To whom it may concern

*IDA Indoor Climate and Energy 4.7 and higher conformance to BREEAM Global and ASHRAE 90.1-2010 G2.2.1, G2.2.2, G2.2.3, G2.2.4, G2.3 and G2.4.*

This is to certify that IDA ICE v. 4.7 and higher conforms to the following requirements. Screen capture images from the program and its documentation are provided as supporting evidence.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Evidence in support of IDA ICE 4 compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hourly analysis for energy flows including 8760 hours of analysis.</td>
<td><img src="image" alt="Screen capture of time series for distributed power" /></td>
</tr>
</tbody>
</table>

Screen capture of time series for distributed power
**Requirement**

- Hourly variation of input data such as scheduled (lighting, occupancy, appliances, etc).

**Evidence in support of IDA ICE 4 compliance**

**Example of schedule dialog**

**Form for dynamical wall model**
<table>
<thead>
<tr>
<th>Requirement</th>
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</thead>
<tbody>
<tr>
<td>* Zoning capabilities to distinguish the different thermal zones existing in the building</td>
<td>Sample visualized zone-dependent results</td>
</tr>
<tr>
<td>* Modelling part load of equipments</td>
<td>Sample input dialog for part load performance</td>
</tr>
</tbody>
</table>
Requirement

- Modelling economisers as requested by the ASHRAE reference building.

Evidence in support of IDA ICE 4 compliance

ASHRAE 90.1 System 7 including economizer

Report of intermediate hourly results of calculations.

Main temperatures

IDA Indoor Climate and Energy  4.7 License: ICE40X.11DEC
Object: Zone: Main temperatures
System: building5.idm
Description: 
Date: 2018-07-15
Simulated:  2018-01-21 17:29:15

<table>
<thead>
<tr>
<th>Hour</th>
<th>Mean air temperature, Deg-C</th>
<th>Operative temperature, Deg-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25.0</td>
<td>25.5</td>
</tr>
<tr>
<td>2</td>
<td>25.0</td>
<td>25.5</td>
</tr>
<tr>
<td>3</td>
<td>25.0</td>
<td>25.4</td>
</tr>
<tr>
<td>4</td>
<td>25.0</td>
<td>25.4</td>
</tr>
</tbody>
</table>

Report examples

Evidence proving that the software complies with

ANNEX

General framework for the calculation of energy performance of buildings (Article 3)

1. The methodology of calculation of energy performances of buildings shall include at least the following aspects:
Requirement
the following Design features:
• EPBD requirements on directive annex

Evidence in support of IDA ICE 4 compliance
(a) thermal characteristics of the building (shell and internal partitions, etc.). These characteristics may also include air-tightness;

Input for window glazing, see also form for dynamical wall model above

(b) heating installation and hot water supply, including their insulation characteristics;

Screen capture of part of heating system input
Requirement | Evidence in support of IDA ICE 4 compliance
--- | ---
| Screen capture of DHW and losses input form | 
- (c) air-conditioning installation; 
  *See ASHRAE 90.1 System 7 example above*
- (d) ventilation; 
  *See treatment below on ventilation*
- (e) built-in lighting installation (mainly the non-residential sector); 
  *See treatment below*
- (f) position and orientation of buildings, including outdoor climate; 
  *See zoning screen capture above*
- (g) passive solar systems and solar protection;
Requirement

Evidence in support of IDA ICE 4 compliance

Screen capture of shading computation

(h) natural ventilation;
See infiltration dialog below

(i) indoor climatic conditions, including the designed indoor climate.

Screen capture of sample indoor climate results

2. The positive influence of the following aspects shall, where relevant in this calculation, be taken into account:

(a) active solar systems and other heating and electricity systems based on renewable energy sources;

Screen capture of sample system, involving solar thermal and PV

(b) electricity produced by CHP;
Presently treated by building such systems with basic blocks, see sample block library below

(c) district or block heating and cooling systems;

District heating/cooling energy meter
Requirement: **Evidence in support of IDA ICE 4 compliance**

- Ventilation (including natural and mechanical systems, heat gains, heat losses, heat recovery, efficiency, and room temperature feedback on varying ventilation rates)

**Computed daylight level**

**Sample heat balance report including ventilation**
**Requirement**  
Evidence in support of IDA ICE 4 compliance

Some infiltration input data

* Infiltration (including effect of both gains and heat losses)

Sample result of infiltration heat flux

* Thermal performance of building fabric (including floors, walls, roof, windows and doors)

See forms for dynamical wall and window glazing above
**Requirement**

- Thermal bridging

**Evidence in support of IDA ICE 4 compliance**

- Form for thermal bridge input

- Artificial lighting and natural daylighting (including energy consumption, heat gains)

