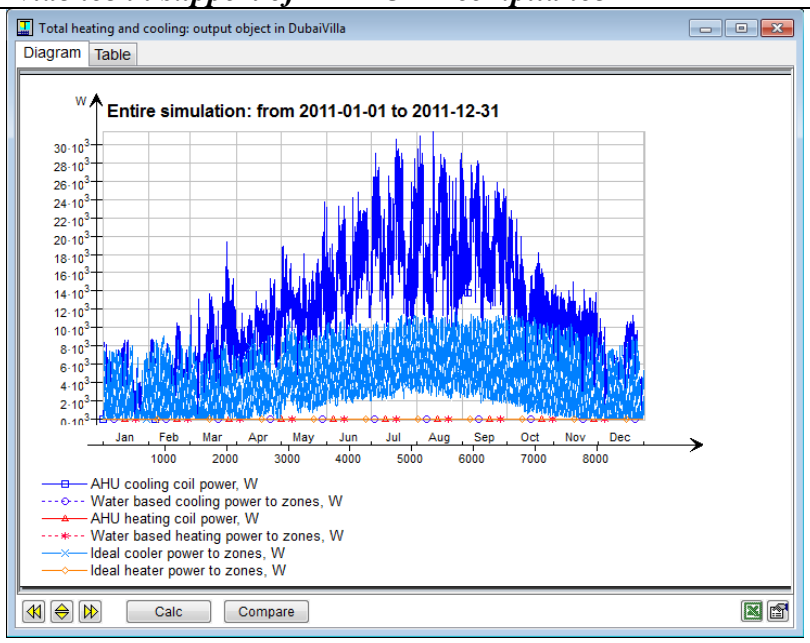
EQUA
SIMULATION TECHNOLOGY GROUP

Stockholm, 2019-09-18

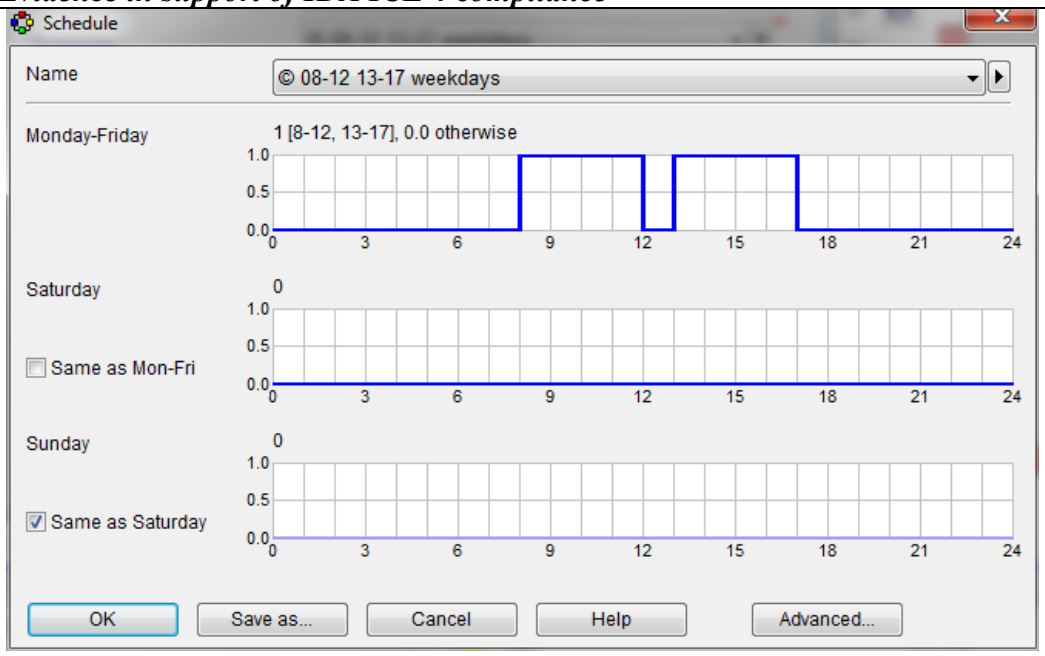
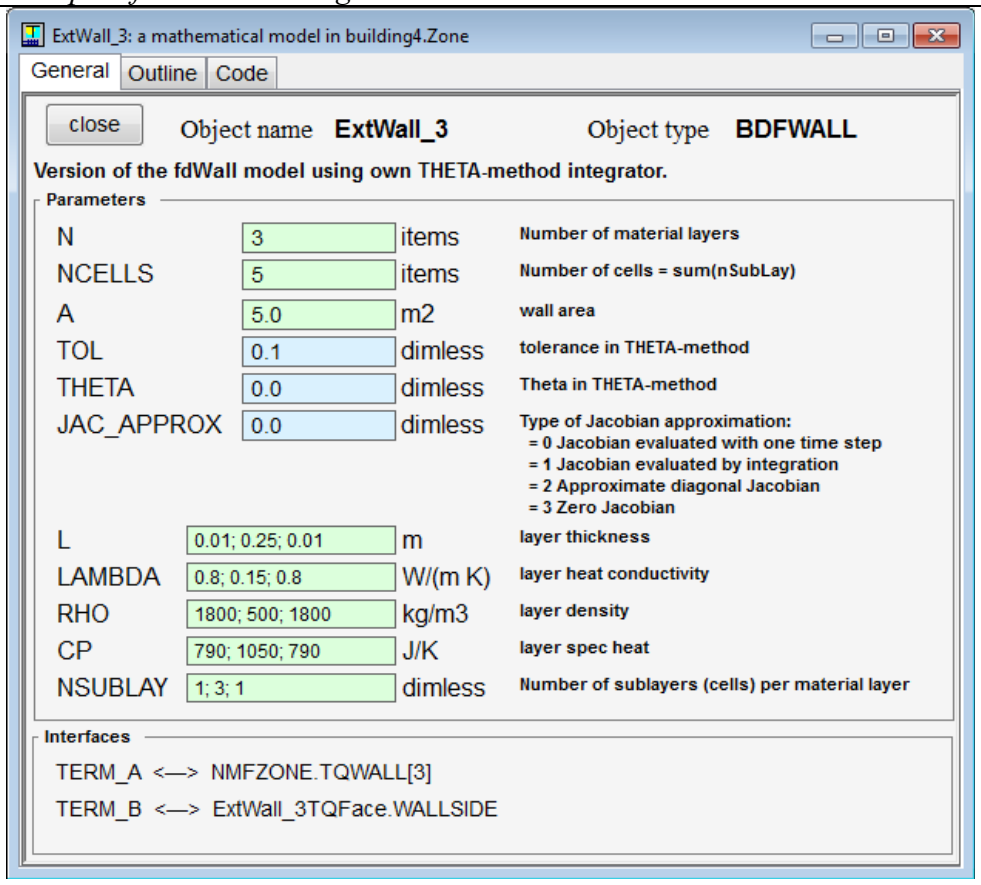
To whom it may concern

