Input Output Reference – Draft Final Changes for ElectricEquipment:ITE:AirCooled

MJW Oct 31, 2014, Rev. Nov 4, 2014

### OtherEquipment

Other Equipment object is provided as an additional source for heat gains or losses directly to the zone. That is to say, a loss can be entered by putting a negative value into the Design Level field(s). Note, too, that this object does not have an end-use component – gains or losses do not show up in the bottom energy lines (except as influencing overall zone gains or losses).

#### Field: Name

The name of the OtherEquipment object.

#### Field: Zone or ZoneList Name

This field is the name of the thermal zone (ref: Zone) and attaches a particular other equipment statement to a thermal zone or set of thermal zones in the building. When the ZoneList option is used then this other equipment definition is applied to each of the zones in the zone list effecting a global definition for the amount of other in the zone. This option can be used effectively with the watts/area and watts/person options of the Design Level Calculation Method.

#### Field: Schedule Name

This field is the name of the schedule that modifies the design level parameter for other equipment (see Design Level Calculation Method field and related subsequent fields). The schedule values can be any positive number. The actual energy input for other equipment in a zone as defined by this statement is the product of the design level field and the value of the schedule specified by name in this field.

#### Field: Design Level Calculation Method

This field is a key/choice field that tells which of the next three fields are filled and is descriptive of the method for calculating the nominal other equipment level in the Zone. The key/choices are:

* EquipmentLevel

With this choice, the method used will be a straight insertion of the other equipment level (Watts) for the Zone. (The Design Level field should be filled.)

* Watts/Area or Power/Area

With this choice, the method used will be a factor per floor area of the zone. (The Power per Zone Floor Area field should be filled).

* Watts/Person or Power/Person

With this choice, the method used will be a factor of equipment level (watts) per person. (The Power per Person field should be filled).

#### Field: Design Level

This field (in Watts) is typically used to represent the maximum energy input to other equipment in a zone that is then multiplied by a schedule fraction (see previous field). In EnergyPlus, this is slightly more flexible in that the other equipment design level could be a “diversity factor” applied to a schedule of real numbers. This value can be negative to denote a loss. Note that while the schedule value can vary from hour to hour, the design level field is constant for all simulation environments.

#### Field: Power per Zone Floor Area

This factor (watts/m2) is used, along with the Zone Area to determine the maximum equipment level as described in the Design Level field. This value can be negative to denote a loss. The choice from the method field should be “**Watts/Area**” or “**Power/Area**”.

#### Field: Power per Person

This factor (watts/person) is used, along with the number of occupants (people) to determine the maximum equipment level as described in the Design Level field. This value can be negative to denote a loss. The choice from the method field should be “**Watts/Person**” or “**Power/Person**”.

#### Heat Gains/Losses from Other Equipment:

The fuel input to the equipment ultimately appears as heat that contributes to zone loads. In EnergyPlus this heat is divided into four different fractions. Three of these are given by the input fields Fraction Latent, Fraction Radiant and Fraction Lost. A fourth, defined as the fraction of the heat from other equipment convected to the zone air, is calculated by the program as:

fconvected = 1.0 – (Fraction Latent + Fraction Radiant + Fraction Lost)

You will get an error message if Fraction Latent + Fraction Radiant + Fraction Lost exceeds 1.0.

#### Field: Fraction Latent

This field is a decimal number between 0.0 and 1.0 and is used to characterize the amount of latent heat given off by other equipment in a zone. The number specified in this field will be multiplied by the total energy consumed by other equipment to give the amount of latent energy produced by the other equipment. This energy affects the moisture balance within the zone.

#### Field: Fraction Radiant

This field is a decimal number between 0.0 and 1.0 and is used to characterize the amount of long-wave radiant heat being given off by other equipment in a zone. The number specified in this field will be multiplied by the total energy consumed by other equipment to give the amount of long wavelength radiation gain from other equipment in a zone.

#### Field: Fraction Lost

This field is a decimal number between 0.0 and 1.0 and is used to characterize the amount of “lost” heat being given off by other equipment in a zone. The number specified in this field will be multiplied by the total energy consumed by other equipment to give the amount of heat which is “lost” and does not impact the zone energy balances. This might correspond to input energy converted to mechanical work or heat that is vented to the atmosphere.

IDF Examples

OtherEquipment,

BASE-1 OthEq 1, !- Name

BASE-1, !- Zone Name

ALWAYSON, !- SCHEDULE Name

EquipmentLevel, !- Design Level calculation method

6766., !- Design Level {W}

, !- Power per Zone Floor Area {watts/m2}

, !- Power per Person {watts/person}

0, !- Fraction Latent

0.3, !- Fraction Radiant

0; !- Fraction Lost

### Electric, Gas, Other, HotWater, Steam Equipment Outputs

Each type of equipment object has output variables for individual objects and for zone totals.

