## Occupancy Sensors for Lighting

### Author

Matt Steen, Eric Ringold - Ambient Energy

### Description

This energy efficiency measure (EEM) adjusts the interior lighting power per for affected space types to account for occupant sensors according to Standard 90.1-2010 Table 9.6.2 and Addendum cg Table G3.1(g). Lighting power for affected space types is adjusted by a fixed control factor of 0.05 for multi-level occupancy sensors in breakrooms, conference rooms, offices, restrooms, and stairs. The measure does not change the model unless Space Types use Measure Tags for Standards Space Type and Lights Definitions use either W/area or W/person inputs (an absolute W input is not supported).

### Modeler Description

This measure loops through space types in the model and adjusts the lighting power per area (W/ft2) or lighting power per person (W/person) for affected space types. The measure is not currently able to change the lighting power is specified using the Lighting Level (W) input option.

### Use Case Types

Retrofit, LEED models,

This measure applies to the following DOE Prototype Buildings:

1. Small Office
2. Medium Office
3. Large Office
4. Hospital
5. Midrise Apartment
6. Outpatient Healthcare
7. Primary School
8. Secondary School
9. Small Hotel
10. Supermarket
11. Warehouse

In the following space types:

1. open offices
2. private offices
3. conference rooms
4. restrooms
5. stairways
6. break rooms

### Arguments

“run\_measure” is a choice argument that determines whether or not the Measure is applied during a given run.

### Initial Condition Message

# report initial condition

runner.registerInitialCondition("Total interior lighting power = #{TODO}")

### Final Condition Message

### # report final condition

### runner.registerFinalCondition("Total interior lighting power = #{TODO}”)

### Not Applicable Messages

runner.registerAsNotApplicable("No affected space types found")

### Warning Messages

runner.registerWarning("Lighting power is specified using Lighting Level (W) for affected space type: #{st.name}")

### Information Messages

runner.registerInfo("Adjusting interior lighting power for space type: #{st.name}")

runner.registerInfo("Initial interior lighting power = #{lpd\_area\_ip.round(2)} W/ft2")

runner.registerInfo("Final interior lighting power = #{lpd\_area\_new\_ip.round(2)} W/ft2")

runner.registerInfo("Initial interior lighting power = #{lpd\_people} W/person")

runner.registerInfo("Final interior lighting power = #{lpd\_people\_new} W/person")

### Error Messages

None

### Code Outline

1. Get Space Types in model
2. Loop through Space Types
   1. Loop through affected space types
      1. If space type is affected
         1. Affected space types are “BreakRoom”, “Conference”, “Office”, “Restroom”, and “Stair”
         2. Reduce lighting by 5% per 90.1-2010 Table 9.6.2 (p. 85)

### Tests

The following test should be verified:

* All affected space type lighting power is changed by the measure
* Lighting power per area case results in changed values
* Lighting power per person case results in changed values
* Lighting level case results in NA message
* Models with no affected space types results in NA message
* Info messages show 5% reduction in lighting power for affected spaces.