intent of the conflicting requirement of these ENERGY STAR guidelines (e.g., switching from exterior to interior slab edge insulation).

2. The *Performance Path Calculator* is a set of worksheets in an Excel file designed to provide consistency among energy modelers by providing the exact calculations described in the Simulation Guidelines. It also provides a consistent format for reporting the results of the Performance Rating. Many of these worksheets are optional, however, submission of the Excel file, with Basic Info and Reporting Summary worksheets completed, is mandatory.

3. Each building that participates in the program, regardless if it chooses the Performance Path or the Prescriptive Path, must meet certain mandatory program requirements. These requirements are listed within this document and outlined in the *Prerequisites Checklist*, a worksheet within the *ENERGY STAR MFHR Testing and Verification Worksheets*. These prerequisites establish the minimum program requirements within which the design team may make performance trade-offs in the design of an ENERGY STAR certified building. While these prerequisites can contribute to the achievement of the Performance Target, these requirements alone are not sufficient to earn the ENERGY STAR. As used in this document, the word 'shall' means that the action specified is mandatory and must be accomplished.

Heating and Cooling Equipment

4. Heating and cooling loads shall be calculated, equipment capacity shall be selected, and duct systems shall be sized according to the latest editions of ACCA Manual J, S, & D, respectively, ASHRAE 2009 Handbook of Fundamentals, or a substantively equivalent procedure. Indoor temperatures shall be 70°F for heating and 75°F for cooling. Outdoor temperatures shall be the 1.0% and 99.0% design temperatures, respectively, as published by the ASHRAE Handbook of Fundamentals.

Heating and Cooling Distribution

5. Terminal heating and cooling distribution equipment serving an apartment shall be controlled by a thermostat(s) within the same apartment.

6. Heating and cooling ductwork shall be sealed at all transverse joints and connections, including ductwork connections through drywall or other finish materials, using UL-181 compliant methods and materials. Construction documents shall specify that ductwork must be inspected before access is covered up. As an alternative to meeting total duct leakage requirements post-construction, total duct leakage measured at rough-in, ≤4 CFM25 per 100ft$^2$, with air handler and all ductwork installed, is accepted.

7. Heating and cooling ductwork that is specified as flex duct shall follow the Sheet Metal and Air Conditioning Contractors' (SMACNA) installation standards for flex ducts (see *Appendix A*).

8. For hydronic distribution systems, all terminal heating and cooling distribution equipment must be separated from the riser or distribution loop by a control valve or terminal distribution pump, so that heated or cooled fluid is not delivered to the apartment distribution equipment when there is no call from the apartment thermostats.

9. Piping carrying fluid or steam with temperatures greater than 105°F must have a minimum of 1" of insulation; pipes 1.5" in diameter and greater must have a minimum of 1.5" of insulation. Piping carrying fluid (chilled water or refrigerant) with

# ENERGY STAR Multifamily High Rise National Performance Path Notes

temperatures less than 60°F must have a minimum of 0.5" of insulation; pipes 1.5" in diameter and greater must have a minimum of 1.0" of insulation. Construction documents must account for piping total thickness including required insulation when passing through planks or any other penetrations. For PTACs or any other heating/cooling systems that require branch pipe insulation, the insulation thickness must be considered when designing room dimensions and access chases. Construction documents shall specify that the piping must be inspected before access is covered up. Extent and location to be determined by ASHRAE 90.1-2007 Section 6.4.4.1.3 or local code.

10. For systems designed with outdoor-air supplied to the heating, cooling, or ventilation distribution system, provide motorized dampers that will automatically shut when systems or spaces are not in use.

11. For hydronic distribution systems without automatic balancing valves, all supply/return headers must be designed in a "reverse return" configuration (i.e. first riser supplied is the last returned, etc.) and/or sized based on a water velocity of less than 4 ft/s. Total pressure drop of terminal unit branch piping and fittings between a supply and return riser must be significantly greater than the total pressure drop from the top to the bottom of these risers. Calculations and assumptions for sizing circulating pumps must meet Chapter 43 of the ASHRAE Handbook, HVAC Systems and Equipment or equivalent industry accepted standard.