Electric Equipment

Zone,Average,Electric Equipment Electric Power [W]

Zone,Sum,Electric Equipment Electric Energy [J]

Zone,Sum,Electric Equipment Radiant Heating Energy [J]

Zone,Average,Electric Equipment Radiant Heating Rate [W]

Zone,Sum,Electric Equipment Convective Heating Energy [J]

Zone,Average,Electric Equipment Convective Heating Rate [W]

Zone,Sum,Electric Equipment Latent Gain Energy [J]

Zone,Average,Electric Equipment Latent Gain Rate [W]

Zone,Sum,Electric Equipment Lost Heat Energy [J]

Zone,Average,Electric Equipment Lost Heat Rate [W]

Zone,Sum,Electric Equipment Total Heating Energy [J]

Zone,Average,Electric Equipment Total Heating Rate [W]

Zone,Average,Zone Electric Equipment Electric Power [W]

Zone,Sum,Zone Electric Equipment Electric Energy [J]

Zone,Sum,Zone Electric Equipment Radiant Heating Energy [J]

Zone,Average,Zone Electric Equipment Radiant Heating Rate [W]

Zone,Sum,Zone Electric Equipment Convective Heating Energy [J]

Zone,Average,Zone Electric Equipment Convective Heating Rate [W]

Zone,Sum,Zone Electric Equipment Latent Gain Energy [J]

Zone,Average,Zone Electric Equipment Latent Gain Rate [W]

Zone,Sum,Zone Electric Equipment Lost Heat Energy [J]

Zone,Average,Zone Electric Equipment Lost Heat Rate [W]

Zone,Sum,Zone Electric Equipment Total Heating Energy [J]

Zone,Average,Zone Electric Equipment Total Heating Rate [W]

**Gas Equipment**

Zone,Average,Gas Equipment Gas Rate [W]

Zone,Sum,Gas Equipment Gas Energy [J]

Zone,Sum,Gas Equipment Radiant Heating Energy [J]

Zone,Sum,Gas Equipment Convective Heating Energy [J]

Zone,Sum,Gas Equipment Latent Gain Energy [J]

Zone,Sum,Gas Equipment Lost Heat Energy [J]

Zone,Sum,Gas Equipment Total Heating Energy [J]

Zone,Average,Gas Equipment Radiant Heating Rate [W]

Zone,Average,Gas Equipment Convective Heating Rate [W]

Zone,Average,Gas Equipment Latent Gain Rate [W]

Zone,Average,Gas Equipment Lost Heat Rate [W]

Zone,Average,Gas Equipment Total Heating Rate [W]

Zone,Average,Zone Gas Equipment Gas Rate [W]

Zone,Sum,Zone Gas Equipment Gas Energy [J]

Zone,Sum,Zone Gas Equipment Radiant Heating Energy [J]

Zone,Average,Zone Gas Equipment Radiant Heating Rate [W]

Zone,Sum,Zone Gas Equipment Convective Heating Energy [J]

Zone,Average,Zone Gas Equipment Convective Heating Rate [W]

Zone,Sum,Zone Gas Equipment Latent Gain Energy [J]

Zone,Average,Zone Gas Equipment Latent Gain Rate [W]

Zone,Sum,Zone Gas Equipment Lost Heat Energy [J]

Zone,Average,Zone Gas Equipment Lost Heat Rate [W]

Zone,Sum,Zone Gas Equipment Total Heating Energy [J]

Zone,Average,Zone Gas Equipment Total Heating Rate [W]

**HotWater Equipment**

Zone,Average,Hot Water Equipment District Heating Rate [W]

Zone,Sum,Hot Water Equipment District Heating Energy [J]

Zone,Sum,Hot Water Equipment Radiant Heating Energy [J]

Zone,Average,Hot Water Equipment Radiant Heating Rate [W]

Zone,Sum,Hot Water Equipment Convective Heating Energy [J]

Zone,Average,Hot Water Equipment Convective Heating Rate [W]

Zone,Sum,Hot Water Equipment Latent Gain Energy [J]

Zone,Average,Hot Water Equipment Latent Gain Rate [W]

Zone,Sum,Hot Water Equipment Lost Heat Energy [J]

Zone,Average,Hot Water Equipment Lost Heat Rate [W]

Zone,Sum,Hot Water Equipment Total Heating Energy [J]

Zone,Average,Hot Water Equipment Total Heating Rate [W]

Zone,Average,Zone Hot Water Equipment District Heating Rate [W]

Zone,Sum,Zone Hot Water Equipment District Heating Energy [J]

Zone,Sum,Zone Hot Water Equipment Radiant Heating Energy [J]

Zone,Average,Zone Hot Water Equipment Radiant Heating Rate [W]

Zone,Sum,Zone Hot Water Equipment Convective Heating Energy [J]

Zone,Average,Zone Hot Water Equipment Convective Heating Rate [W]

Zone,Sum,Zone Hot Water Equipment Latent Gain Energy [J]

Zone,Average,Zone Hot Water Equipment Latent Gain Rate [W]

Zone,Sum,Zone Hot Water Equipment Lost Heat Energy [J]

Zone,Average,Zone Hot Water Equipment Lost Heat Rate [W]

Zone,Sum,Zone Hot Water Equipment Total Heating Energy [J]

Zone,Average,Zone Hot Water Equipment Total Heating Rate [W]

**Steam Equipment**

Zone,Average,Steam Equipment District Heating Rate [W]

Zone,Sum,Steam Equipment District Heating Energy [J]

Zone,Sum,Steam Equipment Radiant Heating Energy [J]