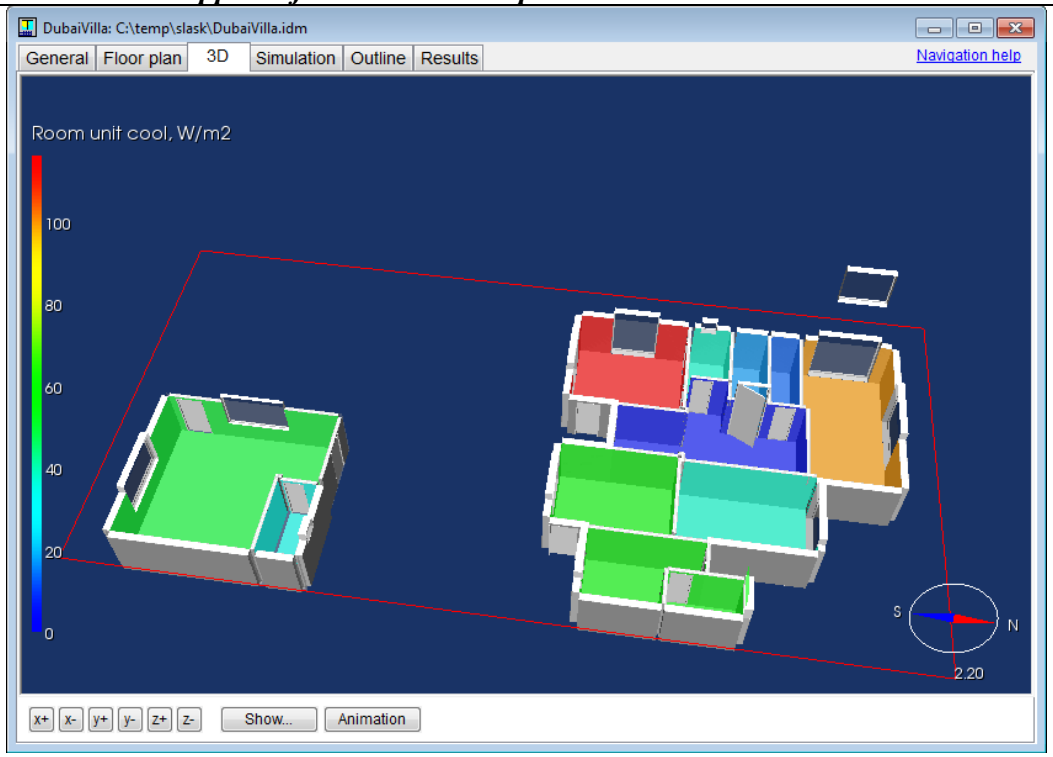
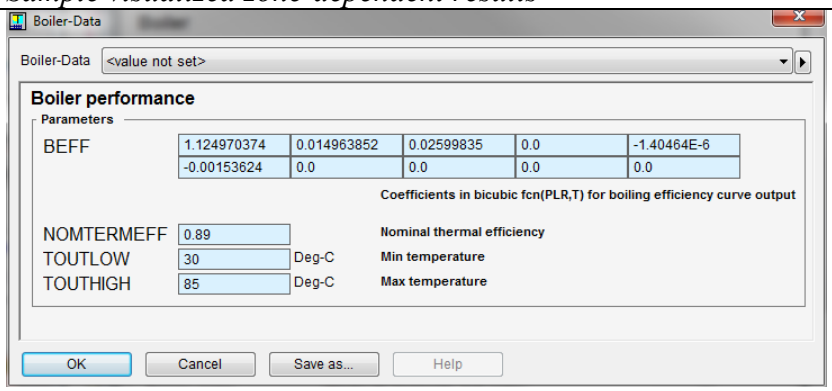
IDA Indoor Climate and Energy 4.7 and higher conformance to BREEAM Global and ASHRAE 90.1-2010 G2.2.1, G2.2.2, G2.2.3, G2.2.4, G2.3 and G2.4.

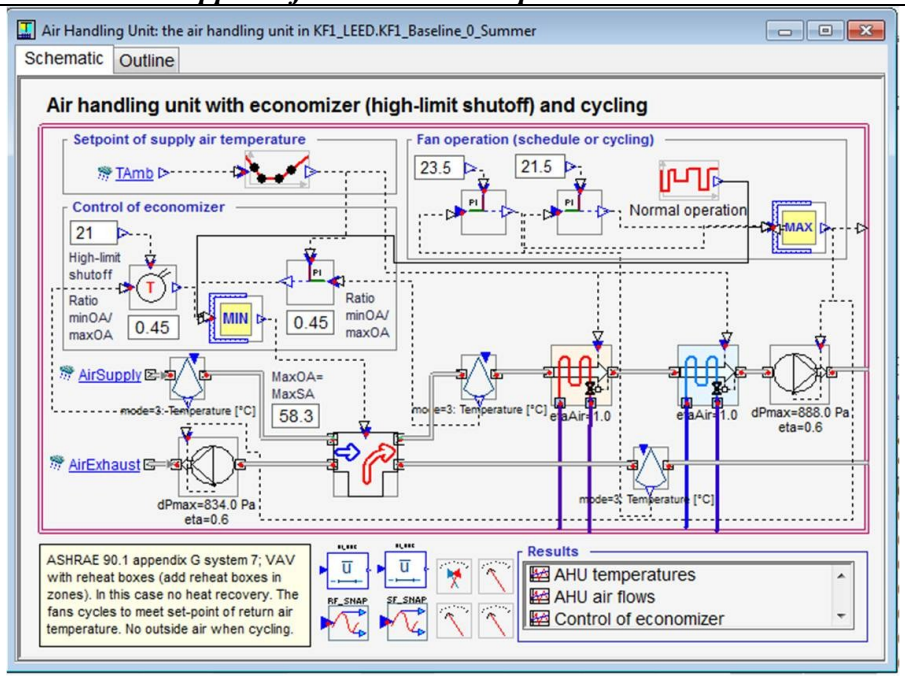
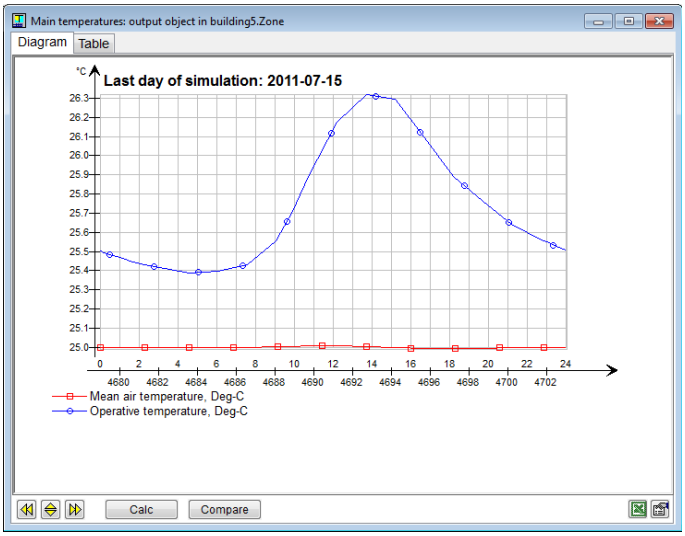
This is to certify that IDA ICE v. 4.7 and higher conforms to the following requirements. Screen capture images from the program and its documentation are provided as supporting evidence.