12. For in-unit forced air distribution systems, perform design calculations (using ACCA Manuals J and D, the ASHRAE Handbook of Fundamentals, or an equivalent procedure) and install ducts accordingly. Bedrooms must be pressure-balanced using any combination of transfer grills, jump ducts, dedicated return ducts, and/or undercut doors.

Envelope

13. When required by local building code, entranceways shall be designed with vestibules with weather-stripping hard-fastened to the door or frame.

14. If installing sleeves for through-wall AC units, insulated covers must be provided by the building for use during heating season and when AC units are not installed.

15. Ductwork penetrating the building envelope shall be sealed to prevent air leakage through the duct system and/or the building envelope. This includes, but is not limited to, roof curbs and exterior wall exhaust/intake vents.

16. An area weighted average of the U-factors of the wall and floor perimeter assemblies is acceptable in the energy model. When calculating the wall U-factor, the full R-value for any exterior wall insulation can only be used for portions of the assembly where shelf angles or other continuous metal fastened to the wall are not used. For portions of this assembly where shelf angles or other continuous metal fastened to the wall are used, the exterior insulation cannot contribute to the assembly R-value and an overall U-value shall be calculated based on an area weighted ratio.

17. Where specific details cannot meet this continuous insulation requirement, the Licensed Professional shall provide the detail to EPA to request an exemption prior to the building's certification. Projected balconies are currently exempt, however EPA recommends that they be thermally broken.

Garages and Sidewalks

18. Garages, including plenums and dropped ceilings within the garage, shall not be heated for comfort or to prevent pipes from freezing. Piping design and layout shall locate piping within conditioned spaces or grouped and properly insulated to prevent freezing. If heat tracing is used for freeze protection, it must be activated based on pipe wall temperature, rather than air temperature, and the energy consumption must be modeled in the As-Built (but excluded in the Baseline). The heat tracing thermostat set point must be no higher than 40°F and the set point must be confirmed by a field inspection.

19. Radiant heating (i.e. infrared), either wall or ceiling-mounted, or heating within the garage floor (or sidewalks) may be used to prevent ice formation on the ground as a safety feature only and temperature-based controls must comply with

# ENERGY STAR Multifamily High Rise National Performance Path Notes

ASHRAE 90.1-2007 Section 6.4.3.8. Energy consumption associated with these systems must be modeled in the As-Built (but excluded in the Baseline).

Ventilation and Infiltration

20. Ventilation system ductwork shall be sealed at all transverse joints and connections including boot to wall/ceiling connections through drywall using UL-181 compliant materials and methods. Central exhaust systems that serve one or more apartments must be tested for duct leakage, where the maximum leakage allowance is calculated as 5 CFM per register per shaft plus 5 CFM per floor per shaft. See *T&V Protocols* for details.

21. Compliance with ASHRAE 62.2-2007 Sections 4.3 and 5.3.1 is recommended, but not required. Providing outdoor air to each unit directly from the outdoors is recommended, but not required. For kitchen exhaust fans, prescriptive duct sizing requirements described at www.energystar.gov/newhomesresources may be used in lieu of measuring the actual air flow rate.

Domestic Water Heating

22. The temperature setting of in-unit storage water heaters must not exceed 140°F. For both in-unit and central DHW systems, temperatures measured at faucets and showerheads must not exceed 125°F. Domestic hot water piping carrying liquid with temperatures greater than 105°F must have a minimum of 1" insulation. Pipes over 1.5" in diameter must have a minimum of 1.5" of insulation. Extent and location to be determined by ASHRAE 90.1-2007 Section 7.4.3 or local code.

23. Self-contained or electronic mixing valves shall be used to control hot water temperature for central domestic water heating systems serving apartments.

24. If flow ratings at 80 psi are not available, WaterSense® labeled faucets or aerators may be used to meet this prerequisite.

Lighting

25. ASHRAE 90.1-2007, Section 9.1.4a, requires that light fixtures be modeled with the maximum labeled wattage of the fixture. EPA will allow light fixtures to be modeled based on the installed wattage of the lamps. Ex: A fixture with a 13 W screw-in CFL can be modeled as 13 W, plus any associated ballast power. See Appendix B to determine input power.