Zone,Average,Steam Equipment Radiant Heating Rate [W]

Zone,Sum,Steam Equipment Convective Heating Energy [J]

Zone,Average,Steam Equipment Convective Heating Rate [W]

Zone,Sum,Steam Equipment Latent Gain Energy [J]

Zone,Average,Steam Equipment Latent Gain Rate [W]

Zone,Sum,Steam Equipment Lost Heat Energy [J]

Zone,Average,Steam Equipment Lost Heat Rate [W]

Zone,Sum,Steam Equipment Total Heating Energy [J]

Zone,Average,Steam Equipment Total Heating Rate [W]

Zone,Average,Zone Steam Equipment District Heating Rate [W]

Zone,Sum,Zone Steam Equipment District Heating Energy [J]

Zone,Sum,Zone Steam Equipment Radiant Heating Energy [J]

Zone,Average,Zone Steam Equipment Radiant Heating Rate [W]

Zone,Sum,Zone Steam Equipment Convective Heating Energy [J]

Zone,Average,Zone Steam Equipment Convective Heating Rate [W]

Zone,Sum,Zone Steam Equipment Latent Gain Energy [J]

Zone,Average,Zone Steam Equipment Latent Gain Rate [W]

Zone,Sum,Zone Steam Equipment Lost Heat Energy [J]

Zone,Average,Zone Steam Equipment Lost Heat Rate [W]

Zone,Sum,Zone Steam Equipment Total Heating Energy [J]

Zone,Average,Zone Steam Equipment Total Heating Rate [W]

**Other Equipment**

Zone,Sum,Other Equipment Radiant Heating Energy [J]

Zone,Average,Other Equipment Radiant Heating Rate [W]

Zone,Sum,Other Equipment Convective Heating Energy [J]

Zone,Average,Other Equipment Convective Heating Rate [W]

Zone,Sum,Other Equipment Latent Gain Energy [J]

Zone,Average,Other Equipment Latent Gain Rate [W]

Zone,Sum,Other Equipment Lost Heat Energy [J]

Zone,Average,Other Equipment Lost Heat Rate [W]

Zone,Sum,Other Equipment Total Heating Energy [J]

Zone,Average,Other Equipment Total Heating Rate [W]

Zone,Sum,Zone Other Equipment Radiant Heating Energy [J]

Zone,Average,Zone Other Equipment Radiant Heating Rate [W]

Zone,Sum,Zone Other Equipment Convective Heating Energy [J]

Zone,Average,Zone Other Equipment Convective Heating Rate [W]

Zone,Sum,Zone Other Equipment Latent Gain Energy [J]

Zone,Average,Zone Other Equipment Latent Gain Rate [W]

Zone,Sum,Zone Other Equipment Lost Heat Energy [J]

Zone,Average,Zone Other Equipment Lost Heat Rate [W]

Zone,Sum,Zone Other Equipment Total Heating Energy [J]

Zone,Average,Zone Other Equipment Total Heating Rate [W]

#### Electric Equipment Electric Power [W]

#### Electric Equipment Electric Energy [J]

The electric equipment electric power consumption in Watts (for power) or Joules (for energy). It is the sum of the radiant, convective, latent and lost components. This energy use is added to the electricity meters that are associated with the zone – Electricity:Facility, Electricity:Buidling, Electricity:Zone:<Zone Name>, InteriorEquipment:Electricity: :Zone:<Zone Name>, and <End-Use Subcategory>:InteriorEquipment:Electricity.

#### Gas Equipment Gas Rate [W]

#### Gas Equipment Gas Energy [J]

The gas equipment natural gas consumption in Watts (for power) or Joules (for energy). It is the sum of the radiant, convective, latent and lost components. This energy use is added to the electricity meters that are associated with the zone – Gas:Facility, Gas:Buidling, Gas:Zone:<Zone Name>, InteriorEquipment:Gas: :Zone:<Zone Name>, and <End-Use Subcategory>:InteriorEquipment:Gas.

#### Hot Water Equipment District Heating Rate [W]

#### Hot Water Equipment District Heating Energy [J]

The hot water equipment district heating consumption in Watts (for power) or Joules (for energy). It is the sum of the radiant, convective, latent and lost components. This energy use is added to the district heating meters that are associated with the zone – DistrictHeating:Facility, DistrictHeating:Buidling, DistrictHeating:Zone:<Zone Name>, InteriorEquipment: DistrictHeating: :Zone:<Zone Name>, and <End-Use Subcategory>:InteriorEquipment: DistrictHeating.

#### Steam Equipment District Heating Rate [W]

#### Steam Equipment District Heating Energy [J]

The steam equipment district heating consumption in Watts (for power) or Joules (for energy). It is the sum of the radiant, convective, latent and lost components. This energy use is added to the district heating meters that are associated with the zone – DistrictHeating:Facility, DistrictHeating:Buidling, DistrictHeating:Zone:<Zone Name>, InteriorEquipment: DistrictHeating: :Zone:<Zone Name>, and <End-Use Subcategory>:InteriorEquipment: DistrictHeating.

Note that zone energy consumption is not reported for OTHER EQUIPMENT and does not go on any meter.

