### 4.4.15 Single-Package and Split System Unitary Air Conditioners

**Description**

This measure promotes the installation of high-efficiency unitary air-, water-, and evaporatively cooled air conditioning equipment, both single-package and split systems. Air conditioning (AC) systems are a major consumer of electricity and systems that exceed baseline efficiencies can save considerable amounts of energy. This measure could apply to the replacing of an existing unit at the end of its useful life or the installation of a new unit in a new or existing building.

This measure was developed to be applicable to the following program types: TOS, NC. If applied to other program types, the measure savings should be verified.

**Definition of Efficient Equipment**

In order for this characterization to apply, the efficient equipment is assumed to be a high-efficiency air-, water-, or evaporatively cooled air conditioner that exceeds the energy efficiency requirements of the 2012 or 2015 International Energy Conservation Code (IECC), depending on the IECC in effect on the date of the building permit.

**Definition of Baseline Equipment**

In order for this characterization to apply, the baseline equipment is assumed to be a standard-efficiency air-, water, or evaporatively cooled air conditioner that meets the energy efficiency requirements of the 2012 or 2015 IECC, depending on the IECC in effect on the date of the building permit. The rating conditions for the baseline and efficient equipment efficiencies must be equivalent.

**Deemed Lifetime of Efficient Equipment**

The expected measure life is assumed to be 15 years.[[1]](#footnote-1)

**Deemed Measure Cost**

The incremental capital cost for this measure is assumed to be $100 per ton.[[2]](#footnote-2)

**Loadshape**

Loadshape C03 - Commercial Cooling

**Coincidence Factor**

The summer peak coincidence factor for cooling is provided in two different ways below. The first is used to estimate peak savings during the utility peak hour and is most indicative of actual peak benefits, and the second represents the *average* savings over the defined summer peak period, and is presented so that savings can be bid into PJM’s Forward Capacity Market.  Both values provided are based on analysis of Itron eShape data for Missouri, calibrated to Illinois loads, supplied by Ameren.

CFSSP = Summer System Peak Coincidence Factor for Commercial cooling (during system peak hour)

= 91.3% [[3]](#footnote-3)

CFPJM = PJM Summer Peak Coincidence Factor for Commercial cooling (average during peak period)

= 47.8% [[4]](#footnote-4)

**Algorithm**

**Calculation of Savings**

**Electric Energy Savings**

For units with cooling capacities less than 65 kBtu/hr:

ΔkWH = (kBtu/hr) \* [(1/SEERbase) – (1/SEERee)] \* EFLH

For units with cooling capacities equal to or greater than 65 kBtu/hr:

ΔkWH = (kBtu/hr) \* [(1/EERbase) – (1/EERee)] \* EFLH

Where:

kBtu/hr = capacity of the cooling equipment actually installed in kBtu per hour (1 ton of cooling capacity equals 12 kBtu/hr)

SEERbase = Seasonal Energy Efficiency Ratio of the baseline equipment

= SEER values from tables below, based on applicable IECC on date of building permit

SEERee = Seasonal Energy Efficiency Ratio of the energy efficient equipment (actually installed)

EERbase = Energy Efficiency Ratio of the baseline equipment

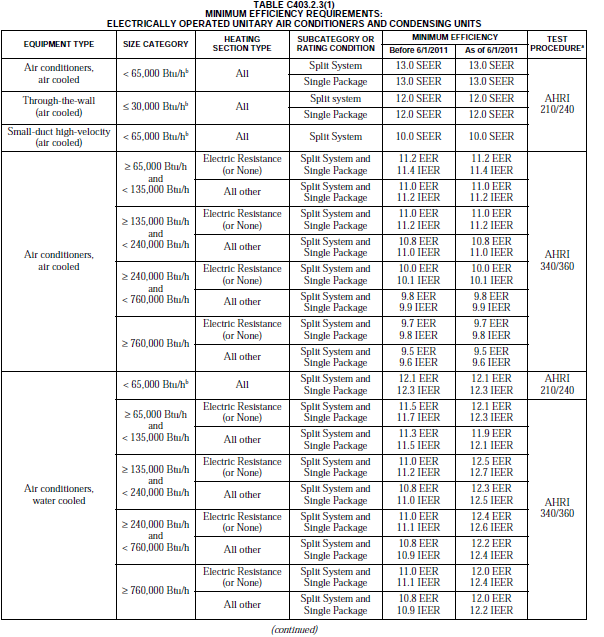
= EER values from tables below, based on applicable IECC on date of the building permit. (For air-cooled units < 65 kBtu/hr, assume the following conversion from SEER to EER for calculation of peak savings: EER≈SEER/1.1).