# ENERGY STAR Multifamily High Rise National Performance Path Notes

26. Lighting must comply with ASHRAE 90.1-2007, Section 9.4. At a minimum, interior lighting must be designed or measured to meet light levels (footcandles) by space type as recommended by the Illumination Engineering Society (IESNA) Lighting Handbook, 9th edition. Values for commonly used spaces are listed below. For senior housing, minimum illumination requirements may follow recommendations in IESNA's 2007 Lighting and the Visual Environment for Senior Living, and an increase in lighting power densities and allowances corresponding to the increase in footcandles, is permitted. See Appendix B to determine lamp lumens.

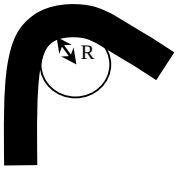
| ASHRAE Space Type | Lighting Power Densities ($W/ft^2$) | Recommended Light Levels (Weighted Avg. Footcandles) | ASHRAE Space Type | Lighting Power Densities ($W/ft^2$) | Recommended Light Levels (Weighted Avg. Footcandles) |
|---|---|---|---|---|---|
| Apartments | 1.1 | 10 | Stairs - Active | 0.6 | 15 |
| Storage, active | 0.8 | 20 | Restroom | 0.9 | 12 |
| Storage, inactive | 0.3 | 8 | Office | 1.1 | 35 |
| Food Preparation | 1.2 | 40 | Conference/meeting/ multipurpose | 1.3 | 30 |
| Dining Area - For Family Dining | 2.1 | 23 | Electrical/Mechanical | 1.5 | 30 |
| Lobby/Elevator | 1.3 | 16 | Workshop | 1.9 | 50 |
| Corridor/Transition | 0.5 | 10 | Parking garage | 0.2 | 7 |

Motors

27. Many motors are NEMA labeled and this label alone, does not ensure that a motor is energy-efficient. This requirement refers specifically to the **NEMA Premium** energy efficient motors program. Participating companies may be found at http://www.nema.org/Policy/Energy/Efficiency/Documents/NEMA_Premium_Partners.pdf. Motors for fire pumps and booster pumps are exempt from this requirement.

# ENERGY STAR Multifamily High Rise National Performance Path Notes

## Appendix A: Specifications for Flexible Duct Installation

| Component/Location | Standard |
|---|---|
| **Duct length** | Limit duct length to no more than 25' per run for flex duct, not to exceed the manufacturer's recommended limit |
| **Excess ductwork** | Runs should be as direct as possible. Excess ductwork should be no more than 5% for any given section of flexible duct. |
| **Supports** | Suspended horizontal ducts should be supported at least every 5'. |
| **Hangers** | Hanger material should be at least 1-1/2" in width and hangers should not crimp the ductwork, causing the interior dimension of the duct to be less than specified |
| **Sag** | Suspended ductwork should be allowed to sag no more than ½" for every 1' of run |
| **Trunk and boot connections** | Flexible duct should be allowed to run straight out of any connection at least 12" before taking a turn |
| **Bends** | The radius at the centerline of a bend must be a minimum of one duct diameter as shown in the diagram (R = 1 duct diameter):   |
| **Connections** | Connections to boots, collars, and trunks must be substantially airtight |
| **Sealants** | Sealants and tapes used to make ductwork airtight must be compliant with UL=181 standards and installed according to the manufacturer's specifications |

Reference: Sheet Metal and Air Conditioning Contractor's National Association

# ENERGY STAR Multifamily High Rise National Performance Path Notes

## Appendix B: Typical lamp lumens and input power for installed lighting

**Efficacy:** Lumens per Watt = Measured Lamp Lumens [Lumens]/Measured Input Power [Watts]

**High Efficacy Lamps:** Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps or lamps with a minimum efficacy of 60 lumens/W for lamps over 40W; 50 lumens/W for lamps over 15W to 40W; and 40 lumens/W for lamps 15W or less

**Footcandle:** one lumen per square foot.

**Lamp Lumens:** Lamp lumens must be measured using the lamp and ballast that are shipped with the fixture, using the tables on the ENERGY STAR website, or by using the charts below.