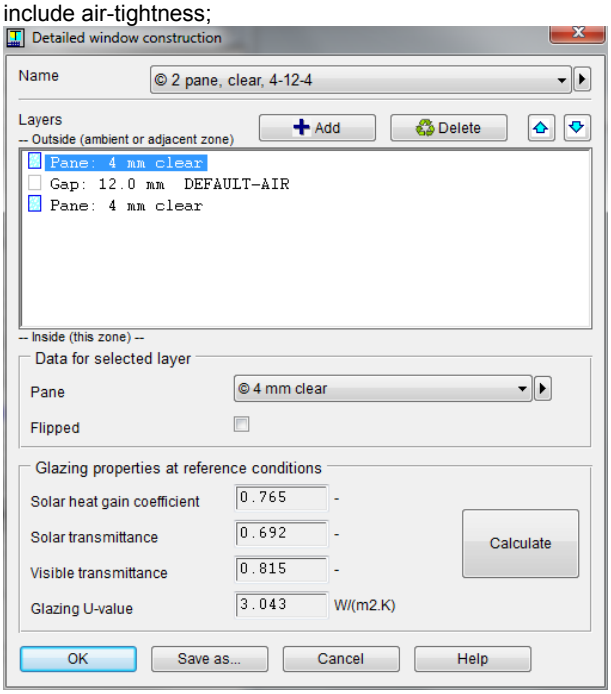
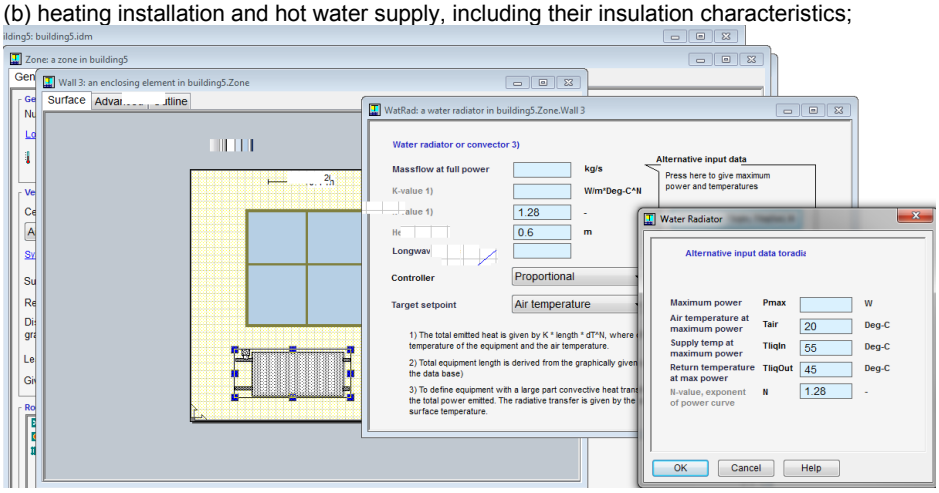
Requirement	***Evidence in support of IDA ICE 4 compliance***
• Hourly analysis for energy flows including 8760 hours of analysis.	 *Screen capture of time series for distributed power*

EQUA Simulation AB, Råsundavägen 100, 169 57 Solna, Sweden
Phone +46 8 546 20 110 Fax +46 8 546 20 111 www.equa.se

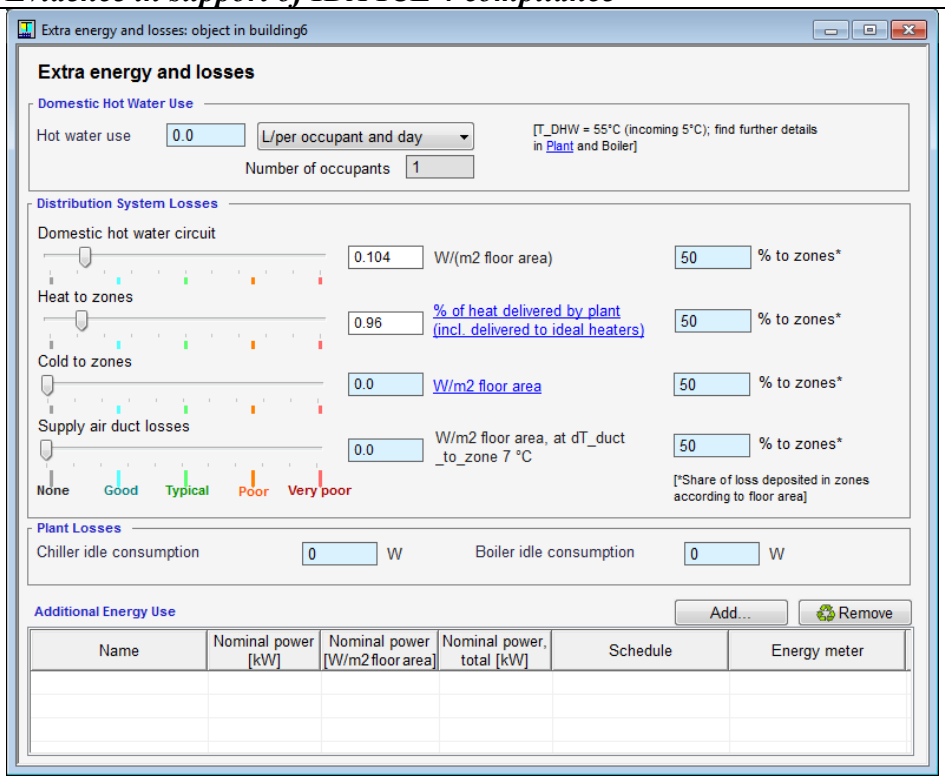
Requirement	*Evidence in support of IDA ICE 4 compliance*
• Hourly variation of input data such as scheduled (lighting, occupancy, appliances, etc)	 *Example of schedule dialog*
• Thermal mass effects	 *Form for dynamical wall model*