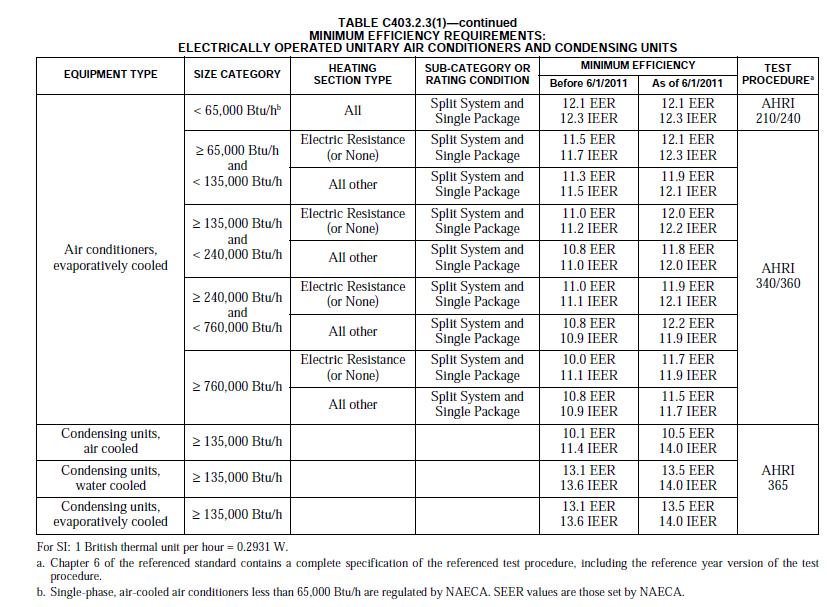
EERee = Energy Efficiency Ratio of the energy efficient equipment. For air-cooled units < 65 kBtu/hr, if the actual EERee is unknown, assume the following conversion from SEER to EER for calculation of peak savings: EER≈SEER/1.1).

= Actual installed

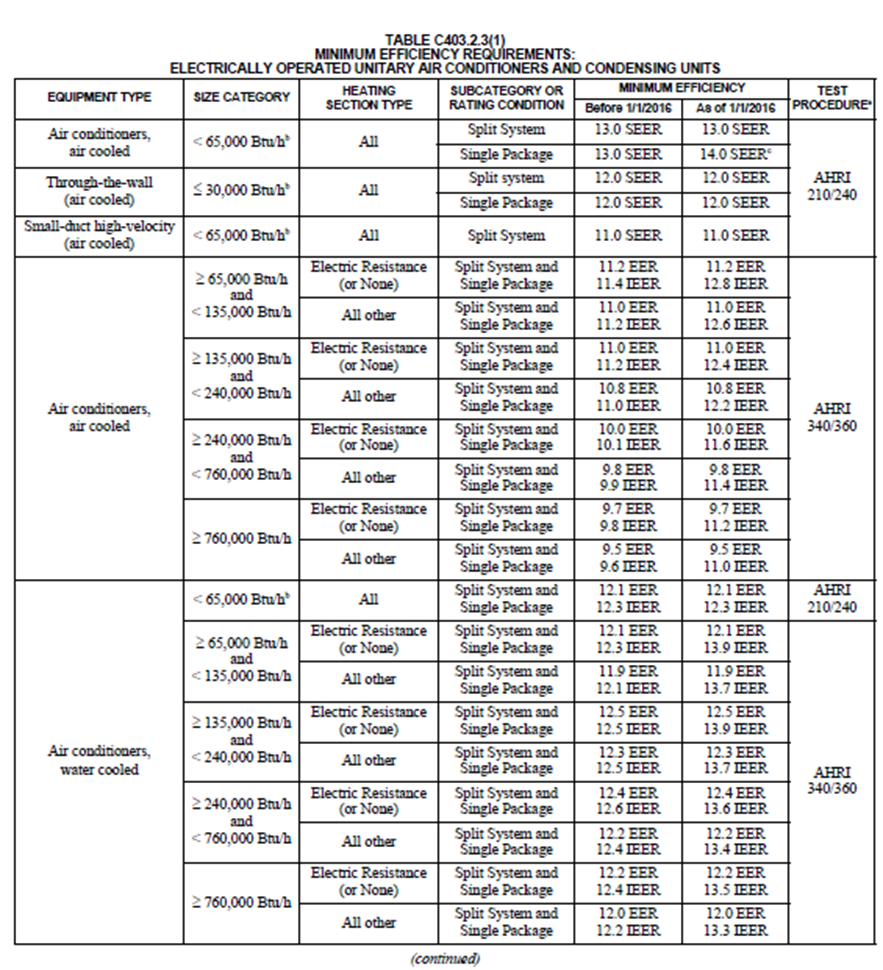
EFLH = Equivalent Full Load Hours for cooling are provided in section 4.4 HVAC End Use