**Input Power:** Input power must be measured with the lamp and ballast that are shipped with the fixture, by using Tables 9-E through 9-H in the User's Manual for ASHRAE 90.1-2007, or the charts below.

| Standard Metal Halide | | | |
|---|---|---|---|
| Lamp Watts | Lumens | Input Power | Efficacy |
| 150 | 13,500 | 186 | 73 |
| 175 | 15,000 | 205 | 73 |
| 250 | 23,000 | 295 | 78 |
| 360 | 36,000 | 388 | 93 |
| 400 | 40,000 | 461 | 87 |

| Typical T-8 (Electronic Ballast) | | | |
|---|---|---|---|
| Lamp Watts | Lumens | Input Power | Efficacy |
| 17 | 1400 | 22 | 64 |
| 25 | 2225 | 27 | 82 |
| 32 | 3100 | 32 | 97 |
| 40 | 3725 | 46 | 81 |
| 86 | 8200 | 88 | 93 |

| Compact Fluorescent | | | | | |
|---|---|---|---|---|---|
| Lamp Watts | Lumens | Input Power | Ballast | Efficacy | Minimum Lumens Needed |
| 9 | 280-680 | 13 | Electro-magnetic | 22*-52 | 650 |
| 9 | 280-680 | 10 | Electronic | 28*-68 | 500 |
| 13 | 600-950 | 17 | Electro-magnetic | 35*-56 | 850 |
| 13 | 600-950 | 14 | Electronic | 43*-68 | 700 |
| 26 | 1200-1900 | 37 | Electro-magnetic | 32*-51 | 1850 |
| 26 | 1200-1900 | 28 | Electronic | 43*-68 | 1400 |

*may not meet current ENERGY STAR specifications, check lamp lumens on ENERGY STAR website.

**4.** Please provide a copy of the analysis performed that yielded the savings discussed in Exhibit B.

**A.** Tampa Electric utilized the energy and economic software program "EnergyGauge" from the University of Central Florida and their Florida Solar Energy Center. The company modeled a new multi-family residential facility that just satisfied the requirements of the Florida Building Code. The company then utilized the checklists and guidance from the ENERGY STAR Multi-Family Program to model the facility to meet the requirements for the ENERGY STAR Award.

This process was followed to be consistent with the Company's ENERGY STAR for New Homes Program which was done following the same process. The following pages outlines the usage results that yielded the summer and winter peak demand (kW) and the annual energy (kWh) savings. The first two pages show the results of the base case multifamily unit that just met the building code. The next two pages show the results of the adjusted multi-family unit that meets the requirements of the ENERGY STAR Multi-Family program. Immediately below is the usage summary from the simulation runs that were used to obtain the summer and winter demand (kW) and the annual energy (kWh) savings:

Base case residential unit that meets Florida Building Code:

| | |
|---|---|
| Annual Energy: | 9,423 kWh (on first page) |
| Summer Demand: | 1.484 kW (August – on second page) |
| Winter Demand: | 1.617 kW (January – on second page) |

Adjusted residential unit that meets ENERGY STAR:

| | |
|---|---|
| Annual Energy: | 8,184 kWh (on first page) |
| Summer Demand: | 1.123 kW (August – on second page) |
| Winter Demand: | 1.375 kW (January – on second page) |

Resulting differentials between Base case and Adjusted residential unit ENERGY STAR:

| | |
|---|---|
| Annual Energy: | 1,239 kWh |
| Summer Demand: | 0.361 kW |
| Winter Demand: | 0.242 kW |

# Annual Energy Summary

Energy Gauge
Anyplace
Tampa, FL,
Registration #:

Title: MultiFamily FL-example_2-story_Tampa
User

TMY City: FL_TAMPA_INTERN
Elec Util: MyFloridaAverage
Gas Util: MyFloridaAverage
Run Date: 06/13/2016 13:16:05

