OEx Limited
Architecture · Design · Energy Consultancy · Project Management

Energy Consultancy Service

INDEX:

OEx Process

- OEX Process Weather/Climate Data Analysis
  - Building Structure Assessment
  - Building Services Assessment
  - Building Structure Conceptual Design
  - Building Services Conceptual Design
  - Building Structure Full Design
  - Building Services Full Design
  - Dynamic Building Simulation
  - Computational Fluid Dynamics Analysis
  - Cold Bridge Analysis (ψ)
  - Sun & Shading Analysis
  - Thermal Comfort Analysis
  - Zoning and User Profile/Pattern Analysis
  - Building Improvement Measures Evaluation
  - Services/System Design
  - Heat Recovery Ventilation Design
  - Energy and Emissions Audits/Monitoring
  - Post Occupancy Evaluation (POE)

OEx Process cont/...

The OEx process has been developed for 2 main reasons:

- The most **accurate methodology** for the least time spent.
- The most **cost effective** method for building specification.

General:

The OEx process has been developed to bridge the gap between very simple valuation systems and very complex dynamic building simulations.

Simple valuation systems (such as SAP) are based on a highly simplified data set and are only useful for verification purposes, they don't require a high level of expertise and usually require very little time to process. They are clearly not a design tool, and they do not provide accurate predictions of energy use.

Dynamic building simulation on the other hand, is based on a set of very complex numerical calculations. This is useful in process control and in mechatronic systems (fine tuning of building services). However these calculations are very dependent on the user's level of expertise and can be extremely time consuming. Also the data output for low energy building systems needs to be verified against actual monitoring before being used for design purposes.

The OEx process is based on a quasi static calculation on an hourly basis through a typical year. There is still a high level of expertise required but the calculation can be performed within days rather than weeks.

Accuracy:

The OEx process uses local weather data as the basis for the calculation to measure the performance of the building shell and system, and on-site renewable energy generation.

The data output is verified through building monitoring research data as part of DIN 18599; which is recognised under the EU Energy Performance of Buildings Directive 2002/91/EG and Recast 2010 as the only fully compliant method (mandatory and non-mandatory requirements) for cost effective emissions reductions in buildings.

Databases of building materials and services incorporated in the energy modelling process have been tested by independent institutions for their performance rating.

Furthermore, the OEx process is the only available design tool for all building types (domestic, commercial, industrial), all types of work (new build, refurbishment) and all performance levels (listed buildings, current standard, Passivhaus, Zero Carbon).

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OEx Comparison of Calculation Methods

Name	IES	TAS	TRNSYS	PHPP 4	OEX 18599	SBEM	SAP	DOE
Cost - Benefit								
Accuracy of Prediction	★★★★☆	★★★★★	★★★★★	★★★☆☆4	★★★★☆	☆☆☆☆☆	☆☆☆☆☆	☆☆☆☆☆
Time Involved	★★★★☆	★★★★★	★★★★★	★★★☆☆4	★★★☆☆	★★☆☆☆	★☆☆☆☆	★★☆☆☆
Cost	★★★★★	★★★★★	★★★★★	★★☆☆☆4	★★☆☆☆	★☆☆☆☆	★☆☆☆☆	★☆☆☆☆
Tool Purpose								
Design	•	•	•	•4	•			
Verification	• 1			• 2	•	• 1	• 1	• 3
Building Types								
Existing	•	•	•	• 4	•			•
New Build	•	•	•	• 4	•	• 5	• 6	•
Zero Carbon/Passivhaus				• 4	•			
Norm/Code compliance								
EU	Mandatory EPBD					•	• 7	• 7	
	Voluntary EPBD					•			
USA	ASHRAE 90.1					•			•
	LEED	•				•			
	California Title 24					•			•
Other	Passivhaus				•	•			
UK specific	UK Building Regs	•	•	•		•	•	•	
	BREEAM	•		•		•			
	EPC	•	•	•		•	•	•	
	DEC	•				•			
	BER	•	•	•		•	•	•	
	CFSH	•	•	•		•		•	
Input method								
Interface	Graphical	Graphical	Graphical	Spreadsheet	Graphical	Spreadsheet	Spreadsheet	Graphical
Manual numbers			•	•	•	•	•	•
3D CAD building geometry	•	•	•		•			•
Semi auto Areas/Volumes			•	•	•	•	•	
CAD exchange	•	•	•		•			•
Automatic import	•	•	•		•			•
Additional plug-ins	•		•		•			

OEx Comparison of Calculation Methods cont/....