Requirement	*Evidence in support of IDA ICE 4 compliance*
• Zoning capabilities to distinguish the different thermal zones existing in the building	 *Sample visualized zone-dependent results*
• Modelling part load of equipments	 *Sample input dialog for part load performance*

Requirement	*Evidence in support of IDA ICE 4 compliance*
• Modelling economisers as requested by the ASHRAE reference building.	 *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 [1] Saved: Hour | Variables (averages for preceeding hours): Mean air temperature, Deg-C | Operative temperature, Deg-C 1 | 25.0 | 25.5 2 | 25.0 | 25.5 3 | 25.0 | 25.4 4 | 25.0 | 25.4 …  *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	*Evidence in support of IDA ICE 4 compliance*
the following Design features: • EPBD requirements on directive annex	(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

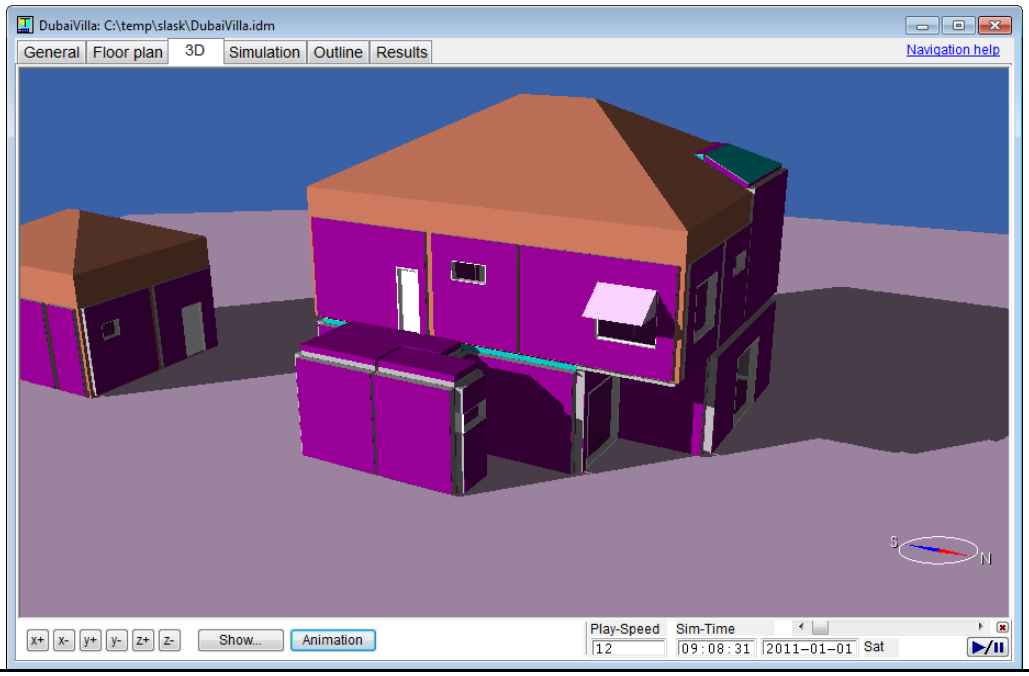
(e) built-in lighting installation (mainly the non-residential sector);

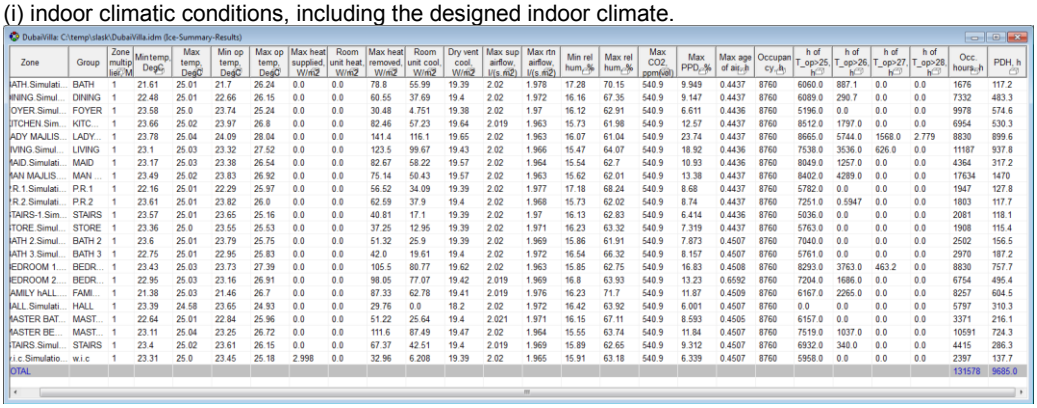
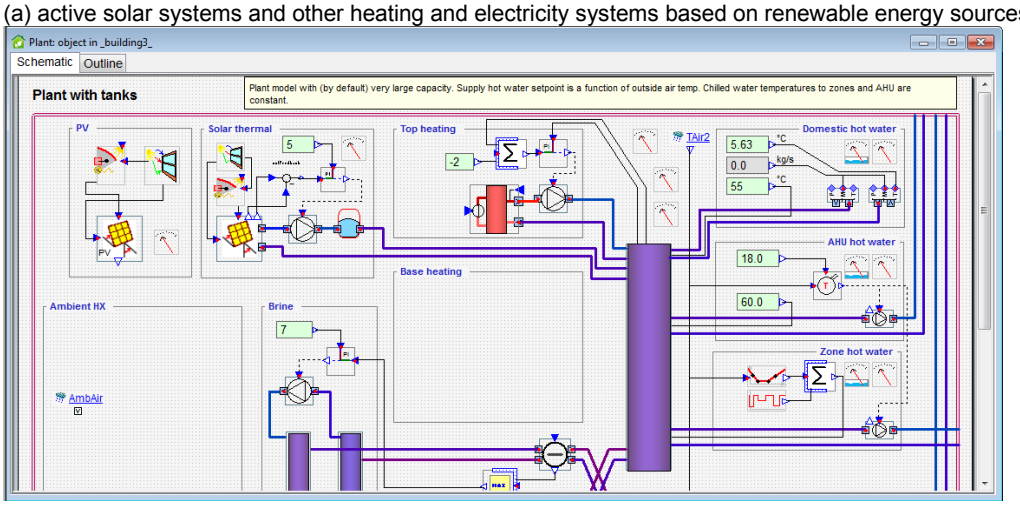
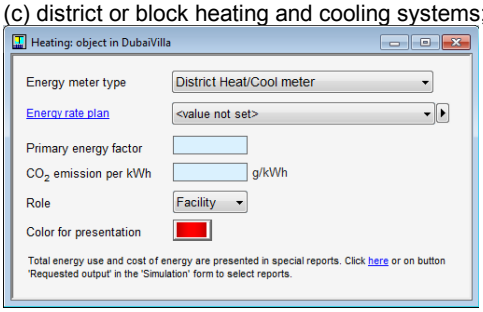
See treatment below