Florida Code Example

| End-Use | Energy Consumption | Annual Cost |
|---|---|---|
| Cooling (34 kBtu/hr) | 2139 kWh | $235 |
| Cooling Fan | 351 kWh | $39 |
| Mechanical Vent Fan | 0 kWh | $ 0 |
| Total Cooling | **2490 kWh** | **$274** |
| Heating (34 kBtu/hr) | 87 kWh | $10 |
| Heating Fan/Pump | 12 kWh | $1 |
| Mechanical Vent Fan | 0 kWh | $ 0 |
| Total Heating | **99 kWh** | **$11** |
| Hot Water | 2486 kWh | $273 |
| Hot Water Pump | 0 kWh | $0 |
| Total Hot Water | **2486 kWh** | **$273** |
| Ceiling Fans | 0 kWh | $0 |
| Clothes Washer | 0 kWh | $0 |
| Dishwasher | 0 kWh | $0 |
| Dryer | 891 kWh | $98 |
| Lighting | 1175 kWh | $129 |
| Miscellaneous | 1060 kWh | $117 |
| Pool Pump | 0 kWh | $0 |
| Range | 447 kWh | $49 |
| Refrigerator | 775 kWh | $85 |
| Total (kWh) | 9423 kWh | $1036 |
| Total (Therms) | 0 Therms | $0 |
| Total (Oil Gallons) | 0 Gallons | $0 |
| Total (Propane Gallons) | 0 Gallons | $0 |
| PV Produced (kWh)* | 0 kWh | $0 |
| * Assumes net metering | | |
| Total Cost | | $1036 |

**Emissions** (Calculated as Total - PV Produced)

| | |
|---|---|
| SO2 | 37.42 Lbs. |
| NOX | 21.98 Lbs. |
| CO2 | 6.35 Tons |

# SYSTEM MONTHLY LOADS SUMMARY

## ENERGY GAUGE: MultiFamily FL-example_2-

Report Code: **SS-A** Report Section: **SYS-1** 

1 ENERGY GAUGE: MultiFamily FL-example_2- GENERATED FROM CURRENT BUILDING DOE-2.1E-120 Mon Jun 13 13:16:05 2016SDL RUN 1
May-June, 1998
REPORT- SS-A SYSTEM MONTHLY LOADS SUMMARY FOR SYS-1 WEATHER FILE- TAMPA_INTERNATIONAL_

| | COOLING | | | | | | HEATING | | | | | | ELEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | COOLING ENERGY (MBTU) | TIME OF MAX DY | TIME OF MAX HR | DRY-BULB TEMP | WET-BULB TEMP | MAXIMUM COOLING LOAD (KBTU/HR) | HEATING ENERGY (MBTU) | TIME OF MAX DY | TIME OF MAX HR | DRY-BULB TEMP | WET-BULB TEMP | MAXIMUM HEATING LOAD (KBTU/HR) | ELEC-TRICAL ENERGY (KWH) | MAXIMUM ELEC LOAD (KW) |
| JAN | 0.02941 | 17 | 16 | 78.F | 65.F | 3.990 | -0.256 | 9 | 6 | 29.F | 27.F | -7.681 | 327. | 1.617 |
| FEB | 0.19026 | 18 | 14 | 81.F | 71.F | 7.373 | -0.172 | 9 | 7 | 28.F | 24.F | -6.736 | 308. | 1.531 |
| MAR | 0.57038 | 29 | 16 | 82.F | 74.F | 7.750 | -0.041 | 11 | 7 | 40.F | 36.F | -3.614 | 333. | 1.168 |
| APR | 1.07960 | 13 | 14 | 86.F | 76.F | 8.221 | 0.000 | | | | | 0.000 | 354. | 1.106 |
| MAY | 3.09087 | 15 | 18 | 91.F | 75.F | 10.602 | 0.000 | | | | | 0.000 | 500. | 1.357 |
| JUN | 4.33492 | 14 | 16 | 88.F | 77.F | 12.044 | 0.000 | | | | | 0.000 | 576. | 1.428 |
| JUL | 5.14783 | 21 | 17 | 90.F | 81.F | 12.487 | 0.000 | | | | | 0.000 | 643. | 1.476 |
| AUG | 5.07315 | 7 | 17 | 93.F | 80.F | 13.491 | 0.000 | | | | | 0.000 | 636. | 1.484 |
| SEP | 4.77790 | 28 | 15 | 93.F | 78.F | 12.878 | 0.000 | | | | | 0.000 | 607. | 1.475 |
| OCT | 2.69431 | 11 | 17 | 87.F | 76.F | 11.164 | 0.000 | | | | | 0.000 | 471. | 1.326 |
| NOV | 0.87950 | 11 | 13 | 84.F | 77.F | 8.175 | -0.017 | 30 | 8 | 38.F | 33.F | -3.170 | 345. | 1.125 |
| DEC | 0.24207 | 9 | 13 | 81.F | 72.F | 9.089 | -0.210 | 27 | 7 | 36.F | 33.F | -5.598 | 334. | 1.387 |
| TOTAL | 28.110 | | | | | | -0.696 | | | | | | 5436. | |
| MAX | | | | | | 13.491 | | | | | | -7.681 | | 1.617 |