Data input								
Climate/Weather data	•	•	•	• 8	•	UK ONLY	UK ONLY	US ONLY
Construction/Built Form	•	•	•	•	•	•	•	•
Detailed HVAC Plant Data	• 9	• 9	• 9	• 9	•			•
Zoning	•	•	•		•			•
Building User Characteristics	•	•	•	•	•			•
Lighting & Appliances	• 10	• 10	• 10	•	•			•

Calculation output								
CFD	2D	2D		3D	2D			
Daylight and shading	•	•	•	•	•			•
Energy gains	•	•	•	•	•			•
Energy losses	•	•	•	•	•			•
Cold bridges				•	•			
Heating load	•	•	•	•	•			
Cooling load	•	•	•	•	•			
Ventilation	•	•	•	•	•			
Hot water system sizing	•	•	•	•	•			
Solar thermal sizing	•	•	•		•			
PV sizing	•	•	•		•			
Wind generator sizing					•			
Artifical lighting load	•	•	•	•	•			
Appliances	•	•	•	•	•			
Control analysis	•	•	•	•	•			
Thermal comfort	•	•	•	•	•			
CO_2 projections	•	•	•	•	•	• 11	• 11	• 11
All Other GHG projections		•	•		•			
Cost analysis					•			• 12

1 UK ONLY.
2 For Passivhaus Verification ONLY.
3 US ONLY.
4 Passivhaus Standard or close to PH Standard ONLY.
5 Non-Domestic Building ONLY.
6 Domestic Buildings ONLY.
7 Not fully compliant valid for UK ONLY.
8 Very limited data sets available.
9 Manual set up ONLY.
10 Energy demand calculation not included.
11 For verification purposes ONLY.
12 For US verification purposes ONLY.

Summary of Cost Effectiveness:

The OEx 18599 process is the most valuable tool available to calculate and design buildings to produce cost effective energy use and emissions reductions. It already complies with the EU Standard, EN15603 which will be the standard for energy use and emissions reductions, across Europe, in the coming decades.

OEx Specification

OEx Process

Calculations carried out in line with DIN 18599 allow the assessment (in line with both mandatory and voluntary sections of the Directive 2002/91/EC and Recast 2010, on the Energy Performance of Buildings) of all types of necessary energy flows for the intended heating, cooling, domestic hot water, ventilation, lighting and appliances of buildings. The calculation is crucially taking into account the effects of the interaction of energy flows between the elements of building structure and building systems.

OEx 18599 has been designed for:

- Domestic and Non-Domestic Buildings
- New Build and Existing

The OEx 18599 comprises 11 parts:

- Part 1: General Calculation Procedures, Definitions, Zoning and Rating of Fuel Sources
- Part 2: Net Energy Demand of Heating and Cooling Systems of Building Zones
- Part 3: Net Energy Demand of Ventilation Systems
- Part 4: Net and Final Energy Demand of Lighting Systems
- Part 5: Final Energy Demand of Heating Systems
- Part 6: Final Energy Demand of Ventilation Systems and Warm-Air Heating Systems for Domestic Buildings
- Part 7: Final Energy Demand of Ventilation and Air-conditioning Systems for Non-
- Domestic Buildings
- Part 8: Net and Final Energy Demand of Hot Water Systems
- Part 9: Final and Primary Energy Demand of Combined Heat Power Systems
- Part 10: Usage Boundary Conditions, Climate Data
- Part 11: Demand/Usage Alignment

Details of the calculation algorithm of OEx - 18599 are as follows:

- Calculation of the thermal characteristics of buildings (thermal envelope, internal walls, etc.) including airtightness
- Heating/cooling and hot water systems including its insulation characteristics
- Air conditioning systems
- Ventilation systems
- Lighting systems
- Climate/Weather data
    - General Analysis
    - Historic weather
    - 10 year average
    - 30 year average
    - Average minimum and maximum
    - Extremes
    - Current
    - Predictions with 2 deg or 4 deg increase
- User pattern of appliances
- Detailed appliances analysis and interaction
- Position and orientation of the building including external climate data
- Passive solar systems and shading facilities
- Uncontrolled manual ventilation
- Active solar systems and other systems for the provision of heat or electricity on the basis of renewable energy sources
- Combined heat power systems
- District heating and cooling
- Natural lighting
- User patterns for different types of buildings
- Single and multi zone calculation
- Hourly calculation basis of lighting system (multiple systems possible for each zone)
- Calculation of all greenhouse gases (CO2, CO, NOX, CXHY), and SO2
- Thermal mass
- Auxiliary energy usage