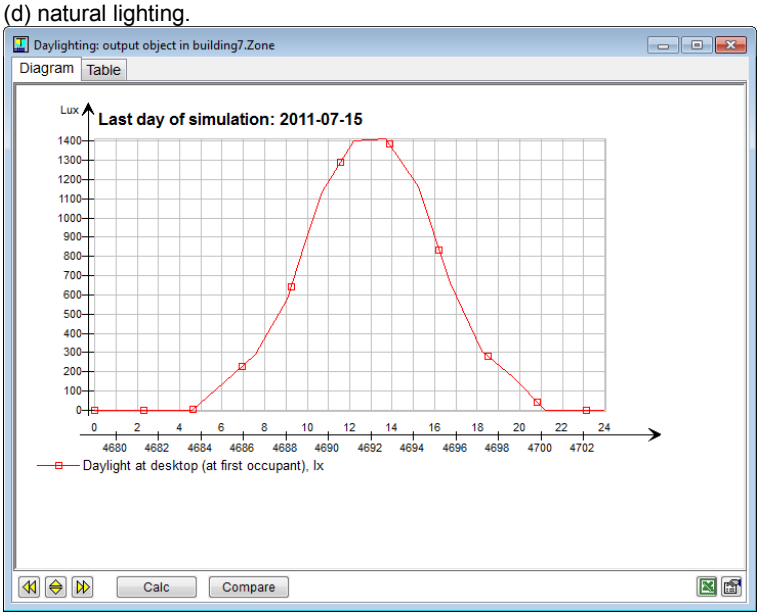
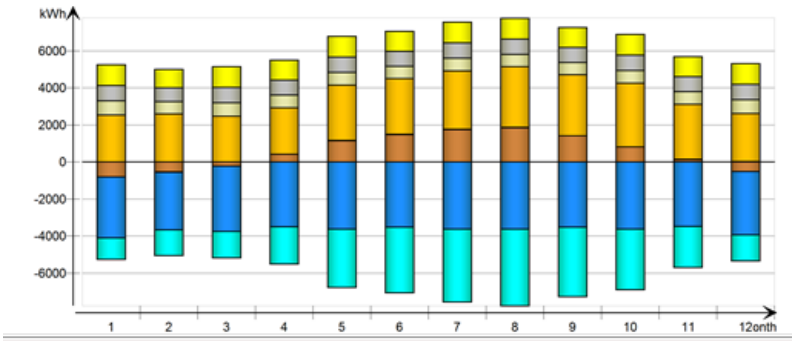
(f) position and orientation of buildings, including outdoor climate;

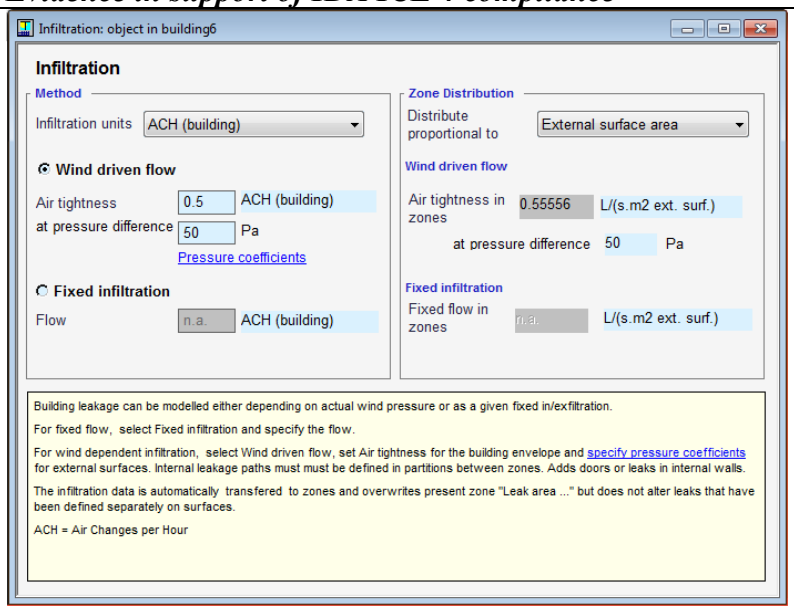
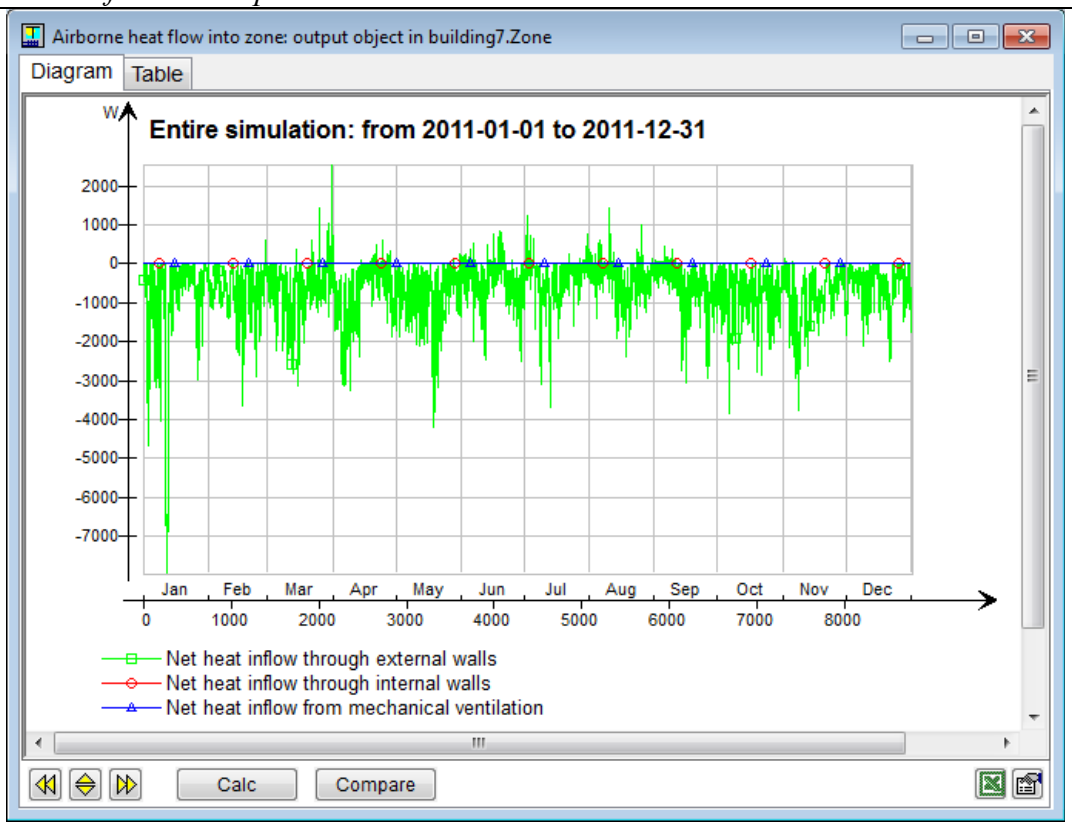
See zoning screen capture above