ElectricEquipment :ITE:AirCooled

This object describes air-cooled electric information technology equipment (ITE) which has variable power consumption as a function of loading and temperature.

***Field: Name***

The name of this object.

***Field: Zone Name***

This field is the name of the thermal zone (ref: Zone) which contains this ElectricEquipment:ITE:AirCooled object.

***Field: Design Power Input Calculation Method***

This field is a key/choice field that tells which of the next two fields are filled and is descriptive of the method for calculating the nominal electric power input to the ITE. The key/choices are:

*Watts/Unit*

With this choice, the design power input will be the product of Design Level per Unit and Number of Units. (Both of these fields should be filled.) This is the default.

*Watts/Area*

With this choice, the design power input will be a factor per floor area of the zone. (The Watts per Zone Floor Area field should be filled).

***Field: Watts per Unit***

This field (in Watts) is typically used to represent the design electrical power input to the ITE when fully loaded and the entering air temperatures is at the specified design value. This field is used if the choice from the method field is “EquipmentLevel”.

***Field: Number of Units***

This field is multiplied times the Design Level per Unit to determine the design electrical power input to this ITE object when fully loaded and the entering air temperature is at the specified design value. This field is used if the choice from the method field is “EquipmentLevel”. The default is 1.

***Field: Watts per Zone Floor Area***

This factor (Watts/m2) is used, along with the Zone Area to determine the design electrical power input as described in the Design Level field above. This field is used if the choice from the method field is “Watts/Area”.

***Field: Design Power Input Schedule Name***

This field is the name of the operating schedule that modifies the design level power input for this equipment This schedule specifies the fraction (typically 0.0 to 1.0) of this equipment which is available (powered up), regardless of CPU utilization. If this field is blank, the schedule is assumed to always be 1.0.

***Field: CPU Loading Schedule Name***

This field is the name of the schedule that specifies the CPU loading for this equipment as a fraction from 0.0 (idle) to 1.0 (full load). If this field is blank, the schedule is assumed to always be 1.0.

***Field: CPU Power Input Function of Loading and Air Temperature Curve Name***

The name of a two-variable curve or table lookup object which modifies the CPU power input as a function of CPU loading (x) and air inlet node temperature (y). This curve (table) should equal 1.0 at design conditions (CPU loading = 1.0 and Design Entering Air Temperature).

***Field: Design Fan Power Input Fraction***

This field is a decimal number between 0.0 and 1.0 and is used to specify the fraction of the total power input at design conditions which is for the cooling fan(s). If fan power data is not available, set this fraction to 0.0. The default is 0.0.

***Field: Design Fan Air Flow Rate per Power Input***

Specifies the cooling fan air flow rate in m3/s per Watt of total electric power input at design conditions (CPU loading = 1.0 and Design Entering Air Temperature).  
This is normalized by power input to allow the design power input to be changed without needing to change this value.

***Field: Air Flow Function of Loading and Air Temperature Curve Name***

The name of a two-variable curve or table lookup object which modifies the cooling air flow rate as a function of CPU loading (x) and air inlet node temperature (y). This curve (table) should equal 1.0 at design conditions (CPU loading = 1.0 and Design Entering Air Temperature).

***Field: Fan Power Input Function of Flow Curve Name***

The name of a single-variable curve or table lookup object which modifies the fan power input as a function of airflow fraction (x). This curve (table) should equal 1.0 at the design air flow rate (flow fraction = 1.0).

***Field: Design Entering Air Temperature***

Specifies the entering air temperature in deg. C at design conditions. The default is 15C.

***Field: Environmental Class***

Specifies the allowable operating conditions for the air inlet conditions. The available inputs are A1, A2, A3, A4, B, C, or None. This is used to report the “ITE Air Inlet Operating Range Exceeded Time” If None is specified (the default), then no reporting of time outside allowable conditions will be done.

***Field: Air Inlet Connection Type***

Specifies the type of connection between the zone and the ITE air inlet node. The choices are:

*AdjustedSupply* = This option is used to apply a recirculation adjustment to the ITE inlet conditions. If this option is specified, then the Supply Air Node Name is required and the air inlet temperature to the ITE will be the current supply air node temperature adjusted by the current recirculation fraction. All heat output is added to the zone air heat balance as a convective gain. *AdjustedSupply* is the default.

*ZoneAirNode* = This option is used if there is no containment and the ITE air inlet node is at the average zone condition. All heat output is added to the zone air heat balance as a convective gain.

*RoomAirModel* = This option connects the ITE air inlet and outlet nodes to a room air model (Ref. RoomAirModelType and RoomAir:Node).

***Field: Air Inlet Room Air Model Node Name***

Specifies the name of a room air model node (ref. RoomAir:Node) which is the air inlet to this equipment. This field is required if the Air Node Connection Type = *RoomAirModel*.

***Field: Air Outlet Room Air Model Node Name***

Specifies the node name of a room air model node (ref. RoomAir:Node) which is the air outlet from this equipment. This field is required if the Air Node Connection Type = *RoomAirModel*.

***Field: Supply Air Node Name***

Specifies the node name of the supply air inlet node service this ITE. If the Air Node Connection Type = *AdjustedSupply* ,then this field is required, and the conditions at this node will be used to determine the ITE air inlet conditions. This field is also required if reporting of the Supply Heat Index is desired.