# Annual Energy Summary

Energy Gauge
Anyplace
Tampa, FL,
Registration #:

Title: MultiFamily FL- ESTAR ex2 2-story_Tampa
User

TMY City: FL_TAMPA_INTERN
Elec Util: MyFloridaAverage
Gas Util: MyFloridaAverage
Run Date: 06/13/2016 13:27:14

Florida Code Example

| End-Use | Energy Consumption | Annual Cost |
|---|---|---|
| Cooling (24 kBtu/hr) | 1499 kWh | $165 |
| Cooling Fan | 247 kWh | $27 |
| Mechanical Vent Fan | 0 kWh | $ 0 |
| Total Cooling | **1746 kWh** | **$192** |
| Heating (24 kBtu/hr) | 43 kWh | $5 |
| Heating Fan/Pump | 6 kWh | $1 |
| Mechanical Vent Fan | 0 kWh | $ 0 |
| Total Heating | **49 kWh** | **$6** |
| Hot Water | 2041 kWh | $225 |
| Hot Water Pump | 0 kWh | $0 |
| Total Hot Water | **2041 kWh** | **$225** |
| Ceiling Fans | 0 kWh | $0 |
| Clothes Washer | 0 kWh | $0 |
| Dishwasher | 0 kWh | $0 |
| Dryer | 891 kWh | $98 |
| Lighting | 1175 kWh | $129 |
| Miscellaneous | 1060 kWh | $117 |
| Pool Pump | 0 kWh | $0 |
| Range | 447 kWh | $49 |
| Refrigerator | 775 kWh | $85 |
| Total (kWh) | 8184 kWh | $901 |
| Total (Therms) | 0 Therms | $0 |
| Total (Oil Gallons) | 0 Gallons | $0 |
| Total (Propane Gallons) | 0 Gallons | $0 |
| PV Produced (kWh)* | 0 kWh | $0 |
| Total Cost | | $901 |

* Assumes net metering

**Emissions** (Calculated as Total - PV Produced)

| | |
|---|---|
| SO2 | 32.5 Lbs. |
| NOX | 19.09 Lbs. |
| CO2 | 5.52 Tons |

# SYSTEM MONTHLY LOADS SUMMARY

## ENERGY GAUGE: MultiFamily FL-ESTAR Run

Report Code: **SS-A** Report Section: **SYS-1** Page **1** of **4**

1 ENERGY GAUGE: MultiFamily FL-ESTAR Run GENERATED FROM CURRENT BUILDING DOE-2.1E-120 Tue Jun 14 07:57:57 2016SDL RUN 1
May-June, 1998
REPORT- SS-A SYSTEM MONTHLY LOADS SUMMARY FOR SYS-1 WEATHER FILE- TAMPA_INTERNATIONAL_