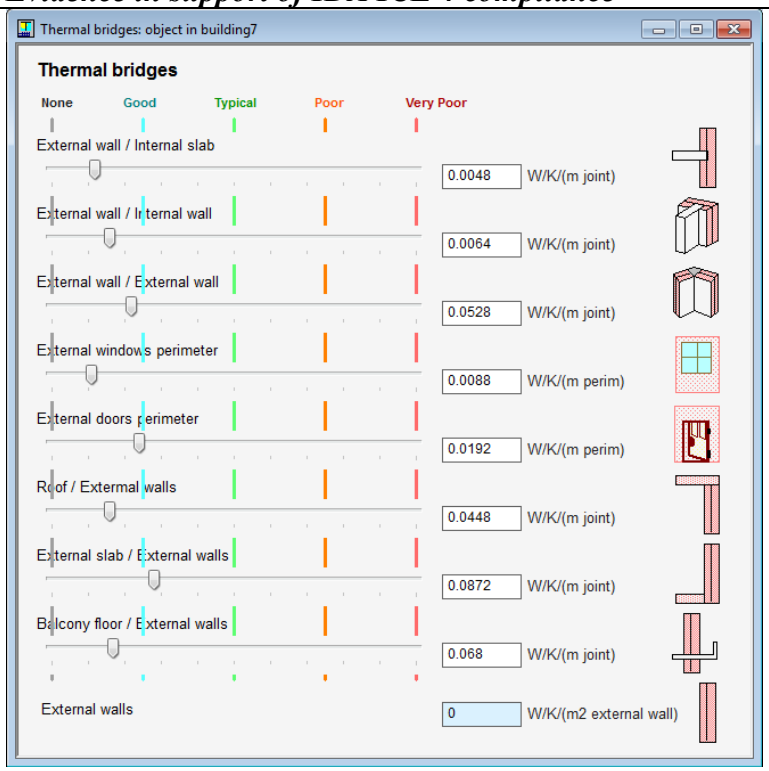
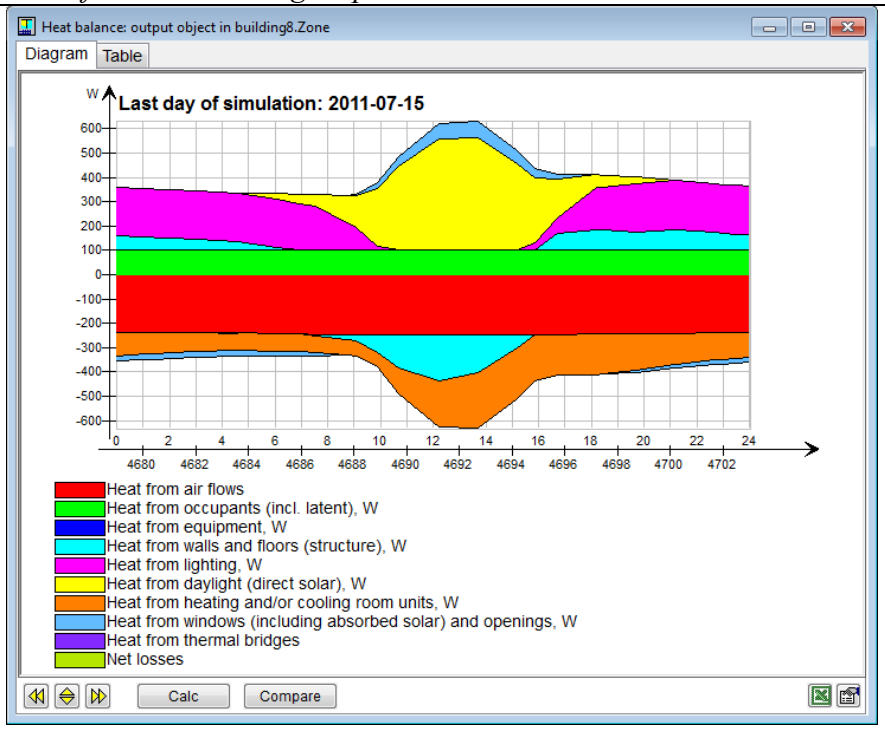
(g) passive solar systems and solar protection;