- Hot water:
  1. Demand, including heat losses
  2. Generation and energy requirements

  a) See form above for DHW demand and heat losses
  b) See sample system with solar thermal above
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Evidence in support of IDA ICE 4 compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement of supporting technologies (including LZC, district heating, CHP or other technologies used in the building).</td>
<td>• Passive design features included in the building as significant means to achieve certain energy performance</td>
</tr>
<tr>
<td>• Passive design features included in the building as significant means to achieve certain energy performance</td>
<td><strong>See shading computation above</strong></td>
</tr>
<tr>
<td>• Indoor air quality (including ventilation rate) and thermal comfort</td>
<td></td>
</tr>
<tr>
<td>• Indoor air quality (including ventilation rate) and thermal comfort</td>
<td><strong>See shading computation above</strong></td>
</tr>
<tr>
<td>• Solar exposure (heat gains and solar protection)</td>
<td></td>
</tr>
<tr>
<td>• Position, orientation of buildings and influence of neighbouring structures</td>
<td><strong>See shading computation above</strong></td>
</tr>
<tr>
<td>• Heat gains from internal activities and occupants</td>
<td><strong>See heat balance result above</strong></td>
</tr>
<tr>
<td>• Impact of systems controls on the energy consumption of the building (including energy consumption of controlling</td>
<td></td>
</tr>
<tr>
<td>Requirement</td>
<td>Evidence in support of IDA ICE 4 compliance</td>
</tr>
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<td>-------------</td>
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</tbody>
</table>

- Inclusion of both primary and secondary space and water heating and cooling systems

Sample library of control objects and a window opening control system

Sample primary system for heating and cooling. See sample radiator form above (similar for room based cooling devices).
<table>
<thead>
<tr>
<th>Requirement</th>
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</thead>
</table>
| • Space heating:  
  a) Demand, including heat losses and heat gains  
  b) Generation and energy requirements of supporting technologies (including LZC, district heating, CHP or other technologies used in the building). | a) See heat balance diagram and other results above  
  b) See sample primary systems above |

• Space cooling:  
  a) Demand, including heat gains  
  b) Generation and energy requirements of supporting technologies (including LZC, district heating, CHP or other technologies used in the building). |

Evidence confirming the assessable building types and climates the software deals with.  

IDA ICE is not restricted to any particular building type or climate zone. Here is an example from a hospital building from Finland; A simpler residential building in Dubai is shown above.
<table>
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<tbody>
<tr>
<td>Evidence confirming Testing:</td>
<td>Climate data from all over the world is available from the IDA ICE web site. Zipped weather files in E+ format can be directly downloaded and installed.</td>
</tr>
<tr>
<td>• the software has been tested according to the BESTEST set or, alternatively, EN 15265.</td>
<td>Yes, both, see <a href="http://www.equaonline.com/iceuser/validation">www.equaonline.com/iceuser/validation</a></td>
</tr>
<tr>
<td>• the software has been tested according to ANSI/ASHRAE Standard 140.</td>
<td>Yes, see <a href="http://www.equaonline.com/iceuser/validation">www.equaonline.com/iceuser/validation</a></td>
</tr>
</tbody>
</table>

G2.2.1  The simulation program shall be approved by the rating authority and shall, at a minimum, have the ability to explicitly model all of the following:

(a) 8,760 hours per year;

Compliant, see treatment above

(b) hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat setpoints, and HVAC system operation, defined separately for each day of the week and holidays;

Compliant, see treatment above

(c) thermal mass effects;

Compliant, see treatment above

(d) ten or more thermal zones;

Compliant, see treatment above

(e) part-load performance curves for mechanical equipment;

Compliant, see treatment above

(f) capacity and efficiency correction curves for mechanical heating and cooling equipment;

Compliant, see treatment above

(g) air-side economizers with integrated control;

Compliant, see treatment above

(h) baseline building design characteristics specified in G3

Compliant

G2.2.2  The simulation program can both directly and by export of hourly values determine the proposed and baseline building performance.

Compliant

G2.2.3  The simulation program is capable of performing design load calculations in accordance with generally accepted engineering standards and handbooks.

Compliant

G2.2.4  The simulation program has been tested according to ASHRAE Standard 140 and the results are presented on [www.equaonline.com/iceuser/validation](http://www.equaonline.com/iceuser/validation)

Compliant

G2.3
The simulation program uses hourly climatic data in several well-known formats, such as ASHRAE IWEC and EPW.

G2.4

The simulation program can compute annual energy costs based on fixed or time-varying rates.

Yours sincerely,

EQUA Simulation AB

Per Sahlin
CEO