| | COOLING | | | | | | HEATING | | | | | | ELEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | COOLING ENERGY (MBTU) | TIME OF MAX DY | TIME OF MAX HR | DRY-BULB TEMP | WET-BULB TEMP | MAXIMUM COOLING LOAD (KBTU/HR) | HEATING ENERGY (MBTU) | TIME OF MAX DY | TIME OF MAX HR | DRY-BULB TEMP | WET-BULB TEMP | MAXIMUM HEATING LOAD (KBTU/HR) | ELEC-TRICAL ENERGY (KWH) | MAXIMUM ELEC LOAD (KW) |
| JAN | 0.00000 | | | | | 0.000 | -0.228 | 9 | 6 | 29.F | 27.F | -8.293 | 246. | 1.375 |
| FEB | 0.00000 | | | | | 0.000 | -0.153 | 9 | 6 | 30.F | 25.F | -7.717 | 222. | 1.282 |
| MAR | 0.09918 | 29 | 16 | 82.F | 74.F | 5.301 | -0.019 | 11 | 6 | 42.F | 37.F | -3.408 | 228. | 0.888 |
| APR | 0.29616 | 13 | 15 | 84.F | 76.F | 6.973 | 0.000 | | | | | 0.000 | 231. | 0.760 |
| MAY | 2.01169 | 16 | 15 | 90.F | 79.F | 9.599 | 0.000 | | | | | 0.000 | 345. | 1.010 |
| JUN | 3.14817 | 14 | 15 | 91.F | 77.F | 11.084 | 0.000 | | | | | 0.000 | 410. | 1.082 |
| JUL | 3.89148 | 21 | 15 | 89.F | 80.F | 11.653 | 0.000 | | | | | 0.000 | 465. | 1.128 |
| AUG | 3.82865 | 23 | 15 | 92.F | 79.F | 11.866 | 0.000 | | | | | 0.000 | 460. | 1.123 |
| SEP | 3.44209 | 28 | 15 | 93.F | 78.F | 11.074 | 0.000 | | | | | 0.000 | 429. | 1.077 |
| OCT | 1.50374 | 2 | 15 | 87.F | 74.F | 8.661 | 0.000 | | | | | 0.000 | 313. | 0.949 |
| NOV | 0.24562 | 2 | 15 | 82.F | 75.F | 5.736 | -0.008 | 30 | 7 | 38.F | 33.F | -2.036 | 230. | 0.788 |
| DEC | 0.02308 | 9 | 16 | 77.F | 72.F | 2.299 | -0.116 | 27 | 6 | 37.F | 34.F | -6.238 | 235. | 1.129 |
| TOTAL | 18.490 | | | | | | -0.524 | | | | | | 3815. | |
| MAX | | | | | | 11.866 | | | | | | -8.293 | | 1.375 |

**5.** Please provide a copy of the Total Resource Cost Test, the Participants Test, and the Rate Impact Measure Test excel sheets with all formulae intact.

**A.** On the enclosed disc is the cost-effectiveness tests results for this proposed program: Total Resource Cost Test, the Participants Test, and the Rate Impact Measure Test excel sheets with all formulae intact.

**6.** Please provide the estimated monthly residential bill impact (at 1,000 kWh and 1,200 kWh) and the estimated annual Energy Conservation Cost Recovery expenses associated with this program.

**A.** The table below provides the estimated monthly residential bill impact (at 1,000 kWh and 1,200 kWh) and the estimated annual Energy Conservation Cost Recovery expenses associated with this program.

| | | | | | | | | Monthly Residential bill impact | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Projected Activity | Incentives | Vehicles | Labor | Other | Advertising | Total Annual Cost | 1,000 kWh | 1,200 kWh |
| 2017 | 600 | $195,000 | $500 | $15,000 | $3,000 | $2,000 | $215,500 | $0.0127 | $0.0152 |
| 2018 | 600 | $195,000 | $500 | $15,000 | $3,000 | $2,000 | $215,500 | $0.0127 | $0.0152 |
| 2019 | 800 | $260,000 | $600 | $17,000 | $3,000 | $2,000 | $282,600 | $0.0166 | $0.0199 |
| 2020 | 800 | $260,000 | $600 | $17,000 | $3,000 | $2,000 | $282,600 | $0.0166 | $0.0199 |
| 2021 | 800 | $260,000 | $600 | $17,000 | $3,000 | $2,000 | $282,600 | $0.0166 | $0.0199 |
| 2022 | 1000 | $325,000 | $800 | $20,000 | $3,000 | $2,000 | $350,800 | $0.0206 | $0.0248 |
| 2023 | 1000 | $325,000 | $800 | $20,000 | $3,000 | $2,000 | $350,800 | $0.0206 | $0.0248 |
| 2024 | 1000 | $325,000 | $800 | $20,000 | $3,000 | $2,000 | $350,800 | $0.0206 | $0.0248 |