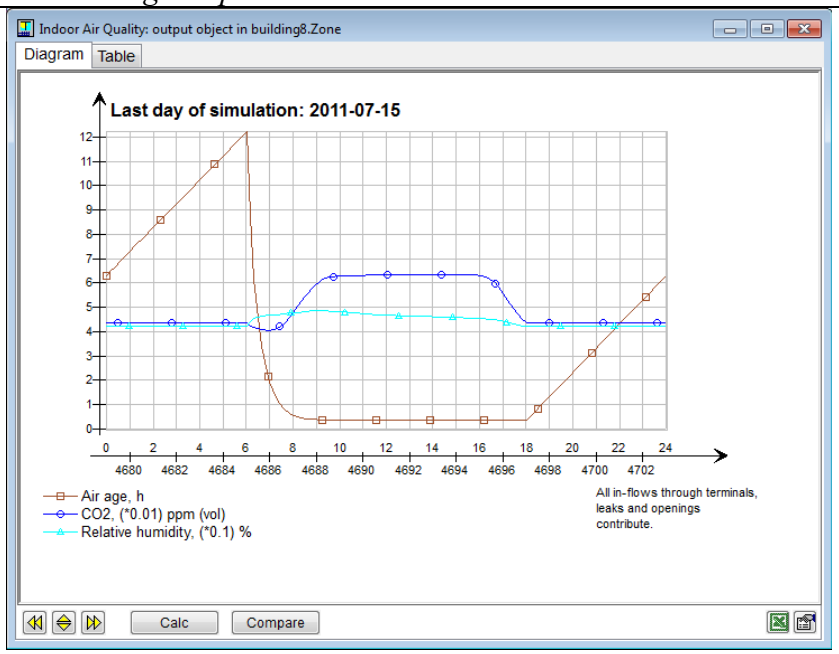


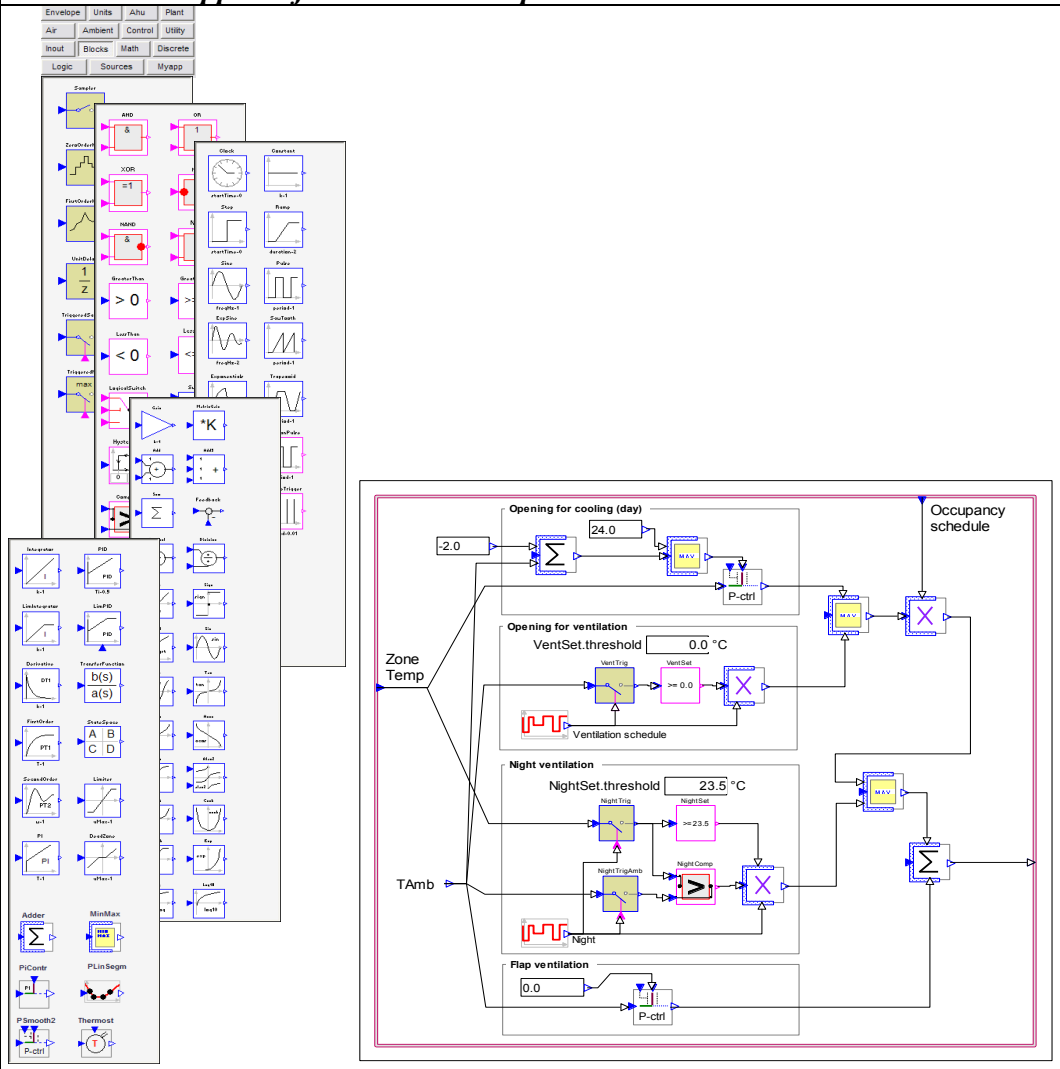
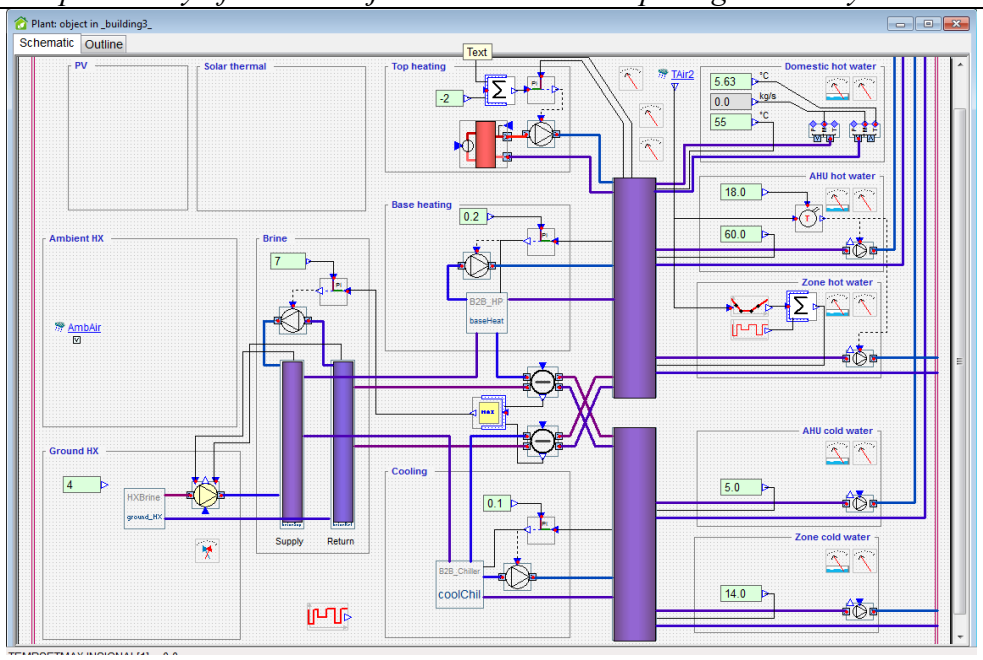
Requirement	*Evidence in support of IDA ICE 4 compliance*
	Screen capture of shading computation (h) natural ventilation; *See infiltration dialog below* (i) indoor climatic conditions, including the designed indoor climate.  *Screen capture of sample indoor climate results* 2. The positive influence 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*