***Field: Design Recirculation Fraction***

Specifies the recirculation fraction for this equipment at design conditions. This field is used only if the Air Node Connection Type = *AdjustedSupply.* The recirculation fraction is defined as the ratio of recirculated air flow to total air flow entering the ITE. Recirculation is dependent upon many factors including rack and containment configuration. The default is 0.0 (no recirculation).

***Field: Recirculation Function of Loading and Supply Temperature Curve Name***

The name of a two-variable curve or table lookup object which modifies the Design Recirculation Fraction as a function of CPU loading (x) and supply air node temperature (y). This curve (table) should equal 1.0 at design conditions (CPU loading = 1.0 and Design Entering Air Temperature). This field is used only if the Air Node Connection Type = *AdjustedSupply.* If this curve is left blank, then the curve is assumed to always equal 1.0.

***Field: Design Electric Power Supply Efficiency***

This field is a decimal number used to specify the efficiency of the power supply system serving this ITE. The default is 1.0.

***Field: Electric Power Supply Efficiency Function of Part Load Ratio Curve Name***

The name of a single-variable curve or table lookup object which modifies the electric power supply efficiency as a function of part load ratio (x). This curve (table) should equal 1.0 at the design power consumption (part load ratio = 1.0). If this curve is left blank, then the curve is assumed to always equal 1.0.

***Field: Fraction of Electric Power Supply Losses to Zone***

This field is a decimal number between 0.0 and 1.0 and is used to specify the fraction of the electric power supply losses which are a heat gain to the zone containing the ITE. If this value is less than 1.0, the remainder of the losses are assumed to be lost to the outdoors. The default is 1.0.

***Field: CPU End-Use Subcategory***

This equipment is metered on the Interior Equipment end-use category for Electricity. This field allows you to specify a user-defined end-use subcategory for the CPU power consumption. A new meter for reporting is created for each unique subcategory (ref: Output:Meter object). Subcategories are also reported in the ABUPS table. The default is ITE-CPU.

***Field: Fan End-Use Subcategory***

This equipment is metered on the Interior Equipment end-use category for Electricity. This field allows you to specify a user-defined end-use subcategory for the fan power consumption. A new meter for reporting is created for each unique subcategory (ref: Output:Meter object). Subcategories are also reported in the ABUPS table. The default is ITE-Fans

***Field: Electric Power Supply End-Use Subcategory***

This equipment is metered on the Interior Equipment end-use category for Electricity. This field allows you to specify a user-defined end-use subcategory for the electric power supply power consumption. A new meter for reporting is created for each unique subcategory (ref: Output:Meter object). Subcategories are also reported in the ABUPS table. The default is ITE-UPS

An IDF example:

ElectricEquipment:ITE:AirCooled,

Data Center Servers, !- Name

Main Zone, !- Zone Name

Watts/Unit, !- Design Power Input Calculation Method

500, !- Watts per Unit {W}

200, !- Number of Units

, !- Watts per Zone Floor Area {W/m2}

Data Center Operation Schedule, !- Design Power Input Schedule Name

Data Center CPU Loading Schedule, !- CPU Loading Schedule Name

Model 5250 Power fLoadTemp, !- CPU Power Input Function of Loading and Air Temperature Curve Name

0.4, !- Design Fan Power Input Fraction

0.0001, !- Design Fan Air Flow Rate per Power Input {m3/s-W}

Model 5250 AifFlow fLoadTemp, !- Air Flow Function of Loading and Air Temperature Curve Name

ECM FanPower fFlow, !- Fan Power Input Function of Flow Curve Name

15, !- Design Entering Air Temperature {C}

A3, !- Environmental Class

AdjustedSupply, !- Air Inlet Connection Type

, !- Air Inlet Room Air Model Node Name

, !- Air Outlet Room Air Model Node Name

Main Zone Inlet Node, !- Supply Air Node Name

0.1, !- Design Recirculation Fraction

Data Center Recirculation fLoadTemp, !- Recirculation Function of Loading and Supply Temperature Curve Name

0.9, !- Design Electric Power Supply Efficiency

UPS Efficiency fPLR, !- Electric Power Supply Efficiency Function of Part Load Ratio Curve Name

1, !- Fraction of Electric Power Supply Losses to Zone

ITE-CPU, !- CPU End-Use Subcategory

ITE-Fans, !- Fan End-Use Subcategory

ITE-UPS; !- Electric Power Supply End-Use Subcategory

ElectricEquipment:ITE:AirCooled Outputs

Zone,Average,ITE CPU Electric Power [W]

Zone,Average,ITE Fan Electric Power [W]

Zone,Average,ITE UPS Electric Power [W]

Zone,Average,ITE CPU Electric Power at Design Inlet Conditions [W]

Zone,Average,ITE Fan Electric Power at Design Inlet Conditions [W]

Zone,Average,ITE UPS Heat Gain to Zone Rate [W]

Zone,Average,ITE Total Heat Gain to Zone Rate [W]

Zone,Sum,ITE CPU Electric Energy [J]

Zone,Sum,ITE Fan Electric Energy [J]

Zone,Sum,ITE UPS Electric Energy [J]