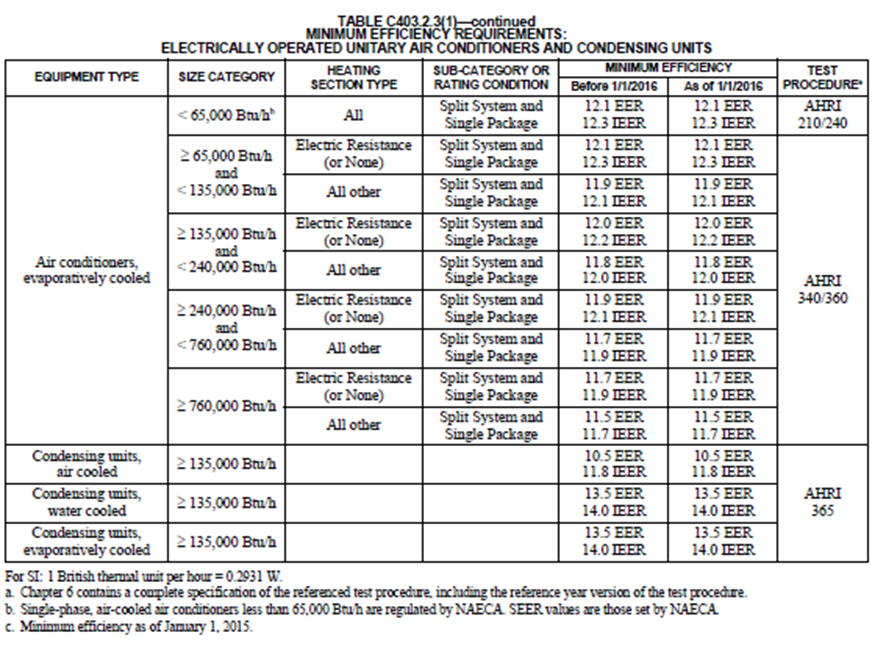
2012 IECC Minimum Efficiency Requirements





2015 IECC Minimum Efficiency Requirements





For example a 5 ton air cooled split system with a SEER of 15 at a retail strip mall in Rockford would save:

ΔkWH = (60) \* [(1/13) – (1/15)] \* 950

= 585 kWh

**Summer Coincident Peak Demand Savings**

ΔkWSSP = (kBtu/hr \* (1/EERbase - 1/EERee)) \* CFSSP

ΔkWPJM = (kBtu/hr \* (1/EERbase - 1/EERee)) \* CFPJM

Where:

CFSSP = Summer System Peak Coincidence Factor for Commercial cooling (during system peak hour)

= 91.3% [[5]](#footnote-6)

CFPJM = PJM Summer Peak Coincidence Factor for Commercial cooling (average during peak period)

= 47.8% [[6]](#footnote-7)

For example, a 5 ton air cooled split system with a SEER of 15 in Rockford would save:

ΔkWSSP = (60) \* [(1/13) – (1/15)] \* .913

= 0.562 kW

**Natural Gas Energy Savings**

N/A

**Water Impact Descriptions and Calculation**

N/A

**Measure Code: CI-HVC-SPUA-V04-160601**

1. Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures, GDS Associates, Inc., June 2007. [↑](#footnote-ref-1)
2. Based on a review of TRM incremental cost assumptions from Vermont, Wisconsin, and California. This assumes that baseline shift from IECC 2012 to IECC 2015 carries the same incremental costs. Values should be verified during evaluation [↑](#footnote-ref-2)
3. Based on analysis of Itron eShape data for Missouri, calibrated to Illinois loads, supplied by Ameren. The AC load during the utility’s peak hour is divided by the maximum AC load during the year. [↑](#footnote-ref-3)
4. Based on analysis of Itron eShape data for Missouri, calibrated to Illinois loads, supplied by Ameren. The average AC load over the PJM peak period (1-5pm, M-F, June through August) is divided by the maximum AC load during the year [↑](#footnote-ref-4)
5. Based on analysis of Itron eShape data for Missouri, calibrated to Illinois loads, supplied by Ameren. The AC load during the utility’s peak hour is divided by the maximum AC load during the year. [↑](#footnote-ref-6)
6. Based on analysis of Itron eShape data for Missouri, calibrated to Illinois loads, supplied by Ameren. The average AC load over the PJM peak period (1-5pm, M-F, June through August) is divided by the maximum AC load during the year [↑](#footnote-ref-7)