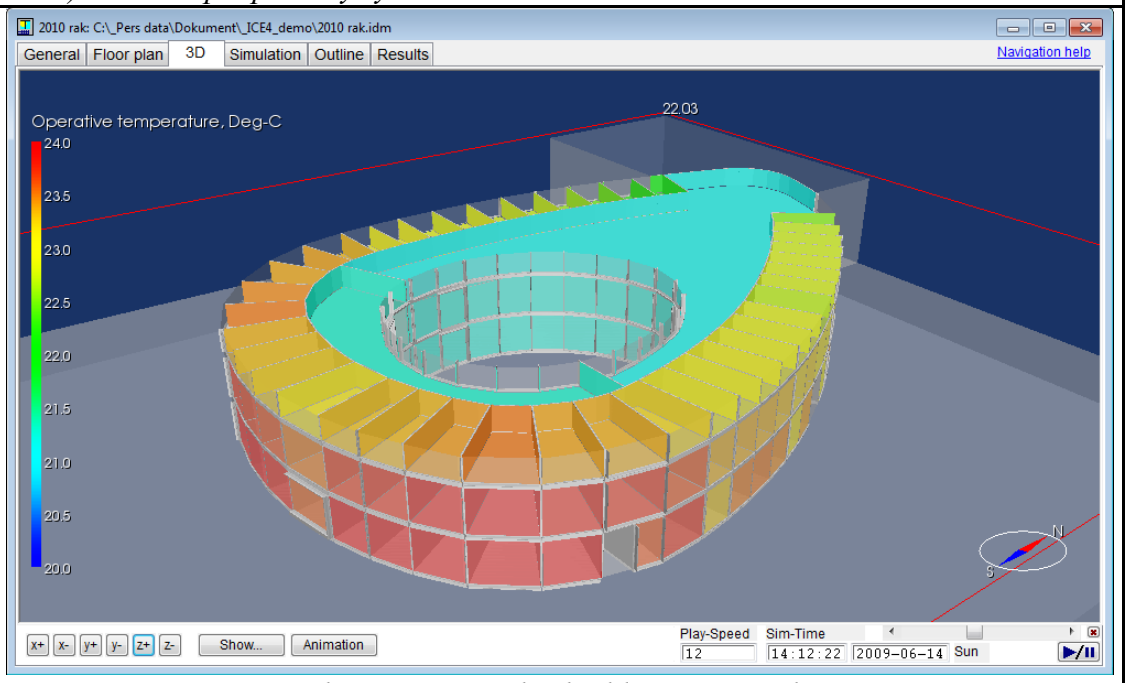
Requirement	*Evidence in support of IDA ICE 4 compliance*
	(d) natural lighting.  *Computed daylight level*
• Ventilation (including natural and mechanical systems, heat gains, heat losses, heat recovery, efficiency, room temperature feedback on varying ventilation rates)	EQUA SIMULATION TECHNOLOGY GROUP **Energy for zones** **Project** / **Building** Customer Created by: Per Sahlin Location: Abu Dhabi Climate file: Abu Dhabi ASHRAE Case: Dub Simulated: 2011-01-21 11:12:37 Model floor area: 250.3 m² Model volume: 820.9 m³ Model ground area: 144.0 m² Model envelope area: 541.3 m² Window/Envelope: 12.0 % Average U-value: 0.6142 W/(K·m²) Envelope area per Volume: 0.6594 m²/m³ **Zones with floor level 0.1, 3.6** **kWh (sensible only)** Month / Envelope & Thermal bridges / Internal Walls and Masses / External Window & Solar / Mech. supply air / Infiltration & Openings / Occupants / Equipment / Lighting / Local heating units / Local cooling units / Net losses Total: 6925.4 / 124.6 / 34879.7 / -41852.0 / -2.7 / 8383.5 / 9868.9 / 13158.0 / 0.0 / -31333.4 / 0.0 During heating: -15.4 / 13.1 / -4.4 / -30.5 / 0.0 / 8.8 / 7.8 / 10.4 / 0.0 / 0.0 / 0.0 During cooling: 7388.6 / -312.8 / 34754.5 / -39695.9 / -5.3 / 7771.6 / 9259.9 / 12345.0 / 0.0 / -31332.5 / 0.0 Rest of time: -424.8 / 424.3 / 129.6 / -2135.6 / 2.6 / 603.1 / 601.2 / 802.6 / 0.0 / -0.9 / 0.0  *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	*Evidence in support of IDA ICE 4 compliance*
• Thermal bridging	 *Form for thermal bridge input*
• Artificial lighting and natural daylighting (including energy consumption, heat gains)	 *Zone heat balance, including day and artificial light contributions*
• Hot water: a) Demand, including heat losses b) Generation and energy requirements	*a) See form above for DHW demand and heat losses* *b) See sample system with solar thermal above*

Requirement	*Evidence in support of IDA ICE 4 compliance*
of supporting technologies (including LZC, district heating, CHP or other technologies used in the building).	
• Passive design features included in the building as significant means to achieve certain energy performance	*See shading computation above*
• Indoor air quality (including ventilation rate) and thermal comfort	 *See sample IAQ results; for thermal comfort, see results table above*
• Solar exposure (heat gains and solar protection)	*See shading computation above*
• Position, orientation of buildings and influence of neighbouring structures	*See shading computation above*
• Heat gains from internal activities and occupants	*See heat balance result above*
• Impact of systems controls on the energy consumption of the building (including energy consumption of controlling	

Requirement	*Evidence in support of IDA ICE 4 compliance*
devices)	 *Sample library of control objects and a window opening control system*
• Inclusion of both primary and secondary space and water heating and cooling systems	 *Sample primary system for heating and cooling. See sample radiator form above (similar for room based cooling devices).*

Requirement	*Evidence in support of IDA ICE 4 compliance*
• 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).	*a) See heat balance diagram and other results above* *b) See sample primary systems above*
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.*

Requirement	*Evidence in support of IDA ICE 4 compliance*
	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.
Evidence confirming Testing:	
• the software has been tested according to the BESTEST set or, alternatively, EN 15265.	*Yes, both, see www.equaonline.com/iceuser/validation*
• the software has been tested according to ANSI/ASHRAE Standard 140.	*Yes, see www.equaonline.com/iceuser/validation*

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.

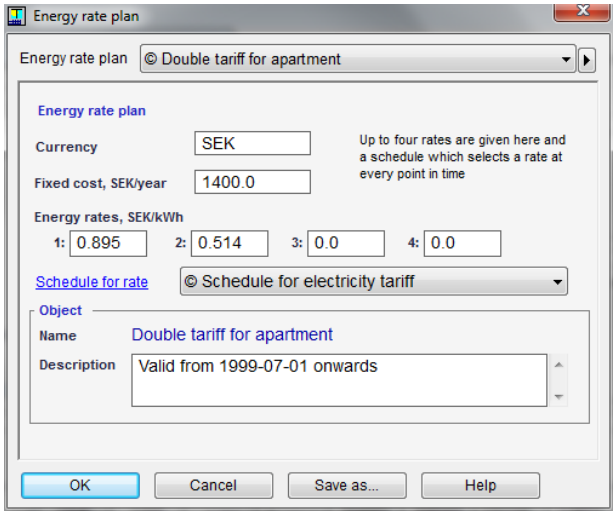
G2.2.3
The simulation program is capable of performing design load calculations in accordance with generally accepted engineering standards and handbooks.

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

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