Zone,Sum,ITE CPU Electric Energy at Design Inlet Conditions [J]

Zone,Sum,ITE Fan Electric Energy at Design Inlet Conditions [J]

Zone,Sum,ITE UPS Heat Gain to Zone Energy [J]

Zone,Sum,ITE Total Heat Gain to Zone Energy [J]

Zone,Average,ITE Standard Density Air Volume Flow Rate [m3/s]

Zone,Average,ITE Current Density Air Volume Flow Rate [m3/s]

Zone,Average,ITE Air Mass Flow Rate [kg/s]

Zone,Average,ITE Air Inlet Dry-Bulb Temperature [C]

Zone,Average,ITE Air Inlet Dewpoint Temperature [C]

Zone,Average,ITE Air Inlet Relative Humidity [%]

Zone,Average,ITE Air Outlet Dry-Bulb Temperature [C]

Zone,Average,ITE Supply Heat Index []

Zone,Sum,ITE Air Inlet Operating Range Exceeded Time [hr]

Zone,Sum,ITE Air Inlet Dry-Bulb Temperature Above Operating Range Time [hr]

Zone,Sum,ITE Air Inlet Dry-Bulb Temperature Below Operating Range Time [hr]

Zone,Sum,ITE Air Inlet Dewpoint Temperature Above Operating Range Time [hr]

Zone,Sum,ITE Air Inlet Dewpoint Temperature Below Operating Range Time [hr]

Zone,Sum,ITE Air Inlet Relative Humidity Above Operating Range Time [hr]

Zone,Sum,ITE Air Inlet Relative Humidity Below Operating Range Time [hr]

Zone,Average,ITE Air Inlet Dry-Bulb Temperature Difference Above Operating Range [deltaC]

Zone,Average,ITE Air Inlet Dry-Bulb Temperature Difference Below Operating Range [deltaC]

Zone,Average,ITE Air Inlet Dewpoint Temperature Difference Above Operating Range [deltaC]

Zone,Average,ITE Air Inlet Dewpoint Temperature Difference Below Operating Range [deltaC]

Zone,Average,ITE Air Inlet Relative Humidity Difference Above Operating Range [%]

Zone,Average,ITE Air Inlet Relative Humidity Difference Below Operating Range [%]

Zone,Average,Zone ITE CPU Electric Power [W]

Zone,Average,Zone ITE Fan Electric Power [W]

Zone,Average,Zone ITE UPS Electric Power [W]

Zone,Average,Zone ITE CPU Electric Power at Design Inlet Conditions [W]

Zone,Average,Zone ITE Fan Electric Power at Design Inlet Conditions [W]

Zone,Average,Zone ITE UPS Heat Gain to Zone Rate [W]

Zone,Average,Zone ITE Total Heat Gain to Zone Rate [W]

Zone,Sum,Zone ITE CPU Electric Energy [J]

Zone,Sum,Zone ITE Fan Electric Energy [J]

Zone,Sum,Zone ITE UPS Electric Energy [J]

Zone,Sum,Zone ITE CPU Electric Energy at Design Inlet Conditions [J]

Zone,Sum,Zone ITE Fan Electric Energy at Design Inlet Conditions [J]

Zone,Sum,Zone ITE UPS Heat Gain to Zone Energy [J]

Zone,Sum,Zone ITE Total Heat Gain to Zone Energy [J]

Zone,Average,Zone ITE Standard Density Air Volume Flow Rate [m3/s]

Zone,Average,Zone ITE Air Mass Flow Rate [kg/s]

Zone,Average,Zone ITE Average Supply Heat Index []

Zone,Sum,Zone ITE Any Air Inlet Operating Range Exceeded Time [hr]

Zone,Sum,Zone ITE Any Air Inlet Dry-Bulb Temperature Above Operating Range Time [hr]

Zone,Sum,Zone ITE Any Air Inlet Dry-Bulb Temperature Below Operating Range Time [hr]

Zone,Sum,Zone ITE Any Air Inlet Dewpoint Temperature Above Operating Range Time [hr]

Zone,Sum,Zone ITE Any Air Inlet Dewpoint Temperature Below Operating Range Time [hr]

Zone,Sum,Zone ITE Any Air Inlet Relative Humidity Above Operating Range Time [hr]

Zone,Sum,Zone ITE Any Air Inlet Relative Humidity Below Operating Range Time [hr]

***Zone ITE CPU Electric Power [W]***

***ITE CPU Electric Power [W]***

***Zone ITE CPU Electric Energy [J]***

***ITE CPU Electric Energy [J]***

The electric power (or energy) input to the ITE equipment CPU (total power input less cooling fan power). The ITE CPU Electric Energy output is also added to a meter object with Resource Type = Electricity, End Use Key = InteriorEquipment, Group Key = Building (Ref. Output:Meter object).

***Zone ITE CPU Electric Power at Design Inlet Conditions [W]***

***ITE CPU Electric Power at Design Inlet Conditions [W]***

***Zone ITE CPU Electric Energy at Design Inlet Conditions [J]***

***ITE CPU Electric Energy at Design Inlet Conditions [J]***

The electric power (or energy) input to the ITE equipment CPU (total power input less cooling fan power) if the air inlet temperature were held at the design condition. May be used to calculate “IT efficiency”, the ratio of (IT energy consumed in the facility) / (IT energy that would have been consumed in the facility if the ITE were held at the reference temperature).

***Zone ITE Fan Electric Power [W]***

***ITE Fan Electric Power [W]***

***Zone ITE Fan Electric Energy [J]***

***ITE Fan Electric Energy [J]***

The electric power (or energy) input to the ITE cooling fan. The ITE Fan Electric Energy output is also added to a meter object with Resource Type = Electricity, End Use Key = InteriorEquipment, Group Key = Building (Ref. Output:Meter object).

***Zone ITE Fan Electric Power at Design Inlet Conditions [W]***

***ITE Fan Electric Power at Design Inlet Conditions [W]***

***Zone ITE Fan Electric Energy at Design Inlet Conditions [J]***

***ITE Fan Electric Energy at Design Inlet Conditions [J]***

The electric power (or energy) input to the ITE cooling fan if the air inlet temperature were held at the design condition. May be used to calculate “IT efficiency”, the ratio of (IT energy consumed in the facility) / (IT energy that would have been consumed in the facility if the ITE were held at the reference temperature).

***Zone ITE UPS Electric Power [W]***

***ITE UPS Electric Power [W]***

***Zone ITE UPS Electric Energy [J]***

***ITE UPS Electric Energy [J]***

The net electric power (or energy) input to the ITE equipment UPS (total power input less power delivered to ITE). The ITE UPS Electric Energy output is also added to a meter object with Resource Type = Electricity, End Use Key = InteriorEquipment, Group Key = Building (Ref. Output:Meter object).

***Zone ITE UPS Heat Gain to Zone Rate [W]***

***ITE UPS Heat Gain to Zone Rate [W]***

***Zone ITE UPS Heat Gain to Zone Energy [J]***

***ITE UPS Heat Gain to Zone Energy [J]***

The heat gain rate (or energy) to the zone from the UPS.

***Zone ITE Total Heat Gain to Zone Rate [W]***

***ITE Total Heat Gain to Zone Rate [W]***

***Zone ITE Total Heat Gain to Zone Energy [J]***

***ITE Total Heat Gain to Zone Energy [J]***

The heat gain rate (or energy) to the zone from the UPS and from the CPU and fans if the ITE. Air Inlet Connection Type is AdjustedSupply or ZoneAirNode. If RoomAirModel is selected, then only the heat gain from the UPS is added directly to the zone air heat balance, the heat gain from the CPU and fans will be added to the ITE air Outlet Room Air Model Node

***Zone ITE Standard Density Air Volume Flow Rate [m3/s]***

***ITE Standard Density Air Volume Flow Rate [m3/s]***

Reports the average air volume flow rate through the ITE over the reporting interval. Standard density in EnergyPlus corresponds to 20ºC dry bulb, dry air, and nominally adjusted for elevation.

***Zone ITE Current Density Air Volume Flow Rate [m3/s]***

***ITE Current Density Air Volume Flow Rate [m3/s]***

Reports the average air volume flow rate through the ITE over the reporting interval, calculated using the current density at the air inlet node.

***Zone ITE Air Mass Flow Rate [kg/s]***

***ITE Air Mass Flow Rate [kg/s]***

Reports the average air mass flow rate through the ITE over the reporting interval, calculated using the current density at the air inlet node.

***ITE Air Inlet Dry-Bulb Temperature [C]***

The dry-bulb temperature of the air entering the ITE.

***ITE Air Inlet Dewpoint Temperature [C]***

The dewpoint temperature of the air entering the ITE.

***ITE Air Inlet Relative Humidity [%]***

The dewpoint temperature of the air entering the ITE.

***ITE Air Outlet Dry-Bulb Temperature [C]***

The dry-bulb temperature of the air leaving the ITE.

***Zone ITE Average Supply Heat Index []***

***ITE Supply Heat Index []***

The supply heat index (SHI) for this equipment. SHI is a dimensionless measure of recirculation of hot air into the cold air intake of the ITE. SHI = (Tin – Tsupply)/(Tout-Tsupply) where Tin is the dry-bulb temperature of the air entering the ITE, Tout is the dry-bulb temperature of the air leaving the ITE, and Tsupply is the dry-bulb temperature at the Supply Air Node. If a Supply Air Node Name is not specified for this object, then this output will not be reported.

***Zone ITE Any Air Inlet Operating Range Exceeded Time [hr]***

***ITE Air Inlet Operating Range Exceeded Time [hr]***

Hours when the dry-bulb and/or dewpoint temperature of the air entering the ITE is outside the range specified by the ITE Environmental Class.

***Zone ITE Any Air Inlet Dry-Bulb Temperature Above Operating Range Time [hr]***

***ITE Air Inlet Dry-Bulb Temperature Above Operating Range Time [hr]***

Hours when the dry-bulb temperature of the air entering the ITE is above the range specified by the ITE Environmental Class.

***ITE Air Inlet Dry-Bulb Temperature Difference Above Operating Range [deltaC]***

The temperature difference (in degrees DeltaC) between the air inlet dry-bulb temperature and the maximum allowable dry-bulb temperature specified by the ITE Environmental Class. Only positive values are reported. When the dry-bulb temperature of the air entering the ITE is below the maximum specified by the ITE Environmental Class, this output will be zero.

***Zone ITE Any Air Inlet Dry-Bulb Temperature Below Operating Range Time [hr]***

***ITE Air Inlet Dry-Bulb Temperature Below Operating Range Time [hr]***

Hours when the dry-bulb temperature of the air entering the ITE is above the range specified by the ITE Environmental Class.

***ITE Air Inlet Dry-Bulb Temperature Difference Below Operating Range [deltaC]***

The temperature difference (in degrees DeltaC) between the air inlet dry-bulb temperature and the minimum allowable dry-bulb temperature specified by the ITE Environmental Class. Only negative values are reported. When the dry-bulb temperature of the air entering the ITE is above the minimum specified by the ITE Environmental Class, this output will be zero.

***Zone ITE Any Air Inlet Dewpoint Temperature Above Operating Range Time [hr]***

***ITE Air Inlet Dewpoint Temperature Above Operating Range Time [hr]***

Hours when the dewpoint temperature of the air entering the ITE is above the range specified by the ITE Environmental Class.

***ITE Air Inlet Dewpoint Temperature Difference Above Operating Range [deltaC]***

The temperature difference (in degrees DeltaC) between the air inlet dewpoint temperature and the maximum allowable dewpoint temperature specified by the ITE Envionmental Class. Only positive values are reported. When the dewpoint temperature of the air entering the ITE is below the maximum specified by the ITE Environmental Class, this output will be zero.

***Zone ITE Any Air Inlet Dewpoint Temperature Below Operating Range Time [hr]***

***ITE Air Inlet Dewpoint Temperature Below Operating Range Time [hr]***

Hours when the dewpoint temperature of the air entering the ITE is above the range specified by the ITE Environmental Class.

***ITE Air Inlet Dewpoint Temperature Difference Below Operating Range [deltaC]***

The temperature difference (in degrees DeltaC) between the air inlet dewpoint temperature and the minimum allowable dewpoint temperature specified by the ITE Envionmental Class. Only negative values are reported. When the dewpoint temperature of the air entering the ITE is above the minimum specified by the ITE Environmental Class, this output will be zero.

***Zone ITE Any Air Inlet Relative Humidity Above Operating Range Time [hr]***

***ITE Air Inlet Relative Humidity Above Operating Range Time [hr]***

Hours when the relative humidity of the air entering the ITE is above the range specified by the ITE Environmental Class.

***ITE Air Inlet Relative Humidity Difference Above Operating Range [%]***

The temperature difference (in degrees DeltaC) between the air inlet relative humidity and the maximum allowable relative humidity specified by the ITE Envionmental Class. Only positive values are reported. When the relative humidity of the air entering the ITE is below the maximum specified by the ITE Environmental Class, this output will be zero.

***Zone ITE Any Air Inlet Relative Humidity Below Operating Range Time [hr]***

***ITE Air Inlet Relative Humidity Below Operating Range Time [hr]***

Hours when the relative humidity of the air entering the ITE is above the range specified by the ITE Environmental Class.

***ITE Air Inlet Relative Humidity Difference Below Operating Range [%]***

The temperature difference (in degrees DeltaC) between the air inlet relative humidity and the minimum allowable relative humidity specified by the ITE Envionmental Class. Only negative values are reported. When the relative humidity of the air entering the ITE is above the minimum specified by the ITE Environmental Class, this output will be zero.

### ZoneContaminantSourceAndSink:CarbonDioxide

The ZoneContaminantSourceAndSink:CarbonDioxide object allows users to input carbon dioxide sources or sinks in a zone. Note that carbon dioxide generation within a zone can also be specified using People and GasEquipment objects. Multiple ZoneContaminantSourceAndSink:CarbonDioxide objects can be specified for the same zone.

#### Field: Name

The name of the ZoneContaminantSourceAndSink:CarbonDioxide object. The name for each ZoneContaminantSourceAndSink:CarbonDioxide object must be unique.

#### Field: Zone Name

This field is the name of the zone (ref: **Zone**) and links a particular ZoneContaminantSourceAndSink:CarbonDioxide object to a thermal zone in the building.

#### Field: Design Generation Rate

This field denotes the design carbon dioxide generation rate (m3/s). The design value is modified by the schedule fraction (see Field: Schedule Name). The resulting volumetric generation rate is converted to mass generation rate using the current zone indoor air density at each time step. The rate can be either positive or negative. A positive value represents a source rate (CO2 addition to the zone air) and a negative value represents a sink rate (CO2 removal from the zone air).

#### Field: Schedule Name

This field is the name of the schedule (ref: Schedules) that modifies the design carbon dioxide generation rate (see previous field). The schedule values can be any positive number between 0.0 and 1.0. For each simulation time step, the actual CO2 generation rate in a zone is the product of the Design Generation Rate field (above) and the value specified by this schedule.

An IDF example is provided below:

ZoneContaminantSourceAndSink:CarbonDioxide,

NORTH\_ZONE CO2, !- Name

NORTH\_ZONE, !- Zone Name

1.e-6, !- Design Generation Rate {m3/s}

CO2 Source Schedule; !- Schedule Name